U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-454; 50-455
License Nos:	NPF-37; NPF-66
Report No:	50-454/455-99010(DRP)
Licensee:	Commonwealth Edison Company
Facility:	Byron Generating Station, Units 1 and 2
Location:	4450 N. German Church Road Byron, IL 61010
Dates:	June 22 - August 2, 1999
Inspectors:	E. Cobey, Senior Resident Inspector B. Kemker, Resident Inspector T. Tongue, Project Engineer, RIII C. Thompson, Illinois Department of Nuclear Safety
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EXECUTIVE SUMMARY

Byron Generating Station Units 1 and 2
NRC Inspection Report 50-454/99010(DRP); 50-455/99010(DRP)

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 6-week period of inspection activities by the resident staff and region based inspectors.

Operations

- Operations of the facility were conducted in a safe, professional, and controlled manner. Shift turnover briefings were performed well, heightened level of awareness briefings for high risk and infrequently performed evolutions were conducted well, and operators appropriately responded to control room annunciators. Operators generally adhered to the station's standards for control room conduct, procedural adherence, and use of three-way communications. (Section O1.1)

- On July 8, 1999, the licensee rendered the Unit 1B diesel generator inoperable for approximately 3 hours and 45 minutes, while the flood door to the 1B diesel oil storage tank room was left ajar and unattended. The inspectors determined that corrective actions taken by the licensee following a similar event in March 1999, when the Unit 1A diesel oil storage tank room flood door was found open and unattended, were not sufficient to preclude a recurrence. No violation of regulatory requirements occurred since the licensee restored the door to comply with the Technical Specification limiting condition for operation upon discovery and within the required completion time of the limiting condition for operation action statement. (Section O2.1)

Maintenance/Surveillance

- The installation of a jumper to bypass a potentially degraded cell on the Unit 2 train B safety-related 125 volt battery was performed well. Specifically, maintenance and engineering department personnel were knowledgeable of the tasks; compensatory actions commensurate with the risk significance of the activity were implemented; and, work was performed in accordance with station procedures for performing emergent work. (Section M1.1)

- Observed maintenance activities were conducted well. Maintenance personnel were knowledgeable of the tasks and professionally completed the work. In particular, maintenance associated with the replacement of a degraded cell in the Unit 2 train B safety-related 125 volt battery was planned and executed well. (Section M1.2)

- Post-maintenance testing assigned to replacement of the 2B auxiliary feedwater (AF) pump and the 0B essential service water make-up pump control power diodes was not adequate to demonstrate operability of the control circuit following the maintenance. Two examples of a Non-Cited Violation were issued. (Section M1.2)

- The licensee was not pro-active and had missed prior opportunities to identify multiple material condition deficiencies in the plant and had failed to enter those material condition deficiencies into the corrective maintenance program for repairs. (Section M2.1)

Engineering

- The licensee had clearly defined reliability and availability criteria for the safety-related 125 volt direct current system equipment as well as a reasonable definition of a functional failure. (Section E1.1.2)

- Surveillance test procedures reviewed for the safety-related 125 volt direct current system satisfied the requirements of the Technical Specifications. (Section E1.1.3)

- The inspectors concluded that the actual load magnitudes and durations for the safety-related 125 volt (V) direct current system loads were within the design capacity of the batteries as demonstrated by the results of service and modified performance testing. The inspectors also concluded that the licensee met design basis assumptions for the safety-related 125V direct current system contained in the Updated Final Safety Analysis Report and met applicable industry standards for maintenance, testing, and sizing of the batteries committed to in the Updated Final Safety Analysis Report with one minor exception. (Section E1.1.4)

- The operability assessments reviewed adequately justified continued operability of the affected structures, systems, and components. (Section E2.1)

Report Details

Summary of Plant Status

The licensee operated Unit 1 at or near full power until July 25, 1999, when the licensee reduced power level to approximately 25 percent power to replace a reactor coolant system loop flow transmitter. Following the maintenance activity, the licensee returned Unit 1 to full power and operated at or near full power for the remainder of the inspection period.

The licensee operated Unit 2 at or near full power until July 15, 1999, when the licensee reduced power level to approximately 90 percent power to repair a tube leak in a feedwater heater drain cooler. Following the repair on July 19, 1999, the licensee returned Unit 2 to full power and operated at or near full power for the remainder of the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 General Observations (71707)

During this inspection period, the inspectors routinely observed the conduct of plant operations from the control room. The inspectors noted that shift turnover briefings were performed well, heightened level of awareness briefings for high risk and infrequently performed evolutions were conducted well, and operators appropriately responded to control room annunciators. The inspectors also noted that operators generally adhered to the station's standards for control room conduct, procedural adherence, and use of three-way communications. The inspectors concluded that operations of the facility were conducted in a safe, professional, and controlled manner.

