U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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Report No: 50-454/96009, 50-455/96009

Licensee: Commonwealth Edison Company

Facility: Byron Generating Station, Units 1 & 2

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

Dates: September 27 - December 17, 1996

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EXECUTIVE SUMMARY
Byron Generating Station, Units 1 & 2
NRC Inspection Report 50-454/96009, 50-455/96009

This inspection included aspects of licensee operations, engineering, maintenance, and plant support. The report covers a resident inspection conducted from September 27 through December 17, 1996.

Operations

- The station auxiliary transformer (SAT) switching and restoration operations were carefully planned and professionally executed. (Section O1.3)

Maintenance

- Maintenance and surveillance activities were completed thoroughly and professionally. (Section M1.1)
- Surveillance test OBVS SX-5 contained inadequate acceptance criteria to determine SX system operability. (Section M1.2)
- System engineering failed to appreciate or understand the importance of the surveillance test with respect to SX system operability. Previous surveillances documented silt accumulation outside the acceptance criteria and degraded trash racks since 1993 with no operability assessments performed. (Section M1.3)
- Heat exchanger inspections and cleaning found minimal silt. (Section M1.6)
- Comprehensive maintenance activities significantly improved the weather protection of the Unit 2 SAT. (Section M1.7)

Engineering

- Based on excessive silt found in the essential service water (SX) cooling towers on October 15, 1996, engineering determined that the SX system was inoperable when the plant relied on the deep well pumps for makeup capability. (Section E1.1)
- The design input used in calculating the ultimate heat sink cooling tower basin makeup did not reflect the SX system design features since initial plant operation. The 1991-1992 design-basis reconstitution failed to identify this error. (Section E1.2)
- Engineering did not appear to be knowledgeable of the SX system design as it was documented in the UFSAR. (Section E1.3)
- The license submittal regarding spent fuel pool (SFP) Boraflex degradation and the decision to checkerboard the SFP was not pursued in a timely manner until after discussions with the NRC. (Section E2.1)

- Engineering aggressively pursued the motor control center spacer issue with Westinghouse. The operability assessment and corrective actions to install the spacers was timely and thorough. (Section E2.2)

Plant Support

- The inspectors identified a worker lying in the Unit 1 positive displacement charging pump room. During an approximate 25-minute stay, the individual received undetectable radiation exposure. (Section R1.1)

- The inspectors identified a containment spray fire door blocked open without a fire barrier impairment perm[illegible] A violation was issued. (Section F1.1)

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at power levels up to 97 percent during this inspection period.

Unit 2 was in a refueling outage (B2R06) until October 4, 1996, when the unit went critical and was placed on the grid October 5, 1996. Subsequently, the unit operated at power levels up to 100 percent.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

Using Inspection Procedure 71707, the inspectors conducted frequent reviews of ongoing plant operations. In general, the conduct of operations was professional and safety-conscious. Specific events and noteworthy observations are detailed in the sections below.

O1.2 Unit 2 Startup (71707)

The licensee shutdown Unit 2 on August 8, 1996, due to a 120 gallons per day steam generator tube leak. After approximately 1 week, the licensee transitioned to the refueling outage, originally scheduled to start September 7, 1996. During the outage, the licensee completed steam generator inspections and repairs and a reactor coolant system resistance temperature detector (RTD) bypass loop elimination modification. On October 4, 1996, at approximately 12:30 a.m. (CDT), Unit 2 criticality was achieved by diluting the reactor coolant system boron concentration. Following the performance of low power physics testing, the unit was placed on the grid on October 5, 1996, at 1:56 p.m. (CDT).

O1.3 Station Auxiliary Transformer Outage Operations

a. Inspection Scope

The licensee performed a Unit 2 Station Auxiliary Transformer (SAT) bus duct inspection as part of the corrective actions from the Unit 1 loss of offsite power on May 23, 1996. The inspectors observed portions of the electrical operations required to restore SAT 242-1 and place SAT 242-2 out of service and to restore Unit 2 to a normal off-site power electrical lineup after inspection completion. The inspectors also observed portions of the maintenance inspections performed on the bus ducts (see Section M1.7).

b. Observations and Findings

On October 26 and November 2, 1996, the inspectors observed the SAT pre-job briefings. Both briefings were attended by all operators involved in the SAT outage and the planned evolutions were discussed in detail. Contingency plans were discussed with dedicated operators assigned to complete any required actions. Extra operators and shift management were available to support the evolutions. Communications were clear and concise with questions and answers. The significance of the evolution and management expectations were discussed.

The inspector also observed emergency diesel generator runs, electrical bus switching evolutions, breaker manipulations, and out of service activities. The inspector observed consistent application of three-way communications, procedure use and place keeping, and peer checking.

c. Conclusions

The inspector concluded that the SAT switching and restoration operations were carefully planned and professionally executed.

