U.S NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-454/85033(DRS)

Docket No. 50-454 License No. NPF-37

Licensee: Commonwealth Edison Company
Post Office Box 757
Chicago, IL 60690

Facility Name: Byron Station, Unit 1

Inspection At: Byron Station, Byron, IL

Inspection Conducted: July 9 through July 26, 1985

Inspector: C. A. VanDenburgh 8-13-85
Date

Approved By: M. Ring, Chief 8-13-85
Test Programs Section Date

Inspection Summary

Inspection on July 9 through 26, 1985 (Report No. 50-454/85033(DRS))
Areas Inspected: Special, announced safety inspection to review licensee actions following operational occurrences. The inspection involved 46 inspector-hours onsite and 15 inspector-hours in office by one inspector.
Results: In the area inspected one violation was identified (failure to identify a deviation - paragraph 2.e). There were also issues identified during the course of this inspection which could potentially effect the plant or public safety, these issues are discussed in section 2.d.

DETAILS

1. Persons Contacted

#*R. Querio, Station Superintendent
*T. Maiman, Manager of Projects
R. Ward, Assistant Superintendent, Administrative
*R. Pleniewicz, Assistant Station Superintendent, Operations
*L. Sues, Assistant Station Superintendent, Maintenance
T. Tulon, Operating Engineer
#*D. St. Clair, Technical Staff Supervisor
R. Flahive, Shift Overview Supervisor
#*W. Burkamper, Quality Assurance Supervisor, Operations
#*A. Chernick, Compliance Supervisor, Licensing
A. Britton, Quality Assurance
#*J. Langen, Licensing
M. Snow, Licensing
R. Choinard, Technical Staff
J. Davis, Technical Staff
P. Reister, Technical Staff
R. Branson, Master Electrician, Electrical Maintenance
P. Johnson, Master Instrument Mechanic, Instrument Maintenance
J. Perteete, Foreman, Instrument Maintenance
S. Lantz, Electrical Maintenance

* Denotes those personnel present at the exit interview of July 19, 1985.

# Denotes those personnel present at the exit interview of July 26, 1985.

2. Onsite Followup of Events at Operational Reactors

a. General

On June 24, July 8, and July 13, 1985, the licensee experienced operational problems with the rod control system. On each of these occasions Rod Cluster Control Assembly (RCCA) P-8 became misaligned with the remainder of the Control Bank C (CBC) Group 1 rods. The licensee had previously experienced problems with a single dropped rod due to a blown fuse for the stationary gripper coil and for Shutdown Bank B dropped rods due to a component failure on a circuit card in the Rod Drive Logic Cabinet.

On July 16, 1985, the licensee experienced operational problems with RCCA's B-6 and B-8 in that the rods could not be withdrawn from the bottom of the core. There have been no previous occurrences of this type at the Byron site, however the licensee's vendor has encountered the problem at other facilities.

The inspector performed onsite followup activities for the aforementioned events. This followup included a review of operating logs and procedures, the vendor's technical manuals, the licensee's

Final Safety Analysis Report (FSAR), Quality Assurance Manual, the Byron Administrative Procedures (BAPs), Deviation Reports (DVRs) and Deviation Investigation Reports (DIRs) written for each occurrence, and interviews with individuals involved in the performance of the troubleshooting actions. The inspector reviewed the licensee's immediate actions taken in response to these operational occurrences and the subsequent troubleshooting actions taken to resolve the deficiencies. Specific attention was given to the troubleshooting actions taken in response to the first and second occurrences of the same problem with RCCA P-8 in order to determine whether the troubleshooting actions and procedures were adequate to resolve operational occurrences which impact the reliability as well as the safe operation of the plant. For each event the inspector developed a chronology. Details of the events and licensee corrective actions developed through inspector followup are provided in paragraphs below.

b. Operational Occurrences

(1) June 24, 1985

At 0730 while conducting an approach to criticality, RCCA P-8 in Group 1 of Control Bank C (CBC) stopped withdrawing at 96 steps. Control bank withdrawal was terminated when the deviation between RCCA P-8 and the other rods in CBC was 12 steps as indicated by the Digital Rod Position Indication (DRPI) System. The Byron Technical Specifications (3.1.3.1) require that all rods be within ±12 steps of their demand position. A Rod Control Non-Urgent Failure alarm annunciator actuated then cleared. The control bank was reinserted with RCCA P-8 remaining 6 to 12 steps lower than the rest of the bank. After 6 to 12 steps of inward rod motion RCCA P-8 dropped to the core bottom as indicated by DRPI. The control bank was inserted and RCCA P-8 was attempted to be withdrawn. RCCA P-8 was withdrawn and again slipped and fell to the bottom of the core. All control rods were then inserted and the startup terminated.