O2 Operational Status of Facilities and Equipment

O2.1 Failure to Control the Configuration of the Unit 1B Diesel Oil Storage Tank Room Flood Door Rendered the 1B Diesel Generator Inoperable

a. Inspection Scope (71707)

The inspectors reviewed the circumstances surrounding the licensee's failure to control the configuration of the Unit 1B diesel oil storage tank (DOST) room flood door, which inadvertently rendered the 1B diesel generator (DG) inoperable for approximately 3 hours and 45 minutes. The inspectors interviewed operations and security department personnel and reviewed applicable portions of the Technical Specifications (TS) and the Updated Final Safety Analysis Report (UFSAR).

b. Observations and Findings

On July 8, 1999, two maintenance department personnel en route to their work assignment found the flood door to the 1B DOST room ajar and unattended. The two maintenance department personnel closed the flood door and notified the shift manager. The licensee completed a prompt investigation which concluded that the 1B DOST room flood door was inadvertently left ajar and unattended by a security guard who had

performed routine security rounds in the DOST rooms. The licensee subsequently initiated a root cause evaluation for this event.

The inspectors reviewed UFSAR Section 10.4.5 and determined that during a design basis turbine building flooding event (rupture of a main condenser circulating water inlet line), the turbine building could be flooded to grade level. The UFSAR further states that the auxiliary building is completely watertight below grade at the turbine building/auxiliary building interface, except for the main steam tunnel. Watertight doors, as described in UFSAR Section 9.5.4.3, protect the DOST rooms, including the fuel oil transfer pumps located inside the rooms, from flooding in the turbine building. The ability of the fuel oil transfer system to transfer fuel oil from the DOST to the day tanks is required for DG operability. The doors are assumed to withstand a flood in the turbine building up to grade level. The inspectors concluded that the 1B DG was rendered inoperable for approximately 3 hours and 45 minutes, while the 1B DOST room flood door was left ajar and unattended.

The inspectors noted that a similar issue with the licensee's failure to control the configuration of the 1A DOST room north flood door was previously identified by the licensee in March 1999, and was entered into the licensee's corrective action program. The inspectors discussed this event in NRC Inspection Report 50-454/455-99003(DRP) and concluded that no violation of regulatory requirements had occurred since the licensee restored the door to comply with the TS limiting condition for operation (LCO) upon discovery and within the required completion time of the LCO action statement. The inspectors noted that corrective actions identified by the licensee following the 1A DOST event did not address potential human factors issues with the operation of the heavy water tight doors. The doors, due to their weight, design, and age do not close easily but are fully functional. Although no violations of regulatory requirements were identified, the inspectors were concerned that corrective actions taken by the licensee following the March 1999 event were not sufficient to preclude a recurrence. This issue is in the licensee's corrective action program as problem identification form (PIF) B1999-2496.

c. Conclusions

On July 8, 1999, the licensee rendered the Unit 1B diesel generator inoperable for approximately 3 hours and 45 minutes, while the flood door to the 1B diesel oil storage tank room was left ajar and unattended. The inspectors determined that corrective actions taken by the licensee following a similar event in March 1999, when the Unit 1A diesel oil storage tank room flood door was found open and unattended, were not sufficient to preclude a recurrence. No violation of regulatory requirements occurred since the licensee restored the door to comply with the TS LCO upon discovery and within the required completion time of the LCO action statement.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Safety-Related Battery Cell Jumper Installation

a. Inspection Scope (62707)

The inspectors observed the installation of a temporary modification to jumper a potentially degraded cell on the Unit 2 train B safety-related 125 volt (V) battery, reviewed the licensee's risk assessment for the activity, observed the heightened level of awareness and pre-job briefings, evaluated the licensee's compensatory actions, and performed a walkdown of redundant train equipment. The inspectors interviewed operations, maintenance, and engineering department personnel and reviewed applicable portions of the TS and the UFSAR. In addition, the inspectors reviewed the following documents: Work Request (WR) 990066982-01, "Charge, Replace, Jumper Battery 212 Low Cell 46"; Design Change Package (DCP) 9900202, "Bypass Battery Cell 46 on Battery 212"; and, Byron Engineering Surveillance Requirement (BVSR) Procedure DC-3, "Single Battery Cell Capacity Test Procedure," Revision 2.

b. Observations and Findings

On June 17, 1999, while performing a quarterly surveillance test on the Unit 2 train B safety-related 125V battery, the licensee identified that one of the cells did not satisfy the TS individual cell voltage limit which rendered the battery inoperable. As a result, the licensee placed the battery on an equalizing charge and entered the appropriate 2-hour TS action statement to restore the battery to an operable status. Approximately 2 hours and 5 minutes later, 5 minutes into the 6-hour TS action statement to place the unit in hot standby, the licensee verified that the cell voltage had been restored to within the TS individual cell voltage limit and exited the TS shutdown action statement.