O8 Miscellaneous Operations Issues (92901)

O8.1 (Closed) Violation 50/454-94022-02: Station procedure BAP 300-1, "Conduct of Operations," and BAP 330-1, "Station Equipment Out-Of-Service Procedure," did not properly verify that the C steam generator (SG) was ready for service prior to refilling it. When the licensee placed the C SG into wet layup after contractor maintenance, approximately 3600 gallons of secondary side water drained onto the containment floor. The inspectors reviewed the licensee's corrective actions that consisted of creating a SG secondary side close-out checklist in procedures BMP 3300-14, "Steam Generator Primary Manway Closure Removal and Installation," Revision 14, and BMP 3300-18, "Steam Generator Secondary Manway/Shell Opening Closure Removal and Installation," Revision 12. The inspectors concluded that the checklist contained appropriate activities that were required to be performed prior to returning the SG secondary side to the operations department for normal system fill or testing following maintenance. The checklist also established better control of contractor activities. During the recent Unit 2 outage (B2R06), the checklist was included in the SG work request packages with no concerns noted. This item is closed.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Maintenance Observations (62703)

The inspectors observed all or portions of the following work activities:

- WR 960094288 Troubleshoot oscillations from 2AF005A.
- WR 960002499 Replacement of RWST access cover gaskets
- WR-960002500 Replacement of RWST access cover gaskets
- WR 960101104 Silt removal in SX cooling tower basins A and B
- WR 960108241 Inspect/Clean Unit 1 SI lube oil cooler

The inspectors found that the maintenance activities were conducted in accordance with approved procedures and were in conformance with technical specifications. The inspectors observed maintenance supervisors and system engineers monitoring job progress. Quality control personnel were also present. When applicable, appropriate radiation control measures were in place. The inspectors identified no concerns as a result of these maintenance observations.

M1.2 Inadequate Surveillance Test Acceptance Criteria and Test Control

a. Inspection Scope

On October 15, 1996, during the performance of surveillance OBVS SX-5, "Inspection of River Screen House (RSH) and Essential Service Water Cooling Tower," the licensee identified that silt levels in the essential service water (SX) cooling tower basins were greater than the acceptance criteria. The inspectors reviewed surveillance procedure OPVS SX-5 for technical adequacy and also discussed the results of the diver's inspection on October 15, 1996, with licensee personnel. Additional observations and issues related to the silt problem are discussed in other sections of this report under II. Maintenance and III. Engineering.

b. Observation and Findings

Inadequate Acceptance Criteria

The inspectors questioned the validity of the SX cooling tower basin acceptance criteria listed in surveillance OBVS SX-5. The acceptance criteria stated that the silt buildup in the SX cooling tower basins shall not exceed 12 inches at two or more points shown on OBVS SX-5, Attachment E. Attachment E, which was an illegible diagram of the SX basins, showed 30 sample locations. The inspectors questioned the operability of the SX system if all 30 silt sample points were measured within the acceptance criteria at 11 inches. The licensee agreed that the procedure was inadequate and could not provide justification for the surveillance acceptance criteria. The inspectors determined that the procedure failed to have sufficient quantitative acceptance criteria to

determine SX system operability based on silt levels in the SX cooling tower basins. This is an apparent violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," (EEI 454/455/96009-01(DRP)).

Inadequate Test Control

The inspectors were told that the October 15, 1996, silt measurements in the SX cooling tower basins were taken with reference to the diver's boot and arm. The inspectors questioned the appropriateness of this practice since surveillance procedure OBVS SX-5 referenced test equipment such as underwater cameras and depth gages that may be used during test performance. Since the silt measurements were used to determine SX system operability, the inspectors considered the diver's boot and arm to be inappropriate measuring devices for measuring the silt height in the SX cooling tower basins. Failure to use adequate test instrumentation to measure the amount of silt in the SX cooling tower basins is an apparent violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," (EEI 454/455/96009-02(DRP)).

c. Conclusions

Inadequate acceptance criteria in surveillance OBVS SX-5 could have resulted in meeting the stated acceptance criteria for silt levels in the SX cooling tower basins even though the SX system would not have been able to meet its design function.

M1.3 Inadequate Evaluation and Corrective Action of Past Surveillances

a. Inspection Scope

The inspectors reviewed past OBVS SX-5 surveillance test results for 1993 through 1995 to determine previous SX basin silting conditions.

b. Observations and Findings

Excessive Silt Accumulation

The acceptance criteria for the amount of silt allowed in surveillance OBVS SX-5 was as follows:

- The RSH intake and forebay shall not exceed 9 inches at two points along the width of the intake channel.
- The RSH SX pump sumps shall not exceed 6 inches sediment accumulation in sumps.
- The SX cooling tower basin shall not exceed 12 inches at two or more points.

