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Report No: 50-454/97022(DRP); 50-455/97022(DRP)

Licensee: Commonwealth Edison Company

Facility: Byron Generating Station, Units 1 and 2

Location: 4450 N. German Church Road
Byron, IL 61010

Dates: October 17 - December 1, 1997

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EXECUTIVE SUMMARY

Byron Generating Station, Units 1 and 2
NRC Inspection Report No. 50-454/97022(DRP); 50-455/97022(DRP)

This inspection included aspects of licensee operations, maintenance, engineering, and plant support. The report covers a 6-week period of resident inspection.

Operations

- The Unit 2 startup on October 21, 1997, demonstrated excellent operator performance. Consistent three-way communications between operators and formal command and control by the unit supervisor and shift manager were observed. The operators minimized the number of personnel in the control room, thus reducing distractions. The qualified nuclear engineer reported directly to the unit supervisor and made good recommendations and observations. The operators responded to each annunciator alarm, reviewed the procedure and took appropriate action. The approach to criticality was slow and controlled (Section O1.1).

- The Unit 1 shutdown on November 7, 1997, was well executed. Excellent command and control, very good three-way communications, and good briefs and oversight by management were observed (Section O1.2).

- Routine control room observations were very good. Control room personnel conducted themselves professionally, unit supervisors and nuclear station operators completed their duties without distraction, control room personnel were knowledgeable of plant conditions, and operators practiced proper three-way communications while performing plant evolutions. The addition of a work execution center outside the control room significantly reduced the number of personnel requiring entry to the control room. Those personnel entering the control room behaved professionally, observed the proper control room protocol, and entered for the conduct of technical or administrative business with the unit supervisors or nuclear station operators (Section O1.3).

- A review of the September 1997 2B chemical and volume control (CV) pump work activity documentation identified several issues. Procedure problems with filling and venting the pump were identified by the licensee; however, no corrective actions were taken or planned until questioned by the inspectors. Additionally, poor inter-department communications existed as demonstrated by the fact that five individuals involved in the CV pump maintenance did not know the status of the pump; specifically, whether or not the pump had been drained during the maintenance activities. A violation example for an inadequate procedure was issued (Section O3.1).

- No corrective actions were taken for two problem identification forms (PIFs) written during the 2B CV pump work. Issues identified in the PIFs included a lack of a CV pump fill and vent procedure, an inadequate safety evaluation, and poor communications between departments. The corrective action program failed to capture the issues identified adequately and assign an appropriate investigation (Section O8.2).

Maintenance/Surveillance

- Observed maintenance and surveillance activities were well conducted. Procedures were used, personnel involved were knowledgeable, most foreign material exclusion (FME) controls were good, and issues were identified by maintenance personnel. Additionally, based on proper authorization, procedure adherence, good communication and coordination, and verification that the surveillance acceptance criteria was met, the observed surveillance testing was well performed (Sections M1.1 and M1.2).

- Foreign material control around the Unit 1 containment floor drain sump was poor and not in accordance with the station procedure governing foreign material control. The sump was designated as an FME area and holes in the floor drain sump cover were not protected with FME covers. A violation for failure to follow the FME procedure was issued (Section M1.3).

- On November 21, 1997, during a system walkdown, the inspectors noted boron deposits on the seal injection lines fittings and connections that had been previously repaired in September 1997. The deposits had been identified by the licensee and an action request had been written. The inspectors considered previous maintenance was not effective to prevent system leakage (Section M1.4).

- The material condition of the Unit 2 residual heat removal (RH) system prevented the satisfactory conduct of the quarterly ASME surveillance as written due to leaking reactor coolant system (RCS) cold leg check valves. The operability evaluation for the condition was adequate, but did not address contingency actions for operators to take to prevent a potential RH pump suction relief valve lift during a small break loss of coolant accident (Section M2.1).

- After dropping a section of runway to be used during the steam generator replacement, the licensee responded appropriately, quarantined the area and promptly performed a formal investigation (Section M8.1).

Engineering

- System engineering identified that two vent valves were not included in the monthly Unit 1 emergency core cooling system (ECCS) venting surveillance test. The valves were discovered during a modification review for system enhancements. The system enhancements were part of actions taken following identification in May 1997 that a residual heat removal vent valve was not being included in the monthly Unit 1 ECCS venting surveillance test (Section E1.2).

Plant Support

- A worker struck contaminated stairs staged in the fuel handling building three times with the uncontaminated handling equipment while using an overhead hoist. Radiological response was appropriate; however, the repeated striking of contaminated equipment showed poor radiological work practices and a disregard for contamination area postings by personnel (Section R1.1).

Report Details

Summary of Plant Status

Unit 1 operated at or near full power until November 7, 1997, when the licensee began a steam generator replacement and refueling outage. Unit 1 remained shutdown at the end of the inspection period.

Unit 2 was synchronized to the grid on October 21, 1997, after extraction steam bellows repairs were completed. Unit 2 then operated at or near full power through the end of the inspection period.

I. Operations

O1 Conduct of Operations

O1.1 Unit 2 Startup following Extraction Steam Bellows Repair (71707)

The inspectors observed significant portions of the Unit 2 startup on October 21, 1997. The inspectors observed consistent three-way communications between operators and formal command and control by the unit supervisor and shift manager. The operators minimized the personnel in the control room, thus reducing distractions. The qualified nuclear engineer reported directly to the unit supervisor and made good recommendations and observations. The inspectors also noted that the operators responded to each annunciator alarm, reviewed the procedure and acted accordingly. The approach to criticality was slow and controlled. The inspectors concluded that the Unit 2 startup demonstrated excellent operator performance.