Because the licensee was unable to determine the cause of the degraded cell voltage and could not ensure that the cell would not degrade further, the licensee decided to install a jumper to bypass the potentially degraded cell. The inspectors were initially concerned that the licensee chose to install the jumper that evening utilizing the emergent temporary modification process rather than waiting until: (1) the temporary modification package could be completed and approved; (2) the 2B diesel generator was returned to service following maintenance later that evening which would have provided greater reliability within the electrical distribution system; and, (3) the TS required battery surveillance test was completed and evaluated early the following morning, which would have provided an indication of the condition of the battery cell. The inspectors discussed the licensee's plan with station management and determined that the licensee had evaluated the potential risks associated with each of the available options. The licensee concluded that the most conservative approach was to immediately install the temporary modification to bypass the potentially degraded cell. The inspectors reviewed the licensee's on-line risk assessment for the activity and concluded that the licensee had fully evaluated the activity and had implemented compensatory actions commensurate with the risk significance of the activity.

The inspectors observed the heightened level of awareness and pre-job briefings for the activity and noted that the briefings were thorough, in that, the briefings included the

roles and responsibilities of participants, sequence of events, contingency actions, and testing to be performed. The inspectors walked down redundant train equipment and noted that the equipment was capable of performing its intended safety function. The inspectors reviewed the WR instructions and observed portions of the jumper installation. The inspectors noted that the work instructions were clear and easy to follow and that maintenance and engineering department personnel were knowledgeable of the tasks and completed the work professionally. The inspectors also noted that supervisors were present and provided an appropriate level of oversight for the evolution.

c. Conclusions

The installation of a jumper to bypass a potentially degraded cell on the Unit 2 train B safety-related 125 volt battery was performed well. Specifically, maintenance and engineering department personnel were knowledgeable of the tasks; compensatory actions commensurate with the risk significance of the activity were implemented; and, work was performed in accordance with station procedures for performing emergent work.

M1.2 Maintenance Observations

a. Inspection Scope (62707)

The inspectors interviewed operations, engineering, and maintenance department personnel and observed the performance of all or portions of the WR listed below. When applicable, the inspectors also reviewed portions of the TS and the UFSAR. In addition, the inspectors reviewed C&D Powercom Vendor Technical Manual RS-1476, "Standby Battery Vented Cell Installation and Operating Instructions," dated February 1997. Maintenance associated with the safety-related 125V battery, the auxiliary feedwater pump, the essential service water make-up pumps, and the diesel generators were selected for observation since they were identified as risk significant components in the Byron Station Individual Plant Examination.

- WR 980014849-01 Replace Body-to-Bonnet Gasket on Containment Spray System Eductor Test Valve 1CS-026A
- WR 980085893-01 Unit 2A Diesel Generator - Replace/Repair Leaking Cam Cover Gaskets RT 2, 3, 4, 5, and 7
- WR 980088392-01 Unit 2A Diesel Generator - Fuel Oil Leaking From 4L Jerk Pump at the Mating Surface
- WR 980100404-01 Calibrate Diesel Oil Storage Tank Ventilation Fan Pressure Switch 2PDS-VD048
- WR 980115794-01 Unit 2A Diesel Generator - Install Lube Oil Strainer Differential Pressure Switch
- WR 990020192-01 Replace Control Power Diodes CR13 and CR14 for 0B Essential Service Water Make-Up Pump
- WR 990020194-01 Replace Control Power Diodes CR13 and CR14 for 2B Auxiliary Feedwater Pump
- WR 990026618-01 Replace All Brass or Worn Stainless Steel Test Tap Fittings on 2A Diesel Generator Starting Air Compressors
- WR 990027314-01 Replace Lube Oil Pressure Gage 0PI-SX166A for 0A Essential Service Water Makeup Pump

- WR 990031996-01 Replace 1A Diesel Generator Fuel Oil Drain Line Due to Distorted Ovality
- WR 990067703-01 125 Volt DC [Direct Current] Battery 212 - Replace Cell 46 - Remove Temporary Alteration (Jumpered Cell)

b. Observations and Findings

Unit 2B Auxiliary Feedwater (AF) Pump Maintenance

The inspectors observed electrical maintenance personnel replace the 2B AF pump control power diodes and noted that the work was performed in accordance with the work instructions, that the work instructions were clear and easy to follow, and that the work request package had all of the appropriate documentation. The inspectors noted that post-maintenance test requirements were not included in the work request package. In response to the inspectors' questions, the licensee stated that at the time the work was completed there were no post-maintenance test requirements associated with the maintenance and that an operations supervisor assigned a post-maintenance operability run of the 2B AF pump as the post-maintenance test.