The inspectors reviewed the 1993 through 1996 completed OBVS SX-5 surveillance tests and identified the following issues:

- On July 26, 1993, the diver recorded 14 areas where silt levels were 12 inches to 24 inches in the SX basin, silt accumulations in one of the sumps was 10 inches, and RSH intake and forebay silt accumulations were 24 to 36 inches. Corrective actions consisted of the diver "distributing" the silt to levels that met the surveillance acceptance criteria. No operability assessment for the SX system was performed on the as found silt condition.

  The silt buildup in the SX cooling tower basin changed the volume of water as analyzed in the UFSAR and therefore could change the consequences of the design-basis accident bounded in the UFSAR. Failure to take appropriate corrective action to the silt accumulation in the SX cooling tower basins is an apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," (EEI 454/455/96009-03A(DRP)).

- On July 26, 1995, the diver recorded silt accumulations of 30 inches to 4 feet in the RSH intake and forebay area. Silt accumulation in the SX makeup pump sump measured 12 to 18 inches. The silt was removed via a vacuum pump. Engineering evaluated the test results on June 17, 1996. No operability assessment for the SX system was performed on the as found silt condition.

Based on previous surveillance results, the inspectors questioned SX system operability since 1993. The licensee initiated a root cause investigation into the SX silting issue and planned to address past SX system operability.

Degraded Trash Rack Grating

The inspectors also identified that the completed surveillance tests for 1993, 1994, and 1995 documented that several portions of the trash rack grating had fallen away from upper lateral supports or were lying in the bottom of the SX cooling tower basins or leaning against the basin support columns. The trash rack grating was attached to the anti-vortex drainage duct located at each end of basin A and B. The trash racks provided a 4 inch by 1-3/16 inch screen for large debris before entering the drainage duct and eventually the SX pump suction. The inspectors also noted that UFSAR Section 3.8.4.1.6, Figure 3.8-66, described the trash rack grating.

System engineering concluded after each surveillance test that the trash rack grating was not part of the test acceptance criteria and that a work request had been previously written in 1993 to restore the grating in basin A and in 1994 for the same repairs in basin B. No safety evaluation or screening for potential unreviewed safety questions had been performed on this change to the SX system. Since the SX cooling tower basins are classified Seismic Category I, the inspectors also questioned the effects the degraded grating potentially had on the UHS seismic qualifications. The failure to take prompt corrective action to

repair the trash racks is an apparent violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," (EEI 454/455/96009-03B(DRP)).

In November 1996 the licensee replaced the grating and repaired or replaced the necessary support brackets that were also degraded. During review of the seismic analysis for the SX cooling tower structure, the licensee identified an error in the methodology used to determine seismic response and member stresses in calculations No. 4.2.3 BY and 3.4.1 BY. The errors were not significant and the licensee planned to regenerate the calculations.

c. Conclusions

System engineering failed to appreciate or understand the importance of the surveillance test with respect to SX system operability. Previous surveillances that documented silt accumulations outside the acceptance criteria brings into question the SX system operability since 1993. Inadequate corrective action to repair the trash racks since 1993 demonstrated a lack of knowledge of SX system design by the licensee and a willingness to operate with a degraded safety system.

M1.4 River Screen House Inspections

a. Inspection Scope

On December 4, 1996, the licensee performed an inspection of the RSH. The inspectors discussed the diver's inspection with licensee personnel.

b. Observations and Findings

On December 4, 1996, with the use of divers the licensee inspected the RSH for silt accumulation and found silt levels that exceeded OBVS SX-5 surveillance acceptance criteria at several locations. Through interviews with the diver and licensee personnel the inspectors found the most significant accumulation was the OA SX makeup pump sump, which contained 36 inches of silt where the acceptance criteria was 6 inches. The licensee's operability assessment determined that presence of the silt accumulation did not impede the operability of the pumps to deliver the required flow rate. This assessment was based on inservice test data (taken every 92 days) that indicated that the pumps were delivering expected flow rates without exceeding differential pressure requirements. The data also indicated no signs of pump cavitation. The inspectors reviewed the data and agreed with the assessment.

As discussed in Section M1.3, surveillance OBVS SX-5, performed on July 26, 1995, documented silt levels of 12 to 18 inches. The silt was removed via a vacuum pump.

c. Conclusions

Based on review of the SX makeup pump inservice testing data, the inspectors confirmed the licensee assessment that the presence of silt

in the sump did not impede the pumps from delivering the required flow rate and showed no signs of pump degradation. The excessive silt accumulation appeared to have taken place over the past 17 months.

M1.5 SX Basin and River Screen House Silt Removal

a. Inspection Scope

The inspectors observed portions of the silt removal from the SX cooling tower basins and the RSH. The inspectors discussed the procedure and process with licensee personnel and the divers.

b. Observations and Findings

To control the cleaning activities in the SX cooling tower basins, the licensee wrote procedure SPP 96-067, "Support for Cleaning, Inspection, and Repair Activities in the Essential Service Water Cooling Tower (SXCT) Basins," Revision 0. This special test detailed the system line-ups needed to support the basin cleaning and also monitored SX system parameters before and after the cleaning to detect any effects the cleaning might have on the SX system. The silt removed from the towers and the RSH was pumped to tanker trucks, which transported the silt to a large earthen basin located just northwest of the plant, within the owner controlled area.

c. Conclusions

The inspectors monitored the activities and had no concerns with the silt removal process. The silt removal activities continued after this inspection period.