O1.2 Unit 1 Shutdown for Refueling and Steam Generator Replacement (71707)

a. Inspection Scope

The inspectors observed portions of the Unit 1 shutdown on November 7, 1997. Observations included licensee preparations, briefings, communications, command and control, and the operators' performance during the unit shutdown.

b. Observations and Findings

Several briefings were provided to the station staff involved in the actual shutdown and outage preparations. The site vice president briefed all site personnel, emphasizing clear communications, nuclear safety, minimizing radiation exposure, personnel safety and the necessity for error free operations. A briefing from the operations manager for the crew performing the shutdown emphasized the following: safety first, if any abnormality or doubt existed don't hesitate to trip the unit, the schedule was not a concern, use three-way communications, and formal command and control. The inspectors also observed the heightened level of awareness (HLA) briefing immediately prior to the shutdown and found it to be thorough and detailed. In addition, several other briefings before each evolution during the shutdown were conducted.

During the shutdown, the inspectors noted excellent command and control with very good three-way communications. The process was well controlled and activities were conducted with minimal congestion in the control room. Personnel involved were knowledgeable of their duties and good management and supervisory oversight

was observed by the inspectors.

c. Conclusion

The inspectors noted that the shutdown was executed as planned. This was exemplified by excellent command and control, very good three-way communications, and oversight by management.

O1.3 Observation of Control Room Conduct (71707)

a. Inspection Scope

The inspectors conducted observations in the control room to assess the conduct of control room personnel, control room communications, and control room access controls. The inspectors reviewed Byron Administrative Procedure (BAP) 300-1, "Conduct of Operations," Revision 14.

b. Observations and Findings

On November 12, 1997, inspectors observed operators in the control room. The inspectors found that control room personnel conducted themselves professionally. For example, control room conversations were conducted in a way that minimized control room distractions and maintained the professional atmosphere. The inspectors observed that the unit supervisors and nuclear station operators (NSOs) were attentive to their duties. The unit supervisors made frequent trips to the "at-the-controls" area of the control room to supervise evolutions in progress, to directly observe a reactivity addition, and to do general control board walkdowns. The unit operators were observed performing frequent control board walkdowns, monitoring surveillance tests and plant evolutions, and closely monitoring reactor core nuclear parameters during and following the withdrawal of control rods (Unit 2).

The inspectors also observed the addition of boric acid solution to the Unit 1 refueling water storage tank and the performance of slave relay surveillance testing on Unit 2. During each of these evolutions, the inspectors observed proper 3-way communications between operators.

The inspectors observed that personnel entering the control room followed the proper control room entry protocol and entered to conduct technical or administrative business. For example, the work execution center NSO entered several times with out-of-service documents that required the unit supervisor's approval. The inspectors observed that the number of non-shift personnel entering the control room was minimal. The work execution center NSO told the inspectors that the recently created work execution center had eliminated the necessity for personnel to enter the control room to obtain approvals to begin work. Most of the work control function was done outside the control room.

c. Conclusions

Based on the observations in the control room on November 12, 1997, the inspectors concluded that the control room personnel conducted themselves professionally, unit supervisors and NSOs completed their duties without distraction, control room personnel were knowledgeable of plant conditions, and operators practiced proper three-way communications while performing plant evolutions.

The inspectors also concluded that the number of personnel entering the control room was significantly reduced by the addition of a work execution center outside the control room. Those personnel entering the control room behaved professionally, observed the proper control room protocol, and entered to conduct technical or administrative business with the unit supervisors or NSOs.

O3 Operations Procedures and Documentation

O3.1 Chemical and Volume Control Pump 2B Fill and Vent (71707)

a. Inspection Scope

The inspectors reviewed several aspects of the work on the 2B chemical and volume control pump, conducted by the licensee in September 1997. The inspectors reviewed Byron Operating Procedure (BOP) CV-3, "Filling and venting the CV system," Revision 5, the licensee's root cause investigation (see Section O8.2), out-of-service (OOS) 970008315, and work request (WR) 970006833, "Seal injection lines need to be cleaned." The inspectors also discussed CV pump venting with the system engineer, operators, and the operating manager.

b. Observations and Findings

On September 8, 1997, the licensee began performing several tasks on the 2B chemical and volume control (CV) pump. One task was to clean the seal injection lines to the 2B CV pump. The original task, first attempted in January 1997, was to clean boron deposits off several connections near the pump casing. However, the leaks were active and the boron deposits continued. During September 1997, mechanical maintenance disassembled and reassembled several threaded connections and a mechanical connection to correct the leaks.

Operators questioned the decision to drain the pump on September 10, 1997, and documented the concern on a problem identification form (PIF). The shift manager noted on the PIF that the CV pump was not drained for scheduled maintenance. However, the inspectors noted that the 2B CV pump out-of-service OOS included 2CV007B, 2B CV PP 2CV01PB Casing Drain Valve, with a comment to use the valve to drain the pump for mechanical maintenance work on the pump seal. The inspectors noted that the seal injection line cleaning was also covered by the same OOS. Additionally, the work package for the seal injection line cleaning required removal of elbows and breaking 4-bolt flanges. The work request documented completion of the disassembly and reassembly on September 9, 1997. The inspectors also observed the actual locations of the elbow fittings and flanges and noted that some of the connections were below the elevation of the upper portion of the pump. All of the connections were several feet lower in elevation that the suction and discharge isolation valves used to isolate the pump. The inspectors concluded that, contrary to the shift manager's statement, the pump was actually partially drained.

