U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-454/93005(DRP); 50-455/93005(DRP)

Docket Nos. 50-454; 50-455 License Nos. NPF-37; NPF-66

Licensee: Commonwealth Edison Company
Opus West III
1400 Opus Place
Downers Grove, IL 60515

Facility Name: Byron Station, Units 1 and 2

Inspection At: Byron Site, Byron, Illinois

Inspection Conducted: March 2, 1993 through April 30, 1993

Inspectors: C. H. Brown
C. Osterholtz

Approved By: Martin J. Farber, Chief
Reactor Projects Section 1A

5/10/93
Date

Inspection Summary

Inspection from March 2, 1993, through April 30, 1993 (Report Nos. 50-454/93005(DRP); 50-455/93005(DRP)).
Areas Inspected: Routine, unannounced safety inspection by the resident inspectors of plant operations, operational safety verification, onsite event followup, current material condition, housekeeping and plant cleanliness, radiological controls, security, B1R05 refueling outage, steam generator tube plugging, regional requests, safety assessment/quality verification, maintenance, surveillance, engineering and technical support, and refueling activities.
Results: Of the 14 areas inspected, no violations or deviations were identified in 13 areas. One licensee identified violation regarding a failure to perform a Technical Specification required surveillance within the required time period is discussed in paragraph 3.b.

The following is a summary of the licensee's performance during this inspection period:

Plant Operations

The licensee's performance in this area remains excellent. The shift briefings were informative and provided overall planning for the shift. This appears to be especially useful in a refueling outage when planning mode changes or equipment outages that require a lot of coordination. One self-identified violation of a missed surveillance occurred this period. This was a non-cited violation due to self-identification and the corrective actions taken.

Safety Assessment/Quality Verification

Performance in this area remains at a high level. Review of the pre-outage Site Quality Verification (SQV) evaluation of the refueling outage showed that a thorough evaluation was performed. It was noted that the ten suggestions made by SQV were all incorporated in the outage schedule. Approximately 85 Field Monitoring Reports pertained to shut down risk assessment. Overall performance was considered excellent.

Maintenance and Surveillance

Performance in this area continues to be excellent. The surveillance program continues to function well. The predictive maintenance program continues to improve.

Engineering and Technical Support

During this inspection period, activities demonstrated a high degree of involvement by the engineering staff in daily operations. The expertise demonstrated in the solution of problems occurring during the outage was excellent. Management involvement was noted to be at a high level during this inspection period. Some examples are: root cause evaluations and solutions to upper internals bent pins and damaged fuel assemblies, and failure of "Erie Fasteners" nuts on safety related valves.

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

* K. Schwartz, Station Manager
* T. Tulon, Operations Manager
* D. St. Clair, SEC Manager
* M. Burgess, Technical Superintendent
* T. Gierich, Assistant Superintendent, Planning
* D. Brindle, Regulatory Assurance Supervisor
* P. Johnson, Maintenance Superintendent
* M. Snow, Services Director
* R. Wegner, Shift Operations Supervisor
* W. Grundmann, SQV Superintendent
* P. Enge, NRC Coordinator

The inspectors also had discussions with other licensee employees, including members of the technical and engineering staffs, reactor and auxiliary operators, shift engineers and foremen, and electrical, mechanical and instrument maintenance personnel, and contract security personnel.

* Denotes those individuals present at the exit interview on May 3, 1993.

3. Plant Operations

Unit 1 was in the fifth refueling outage for most of the inspection period which lasted a total of 66 days. The unit was connected to the grid on April 12, 1993, but was shut down for four days due to a leaking primary safety valve. The plant was returned to the grid on April 19, 1993, and continued to operate in the load following mode up to 100% power.

Unit 2 operated at power levels up to 100% in the load following mode. The unit has been online for 280 days.

a. Operational Safety Verification (71707)

The inspectors verified that the facility was being operated in conformance with the licenses and regulatory requirements, and that the licensee's management control system was effectively carrying out its responsibilities for safe operation.

