U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report No:	50-454/455-99004(DRP)
Licensee:	Commonwealth Edison Company
Facility:	Byron Generating Station, Units 1 and 2
Location:	4450 N. German Church Road Byron, IL 61010
Dates:	March 30 - May 10, 1999
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EXECUTIVE SUMMARY

Byron Generating Station Units 1 and 2
NRC Inspection Report 50-454/99004(DRP); 50-455/99004(DRP)

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

Operations

- The inspectors concluded that operations of the facility were conducted in a safe, professional, and controlled manner. Operators generally adhered to the station's standards for control room conduct, procedural adherence, annunciator response, and use of three-way communications. The inspectors concluded that the licensee's response to a tube leak on the 21A drain cooler was excellent. The licensee appropriately assessed and controlled plant conditions to effect repairs and return Unit 2 to full power. (Section O1.1)

- The inspectors concluded that the Unit 1 reactor startup following refueling outage B1R09 was conducted in a safe and controlled manner. Specifically, just-in-time simulator training was performed in preparation for the startup, the heightened level of awareness briefing was performed well, startup and physics testing procedures were followed, proper three-way communication techniques were used, peer and self-checks were performed, and reactivity manipulations were precisely controlled. The inspectors concluded that operators demonstrated a good safety focus while addressing emergent problems in that operators promptly identified the unexpected conditions, stabilized plant conditions, approached the problems by identifying conservative corrective actions, and implemented those actions in accordance with approved procedures. The inspectors also concluded that supervisors demonstrated good command and control, directly supervised reactivity manipulations, and provided effective oversight of the startup activities. (Section O1.2)

- The inspectors concluded that the licensee's response to the failure of the Unit 1 refueling machine hoist with an irradiated fuel assembly suspended from the machine's grapple was excellent. The licensee controlled and accomplished the task of lowering the fuel assembly to a designated core location in accordance with approved procedures and with a proper focus on safety. The inspectors also concluded that the 10 CFR 50.59 safety evaluation, which was approved by the Plant Operations Review Committee to lower the suspended fuel assembly, failed to address the licensing basis for movements of heavy loads over the reactor vessel as it pertained to the evolution; failed to address the effects of bypassing refueling machine interlocks described in the Updated Final Safety Analysis Report (UFSAR); and, failed to identify temporary changes to words in the UFSAR. A Non-Cited Violation was issued. (Section O1.3)

- The inspectors concluded that observed fuel handling evolutions were performed well and in accordance with the requirements of the Technical Specifications and station fuel handling procedures. Core alterations were strictly controlled and appropriate accountability measures were followed. (Section O1.4)

- The inspectors concluded that the licensee failed to perform an adequate technical review for the out-of-service of essential service water return header cross-connect valve (1SX011) during maintenance work to rebuild the valve's actuator. Consequently, the valve was taken out-of-service in the "open" position for the maintenance work rather than in the "closed" position as specified in Design Change Procedure 9800239. A Non-Cited Violation was issued. (Section O2.1)

- The inspectors concluded that the licensee failed to control the configuration of the engineered safety features (ESF) switchgear ventilation system consistent with the design basis description in the Updated Final Safety Analysis Report (UFSAR) and that the system failure analysis described in the UFSAR was not consistent with the actual failure response of the system. Furthermore, the inspectors concluded that by not monitoring the temperature of the essential service water cooling tower electric substations, the licensee did not appropriately monitor temperatures of ESF switchgear ventilation system areas consistent with Technical Requirements Manual surveillance requirement 3.7.d.1. A Non-Cited Violation was issued. (Section O2.2)

- The inspectors concluded that the licensee failed to control the configuration of the residual heat removal system during emergency core cooling system full flow testing, which resulted in operation of the Unit 1A safety injection pump with an inadequate suction to the pump. (Section O2.3)

- The inspectors concluded that three out-of-service errors resulted in operational events during the four week B1R09 refueling outage, which was an improvement from the B2R07 outage period when nine out-of-service errors resulted in operational events. The inspectors concluded that three recent out-of-service errors had similar weaknesses previously identified by the inspectors during the previous refueling outage (B2R07) and discussed in NRC Inspection Report 50-454/455-98011(DRP). A Non-Cited Violation was issued. (Section O2.4)

Maintenance/Surveillance

- The inspectors concluded that observed maintenance work on the 1A reactor coolant system cold leg loop stop isolation valve was generally performed well; maintenance personnel were knowledgeable of the associated activities; and, work was performed in accordance with station procedures with one notable exception. The inspectors concluded that the licensee failed to complete a final cleanliness inspection quality control hold point prior to re-assembly of the valve which resulted in foreign material left in the reactor coolant system following the maintenance. A Non-Cited Violation was issued. (Section M1.1)

- The inspectors concluded that the observed surveillance tests were performed well and satisfied the requirements of the Technical Specifications. The inspectors identified that a step in the Unit 1 motor driven auxiliary feedwater pump monthly surveillance test procedure incorrectly stated that the procedure met surveillance test requirements that it did not meet; however, the inspectors concluded that those requirements were met by other surveillance test procedures. (Section M1.2)

- The inspectors concluded that material condition in the Unit 1 containment building prior to entry into mode 3 (hot shutdown) was good and that loose items identified by the inspectors posed no significant risk to emergency core cooling system operability. (Section M2.1)

- The inspectors concurred with the licensee's conclusion that multiple human performance deficiencies were the cause for electrical maintenance personnel installing an electrical jumper on the wrong relay while performing surveillance testing on the 1B emergency diesel generator. This caused an inadvertent trip of the common component cooling water pump. Although this event had minimal safety impact, the inspectors were concerned that the licensee's corrective actions for similar previous human performance errors have not been totally effective at preventing their recurrence. (Section M4.1)

- The inspectors concluded that mechanical maintenance personnel adjusted the stem packing on the 1B main steam isolation valve (MSIV) without approved work instructions and operations department authorization for the activity, which rendered the valve inoperable. The inspectors concluded that operators took appropriate actions to promptly address the operability of the 1B MSIV and correctly implemented the required actions of the Technical Specifications. A Non-Cited Violation was issued. (Section M4.2)

Plant Support

- The inspectors concluded that radiologically controlled areas were properly posted and radiation workers demonstrated proper work practices to control the spread of contamination. The inspectors concluded that As-Low-As-Reasonably-Achievable principles were effectively utilized to minimize dose during the Unit 1 refueling outage. (Section R1.1)

Report Details

Summary of Plant Status

At the start of the inspection period, Unit 1 was shutdown for refueling outage B1R09. Following completion of the refueling outage, the licensee synchronized the unit to the grid on April 25, 1999, and the unit was operated at or near full power until the end of the inspection period.

The licensee operated Unit 2 at or near full power for the duration of the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 General Observations

a. Inspection Scope (71707)

During this inspection period, the inspectors routinely observed the conduct of plant operations, with particular emphasis on Unit 1 refueling outage activities. The inspectors also monitored the licensee's actions related to the reduction of Unit 2 power for repair of the 21A heater drain cooler. The inspectors reviewed the Limiting Conditions for Operation Action Requirements (LCOARs) during the Unit 1 refueling outage activities since this was the first outage since ITS implementation.

b. Observations and Findings

The inspectors noted that operators generally adhered to the station's standards for control room conduct, procedural adherence, annunciator response, and use of three-way communications.

On April 2, 1999, the licensee reduced Unit 2 power level to 875 megawatts electric in response to a tube leak on the 21A heater drain cooler. The inspectors noted that the repair effort while on-line was complex and required the use of a line stop to isolate the affected low pressure heater. The heater drain cooler's leak was repaired and Unit 2 was returned to full power on April 6, 1999. The licensee appropriately assessed and controlled plant conditions to effect repairs and return the unit to full power.

On February 5, 1999, the licensee implemented Amendment No. 106 to the station's Technical Specifications (TS). The amendment reflected the full conversion of the licensee's TS to a set of Improved Technical Specifications (ITS) based on NUREG-1431, "Standard Technical Specifications -- Westinghouse Plants," Revision 1, dated April 1995. The licensee identified that on April 22, 1999, the requirements of TS 3.3.2 were not met with Unit 1 in mode 3 (hot standby) during reactor trip breaker testing, which resulted in entry into TS 3.0.3. The inspectors noted that prior to ITS implementation, TS 3.3.2 was applicable only in modes 1 and 2. The inspectors concurred with the licensee in that this event was not safety significant and that except for this single event, the requirements of the TS were satisfied during the outage.

c. Conclusions

The inspectors concluded that operations of the facility were conducted in a safe, professional, and controlled manner. Operators generally adhered to the station's standards for control room conduct, procedural adherence, annunciator response, and use of three-way communications. The inspectors concluded that the licensee's response to a tube leak on the 21A drain cooler was excellent. The licensee appropriately assessed and controlled plant conditions to effect repairs and return Unit 2 to full power.