The inspectors requested the venting procedure for review and were informed by a

system engineer that a venting procedure for the CV pump did not exist for the existing plant conditions (Mode 1). The lack of a standard operating procedure to fill and vent the CV pump was also noted by the nuclear station operator (NSO) on the September 10, 1997, PIF identified above. Discussions with the system engineer revealed that the pump suction and discharge gauges were typically vented to vent air from the isolated portions of the system. The 2B CV pump also had a pipe stub with a cap near an isolation valve that could have been used, although the inspectors noted no vent valve existed. The inspectors noted that the pipe stub and cap did not exist on all of the CV pumps.

Discussions with operations management identified that a fill and vent procedure for the CV system did exist. However, the inspectors reviewed BOP CV-3, "Filling and Venting the CV System," and determined that the procedure was inadequate in that the vent valves identified in the procedure were not within the isolation OOS boundary. The licensee stated that some operators considered removing a pipe cap skill of the craft; however, the inspectors noted that to vent the CV pump, a pipe cap was removed, instrument lines for two gauges were vented, and a temporary procedure change was written to vent the mini-flow line (see Section E1.1). Therefore, the inspectors considered the necessary venting steps significant and warranted an appropriate procedure.

Title 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," stated, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances. The inspectors concluded that a fill and vent of the 2B CV pump was an activity affecting quality and that the existing procedure was not appropriate to the circumstance; therefore, the procedure to accomplish the fill and vent was an example of a violation of 10 CFR 50, Appendix B, Criterion V (50-454/455-97022-01(DRP)).

The inspectors considered the non-cited violation criteria; however, the NSO's identification of the issue was not corrected without the inspectors' questioning. The PIF was "issued closed" by the station event screening committee based on the shift manager's comments. Therefore, no corrective action was taken or planned after the completion of the licensee's root cause (see Section O8.2).

Discussions with the in-plant shift supervisor (a senior reactor operator) indicated that the operating crew did not know the status of the pump early on September 10, 1997. The crew was initially unable to determine whether the pump had been drained. None of the following individuals were aware of whether or not the pump had been drained; the project manager for the work, the work week manager, the system engineer, or the night shift mechanical maintenance supervisor. Through a detailed review of the work packages, operators determined that the pump had been partially drained. The inspectors concluded that the lack of knowledge of the pump status was an example of poor communications between departments.

c. Conclusions

The inspectors concluded that the 2B CV pump was partially drained during the work conducted on September 1997. Although procedure problems with filling and venting the pump were identified by the licensee, no corrective actions were taken or planned until questioned by the inspectors. Additionally, poor inter-department communications existed as demonstrated by the fact that five individuals involved in the CV pump maintenance did not know the status of the pump. A violation example was issued.

O8 Miscellaneous Operations Issues (92700, 92901)

O8.1 (Closed) Follow-Up Item 50-455-97020-02(DRP): 2B CV Pump Maintenance Window. This item was discussed in Sections O3.1, O8.2, M1.4, and E1.1 of this report. The inspectors noted several problems during the work window review. However, the inspectors also noted that operators started a power reduction of Unit 2 when the allowed outage time was nearly exhausted. The power reduction was begun according to company policy and the decision to start the reduction was independent of the status of the 2B CV pump. The inspectors concluded that the operators took conservative actions to begin placing Unit 2 in hot standby with ample time remaining to perform a safe, orderly, controlled shutdown. This item is closed.

O8.2 Root Cause Analysis of 2B CV Pump Work Window (71707)

a. Inspection Scope

The inspectors reviewed root cause report 455-200-97-CAQS00026, Revision 0, "Job Removed from Schedule due to Delays in Providing a Technical Evaluation, Lack of Parts and Incomplete Package Preparation." The inspectors also reviewed PIFs B1997-03144, "Non-conservative decision making," B1997-03103, "Challenges to Shift Operations Due to Questionable Work Window," and B1997-03085, "Job removed from schedule due to Technical Evaluation, Parts and Package Preparation." An On-site Review Report, OSR 97-121, "2B CV Pump Work Window," was also reviewed.

b. Observations and Findings

During the review of PIF B1997-03103, the inspectors noted that the PIF was issued closed to PIF B1997-03085. The lack of a fill and vent procedure for the 2B CV pump and the communications breakdown discussed in Section O3.1 was identified on PIF 03103. The inspectors reviewed PIF 03085 and noted that engineering support issues for the 2B CV pump work window were identified on the PIF.

On October 24, 1997, the licensee issued root cause report 455-200-97-CAQS00026. The root cause report discussed the engineering support issues and identified corrective actions applicable to the engineering support issues. However, the inspectors identified that the issues identified in PIF 03103 were not addressed in the root cause report.

Additionally, the inspectors noted that PIF 03144 was issued closed based on the shift manager's recommendation. This PIF also identifies the lack of a fill and vent procedure and identifies the safety evaluation concerns discussed in Section E1.1 of this report. The inspectors were concerned that no corrective actions were taken for either PIF 03103 or 03144. The inspectors noted the concerns to the operations manager on October 28, 1997. The operations manager agreed with the inspectors that the root cause did not address all the issues and requested that the root cause

organization reopen the investigation and do a supplemental root cause.

On November 25, 1997, the inspectors asked the status of the supplemental root cause investigation and were informed that the investigation had not been started. The root cause organization discovered that the request had not been assigned a due date, the assigned investigator had not been given the task, and the request had not been entered into the licensee's tracking system. After the inspectors' questions, the licensee immediately assigned a new investigator, assigned a due date, and entered the action into the licensee's tracking system. The inspectors noted that the task had not been lost, action had not been taken by the root cause organization to initiate the supplemental investigation, almost a month after the initial decision to do a supplemental investigation.