The inspectors reviewed the system design with engineering personnel and noted that the two control power diodes were installed in parallel and that both diodes were required to function to assure operability of the pump. The inspectors noted that there were two battery banks for the pump, one of which was selected to start the diesel engine and the other battery bank provided control power. The inspectors determined that a failed or incorrectly installed diode could have been masked during the post-maintenance operability test. The inspectors noted that the diodes were each tested in the shop prior to installation to ensure that they functioned properly and maintenance personnel used appropriate verification practices to ensure that the diodes were correctly installed. However, the single post-maintenance operability run of the pump was not adequate to demonstrate operability of both parallel paths of the circuit. The licensee subsequently started the pump on each battery bank as part of their periodic surveillance testing program which acceptably tested both circuit paths.

Code of Federal Regulations Title 10 Part 50, Appendix B, Criteria XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The failure to adequately test the 2B AF pump's control circuit following maintenance to demonstrate that the pump would perform satisfactorily in service is an example of a violation of 10 CFR Part 50, Appendix B, Criteria XI. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/455/99010-01a(DRP)). This issue is in the licensee's corrective action program as PIF B1999-2279.

The inspectors reviewed the licensee's apparent cause evaluation (ACE) for this issue, which concluded that the functional run of the diesel driven pump tested the functionality of the entire circuit (both diodes). The ACE further concluded that no corrective actions were required. The inspectors did not concur with the licensee's conclusion and addressed the results of the ACE with station management. In response to the inspectors' questions, the licensee subsequently initiated work requests to functionally

test each diode in the parallel circuit and modified the ACE to correctly characterize the issue.

Unit 0B Essential Service Water (SX) Make-Up Pump Maintenance

The inspectors reviewed the WR instructions for replacement of the 0B SX make-up pump control power diodes. The inspectors noted that the 0B SX make-up pump maintenance was performed approximately 4 weeks following the inspectors' identification of the inadequate testing of the 2B AF pump's control circuit. Since this maintenance evolution was essentially identical to the 2B AF pump control power diode replacements, the inspectors reviewed the post-maintenance testing to determine if the licensee had translated corrective actions from the 2B AF pump activity to the 0B SX make-up pump activity. In response to the inspectors' questions, the licensee stated that a post-maintenance operability run of the 0B SX make-up pump was performed as the post-maintenance test. The inspectors determined that corrective actions from the 2B AF pump issue were not translated to the 0B SX make-up pump activity. The inspectors were concerned that the licensee had not considered the broader (generic) implications for testing of similar circuits until prompted by the inspectors following the maintenance. As with the 2B AF pump, the diodes were each tested in the shop prior to installation to ensure that they functioned properly and maintenance personnel used appropriate verification practices to ensure that the diodes were correctly installed. The licensee subsequently initiated work requests to functionally test each diode in the parallel circuit.

Code of Federal Regulations Title 10 Part 50, Appendix B, Criteria XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The failure to adequately test the 0B SX make-up pump's control circuit following maintenance to demonstrate that the pump would perform satisfactorily in service is a second example of a violation of 10 CFR Part 50, Appendix B, Criteria XI. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/455/99010-01b(DRP)). This issue is in the licensee's corrective action program as PIF B1999-2742.

Safety-Related 125V Battery Cell Replacement

The inspectors observed electrical maintenance personnel replace a degraded cell in the Unit 2 train B safety-related 125 volt battery. This maintenance evolution had not previously been performed at Byron Station with the unit on-line and required the licensee to enter a 2-hour TS action statement to restore the battery to an operable status. As with the cell jumpering activity discussed in Section M1.1, the inspectors reviewed the licensee's planning, preparation, and execution of this risk significant maintenance evolution. The inspectors noted that the licensee's use of a mock-up of the battery room to walk-through rigging the installed and replacement battery cells contributed to the successful completion of the actual work within the 2-hour TS action statement. The inspectors noted that the work was performed in accordance with the work instructions, that the work instructions were clear and easy to follow, and that the work request package had all of the appropriate documentation.

The inspectors reviewed the WR and identified that the wrong torque value was used for the inter-cell connectors on the replacement cell. The work instructions specified a torque value of 100 - 110 inch-pounds (in-lbs.) and the actual torque documented in the WR for the inter-cell connectors was 105 in-lbs. The inspectors reviewed the vendor's technical manual for the C&D battery and noted that the vendor specified an initial installation torque of 110 - 120 in-lbs. for inter-cell connectors. In response to the inspectors' finding, the licensee initiated an action tracking item to re-torque the inter-cell connectors for the replacement cell to 110 - 120 in-lbs. The inspectors concurred with the licensee's conclusion that the battery remained operable since inter-cell resistance readings were acceptable. Since the incorrect torque value did not result in degradation of the inter-cell connections, the inspectors concluded that the error had minimal safety significance. This issue is in the licensee's corrective action program as Action Tracking Item 990039265.

c. Conclusions

Observed maintenance activities were conducted well. Maintenance personnel were knowledgeable of the tasks and professionally completed the work. In particular, maintenance associated with the replacement of a degraded cell in the Unit 2 train B safety-related 125 volt battery was planned and executed well.