O1.2 Unit 1 Startup Following Refueling Outage B1R09

a. Inspection Scope (71707)

The inspectors observed the startup of Unit 1 following refueling outage B1R09. The inspectors interviewed operations department personnel, observed the licensee's pre-evolution briefings and startup activities, and reviewed the following procedures: Byron General Operating Procedure (1BGP) 100-1, "Plant Heatup," Revision 31; 1BGP 100-2, "Plant Startup," Revision 23; 1BGP 100-2A1, "Reactor Startup" Revision 15; 1BGP 100-3, "Power Ascension," Revision 27; and Byron Engineering Surveillance Requirement (BVSR) Procedure XPT-23, "Unit 1 Low Power Physics Test Program with the Westinghouse ADRC [Advanced Digital Reactivity Computer]," Revision 1.

b. Observations and Findings

On April 24, 1999, the inspectors observed the heightened level of awareness briefing for the Unit 1 startup and noted that all necessary personnel were in attendance. The inspectors noted that the briefing contained a sufficient level of detail to properly perform the startup. The inspectors also noted that in preparation for the startup, operations and nuclear engineering department personnel had received just-in-time simulator training.

The inspectors observed the operators performing startup activities in the control room, noting that procedures were followed, proper three-way communication techniques were used, and peer and self-checks were performed. The inspectors noted that reactivity manipulations associated with reactor criticality, physics testing, and power ascension were precisely controlled, were directly supervised by a senior reactor operator, and were clearly communicated to the unit supervisor and nuclear engineers.

The inspectors noted that operators were required to stop the startup on several occasions when challenged by equipment problems. Operators promptly identified the equipment problems and stabilized plant conditions. Conservative corrective actions were identified and implemented in accordance with approved procedures. Personnel were reminded to take the time necessary to implement corrective actions safely and correctly.

The inspectors noted that the unit supervisor demonstrated good command and control. The unit supervisor remained in the "at-the-controls" area of the control room and appeared to maintain an overall control room perspective. Additionally, the inspectors observed the presence of senior management in the control room during performance of the startup.

c. Conclusions

The inspectors concluded that the Unit 1 reactor startup following refueling outage B1R09 was conducted in a safe and controlled manner. Specifically, just-in-time simulator training was performed in preparation for the startup, the heightened level of awareness briefing was performed well, startup and physics testing procedures were followed, proper three-way communication techniques were used, peer and self-checks were performed, and reactivity manipulations were precisely controlled. The inspectors concluded that operators demonstrated a good safety focus while addressing emergent problems in that operators promptly identified equipment problems and stabilized plant conditions. Conservative corrective actions were identified and implemented in accordance with approved procedures. The inspectors also concluded that supervisors demonstrated good command and control, directly supervised reactivity manipulations, and provided effective oversight of the startup activities.

O1.3 Failure of Unit 1 Refueling Machine With a Suspended Fuel Assembly

a. Inspection Scope (71707)

The inspectors observed the licensee's response to the failure of the Unit 1 refueling machine hoist with an irradiated fuel assembly suspended from the machine's grapple. The inspectors also observed Plant Operations Review Committee (PORC) Meeting 99-38. The inspectors interviewed operations, maintenance, nuclear oversight, and engineering department personnel and reviewed the following procedures: Work Request (WR) 990033818, "Unit 1 Manipulator Crane Will Not Move in Upward Direction;" Special Procedure (SPP) 99-021, "Lower Stuck Fuel Assembly From Refueling Machine While Applying Secondary Restraint;" SPP 99-023, "Lower Stuck Fuel Assembly From Refueling Machine With Polar Crane;" and, Nuclear Station Procedure (NSP) CC-3005, "10 CFR 50.59 Safety Evaluation Process", Revision 0.

b. Observations and Findings

On April 4, 1999, while transferring an irradiated fuel assembly out of the Unit 1 reactor, the refueling machine hoist failed mechanically with the assembly suspended approximately 15 feet above the lower core plate. The licensee was unable to further raise or lower the assembly using the refueling machine.

Since the failure mechanism was not initially understood, the licensee was concerned that the assembly could possibly free fall into the core if the hoist drum brake and gears were to suddenly fail. Therefore, the licensee installed a steel cable restraining device that provided a positive means to prevent the fuel assembly from being lowered or dropped. The inspectors reviewed the work instructions and observed the installation of the restraining device and noted that the work was performed in accordance with established station practices for performing emergent work.

After installing the restraining device, the licensee developed an action plan to lower the fuel assembly into the core. Up to this point, the licensee had determined that the refueling machine hoist could not be used to further raise the fuel assembly. The licensee had not yet attempted to lower the fuel assembly. The inspectors reviewed the procedure and observed performance of SPP 99-021, which was approved for reinserting the fuel assembly into its original core location using the refueling machine

hoist. The inspectors noted that SPP 99-021 contained instructions to use the polar crane auxiliary hook attached to the refueling machine upper cable assembly to provide a supplemental restraining device. The licensee determined that this supplemental restraining method would be necessary because the previously installed cable restraint would have to be removed to allow the refueling machine hoist to operate. The inspectors reviewed Updated Final Safety Analysis Report (UFSAR) Section 9.1.4.3.4 and noted that the refueling machine hoist travel stops and tool length limits prevent the fuel assembly from being raised to a height where less than 9 feet of water remain above the active region of the fuel. The inspectors determined that SPP 99-021 contained appropriate controls to ensure that the maximum refueling machine hoist movement limits would be maintained using the polar crane auxiliary hook. The licensee's attempt to lower the fuel assembly failed because the refueling machine hoist gears were bound.

Since the refueling machine was unable to lower the fuel assembly, the licensee developed an alternative plan (SPP 99-023) to lower the fuel assembly from the refueling machine using the polar crane auxiliary hook attached to the refueling machine upper cable assembly. The inspectors reviewed SPP 99-023 and noted that, as with the previous use of the polar crane, the procedure contained appropriate controls to ensure that upward fuel assembly movement would not challenge the UFSAR assumption that 9 feet of water is maintained above the active region of the fuel. The inspectors also noted that SPP 99-023 contained details for the connection of the polar crane auxiliary hook to the refueling machine upper cable assembly using cables, slings, and other mechanical rigging hardware capable of supporting the weight of the fuel assembly and refueling machine gripper with a margin for safety. The inspectors observed mechanical maintenance personnel install the rigging equipment and cut the refueling machine's cable. The inspectors then observed fuel handling personnel lower the fuel assembly with the polar crane auxiliary hook into a designated core location chosen to maximize its distance from other irradiated fuel assemblies in the core. The inspectors determined that the licensee controlled and accomplished the work professionally and with a proper focus on safety. The inspectors noted that senior management oversight was evident throughout the event and nuclear oversight personnel were present in the containment building and provided oversight of the activities.

Additionally, the inspectors observed PORC Meeting 99-38 that was convened to approve SPP 99-023 and reviewed the safety evaluation which was completed for the SPP and approved by the PORC. The inspectors identified that the safety evaluation failed to address the licensing basis for movements of heavy loads over the reactor vessel as it pertained to the evolution, failed to address the effects of bypassing refueling machine interlocks described in the UFSAR, and failed to identify temporary changes to words in the UFSAR, all of which were required by station procedure CC-3005. The inspectors discussed these concerns with the licensee immediately following the PORC meeting. In response to the inspectors' questions the licensee revised the safety evaluation to adequately address these concerns.