M1.6 Various Heat Exchanger Inspections for Silt

a. Inspection Scope

The inspectors observed portions of small heat exchanger inspections for silt and discussed the findings with licensee engineering.

b. Observations and Findings

To ensure that the de-silting activities at the SX cooling tower basins and the river screen house (RSH) was not adversely affecting plant equipment, the licensee performed inspections and cleaning of various heat exchangers cooled by SX water. The inspectors observed minimal silt in the heat exchangers and agreed with the licensee that heat exchanger performance was not impaired. The licensee planned to continue with the inspections on an increased frequency, until the de-silting was completed and an enhanced inspection schedule was developed.

c. Conclusions

The inspectors found that the inspection activities were conducted in accordance with approved procedures and were in conformance with technical specifications. The inspectors observed maintenance supervisors and system engineers monitoring job progress. Quality control personnel were also present. The inspectors identified no concerns as a result of the heat exchanger inspections since minimal silt was found in SX heat exchangers inspected.

M1.7 Station Auxiliary Transformer Outage Maintenance

a. Inspection Scope

The inspectors observed portions of the maintenance inspections performed on the Unit 2 bus ducts and discussed the overall maintenance activities with the SAT outage project manager. These activities were also reviewed against the Updated Final Safety Analysis Report (UFSAR) descriptions.

b. Observations and Findings

The licensee removed the lower covers for the SAT bus ducts to inspect for water intrusion. The licensee did not identify any significant degradation of bus duct insulators. The bus duct caulk was also inspected and found satisfactory; however, the licensee did add caulk in several areas to provide additional protection. Additional measures taken to improve the weather protection included supporting rubber seals on the transformers to enhance water run off and the addition of a waterproof tape at exterior junctions of the bus duct.

c. Conclusions

The inspector concluded that the licensee significantly improved the weather protection of the Unit 2 SAT by the comprehensive nature of the inspection and enhancements.

M1.8 Surveillance Observations

a. Inspection Scope (61726)

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

- 0BOS 7.5.e.1-1 — Essential Service Water Makeup Pump 0A Monthly Operability Surveillance
- 1BOS 3.1.1-21 — Train B Solid State Protection System (SSPS) Bi-Monthly Surveillance
- 1BOS 3.2.1-941 — ESFAS Instrumentation Slave Relay Surveillance
- 1BOS 7.1.2.1.b-1 — 1A Auxiliary Feedwater Pump Monthly Surveillance
- 1BOS 7.1.2.1.b-2 — Unit 1 Diesel Driven Auxiliary Feedwater Pump Monthly Test

- 1BOS 8.1.1.2.a-1 — Unit 1 1A Diesel Generator Operability Monthly Surveillance
- 1BVS 5.2.f.3-2 — ASME Surveillance Requirements for Residual Heat Removal Pump 1RH01PB
- 2BVS AF-1 — Unit 2 2B Diesel Auxiliary Feed Pump Battery Bank A Capacity Test
- 2BVS AF-3 — Unit 2 Simultaneous Start of Both AF Pumps With Flow to the Steam Generators
- SPP 96-067 — Support for Cleaning, Inspection, and Repair Activities in the Essential Service Water Cooling Tower (SXCT) Basins

b. Observations and Findings

During the 1B SSPS surveillance, the licensee failed to complete the testing within the technical specification (TS) allowed time of 2 hours. Testing was delayed when an operator failed to latch a relay during the test. The operator pushed the relay button in far enough to actuate the relay, but did not latch the relay. Issue resolution delayed the testing. The inspectors noted that the licensee completed the testing, but appropriately entered the limiting condition for operation action requirement, TS 3.3.1 action statement 12.b., for an inoperable reactor trip breaker. TS 3.3.1 action 12.b required the reactor trip breaker to be restored in 6 hours, the licensee completed the testing in 45 minutes and exited the action requirement. The inspectors also noted that the licensee appropriately entered the failure to latch the relay into the operator workaround program for formal resolution.

c. Conclusions

Observed surveillance activities were completed thoroughly with system engineers monitoring activities. Difficulties in completing the 1B SSPS surveillance were appropriately handled with the entry into the TS action statement.

M8 Miscellaneous Maintenance Issues (92902)

M8.1 (Closed) Inspection Followup Item 50/454-95003-03: Diesel generator hairline cracks on air intake manifolds were identified during a monthly surveillance. The licensee's material failure analysis concluded that the manifolds were overstressed during installation resulting in material cracks/defects that propagated during engine operation due to vibration. The licensee installed new intake manifolds on the Unit 1 diesel generator during B1R07. The new manifolds were manufactured to more stringent fabrication and welding criteria. The manifolds from Unit 1 were refurbished by the vendor to the new standards and installed on the Unit 2 diesel generators during B2R06. The inspectors noted no reoccurrence of the hairline cracks since installation of the new/refurbished intake manifolds. This item is closed.