Due to the violation cited in Section O3.1, and an unresolved item discussed in Section E1.1, the inspectors did not consider the missed corrective actions a violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions."

c. Conclusions

The inspectors concluded that no corrective actions were taken for two PIFs. Issues identified in the PIFs included a lack of a CV pump fill and vent procedure, an inadequate safety evaluation, and poor communications between departments. The inspectors concluded that the licensee's corrective action program failed to capture the issues identified adequately and assign an appropriate investigation.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Maintenance Observations (62707)

a. Inspection Scope

The inspectors observed the performance of all or portions of the following work requests (WR). When applicable, the inspectors also reviewed TS and the Updated Final Safety Analysis Report (UFSAR) for potential issues.

WR 940014887-03	Remove/Replace Fill, Fan Blades and Drift Eliminator
WR 960054553-01	Install DCP 9600017/9700469: New Fan Assembly with Forged Blades.
WR 97002159	Reactor Vessel Closure Head Removal
WR 97002170	Reactor Vessel Closure Head Removal
WR 970028840-01	Clean and Inspect the 1A CV Pump Cubicle Cooler
WR 960054553-04	Remove/Install Discharge Check Damper to 0D Auxiliary Building Supply Fan, 0VA01CD

b. Observations and Findings

The inspectors observed that the maintenance activities were conducted according to approved procedures and were in conformance with TS. The inspectors observed maintenance supervisors and system engineers monitoring job progress. Quality control personnel were also present when required. When applicable, appropriate radiation control measures were taken.

Essential Service Water (SX) Tower Fill Replacement

The inspectors noted that foreign material exclusion (FME) protection was good within this project and extensive measures were established to continue operation of the cooling tower to protect operating equipment while the project was being carried out. In addition, after completion of each cell, the licensee planned to conduct a diver inspection of the basin.

0D Auxiliary Building Ventilation Supply Fan Blade Replacement

During the inspection, the inspectors noted some small debris near the fan suction. The inspectors concluded that FME controls were weak initially. However, as the project continued, the work areas were acceptably cleaned. A problem was noted by the licensee with the inadequate fit of a new protective screen installed on the fan intake. At the end of the period, the issue was being resolved by the system engineer.

c. Conclusions

During the inspectors observations, procedures were used, personnel were knowledgeable, FME controls during the SX tower fill replacement were good, and issues were identified by maintenance personnel. The inspectors concluded that observed maintenance activities were well conducted.

M1.2 Surveillance Observations (61726)

a. Inspection Scope

The inspectors observed the performance of all or parts of the following surveillance test procedures. The inspectors also reviewed plant equipment and surveillance testing activities against the UFSAR descriptions.

- 1BOS 0.5-2.SI.2-2.1 Safety Injection System and Spurious Valve Actuation Group Valve Stroke test "A" Train
- 1BOS 0.5-2.SI.3-1 Safety Injection Isolation Valve Indication Test "A" Train
- 2BOS 7.1.2.1.b-1 Motor Driven Auxiliary Feedwater Pump Monthly Surveillance.
- 2BOS 8.1.1.2.a-1 2A Diesel Generator Operability Monthly.

b. Observations and Findings

The inspectors noted that proper authorization was routinely obtained from the control room senior reactor operator (SRO) before the start of each surveillance test. At the completion of the surveillance test and after independent verification of system restoration, the TS action requirement was cleared. The inspectors observed the communications between operators in the control room and the auxiliary building, and observed the coordination between the nuclear station operators and non-licensed operators. Test instruments used were verified to be calibrated as

applicable. The inspectors reviewed completed surveillance tests and verified the surveillance tests met the acceptance criteria.

c. Conclusions

The inspectors concluded that, based on proper authorization, procedure adherence, good communication and coordination, and verification that the surveillance acceptance criteria was met, the observed surveillance testing was well performed.

M1.3 Poor Foreign Material Exclusion (FME) Control Observed in Unit 1 Containment (71707)

a. Inspection Scope

The inspectors made a general inspection of the Unit 1 containment on November 17, 1997. The inspectors reviewed NSWP-A-03, "Foreign Material Exclusion," Revision 0, and discussed the FME issue identified below with a member of station management.

b. Observations and Findings

The inspectors observed that the Unit 1 containment floor drain sump, on the 377 foot level inside the containment missile barrier, had been roped off and had signs designating the area as a foreign material exclusion area. The inspectors observed two holes in the floor drain sump cover, each about 6 inches square, that were not protected with FME covers. Another hole in the floor drain sump cover had an FME cover, but the cover was pulled back, exposing the hole. Inside the designated FME area was a washer and several pieces of debris, immediately outside the FME area on the floor were more pieces of debris. No personnel were monitoring the FME area and no work or testing was being done on the floor drain sump.

NSWP-A-03, Step 6.4.1 states that all system breeches must be covered where possible except when: the opening is attended, and work, inspection, or testing is in progress that requires removal of the FME cover.

The licensee noted that after the identification of the issue, hard covers were installed to adequately prevent foreign material from entering the system. The licensee also noted that the sump was scheduled for a complete inspection at the end of the outage; therefore, the sump was not required to be an FME area. However, the licensee did agree that the area was posted as an FME area and should have met the requirements of NSWP-A-03.