Code of Federal Regulations Title 10 Part 50, Appendix B, Criteria V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Nuclear Station Procedure CC-3005, Section 8.10.7, specified, in part, that changes to structures, systems, and components (SSCs) not

explicitly described must be evaluated to determine if they can have the potential for affecting the function of SSCs which are explicitly described in the UFSAR. In addition, NSP CC-3005, Section 8.10.8, specified, in part, that all significant permanent or temporary changes are to be described. The licensee's failure to address the licensing basis for movements of heavy loads over the reactor vessel as it pertained to performance of SPP 99-023, to address the effects of bypassing refueling machine interlocks described in the UFSAR, and to identify temporary changes to words in the UFSAR is a violation of 10 CFR Part 50, Appendix B, Criteria V for failure to implement the procedure. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/99004-01(DRP)). This violation is in the licensee's corrective action program as problem identification form (PIF) B1999-01252.

c. Conclusions

The inspectors concluded that the licensee's response to the failure of the Unit 1 refueling machine hoist with an irradiated fuel assembly suspended from the machine's grapple was excellent. The licensee controlled and accomplished the task of lowering the fuel assembly to a designated core location in accordance with approved procedures and with a proper focus on safety. The inspectors also concluded that the 10 CFR 50.59 safety evaluation, which was approved by the Plant Operations Review Committee to lower the suspended fuel assembly, failed to address the licensing basis for movements of heavy loads over the reactor vessel as it pertained to the evolution; failed to address the effects of bypassing refueling machine interlocks described in the Updated Final Safety Analysis Report (UFSAR); and, failed to identify temporary changes to words in the UFSAR. A Non-Cited Violation was issued.

C1.4 Unit 1 Refueling Activities During B1R09 (71707)

The inspectors interviewed fuel handlers, observed refueling activities in the containment and fuel handling buildings, and reviewed the following procedures: Byron Administrative Procedure (BAP) 370-3, "Administrative Control During Refueling," Revision 22; Byron Fuel Handling Procedure (BFP) FH-4, "Fuel Movement in Spent Fuel Pool," Revision 8; and, BFP FH-5, "Fuel Movement in Containment," Revision 8. The inspectors noted that all fuel handling activities were conducted in accordance with prescribed procedures and were properly supervised by a senior reactor operator licensed for fuel handling. The inspectors noted that core alterations were strictly controlled and that appropriate accountability measures were followed. The inspectors concluded that observed fuel handling evolutions were performed well and in accordance with the requirements of the TS and station fuel handling procedures.

O2 Operational Status of Facilities and Equipment

O2.1 Out-of-Service Error Resulted in a Failure to Control the Configuration of Essential Service Water (SX) System Return Header Cross-Connect Valve Consistent With Design Change Procedure Description

a. Inspection Scope (71707)

The inspectors reviewed the circumstances surrounding the licensee's failure to control the configuration of SX system return header cross-connect valve (1SX011) during

maintenance work to rebuild the valve's actuator. The inspectors interviewed operations and engineering department personnel; reviewed applicable portions of the TS and the UFSAR; and reviewed the following documents: Work Request (WR) 960002689-01, "SX Basin 1A/1B Return Header Cross-Tie Isolation Valve (EOP [Emergency Operating Procedure] Valve) Various Oil Leaks on Limitorque Actuator;" Design Change Procedure (DCP) 9800239, "Essential Service Water Return Header Cross-Tie Isolation Valve/Remove the Valve Operator for Maintenance;" and, Root Cause Report 454-200-99-CAQ00007, "Failure to Follow Procedures Results in a Valve Motor Operator Taken Out-of-Service in Conflict with a Temporary Alteration."

b. Observations and Findings

On March 9, 1999, the licensee discovered that SX return header cross-connect valve (1SX011) had been taken out-of-service in the "open" position for maintenance work to rebuild the valve's actuator rather than in the "closed" position as specified in DCP 9800239. Although the out-of-service for 1SX011 was properly performed in the field, it did not specify the correct position for the valve because instructions contained in the DCP were not reviewed by operators who prepared and approved the out-of-service. The inspectors noted that the task title and work scope provided on the out-of-service request electronically submitted to the operations department did not address the DCP; however, it did state that the valve must be taken out-of-service in the "shut" position. The licensee identified the out-of-service error upon reassembly of the valve and subsequent clearing of the out-of-service.

The safety evaluation performed in accordance with 10 CFR 50.59 for the DCP assumed that 1SX011 would be locked in the "closed" position with the valve's actuator removed, thereby separating both Unit 1 SX loops. In the event of a postulated failure that would require separation of the SX trains, the valve would already be closed. For other postulated failures, safe shutdown could be accomplished using either one of the two independent SX trains. The inspectors determined that the licensee's failure to have 1SX011 in the "closed" position during the maintenance evolution invalidated the safety evaluation. The inspectors reviewed SX system operability requirements with respect to 1SX011 being failed open and concluded that the SX system remained operable because the UFSAR allowed operation with the valve open or closed.

Code of Federal Regulations Title 10 Part 50, Appendix B, Criteria V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Contrary to the above, BAP 330-1, "Station Equipment Out-Of-Service Procedure," Revision 29, was not of a type appropriate to the circumstances, in that, it did not provide for an adequate technical review of the out-of-service prepared for WR 960002689-01 to ensure that the conditions specified in the safety evaluation completed for DCP 9800239 were incorporated into the out-of-service. Consequently, the weaknesses in BAP 330-1 resulted in the SX return header cross-connect valve (1SX011) being taken out-of-service in the "open" position for maintenance work to rebuild the valve's actuator rather than in the "closed" position. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/99004-02a(DRP)). This violation is in the licensee's corrective action program as problem identification form (PIF) B1999-00823.

c. Conclusions

The inspectors concluded that the licensee failed to perform an adequate technical review for the out-of-service of essential service water return header cross-connect valve (1SX011) during maintenance work to rebuild the valve's actuator. Consequently, the valve was taken out-of-service in the "open" position for the maintenance work rather than in the "closed" position as specified in Design Change Procedure 9800239. A Non-Cited Violation was issued.

O2.2 Failure to Control the Configuration of Engineered Safety Features (ESF) Switchgear Ventilation System Fans Resulted in System Operation Inconsistent With the Design Basis

a. Inspection Scope (71707)

The inspectors reviewed the circumstances surrounding the licensee's failure to control the configuration of the SX cooling tower electric substation ventilation fans, which resulted in ESF switchgear ventilation system operation inconsistent with the design basis of the plant. The inspectors interviewed operations and engineering department personnel; reviewed applicable portions of the Technical Requirements Manual (TRM) and the UFSAR; and reviewed the following procedures: Byron Operating Procedure (BOP) VX-E1, "Switchgear Heat Removal Ventilation Electrical Lineup (Unit 1)," Revision 6 and BOP VX-E2, "Switchgear Heat Removal Ventilation Electrical Lineup (Unit 2)," Revision 6.

b. Observations and Findings

On February 23, 1999, a non-licensed operator discovered that three of the four SX cooling tower electric substation ventilation fans were not running. Operators restarted the three fans upon discovery that the fans should normally be running; although, one of the fans was subsequently secured due to a failed recirculating air damper. The licensee initially concluded that this was not a system configuration control issue since the fans were secured per an approved procedure and the rooms were at normal temperatures.

The inspectors noted that UFSAR Section 9.4.5.4.2 identified the four SX cooling tower electric substation ventilation fans as part of the ESF switchgear ventilation system. As described in UFSAR Section 9.4.5.4.1.1, these ventilation fans are designed to remove equipment heat to maintain the switchgear room temperatures in accordance with equipment requirements. The UFSAR further stated that ESF switchgear ventilation equipment and systems operation are demonstrated during normal plant operation since this system operates continuously. The inspectors identified that by not controlling the configuration of the SX cooling tower electric substation ventilation fans, the licensee did not operate the ESF switchgear ventilation system consistent with the design basis description in the UFSAR.

The inspectors reviewed the status of ESF switchgear ventilation equipment and systems with respect to the maintenance rule requirements contained in 10 CFR 50.65. The inspectors noted that ESF switchgear ventilation equipment met all of the 10 CFR 50.65 paragraph (a)(2) reliability performance criteria and that no functional failures had been identified. The inspectors concluded that the licensee had clearly

defined reliability and availability criteria as well as a reasonable definition of a functional failure.

The inspectors identified that the system failure analysis described in UFSAR Table 9.4-16 was not consistent with the actual failure response of the system. Updated Final Safety Analysis Report Table 9.4-16 stated that when an ESF switchgear ventilation system supply fan experiences a "fan motor trip" condition, the result will be an airflow switch sensing high or low differential pressure across the fan actuating an alarm on the local control panel. However, for an actual "fan motor trip" condition, the low differential pressure alarm will not actuate since the low differential pressure alarm is only active when the fan motor is running. Also, by system design, when an ESF switchgear ventilation system supply fan experiences a "fan motor trip" condition, an alarm will actuate due to a disagreement between the remote (main control room panel 0PM02J) control switch position and an "M" contact for the fan motor's control circuit. The alarm will actuate only if the associated fan's local/remote transfer switch for the fan is selected to the "remote" position. The inspectors noted that the normal ESF switchgear ventilation system lineup procedures positioned each of the fan's local/remote transfer switches to the "local" position. Therefore, a "fan motor trip" condition would not produce an alarm to alert operators of a fault contrary to the design basis description in the UFSAR. At the end of this inspection period, the licensee was evaluating their actions regarding the operation of the ESF switchgear ventilation system and the resolution of apparent discrepancies with the UFSAR.