Post-maintenance testing assigned to replacement of the 2B auxiliary feedwater (AF) pump and the 0B essential service water make-up pump control power diodes was not adequate to demonstrate operability of the control circuit following the maintenance. Two examples of a Non-Cited Violation were issued.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Material Condition Deficiencies Not Entered Into Corrective Maintenance Program

a. Inspection Scope (62707)

The inspectors routinely evaluated the material condition of plant equipment during plant tours and interviewed operations, maintenance, and radiological protection department personnel.

b. Observations and Findings

The inspectors evaluated the material condition of plant equipment during routine tours and identified several deficiencies that had not been previously identified by the licensee and not entered into the licensee's corrective maintenance program. The deficiencies included: (1) boric acid build-up on numerous emergency core cooling system (ECCS) manual high point vent valves in ECCS pump rooms and containment penetration areas; (2) boric acid build-up on several manual valves in the Unit 1 and Unit 2 demineralizer valve aisles; (3) boric acid build-up on an auxiliary building drain system manual valve and two flanged piping connections in the 0B auxiliary equipment drain tank room; (4) boric acid build-up on a radioactive waste disposal system manual valve in the Unit 2 containment penetration area; and, (5) boric acid build-up on a flanged connection to the Unit 2 refueling water storage tank heater pump.

In response to the inspectors' identification of the above material condition deficiencies, the licensee generated action requests to enter the deficiencies into the licensee's corrective maintenance program. The inspectors were concerned that the licensee was not pro-active and had missed prior opportunities to identify these material condition deficiencies. Many of the valves and flanged piping connections had radiological leak catch basins installed under them by radiological protection personnel; however, the deficiencies were not entered into the licensee's corrective maintenance program for repairs. The above material condition deficiencies were easily accessible and the presence of solidified boric acid build-up provided evidence that the deficiencies had existed for at least several weeks. Although the safety consequences of these deficiencies were minor, if left uncorrected, these problems could potentially impact the ability of the systems to perform their required function.

c. Conclusions

The licensee was not pro-active and had missed prior opportunities to identify multiple material condition deficiencies in the plant and had failed to enter those material condition deficiencies into the corrective maintenance program for repairs.

M8 Miscellaneous Maintenance Issues (92700)

M8.1 (Closed) Licensee Event Report (LER) 50-454/98001: "Failure to Test ESF [Engineered Safety Features] Logic Circuit Due to Oversight by Initial Technical Specification Reviewers." During a review of Generic Letter 96-01, "Testing of Safety-Related Logic Circuits," the licensee determined that existing Engineered Safety Features Actuation System (ESFAS) surveillance testing was inadequate because it did not test that contacts could energize the safeguards actuation relays for the ESFAS while a Unit 1 (or Unit 2) ESF bus was cross-tied to a Unit 2 (or Unit 1) bus for station auxiliary transformer (SAT) power. The contacts were not associated with the normal off-site circuit configuration to an ESF bus, but were associated with a reserve configuration. The normal configuration provided off-site power to each ESF bus from its dedicated SAT. The reserve configuration provided off-site power from the opposite unit's SATs. Contacts associated with the normal configuration were tested as required by the TS on a quarterly basis. The licensee subsequently added new testing criteria to the ESFAS surveillance testing procedures and successfully completed testing of the contacts. The licensee reported this event as a condition prohibited by the plant's TS in accordance with 10 CFR 50.73(a)(2)(i)(b).

The licensee's failure to adequately test the ESFAS logic circuits during cross-tie evolutions is considered to be a violation of TS 4.3.2.1, which was applicable at the time this LER was written. This failure constitutes a violation of minor significance and is not subject to formal enforcement action. Although the licensee's testing of the ESFAS circuitry was not in accordance with the TS, the inspectors concluded that actions taken both immediate and long term sufficiently demonstrated ESFAS operability as well as an appropriate focus on safety. The inspectors reviewed the licensee's corrective actions for this event and found them to be acceptable. This LER is closed.

III. Engineering

E1 Conduct of Engineering

E1.1 Safety-Related 125 Volt (V) Direct Current (DC) System Design Review

The inspectors performed a detailed design review of the safety-related 125V DC system. The inspectors performed a system walkdown; reviewed the system's performance with respect to the Maintenance Rule; reviewed applicable portions of the UFSAR and TS; reviewed applicable TS surveillance test procedures; and, reviewed applicable industry standards and design basis documents. Listed below are the results of this review.

E1.1.1 Walkdown of the Safety-Related 125V DC Battery Rooms and Electrical Equipment Areas (71707)

As part of the inspectors' evaluation of the safety-related 125V DC system, the inspectors walked down the battery rooms and the electrical equipment areas which contained the battery chargers, inverters, and switchgear to assess the material condition of the equipment. The inspectors concluded that material condition of the safety-related 125 volt direct current system equipment was acceptable. Equipment areas were well maintained and equipment functioned properly.