M8.2 (Closed) Inspection Followup Item 50/454-96003-03: Potential effect of boric acid corrosion on the carbon steel filtered vent (VF) system due to a blocked safety injection (SI) pump drain line. In response to this

concern, system engineering determined that the boric acid corrosion would be limited to less than 0.002 inches per year based on boron concentrations of 2500 ppm. The VF system is not safety-related and no operability concerns were noted. The licensee repaired the blocked SI drain lines. This item is closed.

M8.3 (Closed) Inspection Followup Item 50/454-96007-02: Containment spray (CS) pump room 1A contaminated due to floor drain plugging. The inspectors questioned the operability of the safety-related equipment in the CS and residual heat removal (RHR) rooms with an inoperable floor drain system, since the UFSAR took credit for the floor drain system to mitigate the consequences of a flood. In response, the licensee found only one of two floor drains in the CS and RHR pump rooms plugged. Based on this configuration, the licensee estimated that during a design-basis flooding accident, the flood level would be about 5 inches below the CS and RHR pumps and would be considered operable. The analysis assumed the flood duration of 30 minutes in accordance with the UFSAR. Corrective actions included hydrolyzing the floor drains at 4 year intervals and inspect, clean, and test the sump alarms at 5 year intervals. This item is closed.

III. Engineering

E1 Conduct of Engineering

E1.1 Excessive Silting in the Essential Service Water Cooling Towers (37551)

a. Inspection Scope

The inspectors reviewed the action taken by engineering to determine the consequences of the silting on the operability of the SX system.

b. Observations and Findings

The licensee identified that silt levels in the SX cooling tower basins were greater than the acceptance criteria stated in surveillance OBVS SX-5. The acceptance criteria stated that silt levels were not to exceed 12 inches at two or more points. Silt levels at 28 points were found to be at 12 to 36 inches.

The inspectors review of the licensee's operability assessment found that the presence of silt in the basin displaced an equivalent volume of water in the basin. Based on silt measurements taken from both basins, it was estimated that approximately 48,000 gallons of water were displaced by the silt. This volume corresponded to a level change of approximately 15 percent on the basin level indicators. The SX cooling tower serves as the ultimate heat sink (UHS) for both units and consists of two interconnected basins, A and B. The water volume in the basin is critical as thermal performance of the UHS relies on a specified water volume to absorb heat energy from safety-related components cooled by the SX system. Both thermal and volumetric considerations (which

include makeup capability) are impacted by the presence of excessive silt.

The licensee's operability assessment of the thermal performance of the UHS determined that an adequate volume of water existed in the SX cooling tower basin to maintain the SX design temperature below 100°F for design-basis accident conditions at the TS minimum basin level of 50 percent.

For makeup capability to the basin, the licensee evaluated the higher-capacity SX makeup pumps, which corresponded to a TS minimum water level of 50 percent, and the lower-capacity-deep well pumps, which required a TS minimum basin level of 82 percent. The makeup capability must be sufficient to offset the evaporation rate of the water in the cooling tower basin. The analysis concluded that the 15 percent silt level in the basin had no significant impact on the ability to makeup the basin with the SX makeup pumps. However, the corresponding evaluation for the deep well pumps determined that the makeup capability was inadequate and one basin would run out of water and be incapable of providing water to the SX system. Therefore, the continued operability of the UHS and the SX system, when relying on the deep well pumps for makeup capability, would only be assured if SX basin level was maintained at or above 97 percent to account for the 15 percent silt accumulation.

As compensatory measures the licensee administratively raised the SX basin levels from 50 percent to 60 percent during normal operations when both SX makeup pumps were available. The water level limit was raised from greater than or equal to 82 percent to 97 percent when relying on the deep well pumps for makeup capability. This reliance occurred when TS 3.7.5 action statement c, e, f, g, or h were entered. This included situations when: (1) one or more SX makeup pumps were inoperable; (2) when one UHS cooling tower basin level switch was inoperable; (3) when the Rock River water level was forecasted to exceed 702.0 feet; (4) when the Rock River water level fell below 664.7 feet or flow was less than 700 cfm; and (5) when a tornado watch was issued for the Byron site.

The inspectors reviewed maintenance records and operator logs and determined that the plant relied on the deep well pumps for makeup capability on July 7 - 12, 1996, during SX makeup pump, 0SX02PB, maintenance and July 23, 1996, when a tornado watch was issued for the Byron area. Based on the licensee's analysis, the UHS and the SX system was considered inoperable at these times.

c. Conclusions

The licensee's operability assessment concluded that the SX system was inoperable, when relying on the deep well pumps for makeup capability, since the basin water volume corresponding to an indicated water level of 82 percent, reduced by 15 percent due to the presence of silt, was an inadequate volume of water to support SX operation.