The inspectors additionally noted that TRM surveillance requirement 3.7.d.1 required area temperatures to be monitored for ESF switchgear ventilation system areas. The required surveillance frequency was every 12 hours and the maximum temperature limit was 108 degrees Fahrenheit (°F). The inspectors identified that the licensee was not monitoring the temperature of the SX cooling tower electric substations in accordance with TRM surveillance requirement 3.7.d.1. Technical Specification 5.4.1.a states that written procedures shall be established, implemented, and maintained for procedures recommended in Appendix A, of Regulatory Guide 1.33, Revision 2, February 1978. Appendix A, of Regulatory Guide 1.33, Revision 2, February 1978, specifies procedures for startup, operation, and shutdown of safety-related PWR [pressurized water reactor] systems as an example of typical safety-related activities that should be covered by written procedures. The Byron Station Technical Requirements Manual, Revision 1, paragraph 1.5.c states, in part, that violations of TRM surveillance requirements shall be treated the same as plant procedure violations. The licensee's failure to monitor the temperature of the SX cooling tower electric substations is a violation of TS 5.4.1.a for failure to implement the TRM surveillance requirements. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/455-99004-03(DRP)). This violation is in the licensee's corrective action program as problem identification form (PIF) B1999-0889.

c. Conclusions

The inspectors concluded that the licensee failed to control the configuration of the engineered safety features (ESF) switchgear ventilation system consistent with the design basis description in the Updated Final Safety Analysis Report (UFSAR) and that the system failure analysis described in the UFSAR was not consistent with the actual failure response of the system. Furthermore, the inspectors concluded that by not monitoring the temperature of the essential service water cooling tower electric

substations, the licensee did not appropriately monitor temperatures of ESF switchgear ventilation system areas consistent with Technical Requirements Manual surveillance requirement 3.7.d.1. A Non-Cited Violation was issued.

O2.3 Failure to Follow a Procedure Resulted in Operation of Unit 1A Safety Injection Pump with an Inadequate Suction to the Pump

a. Inspection Scope (71707)

The inspectors reviewed the circumstances surrounding the start of the 1A safety injection (SI) pump with an inadequate suction to the pump during the performance of emergency core cooling system (ECCS) full flow testing. The inspectors interviewed operations and engineering department personnel and reviewed the licensee's prompt investigation report. The inspectors also reviewed Byron Engineering Surveillance Requirement (BVSR) Procedure 5.5.8.SI.2-1, "ECCS System Check Valve Stroke Test," Revision 2 and Byron Operating Procedure (BOP) RH-6, "Placing the RH [Residual Heat Removal] System in Shutdown Cooling," Revision 16.

b. Observations and Findings

On April 13, 1999, during performance of ECCS full flow testing, the 1A SI pump was started with the pump's suction from the 1B residual heat removal (RH) train isolated. The inspectors noted that the ECCS full flow testing consisted of a series of engineering surveillance test procedures that aligned the ECCS in different accident mode conditions. Surveillance test procedure 1BVSR 5.5.8.SI.2-1 aligned the 1B RH train with a suction from the reactor coolant system (RCS) hot legs and discharge to the RCS cold legs by requiring BOP RH-6 to be performed as a step in the surveillance test procedure. The 1A SI pump was to be supplied a suction from the discharge of the 1B RH pump for the test after RH system alignment to the RCS cold legs was established. The engineering test director recognized that the 1B RH pump was already running and aligned with a suction from the RCS hot legs by a previously performed surveillance test procedure. The test director incorrectly assumed that the intent of BOP RH-6 had been met without verifying that all the appropriate steps of BOP RH-6 had been completed and signed off completion of the step in the surveillance test procedure. However, the 1B RH pump was running in the recirculation mode of operation with the mini-flow recirculation valve open and the pump's discharge valve to the cold legs closed. Shortly after the 1A SI pump was started, the test director and operators identified that pump flow and suction pressure were lower than expected and secured the pump. Inasmuch as the 1A SI pump was later tested and found to be undamaged, the inspectors concluded that the event had minimal safety significance. This failure constitutes a violation of minor significance and is not subject to formal enforcement action.

c. Conclusions

The inspectors concluded that the licensee failed to control the configuration of the residual heat removal system during emergency core cooling system full flow testing, which resulted in operation of the Unit 1A safety injection pump with an inadequate suction to the pump.

O2.4 Review of Out-of-Service Program Implementation During Refueling Outage B1R09

a. Inspection Scope (71707)

The inspectors reviewed the implementation of the licensee's out-of-service program during refueling outage B1R09 to evaluate the effectiveness of corrective actions taken by the licensee for previously identified out-of-service errors. The inspectors also reviewed the circumstances surrounding three events involving out-of-service program implementation errors during the outage. The inspectors interviewed operations department personnel and reviewed Byron Administrative Procedure (BAP) 330-1, "Station Equipment Out-of-Service Procedure," Revision 29 and Byron Operating Procedure (BOP) RH-3, "Fill and Vent of the Residual Heat Removal [RH] System," Revision 13.

b. Observations and Findings

The inspectors reviewed out-of-service errors during the 4-week B1R09 refueling outage and noted that three operational events were attributable to out-of-service errors, which was an improvement from the B2R07 outage period in which nine operational events were attributed to out-of-service errors. One of the weaknesses previously identified by the inspectors was that operators frequently received poor descriptions of the work scope when an out-of-service request was electronically submitted to the operations department. The work scope was frequently vague and did not identify where a task was to be performed. The inspectors noted that this same weakness contributed to the 1SX011 out-of-service event discussed in section O2.1 and the 1RY-8080 out-of-service event discussed below.

The inspectors reviewed the three operational events during B1R09 which were attributable to out-of-service errors. Those events are discussed below.

Failure to Follow Prescribed Sequence for Out-of-Service Clearance Resulted in Water Spilled from the Residual Heat Removal System

On April 4, 1999, while restoring the 1A residual heat removal (RH) train to service following maintenance, approximately 40 gallons of water was inadvertently spilled from the system via an open vent valve to the auxiliary building floor. The licensee's subsequent investigation determined that clearance of the out-of-service was not performed in the sequence prescribed in the Out-of-Service Lift Checklist. Clearance of the out-of-service was performed concurrently with venting and filling of the system piping in accordance with BOP RH-3. Although the out-of-service specified closing system vent valves prior to restoring power to system isolation valve motor operators, operations personnel did not expect any system isolation valves to reposition when power was restored. Operators failed to close the vent valves prior to restoring power to the system isolation valves and as a result, the 1A RH pump recirculating valve (1RH610) stroked open when its power was restored. The inspectors reviewed the system design and noted that 1RH610 automatically opens when RH pump discharge flow is less than 750 gallons-per-minute to ensure that adequate cooling is provided for the pump. Therefore, the valve stroking open was an expected system response. The inspectors also noted that BOP RH-3, Step F.1.i required 1RH610 to be verified closed and a note in the procedure prior to the step stated that the valve may have to be de-energized to remain closed. The failure of operations personnel to follow the

prescribed sequence identified on the Out-of-Service Lift Checklist for clearing out-of-service 990002042 constitutes a violation of minor significance and is not subject to formal enforcement action.

Improper Implementation of Out-of-Service for Feedwater System Isolation Valves Resulted in a Status Control Occurrence

On April 6, 1999, the Unit 1 steam generator feedwater system isolation valves (1FW009A/B/C/D) were re-coupled with an out-of-service in place which required them to be uncoupled. The licensee's apparent cause report determined that the out-of-service was inadequate, in that no out-of-service card was in place on the valves' stems to prevent re-coupling. The licensee's electronic out-of-service program relies on the proper sequencing of out-of-services such that only one card is placed on any one component. The out-of-service card was in place on the valves' actuator because the electronic out-of-service data base did not contain a data point for the valves' stems and special instructions to place an out-of-service card on the valves' stems were not followed. Weaknesses with the licensee's electronic work control system (EWCS) related to out-of-service implementation were previously identified by the inspectors and discussed in NRC Inspection Report 50-454/455-98011(DRP). In this example, the licensee identified that the lack of an EWCS data point for FW009 valve stems contributed to the out-of-service error. The licensee's apparent cause report additionally identified that mechanical maintenance personnel assumed that it was acceptable to re-couple the valves' actuators to the stems with out-of-service cards on the actuators because they were "pre-programmed" to look for cards on the stems. The report stated that this practice did not meet the licensee's expectations to not work on any component with an out-of-service card in place. The inspectors noted that this expectation is not consistent with BAP 330-1 paragraph C.3.e which allows work to be performed on equipment that is tagged out-of-service provided that the work will not interfere with the ability of the equipment to maintain isolation. The inspectors concluded that this out-of-service error was of minor safety significance because valve interlocks prevented the valves from being opened and operators took immediate actions to place the valves out-of-service upon recognizing the deficiency. Re-coupling the Unit 1 steam generator feedwater system isolation valves (1FW009A/B/C/D) with an out-of-service in place which required them to be uncoupled constitutes a violation of minor significance and is not subject to formal enforcement action.