E1.1.2 Review of Safety-Related 125V DC System Maintenance Rule Performance (62707)

The inspectors reviewed the status of the safety-related 125V DC system with respect to the maintenance rule requirements contained in 10 CFR 50.65. The inspectors noted that the safety-related 125V DC system met all of the 10 CFR 50.65 paragraph (a) (2) reliability performance criteria and that one functional failure had been identified. The functional failure was a degraded cell in the Unit 2 train B safety-related 125 volt battery which affected the operability of the battery. The failure did not result in exceeding the reliability criteria for the system, which allowed less than or equal to one functional failure of a DC bus or battery for the station every two years. A new battery had been installed in May 1998 and the cell failure was unexpected. The cell was replaced and the battery restored to full capability. The inspectors concluded that the licensee had clearly defined reliability and availability criteria as well as a reasonable definition of a functional failure.

E1.1.3 Review of Safety-Related 125V DC System Surveillance Test Procedures

a. Inspection Scope (37551, 61726)

The inspectors interviewed engineering department personnel; reviewed applicable portions of the UFSAR and TS; and, reviewed the surveillance test procedures listed below to verify compliance with the TS surveillance requirements. In addition, the inspectors reviewed C&D Powercom Vendor Technical Manual RS-1476, "Standby Battery Vented Cell Installation and Operating Instructions," dated February 1997.

- 1BHSR 8.4-2 125 Volt Battery Bank 18 Month Surveillance, Revision 2
- 1BHSR 8.6-1 125 Volt Battery Bank Quarterly Surveillance, Revision 1

- 1BOSR 8.4-1 — 125V DC Bus 111 Load Shed When Cross-Tied to DC Bus 211, Revision 1
- 1BOSR 8.4-2 — 125V DC Bus 112 Load Shed When Cross-Tied to DC Bus 212, Revision 1
- 1BOSR 8.6.1-1 — 125V DC ESF [Engineered Safety Feature] Battery Bank and Charger 111 Operability Weekly Surveillance, Revision 2
- 1BOSR 8.6.1-2 — 125V DC ESF Battery Bank and Charger 112 Operability Weekly Surveillance, Revision 2
- 1BVSR 8.4.6-1 — Bus 111 125V Battery Charger Operability, Revision 2
- 1BVSR 8.4.6-2 — Bus 112 125V Battery Charger Operability, Revision 2
- 1BVSR 8.4.7-1 — 125 Volt Battery Bank 111 Service Test, Revision 1
- 1BVSR 8.4.7-2 — 125 Volt Battery Bank 112 Service Test, Revision 1
- 1BVSR 8.4.8-1 — Battery 111 125 Volt Battery Bank 5 Year Modified Performance Test, Revision 2
- 1BVSR 8.4.8-2 — Battery 112 125 Volt Battery Bank 5 Year Modified Performance Test, Revision 2
- 2BHSR 8.4-2 — 125 Volt Battery Bank 18 Month Surveillance, Revision 2
- 2BHSR 8.6-1 — 125 Volt Battery Bank Quarterly Surveillance, Revision 1
- 2BOSR 8.4-1 — 125V DC Bus 211 Load Shed When Cross-Tied to DC Bus 111, Revision 1
- 2BOSR 8.4-2 — 125V DC Bus 212 Load Shed When Cross-Tied to DC Bus 112, Revision 1
- 2BOSR 8.6.1-1 — 125V DC ESF Battery Bank and Charger 211 Operability Weekly Surveillance, Revision 2
- 2BOSR 8.6.1-2 — 125V DC ESF Battery Bank and Charger 212 Operability Weekly Surveillance, Revision 2
- 2BVSR 8.4.6-1 — Bus 211 125V Battery Charger Operability, Revision 1
- 2BVSR 8.4.6-2 — Bus 212 125V Battery Charger Operability, Revision 1
- 2BVSR 8.4.7-1 — 125 Volt Battery Bank 211 Service Test, Revision 1
- 2BVSR 8.4.7-2 — 125 Volt Battery Bank 212 Service Test, Revision 1
- 2BVSR 8.4.8-1 — Battery 211 125 Volt Battery Bank 5 Year Capacity Test, Revision 2
- 2BVSR 8.4.8-2 — Battery 212 125 Volt Battery Bank 5 Year Capacity Test, Revision 2

b. Observations and Findings

The inspectors reviewed a selection of the most recently completed surveillance test procedures and found that the performance of each procedure satisfied the requirements of the TS. The inspectors identified a minor deficiency with one of the procedures which is discussed below.