TS 6.8.1, "Procedures and Programs," required that written procedures shall be established, implemented, and maintained for the applicable procedures recommended in Appendix A, of Regulatory Guide 1.33, Revision 2. Regulatory Guide 1.33, Appendix A recommended general procedures for control of maintenance activities. The inspectors concluded that the failure to follow NSWP-A-03 was a violation of TS 6.8.1 (50-454-97022-02(DRP)).

c. Conclusion

The inspectors concluded the foreign material control around the Unit 1 containment floor drain sump on November 17, 1997, was poor and not in accordance with the station procedure governing foreign material control. The inspectors observed that the sump was designated as an FME area and that there were two holes in the floor drain sump cover, each about six inches square, that were not protected with FME

covers. A third hole in the floor drain sump cover that had an FME cover, but the cover was pulled back, exposing the hole. Inside the designated FME area was a washer and several pieces of debris, immediately outside the FME area on the floor were more pieces of debris. A violation was issued.

M1.4 2B CV Pump Seal Injection Line Cleaning

During a routine inspection of the auxiliary building on November 21, 1997, the inspectors noted that the seal injection lines fittings and connections discussed in Section O3.1 had boron deposits again. The inspectors did not identify any water and concluded that the leaks were small. The inspectors also noted that the deposits had been previously identified by the licensee and an action request had been written. The inspectors concluded that the licensee had taken appropriate actions to identify the new leaks; however, the maintenance conducted on September 9, 1997, to repair the previous leaks had been ineffective.

M2 Maintenance and Material Condition of Facilities and Equipment

M2.1 Leaking Reactor Coolant System (RCS) Check Valves Prevents Performance of Residual Heat Removal (RH) Surveillance (61726)

a. Inspection Scope

The inspectors reviewed the following documents: 2BVS 5.2.f.3-1, "ASME [American Society of Mechanical Engineers] Surveillance Requirements for Residual Heat Removal Pump 2RH01PA," Revision 17; Operability Evaluation 97-58; OMa-1988, Part 6, "Inservice Testing of Pumps in Light Water Reactor Power Plants;" Updated Final Safety Analysis Report (UFSAR), Chapters 5 and 6; and TS 3.5.2. The inspectors also interviewed the system engineer.

b. Observations and Findings

The inspectors observed the start of the surveillance test. The test had to be halted because about 10 minutes after the 2A RH pump was started the pump suction pressure increased, reaching about 128 pounds per square inch gage (psig) after about 17 minutes. The 2B RH pump suction pressure increased to about 317 psig because it equalized to the 2A pump discharge pressure. A special suction pressure gage installed for this surveillance had a range of 100 psig and the surveillance could not be completed. After the 2A RH pump was secured, 2A RH suction pressure increased to 279 psig then dropped slowly for about 15 minutes, and then started to increase at a rate of about 50 psig per hour. Suction pressure was then dropped to about 50 psig when the suction lines were vented.

The increase in suction pressure was caused by check valve(s) leakage in the RCS cold leg injection lines. Since the pump recirculates, the pump suction pressure also increased.

Operability evaluation 97-58 stated that a concern existed that during a small break loss of coolant accident, the RH pump suction pressure could increase to the point where the RH suction relief valve would lift, at about 450 psig. The evaluation stated that the pump would be secured before the suction pressure would reach 450 psig based on previous history of how fast the pressure was increasing and how fast operators would secure the pumps according to 2 BEP-1, "Loss of Reactor or Secondary Coolant," Revision 1. Operator response time was based on simulator observations. The operability evaluation did not state that the pressure would continue to rise after the pumps were secured until the suction line was vented. The

inspectors asked the shift manager if any contingency actions existed to vent the RH suction lines for a small break loss of coolant accident. The shift manager said there were none. The inspectors noted, however, 2BEP-1, Step 13 directs the operating crew to cooldown and depressurize the RCS if pressure is above 300 psig. In addition, operations management personnel stated that caution cards would be placed on the Unit 2 RH pump control switches to discuss the need to vent the suction lines if the pumps are operated.

The inspectors verified that the condition with the leaking check valve was listed as an operator work around and that the licensee was working on a plan to identify and repair or replace the leaking check valves during the next Unit 2 refueling outage.

c. Conclusion

The inspectors concluded that the material condition of the residual heat removal system prevented the satisfactory conduct of the quarterly ASME surveillance as written due to leaking RCS cold leg check valves. The inspectors concluded that the licensee's operability evaluation for this condition was adequate but did not address contingency actions for operators to take to prevent RH pump suction relief valve lift during a small break loss of coolant accident.

M8 Miscellaneous Maintenance Issues (92700, 92902)

M8.1 Load Drop During Assembly of Steam Generator Replacement (SGR) Equipment (50001)

a. Inspection Scope

The inspectors reviewed the circumstances surrounding a heavy load drop. The inspectors attended the initial fact finding meeting after the incident, observed the area around the dropped load for potential impact on safety-related equipment, reviewed the licensee's root cause report, and discussed the event with licensee management.

b. Observations and Findings

On November 5, 1997, the licensee's SGR contractor was assembling the structures outside the Unit 1 containment that would be used for moving the new and old SG's in and out of the containment. A 57,000 pound runway section was dropped from about 60 feet in the air. At the time of the drop, the runway was being lifted into place. When the crane operator stopped lifting, the load fell approximately 15 feet. The crane operator took immediate actions to stop the load from dropping and brought the load to a sudden stop. The sudden stop caused all four nylon rigging straps to fail, which allowed the runway section to fall to the ground. The platform was about 46 feet long by 10 feet wide and 2-3 feet high. The platform sustained considerable damage plus some additional damage was inflicted on another support structure lying on the ground. No injuries were identified and there was no evidence of damage to any safety-related equipment. The licensee formed a root-cause team and conducted an investigation with the contractor that identified that the actual root cause was unknown; however, the most probable cause was crane operator error. Five potential scenarios that involved misuse of the crane brake were identified by the root cause team. The mechanical inspection of the crane did not identify any material condition concerns.