An Out-of-Service Error Resulted in a Non-Isolable Reactor Coolant System Pressure Boundary Leak During Pressurizer Sample Valve Replacement

On April 11, 1999, while attempting to replace the Unit 1 pressurizer water space sample valve (1RY-8080), mechanical maintenance personnel ground down approximately 90 percent of two welds and observed water leakage from the partially removed welds on the line connecting the valve to the pressurizer. The work was stopped, supervisors informed, and leakage promptly controlled. The licensee quantified the leak rate at ten gallons-per-hour and determined a maximum possible leak rate with the valve removed of 8.5 gallons-per-minute. Makeup to the system in excess of the possible leakage rate was always available.

The inspectors noted that performance of the maintenance activity required the use of an "exceptional out-of-service," which specified that the pressurizer be drained as a condition to protect plant personnel and equipment. The licensee subsequently

determined that the plant conditions required by the exceptional out-of-service's special instruction (pressurizer drained) had not been maintained. The pressurizer was drained when the out-of-service was hung on April 8, 1999; however, on April 9,1999, the pressurizer and reactor cavity were filled in preparation for loading fuel into the vessel. The work on 1RY-8080 which was initially scheduled for April 8,1999 was delayed until April 10, 1999.

The inspectors reviewed the licensee's prompt investigation for this event which identified three inappropriate actions. First, the outage scheduler, outage director, and shutdown safety manager incorrectly assumed that the work request task title accurately reflected the scope of the work to be performed and did not perform a more in-depth review of the detailed work instructions. Second, out-of-service procedural requirements were not met when maintenance personnel failed to verify the special instructions of the exceptional out-of-service during the out-of-service walkdown. Third, the work execution center supervisor signed in the 1RY-8080 job on April 11, 1999, and failed to recognize that the required plant conditions were not met.

The inspectors reviewed BAP 330-1 and noted that the procedure did not include a qualitative method to maintain required plant conditions for exceptional out-of-services. For example, a conventional out-of-service uses tags to control the configuration of equipment and establish boundaries relied upon for the protection of plant personnel. The existence of these controls are visible to personnel, and are documented and tracked by the out-of-service program. In the case of the exceptional out-of-service the licensee was unable to obtain conventional isolation and included special instructions to establish and maintain specific plant conditions (pressurizer drained) for the protection of plant personnel for the duration of the out-of-service. However, BAP 330-1 did not require qualitative methods to ensure control room operators and other plant personnel were aware of the required plant conditions, nor did it require visible warnings on plant equipment necessary to alter plant conditions. The inspectors reviewed nuclear station operator, unit supervisor, and shift manager turnover sheets from April 8, 1999, through April 11, 1999, and noted no entries discussing the establishment of and the need to maintain plant conditions required by the exceptional out-of-service. The failure to maintain the required plant conditions was synonymous with an unauthorized removal of an out-of-service tag and the elimination of an out-of-service boundary.

Code of Federal Regulations Title 10 Part 50, Appendix B, Criteria V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Contrary to the above, BAP 330-1, "Station Equipment Out-Of-Service Procedure," Revision 29, was not of a type appropriate to the circumstances, in that, it did not ensure that plant conditions required as part of the exceptional out-of-service were accomplished and effectively maintained. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/99004-02b(DRP)). This violation is in the licensee's corrective action program as problem identification form (PIF) B1999-01455.

c. Conclusions

The inspectors concluded that three out-of-service errors resulted in operational events during the four week B1R09 refueling outage, which was an improvement from the

B2R07 outage period when nine out-of-service errors resulted in operational events. The inspectors concluded that three recent out-of-service errors had similar weaknesses previously identified by the inspectors during the previous refueling outage (B2R07) and discussed in NRC Inspection Report 50-454/455-98011(DRP). A Non-Cited Violation was issued.

O8 Miscellaneous Operations Issues (92901)

O8.1 (Closed) Violation 50-454/455-98005-01a(DRP): "Failure to Return Equipment to Service as Required by OOS [Out-of-Service] Program." An out-of-service error on the chemical and volume control system occurred as a result of poor communication between the involved operators, assigning multiple tasks to be performed concurrently, and a perceived pressure to accomplish work rapidly. Although the violation was licensee identified, it was cited because this was a repetitive issue. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-01095.

O8.2 (Closed) Violation 50-454/455-98009-01(DRP): "Unit 1 Entered Mode 4 With Portions of Containment Floor Drain Inoperable." Unit 1 entered into Mode 4 (hot shutdown) from Mode 5 (cold shutdown) with the seal table room floor drain plugged. The inspectors concluded that this event should have been prevented by corrective actions from previously identified issues with the floor drain system. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-01836.

O8.3 (Closed) Violation 50-454/455-98009-02a(DRP): "Inadequate Procedure (BOP [Byron Operating Procedure] VC-2) for Operation of Control Room Ventilation." The inspectors determined that BOP VC-2 was not appropriate to the circumstances due to an inadequate technical review during a procedure revision. Additionally, on at least eight occasions, control room operators performed this procedure and did not identify the procedural deficiencies and initiate corrective actions. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-01835.

O8.4 (Closed) Violation 50-454/455-98011-01a(DRP): "Failure to Implement the OOS [Out-of-Service] Program and Ensure That the OOS Boundary Was Adequate." The licensee failed to adequately provide an isolation boundary for modification work which installed additional venting capability for the 2B chemical and volume control (CV) pump. As a result, when construction personnel drilled a 1/4 inch hole into the 2B CV pump suction piping, a continuous stream of water came out of the hole. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement

Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-02879.

O8.5 (Closed) Violation 50-454/455-98011-03(DRP): "Failure to Follow BOP [Byron Operating Procedure] RH-9 Which Resulted in Level Being Inadvertently Lost From the SFP [Spent Fuel Pool]." The licensee inadvertently lowered the SFP level during the pump down of the Unit 2 refueling cavity. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-02881.

O8.6 (Closed) Violation 50-454/455-98017-02(DRP): "Failure to meet TS 3.0.3 Action Requirements for Two Trains of VC [Control Room Ventilation] Inoperable." The licensee failed to adequately evaluate the effects of multiple impairments of the control room ventilation envelope due to insufficient procedural guidance. As a result, the safety-related VC system was rendered inoperable during two periods of time when the system was not capable of maintaining a required positive pressure greater than or equal to 0.125 inch water gauge relative to ambient pressure in areas adjacent to the control room. The inspectors reviewed the licensee's corrective actions to check for any notable weaknesses. No weaknesses were identified and the corrective actions were found to be acceptable. This violation is closed.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Unit 1 Reactor Coolant Loop Stop Isolation Valve Repair

a. Inspection Scope (62707)

The inspectors observed portions of maintenance performed on the 1A reactor coolant system cold leg loop stop isolation valve (LSIV) and interviewed maintenance and engineering personnel. The inspectors also reviewed the following documents: Work Request (WR) 970122919-01, "Replace Valve Guides Due to Valve Binding and Travel Stop;" Westinghouse Safety Evaluation SECL-99-035, "Byron Station Unit 1 Primary Side Loose Part (Main Loop Stop Valve Internals)," Revision 2; and, ComEd [Commonwealth Edison] Quality Assurance Manual, "Quality Assurance Program Topical Report CE-1-A," Revision 66a.

b. Observations and Findings

At the start of refueling outage B1R09, the 1A cold leg LSIV (1RC8002A) would not close. Based upon a review of design and maintenance work history, the licensee determined the most likely cause to be mis-positioning of one or both valve guides due to failure of the guide positioning pins, which were susceptible to stress corrosion cracking. The valve guides were each held in place with three rolled positioning pins, one along each side near the top of the guide, and one in the bottom. Upon

disassembly of 1RC8002A, the licensee identified the following damage: (1) three guide pins for one of the valve guides had failed and were not found; (2) a small piece (approximately 1 inch x 3 inches x 0.5 inch) of the valve body casting used to hold one of the guides in place had broken off and was not found; (3) one valve guide had slid down below the disk and prevented the disk from closing; and, (4) minor internal valve damage to both the valve disk and seat had resulted from valve guide vibration in the reactor coolant pump (RCP) discharge flow. During the previous operating cycle, the loose parts monitoring system detected a loose part in the 1A cold leg, which the licensee has attributed to the 1RC8002A loose guide. Over time, the vibrating valve guide caused the small piece of the upper retaining casting to break free from the valve body. The licensee concluded that the missing piece and the three positioning pins were swept down the cold leg by the RCP discharge flow, through the reactor vessel downcomer region, and are lying near the reactor lower core components. The licensee repaired the valve during the outage and performed an engineering evaluation on the missing parts.