125 Volt Battery Bank Quarterly Surveillance

The surveillance test was performed, in part, to meet TS surveillance requirement SR 3.8.4.2 which required the licensee to verify no visible corrosion at battery terminals and connectors or verify battery connection resistance to be less than or equal to 150 microhms for inter-cell, inter-rack, inter-tier, and terminal connections. The inspectors noted that the procedure, in a note prior to Step F.11, only addressed the performance of resistance measurements if any terminal or connection showed signs of

corrosion. However, the procedure did not tell electrical maintenance personnel how to perform the resistance measurements. The inspectors identified that the note incorrectly stated to subtract 400 microhms to account for cross-room (inter-rack) connections rather than perform an actual measurement of the inter-rack resistance. In response to the inspectors' findings, the licensee concurred that the procedure should be revised to provide more detailed resistance measurement instructions and to delete the incorrect 400 microhms reference. The inspectors determined that subtracting 400 microhms rather than performing an actual measurement of the inter-rack resistance would result in a non-conservative result; however, sufficient margin existed in the battery design to off-set the worst case error. This issue is in the licensee's corrective action program as Action Tracking Item 00013598.

c. Conclusions

The inspectors concluded that surveillance test procedures reviewed for the safety-related 125 volt direct current system satisfied the requirements of the TSs.

E1.1.4 Review of Selected Industry Standards and Design Basis Documents

a. Inspection Scope (37551)

The inspectors reviewed the following documents: Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications"; IEEE Standard 485-1983, "IEEE Recommended Practice Sizing Large Lead Storage Batteries for Generating Stations and Substations"; Nuclear Design Information Transmittal (NDIT) BYR-99-017, "Transmittal of the Byron Unit 1, 125V DC Safety Related Load Tabulation (C&D Batteries)," dated February 1, 1999; NDIT BYR-98-130, "Transmittal of the Byron Unit 2, 125V DC Safety Related Load Tabulation (C&D Batteries)," dated April 7, 1998; NDIT BYR-99-155, "Transmittal of the Byron Worst Case 125V DC Safety Related Load Profile (C&D Batteries)," dated June 18, 1999; and, NDIT BYR-97-525-01, "Transmittal of Verification of Byron 125V DC Battery Room 111, 112, 211, and 212 Ventilation Requirements and Hydrogen Concentration Evaluation Following a Loss of Battery Room Ventilation," dated May 26, 1998. In addition, the inspectors reviewed applicable portions of the UFSAR and TS.

b. Observations and Findings

The inspectors reviewed the load tabulations and worst case load profile for the safety-related 125V DC batteries and determined that the actual load magnitudes and durations for the DC system loads were within the design capacity of the batteries as demonstrated by the results of service and modified performance testing. The inspectors also reviewed the recommendations of applicable industry standards, design basis assumptions contained in the UFSAR, and licensee commitments stated in the UFSAR to regulatory guides and industry standards and determined that the licensee met those applicable industry standards and commitments except as noted below.

The inspectors reviewed UFSAR Appendix A and noted that it stated that the licensee complies with Revision 1 of Regulatory Guide 1.129 as described in the TS for the C&D batteries except that the licensee performs a modified performance discharge test, as described in IEEE Standard 450-1995. The inspectors reviewed Revision 1 of

Regulatory Guide 1.129 and noted that it endorsed IEEE Standard 450-1975. The inspectors also noted that UFSAR Section 8.3.2.1.1 stated that the time schedule for performing inspections, measurements, and tests is established in accordance with the requirements of IEEE Standard 450-1980. However, based upon discussions with the licensee, the inspectors determined that the licensee currently utilizes IEEE Standard 450-1995 exclusively, contrary to the UFSAR. In response to the inspectors' findings, the licensee concurred that the UFSAR should be revised to reflect the commitment changes to IEEE Standard 450-1995. This issue is in the licensee's corrective action program as Action Tracking Item 00013597.

c. Conclusions

The inspectors concluded that the actual load magnitudes and durations for the safety-related 125 volt (V) direct current (DC) system loads were within the design capacity of the batteries as demonstrated by the results of service and modified performance testing. The inspectors also concluded that the licensee met design basis assumptions for the safety-related 125V DC system contained in the UFSAR and met applicable industry standards for maintenance, testing, and sizing of the batteries committed to in the UFSAR with one minor exception.

E2 Engineering Support of Facilities and Equipment

E2.1 Operability Assessments

a. Inspection Scope (37551)

The inspectors interviewed operations and engineering department personnel, reviewed applicable portions of the UFSAR and TS, and evaluated the following operability assessments.

- 99-017 Missing U-Bolt on 2B Auxiliary Feedwater Pump Auxiliary Lube Oil Pump Discharge Line
- 99-018 Broken U-Bolt on 1B Diesel Generator Starting Air Receiver Drain Line
- 99-019 Large Break Loss of Coolant Accident Computer Code Logic Error Affect on Peak Cladding Temperature Criterion
- 99-020 Fuel Assembly Top Nozzle Spring Screw Potential Failures
- 99-021 1B Steam Generator Power-Operated Relief Valve Response

c. Conclusions

The operability assessments reviewed adequately justified continued operability of the affected structures, systems, and components.