On a sampling basis the inspectors verified proper control room staffing and coordination of plant activities; verified operator adherence with procedures and technical specifications; monitored control room indications for abnormalities; verified that electrical power was available; and observed the frequency of plant and control room visits by station management.

b. Onsite Event Follow-up (93702)

On March 11, 1993, the licensee identified a violation of Technical Specification (TS) 3.7.4.1, which requires that with Unit 1 in Modes 5 or 6, one of its essential service water (SX) pumps be verified available to support Unit 2 operations once every 24 hours. Due to personnel error, the Unit 1 SX pump availability to Unit 2 surveillance was not performed within the TS required 24 hour period. The error was discovered by the licensee and the surveillance was performed approximately 32 hours and 15 minutes after the previous surveillance. The Unit Nuclear Station Operator, Station Control Room Engineer, and Shift Engineer were counseled on the importance of attention to detail and the consequences of complacency. Additional corrective actions taken by the licensee included procedure enhancements to prevent recurrence.

The failure to perform the required TS surveillance on March 11, 1993, within the required 24 hour time period, is a Severity Level V violation. However, to encourage and support licensee initiatives for self-identification and correction of violations, the violation is not being cited because the criteria specified in Section VII.B.(2) of the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy, 10 CFR 2, Appendix C, (1993), were satisfied.

c. Current Material Condition (71707)

The inspectors performed general plant as well as selected system and component walkdowns to assess the general and specific material condition of the plant, to verify that Nuclear Work Requests (NWRs) had been initiated for identified equipment problems, and to evaluate housekeeping. Walkdowns included an assessment of the buildings, components, and systems for proper identification and tagging, accessibility, fire and security door integrity, scaffolding, radiological controls, and any unusual conditions. Unusual conditions included but were not limited to water, oil, or other liquids on the floor or equipment; indications of leakage through ceiling, walls or floors; loose insulation; corrosion; excessive noise; unusual temperatures; and abnormal ventilation and lighting. The painting program is continuing, but the unpainted areas remain dimly lighted at this time. When these areas are painted the light level should improve.

d. Housekeeping and Plant Cleanliness

The inspectors monitored the status of housekeeping and plant cleanliness for fire protection and protection of safety-related equipment from intrusion of foreign matter. Minor amounts of foreign material were noted in out-of-the-way places.

e. Radiological Controls (71707)

The inspectors verified that personnel were following health physics procedures for dosimetry, protective clothing, frisking, posting, etc. and randomly examined radiation protection instrumentation for use, operability, and calibration. The contaminated area continues to be decreased by the "decon" program.

f. Security

Each week during routine activities or tours, the inspectors monitored the licensee's security program to ensure that observed actions were being implemented according to the approved security plan. The inspectors noted that persons within the protected area displayed proper photo-identification badges and those individuals requiring escorts were properly escorted. The inspectors also verified that checked vital areas were locked and alarmed. Additionally, the inspectors also observed that personnel and packages entering the protected area were searched by appropriate equipment or by hand.

g. B1R05 Refueling Outage Steam Generator Tube Plugging

During the refueling outage, a routine eddy current inspection of the steam generator tubes was performed. The results of this inspection required an additional 608 tubes to be plugged. The following table summarized the steam generator plugged tube status:

Steam Generator	Plugged This Outage	Plugged Previous Outages	Total
1A	123	63	186
1B	216	83	299
1C	180	63	243
1D	89	30	119
Total	608	239	847

The cause for this large increase and the large difference between 1B and 1D steam generators is being examined by a task force which includes the licensee and the vendor. The feedwater and steam generator chemistry history for Unit 1 since startup was reviewed by the task force and found to be out of specification less than 1% of the operating time. Braidwood Unit 1 also has the "D-4" model of steam generator and has implemented a change in the chemistry control in the generators termed "Molar Ratio Control Program". Braidwood has about 4 months of data with the revised

chemistry program and Byron Unit 1 is planning on using the program for this fuel cycle. The program uses steam generator blowdown with various combinations of resin demineralizers to maintain a sodium to chloride ratio of 0.2 - 0.5 and reduce the "caustic" crevice cracking of the steam generator tubes.

The T_{hot} (temperature of the hot leg water) program was increased 2 degrees during the outage to compensate for the projected plugging of 300 steam generator tubes (past history of the D-4 generators). With the plugging of 608 tubes, the licensee made the decision to remain with the core design for T_{hot} + 2 degrees and derate the unit if necessary if the resulting steam pressure is insufficient to run the turbine generator to 100% power.

The T_{hot} increase of 2 degrees is not expected to increase inside diameter cracking noticeably. Primary side problems are not significant relative to the cracks developing on the secondary side. The secondary side crack mechanisms are the primary focus for this cycle.

One non-cited violation was identified.