The inspectors reviewed the safety evaluation completed by Westinghouse in accordance with 10 CFR 50.59 and validated by the licensee for the operation of Unit 1 with the missing loose parts. In addition to the missing loose parts from 1RC8002A, the scope of the evaluation assumed that one additional LSIV would produce loose parts. This hypothetically would include both valve guides, all six positioning pins and two broken casting pieces, which could enter the reactor vessel as loose parts. The safety evaluation concluded that the presence of potential or identified loose parts would not adversely affect plant components and safety systems during normal operation and accident conditions.

The inspectors reviewed the circumstances involving the licensee's failure to complete a quality control (QC) inspection hold point during valve re-assembly. During the final visual cleanliness inspection, a QC inspector identified metal filings and weld slag inside of the piping and valve bowl area. Those pieces of debris were removed. Upon subsequent video examination, the QC inspector identified what appeared to be a small, ½ inch long, metal chip in the piping between the LSIV and the reactor vessel nozzle. The mechanical maintenance crew proceeded with valve re-assembly without having the QC inspection hold point (WR 970122919-01, step 56) satisfied. The QC inspector raised this apparent procedure violation to licensee management while the valve re-assembly work continued. The licensee did not attempt to retrieve the foreign material which would have required disassembly of the valve or access via an RCS piping thermowell. Valve disassembly would have resulted in additional radiation dose for the workers and would have required another difficult rigging evolution to remove the bonnet. Access via an RCS piping thermowell would have resulted in significant testing of the pressure boundary upon completion. Instead, the licensee requested Westinghouse to revise their original loose parts safety evaluation to include this extra piece.

Code of Federal Regulations Title 10 Part 50, Appendix B, Criteria X, "Inspections," requires, in part, that a program for inspection of activities affecting quality shall be established and executed by or for the organization performing the activity to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity. The ComEd [Commonwealth Edison] Quality Assurance Manual, "Quality Assurance Program Topical Report CE-1-A," Revision 66a, established the licensee's Quality Assurance Program as described in UFSAR Chapter 17.

Section 3.5.3 of the ComEd Quality Assurance Manual required, in part, that when inspections must be performed before work can continue, hold points are established in appropriate documents. Consent to waive hold points are recorded prior to continuation of work. Additionally, Section 3.5.4 of the ComEd Quality Assurance Manual required that when acceptance criteria are not met, corrected areas are re-inspected. Changes to, or rework of, an item after inspection requires re-inspection of the affected areas. The licensee's failure to complete a quality control inspection hold point during valve re-assembly is a violation of 10 CFR Part 50, Appendix B, Criteria X. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/99004-04(DRP)). This violation is in the licensee's corrective action program as problem identification form (PIF) B1999-01365.

c. Conclusions

The inspectors concluded that observed maintenance work on the 1A reactor coolant system cold leg loop stop isolation valve was generally performed well; maintenance personnel were knowledgeable of the associated activities; and, work was performed in accordance with station procedures with one notable exception. The inspectors concluded that the licensee failed to complete a final cleanliness inspection quality control hold point prior to re-assembly of the valve which resulted in foreign material left in the reactor coolant system following the maintenance. A Non-Cited Violation was issued.

M1.2 Surveillance Test Observations

a. Inspection Scope (61726)

The inspectors interviewed operations, engineering, and regulatory assurance department personnel; reviewed the completed test documentation and applicable portions of the Updated Final Safety Analysis Report (UFSAR) and Technical Specifications (TS); and, observed the performance of selected portions of the following surveillance test procedures.

• 1BOSR 3.2.9-2	Unit 1 Train B Manual Safety Injection Initiation and Manual Phase A Initiation Surveillance
• 1BOSR 7.5.3-1	Unit 1 Motor Driven Auxiliary Feedwater Pump Monthly Surveillance
• 1BOSR 7.5.3-2	Unit 1 Diesel Driven Auxiliary Feedwater Pump Quarterly Surveillance
• 1BOSR 8.1.2-1	Unit 1 1A Diesel Generator Operability Monthly (Staggered) and Semi-Annual (Staggered) Surveillance
• 1BOSR 8.4-2	125V [Volt] DC [Direct Current] Bus 112 Load Shed When Cross-Tied to DC Bus 212
• 2BOSR 3.2.7-646B	Unit 2 ESFAS [Engineered Safety Features Actuation System] Instrumentation Slave Relay Surveillance (Train B Auto SI [Safety Injection] - K646)
• 2BOSR 8.1.2-2	2B Diesel Generator Operability Monthly (Staggered) and Semi-Annual (Staggered) Surveillance
• 1BVSR 1.4.3-1	Unit 1 Manual Rod Drop Time

- 1BVSR 7.5.5-1 Unit 1 Auxiliary Feedwater Pump Emergency Actuation Signal Verification Test
- 1BVSR 8.1.11-2 Unit 1 1B Diesel Generator Sequencer Test - 18 Month

b. Observations and Findings

The inspectors concluded that the observed surveillance tests were performed well and satisfied the requirements of the Technical Specifications. On May 3, 1999, the inspectors observed the performance of 1BOSR 7.5.3-1 and noted that the plant responded as designed throughout the test and that the test was properly performed. However, during review of the surveillance test procedure, the inspectors noted that step A.2 stated that the surveillance test was performed to meet TS surveillance requirements SR 3.7.5.3, SR 3.3.2.3, and SR 3.3.2.8. However, the inspectors determined that the surveillance test procedure did not satisfy the requirements of SR 3.3.2.3. and SR 3.3.2.8. Based upon discussions with engineering and regulatory assurance department personnel, the inspectors determined that surveillance requirements SR 3.3.2.3 and SR 3.3.2.8 were met by surveillance test procedures 1BVSR 3.1.9-2, "Unit 1 Reactor Coolant Pump Bus Undervoltage Quarterly Surveillance," Revision 1 and 1BVSR 3.5.1-1 "Unit 1 Bus 141 Undervoltage Protection Monthly Surveillance," Revision 1. Although the requirements of the TS were being met, the inspectors were concerned that the procedure error indicated a misunderstanding of the actual surveillance requirements. The licensee entered this issue into their corrective action program as problem identification form (PIF) B1999-01881.

c. Conclusions

The inspectors concluded that the observed surveillance tests were performed well and satisfied the requirements of the Technical Specifications. The inspectors identified that a step in the Unit 1 motor driven auxiliary feedwater pump monthly surveillance test procedure incorrectly stated that the procedure met surveillance test requirements that it did not meet; however, the inspectors concluded that those requirements were met by other surveillance test procedures.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Inspection of the Unit 1 Containment Building Prior to Startup Following Refueling Outage B1R09 (61726)

Prior to Unit 1 entry into mode 3 (hot shutdown), the inspectors performed an inspection of the containment building to assess material condition and search for loose debris, which if present could be transported to the containment recirculation sump and cause restriction of flow to the emergency core cooling system (ECCS) pump suctions during loss-of-coolant accident conditions. The inspectors reviewed the licensee's list of outstanding items to be addressed prior to containment building closeout and noted that there were several items on the list. During the inspection of the containment building, the inspectors identified several loose items which should have been removed from the containment building. Those items included two radiological protection warning signs, one screwdriver, several broken plastic cable ties, a four foot length of plastic hose, several felt tip markers, loose pieces of tape, foam earplugs, and wire. In addition, the inspectors identified a piece of mirror insulation hanging loose on a residual heat removal system pipe located above the containment sump screen. The inspectors also

identified loose screws on the containment sump screens and the containment building floor drain sump cover. The inspectors discussed these discrepancies with the licensee upon exiting the containment building. The licensee removed the loose items and satisfactorily addressed the other inspector identified discrepancies. The inspectors concluded that material condition in the Unit 1 containment building was good and that the loose items identified by the inspectors posed no significant risk to ECCS operability.