E8 Miscellaneous Engineering Issues (92700)

E8.1 (Closed) LER 50-454/98020: "Analysis Error in the Boron Dilution [BDPS] Protection System Code." The licensee identified on November 18, 1998, that the BDPS may be incapable of performing its intended safety function within the acceptance criteria of the boron dilution design basis analysis. This was due to an error in the Westinghouse boron dilution analysis computer code used specifically for Byron and Braidwood Stations to evaluate the boron dilution event. Additional analysis by Westinghouse showed that the acceptance criteria times were not being met and that the actuation of BDPS in response to an inadvertent dilution event with Unit 1 and Unit 2 in modes 3, 4, and 5 would not prevent criticality. The licensee reported this issue as a condition that alone could have prevented the fulfillment of a safety function needed to maintain the reactor in a safe shutdown condition in accordance with 10 CFR 50.73(a)(2)(v). The licensee also reported this issue in accordance with 10 CFR Part 21. In response to this event, the licensee declared the BDPS inoperable and completed the actions required of TS 3.1.2.7 for two trains of BDPS inoperable with either unit in modes 3, 4, and 5. As long term corrective actions, the licensee intends to replace the BDPS function with monitoring of the volume control tank and appropriate operator actions. These actions will require a license amendment. The inspectors concurred with the licensee's conclusion that this event was not safety significant, in that the BDPS was still capable of limiting the consequences of an inadvertent criticality event.

Technical Specification 3.1.2.7, which was applicable at the time this LER was written, required two trains of the BDPS to be operable in modes 3, 4, and 5. Prior to November 18, 1998, both Unit 1 and Unit 2 had operated in an operational mode requiring two trains of the BDPS to be operable. This failure constitutes a violation of minor significance and is not subject to formal enforcement action. This issue is in the licensee's corrective program as PIF 1998-4927. This LER is closed.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls (71750)

During routine resident inspection activities, observations were conducted in the area of radiation protection and chemistry. No discrepancies were noted.

P1 Conduct of Emergency Preparedness Activities (71750)

During routine resident inspection activities, observations were conducted in the area of emergency preparedness. On July 28, 1999, the inspectors observed portions of an emergency exercise drill from the Technical Support Center and the operations simulator. No discrepancies were noted.

S1 Conduct of Security and Safeguards Activities (71750)

During routine resident inspection activities, observations were conducted in the area of security and safeguards. No discrepancies were noted.

F1 Control of Fire Protection Activities (71750)

During routine resident inspection activities, observations were conducted in the area of fire protection. No discrepancies were noted.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management at the conclusion of the inspection on August 2, 1999. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

B. Adams, Regulatory Assurance Manager
M. Jurmain, Maintenance Manager
B. Kouba, Engineering Manager
J. Kramer, Work Control Manager
S. Kuczynski, Nuclear Oversight Manager
W. Levis, Site Vice President
R. Lopriore, Station Manager
W. McNeill, Radiation Protection Manager
M. Snow, Operations Manager

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observations
IP 62707:	Maintenance Observations
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 92700:	Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-454/455-99010-01a	NCV	Failure to adequately test 2B auxiliary feedwater pump control circuit following maintenance
50-454/455-99010-01b	NCV	Failure to adequately test 0B essential service water make-up pump control circuit following maintenance

Closed

50-454/455-99010-01a	NCV	Failure to adequately test 2B auxiliary feedwater pump control circuit following maintenance
50-454/455-99010-01b	NCV	Failure to adequately test 0B essential service water make-up pump control circuit following maintenance
50-454/98001	LER	Failure to test ESF [engineered safety features] logic circuit due to oversight by initial TS reviewers
50-454/98020	LER	Analysis error in the boron dilution [BDPS] protection system code

Discussed

None

LIST OF ACRONYMS USED

ACE	Apparent Cause Evaluation
AF	Auxiliary Feedwater
BDPS	Boron Dilution Protection System
BHSR	Byron Maintenance Electrical Surveillance Requirement
BOSR	Byron Operating Surveillance Requirement
BVSR	Byron Engineering Surveillance Requirement
CFR	Code of Federal Regulations
DC	Direct Current
DCP	Design Change Package
DG	Diesel Generator
DOST	Diesel Oil Storage Tank
DRP	Division of Reactor Projects
ECCS	Emergency Core Cooling System
ESF	Engineered Safety Feature
ESFAS	Engineered Safety Feature Actuation Signal
IEEE	Institute of Electrical and Electronics Engineers
IN-LBS.	Inch-Pounds
LCO	Limiting Condition for Operation
LER	Licensee Event Report
NDIT	Nuclear Design Information Transmittal
NRC	Nuclear Regulatory Commission
PIF	Problem Identification Form
SAT	Station Auxiliary Transformer
SX	Essential Service Water
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
V	Volt
WR	Work Request