The inspectors monitored the licensee response and noted that the proper individuals were promptly contacted for investigation and that the entire area was quickly quarantined for the investigation.

The licensee took several corrective actions to prevent recurrence. Actions included the following: briefs of all craft personnel on the event and a special meeting with crane operators discussing the circumstances and corrective actions resulting from the load drop; a complete crane inspection, including a load test; a maintenance program review; walkdowns of various rigging devices; and additional emphasis on communications methods.

c. Conclusions

The inspectors concluded that the licensee responded appropriately, quarantined the area and promptly performed a formal investigation.

III. Engineering

E1 Conduct of Engineering

E1.1 2B CV Pump Fill and Vent Safety Evaluation (37551)

a. Inspection Scope

The inspectors reviewed several aspects of the 2B chemical and volume control (CV) pump work conducted by the licensee in September 1997. The inspectors reviewed the licensee's temporary procedure change to 2BVS 1.2.3.1-2, "ASME surveillance requirements for centrifugal charging pump 2B," revision 15, the associated safety evaluation screening, the UFSAR, and PIF B1997-03144.

b. Observations and Findings

On September 10, 1997, a nuclear station operator (NSO) identified that a Byron Operating Procedure (BOP) to fill and vent the 2B CV pump did not exist (see Section O3.1). Due to the work on the pump mini-flow check valve, system

engineering had made a temporary change to the routine CV pump ASME test to vent the mini-flow line. The ASME test flow path was through the mini-flow recirculation line; therefore, the licensee concluded that performing the ASME test would ensure that the mini-flow line was filled and vented. A temporary procedure change was required to change the return flow path from the normal line-up, which was to the CV pump suction, to the top of the volume control tank (VCT).

System engineering performed a safety evaluation screening on September 10, 1997, for the proposed temporary procedure change and concluded that a safety evaluation was not required. The screening stated that the reason for the realignment of the return path was "to avoid air that may possibly be in recirculation line from being sent directly to suction of CV pumps. . . ." The screening noted that the recirculation line would still be isolated on a safety injection signal and seal water return would still have a flow path to the top of the VCT. The inspectors noted that the recirculation line combined with the reactor coolant pump seal water return line prior to entering the top of the VCT or the CV pump suction line. The inspectors also noted that the Updated Final Safety Analysis Report (UFSAR) stated that the seal water return line was normally aligned to the suction of the CV pumps. However, the NSO identified in a PIF that the screening did not consider the potential introduction of oxygen into the gaseous waste processing system (GWPS). Section 11.3.2.1 of the UFSAR stated the following:

> "The gaseous waste processing system (GWPS) processes hydrogen stripped from the reactor coolant and nitrogen from the closed cover gas system. The components connected to the GWPS are limited to those which contain no air or aerated liquids in order to prevent the accumulation of oxygen in the system. Further, the GWPS is maintained at a pressure above atmospheric to avoid intrusion of air. . . . Hence, the GWPS will normally not contain oxygen and special design precautions are taken in order to avoid unintentional intrusion of oxygen."

The NSO noted that the VCT was a component connected to the GWPS and the inspectors noted during a piping and instrumentation drawing (P&ID) review that the VCT was vented to the GWPS.

The shift manager noted that the system engineer, a chemist, the unit supervisor, and the shift manager determined that the potential addition of oxygen would not affect the VCT hydrogen concentration and therefore was not a significant concern. Thus, the shift manager concluded that no safety evaluation was required. Chemists sampled the VCT gas following the venting activities and the sample showed 0.02 percent oxygen in the gas space. The inspectors discussed the conversation with the system engineer. The engineer confirmed that the conversation occurred and that the conclusion was there was not a significant concern.

The inspectors discussed the issue with members of station management. Initially, the licensee believed that since the activity was a maintenance activity and not routinely performed, the potential addition of oxygen to the GWPS did not require a safety evaluation. The licensee noted that if a modification or change in operating procedure was planned that added a permanent or continuous addition of oxygen to the GWPS, then a safety evaluation would be required. The inspectors believed that the maintenance activity not routinely performed required a safety evaluation. Later, during additional discussions with licensed management, the licensee indicated that if there had been a question concerning how much oxygen would be vented to the VCT, a safety evaluation would have been required. The inspectors noted that the licensee had not evaluated the design or licensing basis allowable amount of oxygen in the GWPS, nor did the licensee have an estimate of how much oxygen would be

added prior to conducting the pump venting.

Title 10 CFR Part 50.59, "Changes, tests and experiments," required that the licensee maintain records of changes in the facility and of changes in procedures made pursuant to 10 CFR 50.59, to the extent that the changes constituted changes in the facility described in the safety analysis report or to the extent that they constituted changes in procedures as described in the safety analysis report. The records must include a written safety evaluation which provided the bases for the determination that the change, test, or experiment did not involve an unreviewed safety question. The inspectors concluded that the failure to perform a written safety evaluation for the potential addition of oxygen to the gaseous waste processing system may be a violation of 10 CFR 50.59. This is an unresolved item pending further NRC review (50-454/455-97022-03(DRP)).

c. Conclusions

The inspectors concluded that the licensee had several opportunities to perform a safety evaluation. An NSO identified the UFSAR section that referenced the GWPS and requested a safety evaluation be performed. The inspectors noted that the original safety evaluation screening was written to make a temporary procedure change to avoid air that may possibly be in the recirculation line from being sent directly to suction of CV pumps. The inspectors concluded that the screening failed to evaluate all integrated plant operations. Additionally, the temporary procedure change was required to compensate for the lack of a standard operating procedure to fill and vent the pump (see Section O3.1). This is an unresolved item pending further NRC review.