4. Regional Requests (92701)

a. A request was received from Region III to evaluate a potential leak path outside containment during a LOCA. This item is described in paragraph 7.f. The possibility of leak at Byron was very small due to tank sizes and the pressures available during the recirculation phase.

b. A Regional request was received on controls in place for a Reactor Coolant Pump restart. The controls at Byron consist of procedural and administrative controls for proper temperature and boron concentration.

5. Safety Assessment/Quality Verification (40500, 90712, 92700)

The Onsite Quality Verification (SQV) group reviewed the shutdown risk assessment (pre-outage) in the outage planning phase and considered the assessment of good quality. The group provided 10 safety improvement suggestions for consideration and all ten were incorporated in the outage schedule. A selected review of the SQV field monitoring reports shows that the reports were of good quality.

The inspectors reviewed the monthly Regulatory Assurance Department Trend Reports. The report is reviewed, noting areas of new trends and the status of open trends on equipment and personnel areas.

In addition to the foregoing, the inspector reviewed the licensee's Problem Identification Forms (PIF) generated during the inspection period. This was done in an effort to monitor the conditions related to plant or personnel performance, potential trends, etc. PIFs were also

reviewed to ensure that they were generated appropriately and dispositioned in a manner consistent with the applicable procedures.

No violations or deviations were identified.

6. Maintenance/Surveillance (62703 & 61726)

a. Maintenance Activities (62703)

Routinely, station maintenance activities were observed or reviewed to ascertain that they were conducted in accordance with approved procedures, regulatory guides and industry codes or standards, and in conformance with technical specifications.

The following items were also considered during this review: approvals were obtained prior to initiating the work; functional testing and/or calibrations were performed prior to returning components or systems to service; quality control records were maintained; and activities were accomplished by qualified personnel.

Portions of the following maintenance activities were observed and reviewed:

- Fabricate Pickup Straps For Damaged Fuel Assemblies
- Upper Internals Repairs
- B00606 Replace Capacitors in 223 Battery Charger
- B00983 Carbon Dioxide Storage Tank Pressure Switch Repair
- B01075 VCT Pressure Transmitter Erratic (recorder)

b. Surveillance Activities (61726)

During the inspection period, the inspectors observed technical specification required surveillance testing and verified that testing was performed in accordance with adequate procedures, that test instrumentation was calibrated, that results conformed with technical specifications and procedure requirements and were reviewed, and that any deficiencies identified during the testing were properly resolved.

The inspectors also witnessed portions of the following surveillances:

- 1BOS 4.6.2.1.D-1 72 Hour RCS Water Inventory Balance
- 1BOS 8.1.1.2a-1 1A DG Monthly Surveillance
- 1BIS 6.4.1.003 Functional Test of Containment Hydrogen Analyzer

No violations or deviations were identified.

7. Engineering & Technical Support (37700)

During this inspection period, the inspector reviewed and observed activities which demonstrated the high degree of involvement of the licensee's engineering staff. The extent to which engineering principles and evaluations were used in daily operations and the technical expertise brought to bear on solving problems occurring during the refueling outage was revealed in the thoroughness of the evaluations and timeliness of the solutions. The following activities were reviewed or included in the observed activities.

Braidwood Unit 1 was tripped while performing "Reactor Coolant Pump Un Underfrequency Quarterly Surveillance." The trip was due to a failed logic card which gave the required two out of four logic. The trip occurred when another channel was placed in trip to perform a surveillance. The Byron staff placed performance of this surveillance on hold until the root cause was identified. The Byron staff was involved in the solution and revising the procedure.

During the refueling outage, Engineering and Technical Support was involved in several event evaluations that indicated a high level of involvement in plant and maintenance activities. These items included:

- Failure of Erie Fasteners on safety related valves
- Misalignment of upper intervals pins with fuel assemblies and crush of guide tubes by the upper nozzle
- Replacement of three damaged fuel assemblies and redesign of the core
- Miswiring of one SSPS switch position
- More than twice the expected number of steam generator tubes required to be plugged
- Loose main generator stator bars
- Potential for a loss of coolant accident (LOCA) outside containment during the recirculation mode after a LOCA.

a. The identification a broken nut during preparation of a valve for maintenance initiated a review that identified three broken nuts at Byron and two at Braidwood. These were identified as having been manufactured and heat treated by Erie Fastener. The material is 410 stainless steel (SA-193 GR.B6).