E1.2 Inadequate SX Makeup Calculation

a. Inspection Scope

During subsequent evaluations, the licensee identified errors in the UHS cooling tower basin makeup calculation. The inspectors discussed the error with the licensee to determine the error consequences on SX system operability.

b. Observations and Findings

The inspectors reviewed the licensee's determination that the UHS cooling tower basin makeup calculation, NED-M-MSD-14, Revision 0 (performed in February 1992) and Revision 1 (performed in August 1992), was based on a usable basin water volume calculated from the bottom of the basin. The inspectors found that the actual usable volume for water was limited by the anti-vortex drainage duct that enclosed the SX pump suction pipe. The anti-vortex drainage duct openings were 8 inches above the basin slab and the makeup calculation did not account for this 8 inches of unusable water volume. The calculation also did not account for any silt accumulation. These calculations were performed during the SX/UHS design-basis reconstitution effort in 1991 and 1992.

With the usable volume reduced 8 inches by the anti-vortex drainage duct, the licensee determined that the deep well makeup pump would not have adequate makeup capability when the UHS basin water level was at 82 percent per TS 3.7.5 action statements c, e, f, g, or h. The TS water level of 82 percent was an inadequate water volume to ensure UHS and SX system operability. The licensee stated that the calculational error had existed since initial plant operation. Failure to have adequate design control measures in place to ensure that the design-basis of the SX system was correctly translated into specifications is an apparent violation of 10 CFR Part 50, Appendix B, Criterion III (EEI 454/455/96009-04(DRP)).

c. Conclusions

The inspectors concluded that the licensee's design input used in calculating the UHS cooling tower basin makeup did not reflect the SX system design features since initial plant operation. The design-basis reconstitution performed in 1991 and 1992 failed to identify this error.

E1.3 UFSAR Discrepancies on SX Cooling Tower Design Features

a. Inspection Scope

The inspectors reviewed applicable sections of the UFSAR to determine if the SX system was accurately reflected.

b. Observations and Findings

The inspectors identified discrepancies between UFSAR Figure 3.8-66 and UFSAR Figures 9.2-25, 9.2-26, and 9.2-27. Figure 3.8-66 showed a small

box-shaped screen (trash rack) over the SX pump suction in the cooling tower basin and the other figures showed a large anti-vortex drainage duct. The licensee investigated the discrepancy and determined that the box-shaped trash rack was part of the initial SX cooling tower basin design. The box-shaped trash rack was designed to both prevent trash from entering the SX pump suction piping and to eliminate vortex formation at the suction piping. Testing, performed at the University of Iowa in 1980, demonstrated that the box-shaped trash rack neither effectively prevented vortex formation nor provided adequate capacity as a trash rack. As a result, prior to receiving an operating license, a design change installed an anti-vortex drainage duct with an attached trash rack that ran the width of each basin and enclosed the SX pump suction. The UFSAR drawings had never been updated to show the current design. Failure to update the UFSAR to assure that the information included in the UFSAR contains the latest material developed is an apparent violation of 10 CFR 50.71, "Maintenance of records, making of reports." (EEI 454/455/96009-05DRP)).

c. Conclusions

Licensee personnel did not appear to be knowledgeable that a portion of the as-built SX system design deviated from design as it was documented in the UFSAR.

E1.4 Additional SX Basin Inspections

a. Inspection Scope

On November 5 and 6, 1996, the inspectors monitored the licensee's performance of additional SX basin inspections to facilitate the trash rack grating replacement and repairs.

b. Observations and Findings

A diver entered SX basin B to better inspect and identify the necessary repairs to the trash rack. During the inspection, the diver identified and removed a 4 foot by 20 foot piece of plastic and two hard hats. Based on interviews of the divers the inspectors determined that the plastic was found crumpled against the anti-vortex drainage duct and the hard hats were found on the basin floor. Because of the uncertainty of similar material being in the A basin, the licensee declared the SX pumps in A train on both units inoperable until an inspection could be performed. On November 6, 1996, the diver inspected the A basin and found a 4 foot by 20 foot piece of plastic and one hard hat. Based on the observed condition of the materials found in both basins, the inspectors concluded that the items had been in the basin for quite some time; however, the inspectors noted that the SX cooling tower basin inspections performed in 1993, 1994, 1995, and on October 15, 1996, did not identify these items.

c. Conclusions

Based on the additional inspections, the licensee concluded that both SX cooling tower basins were free from large foreign material that could potentially block the SX pump suction. The inspectors concluded that the age of the foreign material found in the basins called into question the thoroughness of the previous inspections.