E1.2 Emergency Core Cooling Vent Valve Not Vented (37551)

a. Inspection Scope

The inspectors reviewed the licensee's identification of two safety injection (SI) valves that were not included in the monthly emergency core cooling system (ECCS) venting surveillance test. Included was a review of SI, chemical and volume control (CV), and residual heat removal (RH) drawings and valve line-ups. A comparison of ECCS vent valves, identified by the inspectors, to the monthly venting procedure, 1BOS 5.2.b-1, Revision 6, was also performed. Licensee event reports (LERs) 454/97-009 and 454/97-018 were reviewed along with the corrective actions resulting from a previously identified ECCS venting violation, documented in NRC Inspection Report No. 50-454/455-97009.

b. Observations and Findings

On October 23, 1997, the licensee identified that two vent valves were not included in the monthly Unit 1 ECCS venting surveillance test. The inspectors noted that the valves, 1SI051 and 1SI052 (SI pump to 1A/1D and 1B/1C hot leg vents, for A and B train respectively) were not identified during previous immediate corrective actions for a missed TS surveillance. In May 1997, the inspectors identified that 1RH027, an RH vent valve, was not vented as required by TS. A pre-decisional enforcement conference was held on September 11, 1997, to discuss several TS compliance issues, including the failure to vent the ECCS systems appropriately. One example was the failure to include 1RH027 in the monthly venting surveillance test.

Discussions with the licensee indicated that site engineering was preparing a modification to add hard pipe to several ECCS vent valves. The modification was to route vented water to the floor drain system, enhancing the venting capabilities of the system. An ECCS system engineer was assisting in the review and noted valves on the list that he did not remember being included in the venting surveillance test. Further research by the system engineer confirmed that 1SI051 and 1SI052 were not in the venting procedure. TS 3.0.3 and 4.0.3 were entered for missed surveillance testing and the venting completed after a temporary procedure change was completed to 1BOS 5.2.b-1. No air or gas was identified.

The inspectors' ECCS drawing review identified that the isometrics and the piping and instrumentation drawings (P&IDs) clearly identified the vent valves. The SI system valve line-up also clearly identified 1SI051 and 1SI052 as vent valves.

c. Conclusions

The inspectors concluded system engineering identified that 1SI051 and 1SI052 were not included in the monthly venting surveillance during the corrective actions following identification of 1RH027 not being included in the surveillance test.

E1.3 Material Handling System in the Fuel Handling Building (50001).

a. Inspection Scope

During the inspection period, the inspectors noted that the licensee had removed mechanical stops on the Fuel Handling Building (FHB) crane. The inspectors review included the following: Special Plant Procedures (SPP) 97-125 and 97-136; portions of safety evaluation 6H-97-0048; portions of calculation SG-BYR-96-153, "Material Handling System;" TSs ; the Updated Final Safety Analysis (UFSAR); and NUREG 0612, "Control of Heavy Loads at Nuclear Power Plants."

b. Observations and Findings

The inspectors reviewed the licensee's plans for moving heavy loads (greater than 2,000 pounds) through the FHB into the Unit 1 containment. During the review, the inspectors identified that the licensee designed and built a material handling system (MHS). The MHS consisted of existing rails that were next to one end of the spent fuel pool (SFP), additional elevated rails for entering the containment building through the equipment hatch, a cart, and a winch to pull the cart along the rails. The cart included three significant features, rollers to move the cart along the rails adjacent to the SFP, a "lazy-susan" to rotate the upper portion of the cart into alignment with the equipment hatch, and an upper set of rollers that, when unpinned, allowed the load to be rolled along the elevated rails into containment.

The inspectors review of the UFSAR indicated that two types of accidents in the FHB were analyzed, a fuel handling accident involving dropping a fuel assembly, and a spent fuel cask drop accident. The UFSAR successfully analyzed the fuel handling accident. The inspectors noted that a fuel cask drop into the SFP was not analyzed. Detailed explanation was provided in the UFSAR to demonstrate that a cask would not drop into the SFP.

Heavy loads, as much as 20 to 30 tons, were scheduled to be moved along the entire width of the spent fuel pool on the MHS cart. The inspectors were concerned that a new accident not previously analyzed in the UFSAR had been created, specifically, either a seismic event or load handling accident potentially causing the load on the cart to fall into the SFP. The inspectors review of the safety evaluation noted that the licensee planned to tether the heavy loads with the FHB crane while the load was moved along the width of the spent fuel pool. Based on the tether and the safety margin of greater than 10:1 for the crane's wire rope, the licensee determined that a creditable accident was not possible.

Additional actions taken by the licensee included the construction of a large platform that was placed over the end of the SFP, creating an additional barrier to the SFP and a walkway approximately 5 feet wide. Spent fuel was also removed from the two storage racks in the SFP immediately adjacent to the wall that supported the MHS. The licensee also noted that, although the FHB crane was not seismically qualified to rated capacity, it was seismically qualified to 20 percent of rated capacity.