The evaluation of the Erie Fasteners included an extensive construction documentation search to identify all uses of 1.124 and 1.25 inch nuts on safety related applications. The Erie Fastener nuts were used on 25 valve bonnets in each unit. The information was transmitted to Braidwood. The 25 valve bonnet fasteners on Unit 1 were all visually inspected for cracks before the plant was pressurized. The Unit 2 valves will be inspected during the refueling outage in September 1993.

b. The control rod assembly (for N-9), that could not be moved for the "drag" test after the upper internals were installed, indicated a misalignment problem. The upper internals were removed and bent pins were observed in ninth row positions R, P, and N: the top nozzles for these fuel assemblies were pushed down and tilted. The root cause was determined to be due to bowed fuel assemblies and the loading sequence closing up the spacing between fuel assemblies, which caused the guide pins to misalign with the guide holes. The fuel vendor is notifying other similar plants that misalignment can occur and providing the precautions needed to prevent damage. Two of the damaged assemblies were reloads; similar assemblies were retrieved from Byron's spent fuel pool as replacements. N-9 was a new assembly which was sent back to the factory for refurbishing. A new assembly was obtained from Braidwood Station as a replacement. The refurbished assembly will be returned to Braidwood to replace the assembly given to Byron. The core design calculations were completed before the core was taken critical.

c. During replacement of multi-position switch in the Solid State Protection System, a wiring error was identified. Two wires had been landed on one terminal block pin so that the containment spray logic continuity was not verified. This was corrected on Unit 2 at power after the vendor agreed on the correction. The correction was performed on Unit 1 during the refueling outage. The wiring error had occurred when the vendor built the panels during plant construction.

d. The cause of the unexpectedly large number of steam generator tubes required to be plugged during B1R05 outage is still under review by the engineering group. The possibility of sleeving the tubes is being reviewed. The criteria for tube plugging are being reviewed and evaluated. Chemistry control for the feedwater and secondary side is also being reviewed.

e. The determination, review, and approval of the method of repair for the loose stator bars in the main generator were completed in a timely manner.

f. The possibility of a LOCA outside containment during the recirculation mode was evaluated and found to be of extremely low probability at Byron. The engineering group noted this item on the INPO network in December. The evaluation resulted in placing the check valve on the IST check valve list.

No violations or deviations were identified.

8. Refueling Activities (60710)

The core had been reloaded, verified, and the upper internals assembly installed when on March 6, 1993, during testing, the rod control cluster assembly (RCCA) in N-9 core position could not be moved. The resulting bent-pins on the upper internals and damaged fuel assemblies (discussed in paragraph 2) required the unloading of approximately one-quarter of the core to examine and remove the three damaged fuel assemblies (FA). The damaged FAs were replaced and the core design reverified. The removal of the first damaged FA was monitored by the inspector and video tapes were reviewed on the other FA's removals. The inspector considered the special removal methods and equipment to be conservative and providing an extra measure of protection against a dropped FA. Revised procedures for core reload and verification were used to reassemble the core. The RCCA tests were successfully completed on March 28, 1993.

No violations or deviations were identified.

9. Report Review

During the inspection period, the inspector reviewed the licensee's Monthly Performance Report for February and March 1993. The inspector confirmed that the information provided met the requirements of Technical Specification 6.9.1.8 and Regulatory Guide 1.16.

The inspector also reviewed the licensee's Monthly Plant Status Report for March 1993.

No violations or deviations were identified.

10. Meetings and Other Activities

a. Management Meetings (30702)

- During the week of March 22, 1993, Mr. John Hickman, Byron Licensing Project Manager, NRR was onsite. He toured the plant and discussed items of mutual interest with plant management.

- During the week of April 5, 1993, Mr. Brent Clayton, Chief, Reactor Projects Branch 1 and Mr. Martin J. Farber, Chief, Reactor Projects Section 1A, toured the Byron plant and discussed items of mutual interest with plant management.

- During the week of April 12, 1993, Mr. James Dyer, Director, Project Directorate III-2, NRR, toured the Byron plant and discussed items of mutual interest with plant management.

b. Exit Interview (30703)

The inspectors met with the licensee representatives on May 3, 1993, denoted in paragraph 1 during the inspection period and at the conclusion of the inspection on April 30, 1993. The inspectors summarized the scope and results of the inspection and discussed the likely content of this inspection report. The licensee acknowledged the information and did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.