E2 Engineering Support of Facilities and Equipment

E2.1 Spent Fuel Pool Boraflex Degradation

a. Inspection Scope

Boraflex degradation was first discussed in inspection report 95-09 after the licensee identified elevated silica levels in the spent fuel pool (SFP). Blackness testing, to verify the presence of a neutron absorber, was performed during June 1996. The licensee received the test results on September 3, 1996. The inspector reviewed the blackness test results, the licensee's LER, the licensee's response to NRC Generic Letter 96-04 "Boraflex Degradation on Spent Fuel Pool Racks," and the licensee's license amendment submittal.

b. Observations and Findings

During 1995, the licensee identified elevated levels of silica in the SFP, which was an indicator of Boraflex degradation. Boraflex was constructed of an organic polymer with a silica filler and neutron absorbing boron carbide interspersed within the silica filler. Boraflex degradation consisted of cracks and gaps forming in the Boraflex panels with the Boraflex eventually becoming susceptible to dissolution in the SFP water. The licensee took interim actions to limit the rate of degradation, including not reducing silica levels in the SFP. The licensee also established an administrative limit of greater than 1000 parts per million (ppm) soluble boron in the SFP. The licensee calculated the 1000 ppm boron would be adequate to maintain k_{eff} less than 0.95 if all of the Boraflex was removed.

Blackness testing performed on approximately 300 storage cells during June 1996, indicated three panels where Boraflex gaps exceeded 4 inches. The design criticality analysis assumed any Boraflex gaps to be less than 4 inches. TS 5.6.1.1 required the SFP racks to maintain k_{eff} less than or equal to 0.95 when flooded with unborated water. With the gaps, the calculation that demonstrated TS compliance was invalid and the licensee declared the SFP racks inoperable.

The licensee reviewed the actions taken during the fall of 1995 when the degradation was identified and determined the actions to be adequate interim measures. The licensee originally planned to submit a TS amendment in early 1997 requesting approval to include soluble boron in the criticality analysis. However, after discussions with the NRC, the licensee accelerated the amendment submittal and submitted a license amendment on November 12, 1996.

In addition to the amendment submittal, the licensee planned to arrange the fuel in a checkerboard pattern in the SFP to ensure the SFP remained subcritical with no Boraflex or soluble boron. Checkerboarding placed fuel in the SFP such that either one or two cells out of every four would be empty. A criticality analysis indicated that some checkerboarding was required to demonstrate k_{eff} would be less than 1.0 with no Boraflex and flooded with unborated water.

LER 96-014-00, "Failure to Comply with Design Basis Due to Degradation of Boraflex in Spent Fuel Racks," was reviewed by the inspector. With the addition of the accelerated license amendment submittal and the planned checkerboarding, the inspector considered the LER appropriate. The inspector verified the soluble boron limit was administratively controlled and that the licensee had not been removing silica from the SFP. The inspectors will continue to follow this issue through the licensee's LER supplement.

c. Conclusions

The inspector concluded that the licensee monitored the Boraflex degradation and planned to submit a license amendment. However, the license submittal was not being pursued in a timely manner until after discussions with the NRC. Also, the decision to checkerboard the SFP was not made until after NRC discussions and a criticality analysis indicated that the checkerboard must be performed to ensure the SFP remained subcritical with unborated water.

E2.2 Missing Spacers in Motor Control Center

a. Inspection Scope

During refueling outage B2R06, the licensee noted that spacers were removed from some Westinghouse motor control center (MCC) breaker buckets. The MCC spacers were located between the bucket and the MCC frame. The inspectors reviewed the licensee's corrective actions on the issue.

b. Observations and Findings

Byron engineering contacted Westinghouse and were first told that the spacers were shipping spacers and were not needed and that missing spacers would pose no concern. Engineering continued to pursue the issue with Westinghouse, who later determined that the spacers were installed in the original MCC seismic qualification testing.

The licensee performed an interim operability assessment and determined that the MCC buckets were operable based on comparisons of seismic testing performed at levels four times higher than Byron plant seismic requirements. The inspectors reviewed and agreed with the assessment. The licensee installed the spacers in the MCCs.

c. Conclusions

Engineering aggressively pursued the MCC spacer issue with Westinghouse. The operability assessment and corrective actions to install the spacers was timely and thorough.

IV. Plant Support

R1 Radiological Protection and Chemistry Controls

R1.1 ALARA Concern

a. Inspection Scope

During a routine tour of the auxiliary building, the inspectors identified a worker lying in the Unit 1 positive displacement (PD) charging pump (CV) room. The inspectors reviewed the licensee's corrective actions and initial investigation results.

b. Observations and Findings

On November 27, 1996, the inspectors identified a contracted engineer lying on the floor in the Unit 1 PD CV pump room. The dose rate where the individual was lying was less than 1 mR/hour. The worker was not wearing a hard hat or safety glasses and had his feet propped up on the pump skid piping. The inspector questioned the individual and was told that he was a contracted engineer assigned instrument air system walkdowns. In response to the inspectors ALARA concerns, the licensee determined that the individual was in the auxiliary building for approximately 25 minutes and received no detectable radiation exposure. The individual was relieved of his duties at the site.

c. Conclusions

The inspectors noted prompt management attention to this issue.