The inspectors considered the licensee's actions compensatory measures for the postulated seismic event or load handling accident. The inspectors considered the issues a potential violation of 10 CFR 50.59, "Changes, tests, and experiments," which stated that a licensee may make changes to the facility as described in the UFSAR without prior NRC approval unless the change involves an unreviewed safety question (USQ). An unreviewed safety question included the possibility that an accident or malfunction of a different type than any evaluated previously in the UFSAR may be created. The inspectors concluded that a heavy load drop of this type into the SFP was not previously evaluated in the UFSAR. The inspectors considered the potential for an MHS USQ an unresolved item pending further NRC review (50-454/455-97022-04(DRP)).

c. Conclusions

The inspectors concluded that although the licensee's actions appeared appropriate, the potential for a USQ existed; therefore, further NRC review was required and an unresolved item opened to track the issue.

E8 Miscellaneous Engineering Issues

E8.1 (Closed) LER 50-454/97-018: Missed ECCS Venting Surveillance due to Ineffective Supervisory Methods. The inspectors reviewed the event and Section E1.2 documents the inspectors' findings. The inspectors concluded, after a review of the corrective actions identified in the LER, that the actions were appropriate. This LER is closed.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Radiological Work Practices

a. Inspection Scope (71750)

The inspectors routinely inspected the status and posting of radiologically controlled areas.

b. Observations and Findings

During an inspection in the spent fuel pool area of the fuel handling building (elevation 426) on November 24, 1997, the inspectors observed individuals moving various pieces of equipment using an overhead hoist that could be trolleyed along an overhead track. The equipment was trolleyed over a posted contamination area that was directly below the path of the hoist. The inspectors noted that while the individuals trolleyed the load over the contamination area, it contacted several pieces of equipment stored within. Radiation protection personnel noted this, stopped the movement, and took contamination surveys of both the load being trolleyed and the equipment it had contacted. No loose contamination had been spread outside the posted area. During subsequent movement of equipment over the same contamination area, the inspectors noted that the individuals allowed the hoist's chainfalls to drag across the contamination area posting knocking it down. Radiation protection personnel responded immediately to re-erect the posting. During the next movement of equipment, the inspectors again noted that individuals allowed the hoists chainfalls to drag across the contamination area posting knocking it down.

c. Conclusions

The inspectors concluded that problems observed with the movement of equipment within the spent fuel pool area of the fuel handling building demonstrated poor radiological work practices and a disregard for contamination area postings by personnel conducting the work. An RP technician took prompt, appropriate actions.

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 December 1, 1997. 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

K. Kofron, Byron Station Manager
J. Bauer, Health Physics Supervisor
D. Brindle, Regulatory Assurance Supervisor
E. Campbell, Maintenance Superintendent
T. Gierich, Operations Manager
B. Israel, Site Quality Verification Supervisor
T. Schuster, Manager of Quality & Safety Assessment
M. Snow, Work Control Superintendent
D. Wozniak, Engineering Manager

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 50001:	Steam Generator Replacement Inspection
IP 61726:	Surveillance Observations
IP 62707:	Maintenance Observations
IP 71707:	Plant Operations
IP 71750:	Plant Support
IP 81070:	Access Control - Personnel
IP 92700:	Onsite Follow-up of Written Reports of Non-routine Events at Power Reactor Facilities
IP 92901:	Follow-up - Plant Operations
IP 92902:	Follow-up - Maintenance

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-454/455-97022-01	VIO	Inadequate procedure for CV pump fill and vent.
50-454-97022-02	VIO	Failure to follow procedure NSWP-A-03
50-454/455-97022-03	URI	Potential failure to perform a written safety evaluation for the potential addition of oxygen to the gaseous waste processing system.
50-454/455-97022-04	URI	Potential unreviewed safety question for operation of a material handling system adjacent to the spent fuel pool.

Closed

50-455-97020-02	IFI	2B CV Pump Maintenance Window.
50-454-97-018	LER	Missed ECCS Venting Surveillance due to Ineffective Supervisory Methods

LIST OF ACRONYMS USED

ASME	American Society of Mechanical Engineers
BAP	Byron Administrative Procedure
BEP	Byron Emergency Procedure
BFP	Byron Fuel Handling Procedure
BMP	Byron Mechanical Maintenance Procedure
BOP	Byron Operating Procedure
BRP	Byron Radiation Protection Procedure
CV	Chemical and Volume Control
DG	Diesel Generator
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
ECCS	Emergency Core Cooling System
ECN	Equipment Component Number
FHB	Fuel Handling Building
FME	Foreign Material Exclusion
GWPS	Gaseous Waste Processing System
HLA	Heightened Level of Awareness
LCO	Limiting Condition for Operation
LCOAR	Limiting Condition for Operation Action Requirement
LER	Licensee Event Report
MHS	Material Handling System
NSO	Nuclear Station Operator
NSWP	Nuclear Station Work Procedure
OOS	Out-of-Service
OSR	Onsite Review
PDR	Public Document Room
P&ID	Piping and Instrumentation Drawing
PIF	Problem Identification Form
PSIG	Pounds per Square Inch Gage
RCS	Reactor Coolant System
RH	Residual Heat Removal
SER	Security Event Report
SFP	Spent Fuel Pool
SGR	Steam Generator Replacement
SI	Safety Injection
SPP	Special Plant Procedure
SRO	Senior Reactor Operator
SSPS	Solid State Protection System
SX	Essential Service Water System
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
USQ	Unreviewed Safety Question
VCT	Volume Control Tank
WR	Work Request