M4 Maintenance Staff Knowledge and Performance

M4.1 Human Performance Error During 1B Emergency Diesel Generator Surveillance Testing Resulted in Tripping the Component Cooling Water Pump Supporting Decay Heat Removal

a. Inspection Scope (61726)

The inspectors reviewed the circumstance surrounding the improper installation of an electrical jumper during performance of Byron Engineering Surveillance Requirement (1BVSR) 8.1.12-2, "Unit 1 1B Diesel Generator ESF [Engineered Safety Feature] Actuation Test Signal Start and Non-Emergency Trip Bypass Test, and Generator Differential Trip Test," Revision 1. The inspectors interviewed maintenance department personnel; reviewed the results of the licensee's prompt investigation into the event; and, reviewed the following documents; Common Work Practice Instruction, Nuclear Station Procedure, Conduct of Operations , Instruction 11 (CWPI-NSP-OP-1-11), "Verification Practices," Revision 0; CWPI-NSP-OP-1-09, "Heightened Level of Awareness Briefings," Revision 0; and Byron Site Policy Memo 200.06, "Use of Pre-job and Post-job Briefs."

b. Observations and Findings

On April 11, during the performance of surveillance testing on the 1B emergency diesel generator (EDG), electrical maintenance personnel installed an electrical jumper on the wrong relay causing an inadvertent trip of the common component cooling water (CC) pump. At the time of the trip, the common CC pump was running and removing decay heat in conjunction with the residual heat removal system. In response to this event, operators re-established CC system flow, system engineers performed an evaluation of the trip and determined that no damage to the pump or associated circuitry had occurred, and a prompt investigation was initiated into the cause of the error.

The inspectors reviewed the licensee's prompt investigation, which identified the following apparent causes and contributing factors associated with this event:

- poor labeling of the relays;
- electrical maintenance personnel did not attend the pre-job brief;
- the system engineer provided erroneous guidance;
- the verification process procedure was not followed;
- the surveillance test procedure was not followed; and
- electrical prints were not used at the job site.

The inspectors concurred with the licensee's conclusion that the event was caused by a number of inappropriate actions which included the failure of personnel involved in this event to perform step 2.5 of 1BVSR 8.1.12-2 as written and the failure of personnel to

correctly perform concurrent dual verification. The failure to correctly install a jumper during performance of surveillance testing on the 1B EDG constitutes a violation of minor significance and is not subject to formal enforcement action. Although this event had minimal safety impact, the inspectors were concerned that the licensee's corrective actions for similar human performance errors, which were documented in NRC Inspection Reports 50-454/455-99002(DRP); and 50-454/455-98020(DRP), have not been totally effective at preventing their recurrence.

c. Conclusions

The inspectors concurred with the licensee's conclusion that multiple human performance deficiencies were the cause for electrical maintenance personnel installing an electrical jumper on the wrong relay while performing surveillance testing on the 1B emergency diesel generator. This caused an inadvertent trip of the common component cooling water pump. Although this event had minimal safety impact, the inspectors were concerned that the licensee's corrective actions for similar previous human performance errors have not been totally effective at preventing their recurrence.

M4.2 Unapproved Maintenance Activity Performed by Maintenance Personnel Rendered the1B Main Steam Isolation Valve Inoperable

a. Inspection Scope (62707)

The inspectors reviewed the circumstances surrounding an unauthorized maintenance activity that was performed on the 1B main steam isolation valve (MSIV) that rendered the valve inoperable. The inspectors interviewed operations and maintenance department personnel and reviewed the results of the licensee's prompt investigation into the event.

b. Observations and Findings

On April 24, 1999, during the Unit 1 startup from refueling outage B1R09, mechanical maintenance personnel adjusted the stem packing on the 1B MSIV, an activity affecting quality, without appropriate work authorization from the operations department and rendered the valve inoperable. The inspectors noted that mechanical maintenance personnel failed to have an approved set of work instructions for the packing adjustment prior to performing the activity. The inspectors reviewed the operators' immediate actions to address the operability of the 1B MSIV and determined that operators correctly declared the valve inoperable and implemented the required actions of the TS. Operations personnel subsequently performed 1BVSR 7.2.1, "Unit 1 Main Steam Isolation Valve Operability Test," Revision 3 and declared the valve operable.

Code of Federal Regulations Title 10, Part 50, Appendix B, Criteria V, "Instructions, Procedures, and Drawings," requires, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Contrary to the above, mechanical maintenance personnel performed a stem packing adjustment on the 1B MSIV, an activity affecting quality, without an approved set of instructions containing appropriate quantitative or

qualitative acceptance criteria for determining that the packing adjustment had been satisfactorily accomplished. This is a violation of 10 CFR Part 50, Appendix B, Criteria V. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Appendix C of the NRC Enforcement Policy (50-454/99004-05(DRP)). This violation is in the licensee's corrective action program as problem identification form (PIF) B1999-01746.

c. Conclusions

The inspectors concluded that mechanical maintenance personnel adjusted the stem packing on the 1B main steam isolation valve (MSIV) without approved work instructions and operations department authorization for the activity, which rendered the valve inoperable. The inspectors concluded that operators took appropriate actions to promptly address the operability of the 1B MSIV and correctly implemented the required actions of the Technical Specifications. A Non-Cited Violation was issued.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) Violation 50-454/455-98005-01b(DRP): "Failure to Submit ER [Engineering Request] Prior to Installing Gasket in 1B SX [Essential Service Water] Pump." Appropriate design control measures had not been taken prior to adding a gasket in the 1B SX pump. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-01097.

M8.2 (Closed) Violation 50-454/455-98005-02(DRP): "NSWP [Nuclear Station Work Procedure] A-03 Inadequate to Prevent Material Intrusion in CS [Containment Spray] System." A condenser tube cleaning brush found in the CS system represented an additional example of continuing poor foreign material exclusion controls by the licensee. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-01099.

M8.3 (Closed) Violation 50-454/455-98009-02b(DRP): "Failure to Have Established a Written Procedure for the Control of WRs [Work Requests] While the WRs Were on Hold." The inspectors identified that approximately 50 WRs had senior reactor operator (SRO) authorization signatures without work activities on the current work schedule and were considered on "hold." A violation was cited for the licensee's failure to provide adequate procedural guidance on how to process a WR that had been authorized by an SRO and subsequently put on "hold" for an extended period of time. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-01840.

M8.4 (Closed) Violation 50-454/455-98011-06(DRP): "Multiple Examples of Failure to Follow Ventilation Barrier Impairment Process." The licensee had impaired several ventilation barriers without appropriately processing barrier impairment permits. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-02887.

M8.5 (Closed) Violation 50-454/455-98011-07(DRP): "Failure to Follow Maintenance Procedure Regarding the Control of Penetration Sleeves on the RWST [Refueling Water Storage Tank] Tunnel Hatch." The licensee had improperly impaired the RWST pipe tunnel hatch cover, which is a ventilation barrier between the auxiliary building and the outside atmosphere, by having multiple cable penetrations in the hatch cover open simultaneously. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-02888.

M8.6 (Closed) Violation 50-454/455-98025-03(DRP): "Unacceptable Preconditioning of the Auxiliary Feedwater Pump Discharge Valves, 1/2AF004A/B." The licensee unacceptably preconditioned the stroke time testing of auxiliary feedwater discharge valves, 1/2AF004A/B, by not measuring the stroke time until the sixth time the valves were opened during the testing. The inspectors reviewed the licensee's corrective actions to check for any notable weaknesses. No weaknesses were identified and the corrective actions were found to be acceptable. This violation is closed.

III. Engineering

E8 Miscellaneous Engineering Issues (92700, 92903)

E8.1 (Closed) Violation 50-454/455-98011-11(DRP): "Failure to Update FSAR [Final Safety analysis Report] as Required by 10 CFR 50.71(e)." The licensee failed to submit a required revision to the FSAR to reflect changes in the operation of the containment purge system described in Safety Evaluation T1-93-0152, completed on October 16, 1993. This Severity Level IV violation was issued prior to the implementation of the NRC's new policy for treatment of Severity Level IV violations contained in Appendix C of the Enforcement Policy. This violation would have been treated as a Non-Cited Violation under the new policy and therefore it is closed in this report. This violation is in the licensee's corrective action program as PIF B1998-02891.