F1 Control of Fire Protection Activities

F1.1 Containment Spray Pump Room Fire Door Blocked Open (71750)

a. Inspection Scope

During a routine tour of the auxiliary building, the inspectors identified a fire door between the Unit 2 CS pump rooms blocked open. The inspectors reviewed the licensee's immediate corrective actions and initial investigation results.

b. Findings and Observations

On October 7, 1996, the inspectors identified that fire door D-846, located between the 2A and 2B CS pump rooms, was impaired without a Fire

Barrier Impairment Permit (FBIP) on the door. Cables used to remotely monitor RHR pump oil levels impaired the door. The inspectors notified the operations department and the door was closed.

In response to the inspectors concern, the licensee determined that the door had a FBIP when the cables were installed; however, the FBIP was issued for door repair due to an unrelated door hardware problem. The mechanics installing the cables did not add the cables to the existing FBIP. After the door was repaired, the FBIP was removed. At the end of the inspection period, the licensee was determining the chronology of events after the original FBIP was removed.

Byron Administrative Procedure (BAP) 1100-3, "Fire Protection Systems, Fire Rated Assemblies, Ventilation Seals, and Flood Seal Impairments," Revision 10, stated, in part, that a FBIP was required for all fire protection equipment, fire detection instrumentation, fire rate assemblies, fire rated assemblies sealing devices, ventilation seals, and flood seals which were impaired. Contrary to these requirements, fire door D-846 was impaired without a FBIP initiated. The inspectors considered this failure to follow procedures a violation of TS 6.8.1, "Procedures and Programs" (50-455/96009-06(DRP)).

c. Conclusions

The inspectors concluded the blocked open CS fire door without a FBIP indicated a need for additional improvement in procedure adherence when impairing fire protection equipment.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors presented the inspection results to members of licensee management on November 14, 1996, and at the conclusion of the inspection on December 17, 1996.

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, Station Manager
D. Wozniak, Site Engineering Manager
T. Gierich, Operations Manager
P. Johnson, Technical Service Superintendent
E. Campbell, Maintenance Superintendent
M. Snow, Work Control Superintendent
D. Brindle, Regulatory Assurance Supervisor
K. Passmore, Station Support & Engineering Supervisor
J. Feimster, Site Engineering, Mechanical Lead
M. Robinson, System Engineer
P. Donavin, Site Engineering Mod Design Supervisor
T. Schuster, Site Quality Verification Director
R. Colglazier, NRC Coordinator
B. Gossman, Chemistry Supervisor
S. Gackstetter, Thermal Group Leader
W. Walter, Operations Engineer Unit 0
R. Wegner, Shift Operations Supervisor
W. Kouba, Long Range Work Control Superintendent

INSPECTION PROCEDURES USED

IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observations
IP 62703:	Maintenance Observations
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 92901:	Followup - Plant Operations
IP 92902:	Followup - Maintenance

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

EEI 454/455/96009-01	VIO	Failure to have sufficient quantitative acceptance criteria in procedure OBVS SX-5.
EEI 454/455/96009-02	VIO	Failure to use adequate test instrumentation to measure the amount of silt in the SX cooling tower basins.
EEI 454/455/96009-03A	VIO	Failure to take appropriate corrective action for previous silt accumulation in the SX cooling tower basins.
EEI 454/455/96009-03B	VIO	Failure to take prompt corrective action to repair degraded SX cooling tower basin trash racks.
EEI 454/455/96009-04	VIO	Failure to have adequate design control measures in place to ensure that the design-basis of the SX system was correctly translated into specifications.
EEI 454/455/96009-05	VIO	Failure to update the UFSAR.
50-454/455/96009-06	VIO	Failure to follow procedure BAP 1100-3 regarding fire door impairment.

Closed

50-454/94022-02	VIO	Inadequate procedures
50-454/95003-03	IFI	Diesel generator hairline cracks on air intake manifolds were identified during a monthly surveillance.
50-454/96003-03	IFI	Potential effects of boric acid corrosion on the carbon steel filtered vent system.
50-454/96007-02	IFI	CS pump room 1A contaminated due to floor drain plugging.

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
ASME	American Society of Mechanical Engineers
BAP	Byron Administrative Procedure
BOS	Byron Operating Procedure
BVS	Byron Surveillance Procedure
CS	Containment Spray
FBIP	Fire Barrier Impairment Permit
MCC	Motor Control Center
mR	milliRem
OOS	Out of Service
RH	Residual Heat Removal System
RSH	River Screen House
SAT	Station Auxiliary Transformer
SFP	Spent Fuel Pool
SG	Steam Generator
SI	Safety Injection
SSPS	Solid State Protection System
SX	Essential Service Water
SXCT	Essential Service Water Cooling Tower
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
VF	Filtered Vent System