E8.2 (Closed) Licensee Event Report (LER) 50-455/98002: "Circuit Card Failure Causes Second Inoperable Channel and Technical Specification 3.0.3 Entry." The inspectors reviewed the licensee's corrective actions for the circuit card failure which were to replace the card and monitor card failures via the maintenance rule program. Based on the information that this was the first card of this type to fail, the inspectors concluded that the licensee's corrective actions were acceptable. The inspectors also determined that the licensee's entry into Technical Specification Limiting Condition for Operations 3.0.3 for approximately 12 minutes was correct. This LER is closed.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Radiological Protection Practices

a. Inspection Scope (71750)

The inspectors observed the posting of radiation areas, the control of locked high radiation areas, the application of As-Low-As-Reasonably-Achievable (ALARA) principles, and the radiation work practices of station personnel. Special attention was placed on radiological practices related to the Unit 1 refueling outage.

b. Observations and Findings

The inspectors reviewed the postings and control of radiologically controlled areas and high radiation areas related to refueling activities. The inspectors noted that radiologically controlled areas were properly posted for the condition that existed in the areas. Rope boundaries, swing gates (where applicable) and signs were properly maintained. Access and control of personnel working in the Unit 1 containment building was conducted appropriately.

The inspectors reviewed the ALARA controls used for containment building access. The inspectors noted that prior to containment building entry, radiation protection personnel briefed personnel on the dose rates in the affected areas, identified areas to avoid, and identified the routes that resulted in the lowest dose. In addition, radiation protection personnel observed workers for proper use of anti-contamination clothing, and moving material in and out of the controlled area.

The inspectors observed proper radiation worker practices, which included proper use of anti-contamination clothing, proper frisking upon exit from the contaminated area, and proper use of dosimetry. Personnel properly monitored equipment out of radiologically controlled areas and made proper use of personnel radiation monitors at the exit of radiologically controlled areas. The inspectors also noted proper and efficient separation of personnel entering and exiting the containment building. Inside the containment building, radiation protection technicians at the missile shield entrance were observing worker practices and responded promptly to digital dosimeter alarms.

Following the Unit 1 refueling outage, the inspectors identified an area of loose surface contamination in the form of crystallized boric acid that was not within a contamination control boundary in the Unit 1 auxiliary building containment piping penetration area. The licensee promptly roped off and decontaminated the area. The inspectors concluded that this was an isolated incident which was not indicative of a problem with the licensee's control of contamination areas.

c. Conclusions

The inspectors concluded that radiologically controlled areas were properly posted and radiation workers demonstrated proper work practices to control the spread of contamination. The inspectors concluded that As-Low-As-Reasonably-Achievable principles were effectively utilized to minimize dose during the Unit 1 refueling outage.

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 May 10, 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
W. Levis, Site Vice President
R. Lopriore, Station Manager
W. McNeill, Radiation Protection Manager
T. Schuster, Work Control Manager M. Snow, Operations Manager
M. Snow, Operations Manager
J. Stone, Nuclear Oversight Manager

INSPECTION PROCEDURES USED

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
IP 92901:	Follow-up Plant Operations
IP 92902:	Follow-up Maintenance
IP 92903:	Follow-up Engineering

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-454/99004-01	NCV	Failure to implement safety evaluation procedure for lowering of suspended fuel assembly
50-454/99004-02a	NCV	Inadequate technical review of out-of-service prepared for essential service water return header cross-connect valve maintenance
50-454/99004-02b	NCV	Failure to ensure plant conditions required for exceptional out-of-service were accomplished and maintained
50-454/455/99004-03	NCV	Failure to implement Technical Requirements Manual surveillance requirement to monitor engineered safety features switchgear ventilation system areas
50-454/99004-04	NCV	Failure to complete a quality control inspection hold point during 1A cold leg loop stop isolation valve repair
50-454/99004-05	NCV	1B main steam isolation valve packing adjustment without operation's authorization and appropriate work instructions

Closed

50-454/99004-01	NCV	Failure to implement safety evaluation procedure for lowering of suspended fuel assembly
50-454/99004-02a	NCV	Inadequate technical review of out-of-service prepared for essential service water return header cross-connect valve maintenance
50-454/99004-02b	NCV	Failure to ensure plant conditions required for exceptional out-of-service were accomplished and maintained
50-454/455/99004-03	NCV	Failure to implement Technical Requirements Manual surveillance requirement to monitor engineered safety features switchgear ventilation system areas
50-454/455/98005-01a	VIO	Failure to return equipment to service as required by OOS [out-of-service] program
50-454/455/98009-01	VIO	Unit 1 entered mode 4 with portions of containment floor drain inoperable
50-454/455/98009-02a	VIO	Inadequate procedure (BOP [Byron Operating Procedure] VC-2) for operation of control room ventilation
50-454/455/98011001a	VIO	Failure to implement the OOS [out-of-service] program and ensure that the OOS boundary was adequate

50-454/455/98011-03	VIO	Failure to follow BOP [Byron Operating Procedure] RH-9 which resulted in level being inadvertently lost from the SFP [spent fuel pool]
50-454/455/98017-02	VIO	Failure to meet TS 3.0.3 action requirements for two trains of VC [control room ventilation] inoperable
50-454/99004-04	NCV	Failure to complete a quality control inspection hold point during 1A cold leg loop stop isolation valve repair
50-454/99004-05	NCV	1B main steam isolation valve packing adjustment without operation's authorization and appropriate work instructions
50-454/455/98005-01b	VIO	Failure to submit ER [engineering request] prior to installing gasket in 1B SX [essential service water] pump
50-454/455/98005-02	VIO	NSWP [Nuclear Station Work Procedure] A-03 inadequate to prevent material intrusion in CS [containment spray] system
50-454/455/98009-02b	VIO	Failure to have established a written procedure for the control of WRs [work requests] while the WRs were on hold
50-454/455/98011-06	VIO	Multiple examples of failure to follow ventilation barrier impairment process
50-454/455/98011-07	VIO	Failure to follow maintenance procedure regarding the control of penetration sleeves on the RWST [refueling water storage tank] tunnel hatch
50-454/455/98025-03	VIO	Unacceptable preconditioning of the auxiliary feedwater pump discharge valves, 1/2AF004A/B
50-454/455/98011-11	VIO	Failure to update FSAR [Final Safety Analysis Report] as required by 10 CFR 50.71(e)
50-455/98002	LER	Circuit card failure causes second inoperable channel and Technical Specification 3.0.3 entry

LIST OF ACRONYMS USED

ADRC	Advanced Digital Reactivity Computer
ALARA	As-Low-As-Reasonably-Achievable
BAP	Byron Administrative Procedure
BFP	Byron Fuel Handling Procedure
BGP	Byron General Operating Procedure
BOP	Byron Operating Procedure
BOSR	Byron Operating Surveillance Requirement
BVSR	Byron Engineering Surveillance Requirement
CC	Component Cooling Water
CFR	Code of Federal Regulations
CS	Containment Spray
CV	Chemical and Volume Control
DC	Direct Current
DCP	Design Change Procedure
DRP	Division of Reactor Projects
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
ER	Engineering Request
ESF	Engineered Safety Feature
ESFAS	Engineered Safety Feature Actuation System
EWCS	Electronic Work Control System
FSAR	Final Safety Analysis Report
ITS	Improved Technical Specifications
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LCOAR	Limiting Conditions for Operation Action Requirement
LSIV	Loop Stop Isolation Valve
MSIV	Main Steam Isolation Valve
NCV	Non-cited Violation
NRC	Nuclear Regulatory Commission
NSP	Nuclear Station Procedure
NSWP	Nuclear Station Work Procedure
OOS	Out-Of-Service
PORC	Plant Operational Review Committee
PWR	Pressurized Water Reactor
PIF	Problem Identification Form
QC	Quality Control
RCS	Reactor Coolant System
RCP	Reactor Coolant Pump
RH	Residual Heat Removal
RP&C	Radiological Protection and Chemistry
RWST	Refueling Water Storage Tank
SFP	Spent Fuel Pool
SI	Safety Injection
SPP	Special Procedure
SR	Surveillance Requirement
SRO	Senior Reactor Operator
SSCs	Structures, Systems, and Components

LIST OF ACRONYMS USED (cont'd)

SX	Essential Service Water
TRM	Technical Requirements Manual
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
V	Volts
VC	Control Room Ventilation
VIO	Violation
WR	Work Request