Licensee investigation showed no alarms in the Rod Control System Power and Logic Cabinets. A fuse check determined that the stationary gripper coil fuse was blown, however this was not believed to be the cause of the rod drop. A Brush recorder was used to monitor currents to the stationary gripper, movable gripper, and lift coils of RCCA P-8. The control rod was withdrawn and cycled while monitoring the current traces. These traces showed that the movable gripper coil energization was delayed which allowed both the movable and stationary gripper coils to be deenergized at the same time. When both gripper coils are deenergized in this manner the RCCA will mechanically fall to the bottom of the core.

A Brush recorder was then used to monitor the coil currents of both RCCA P-8 and RCCA H-14 which is also in Group 1 of

CBC. When both rods were withdrawn and cycled no abnormalities in the coil current traces were observed. When contacted, the vendor recommended that the cabling connections be checked and the coil resistances verified. The coil resistances were found to be higher than normal, however this was attributed to the elevated temperature. The cabling connections were verified to be hand tight. RCCA's P-8 and H-14 were cycled an additional five times from full out to full in with no abnormalities observed in the coil current traces. Based on this troubleshooting, RCCA P-8 was declared operational and the reactor startup resumed. The reactor was critical at 2149 on June 24, 1985.

(2) July 8, 1985

At 0349 during a reactor startup while operating control rods in manual to control core average temperature (Tave) following turbine generator synchronization to the grid, RCCA P-8 became misaligned from CBC. The turbine generator load was reduced to its minimum level and the control rods were inserted to level reactor power at 8 percent. During the insertion, RCCA P-8 became further misaligned by 6 to 12 steps with each demanded insertion. A manual turbine trip was initiated to further reduce reactor power. This resulted in a reactor trip due to permissive P-13 not clearing its input to the permissive P-7 logic. The reactor trip was a result of an inaccurate setpoint of the P-13 permissive and was not a direct result of the misalignment of RCCA P-8.

The licensee checked for blown fuses and verified that the coil resistances were consistent with the values provided by the vendor. Brush recorders were again installed to monitor the coil currents of RCCAs P-8 and H-14. The rods were cycled extensively with no abnormalities observed. Components in the Rod Control System Power and Logic Cabinets were inspected and a Zener diode was replaced in the circuit for the movable gripper coil for RCCA P-8. This was believed to be the only component which could cause a failure in RCCA P-8 which would not effect the other RCCA's in the group. Cabling connectors inside containment were disassembled and cleaned, however the connector at the Control Rod Drive Mechanism (CRDM) for RCCA P-8 was not disassembled due to inaccessibility. The connector was verified however, to be hand tight. RCCAs P-8 and H-14 were cycled five times from full out to full in and no abnormalities were observed in the coil current traces. Based on these troubleshooting actions RCCA P-8 was declared operational. The reactor was critical at 1756 on July 8, 1985.

(3) July 13, 1985

At 0139 during power ascension following a reactor startup and while operating control rods in manual to control Tave, RCCA P-8 again exhibited erratic behavior by dropping 6 to 12 steps several times and became misaligned from CBC by approximately 54 steps. Attempts to realign the rod were unsuccessful and a controlled shutdown was initiated. At 11% power a reactor trip occurred due to a Power Range Nuclear Instrument Negative Rate Trip as a result of a loss of power in the Rod Control System Power Cabinet which resulted in dropping some control rods in Shutdown Bank A (SBA). The Rod Control System loss of power was the result of an electrical storm and is not believed to be related to the erratic behavior of RCCA P-8.

Licensee troubleshooting involved verifying fuses and comparing coil resistances to those from two other mechanisms. The coils were meggared from coil to coil and coil to ground with satisfactory results. Coil polarity checks were also satisfactory. The licensee's vendor was then contacted for assistance. Vendor personnel arrived onsite on July 14, 1985, and indicated that the most likely cause was mechanical connectors in the form of cable connectors or fuse connections. Time Domain Reflectometer (TDR) traces were obtained and compared to the traces from three other rods with inconclusive results. A Visicorder was used to provide definition of the RCCA P-8 coil currents while the movable gripper coil on RCCA P-8 was energized manually. The cabling connectors inside containment were vibrated to check for anomalous behavior of the coil currents. When the connector at the CRDM was vibrated the movable gripper coil current showed degradation. A subsequent inspection of the disassembled connector by the vendor determined that one of the six pins inside the connector was not properly seated in the socket. This resulted in an intermittent connection, coil current degradation and subsequent multiple rod drops during the operation of Control Bank C. The vendor inspected the connector for damage and remade the connection. Coil resistance, meggar and polarity checks were again performed satisfactorily. Vibration of the connector at the CRDM following the repair showed no abnormal coil current traces. In order to verify the operability of all the control rods the licensee cycled all rods from full in to full out and cycled CBC a total of ten times.

(4) July 17, 1985

In the process of the operational verification following the repair of RCCA P-8 it was determined that RCCA B-12 in Group 1 of SBA, RCCA L-3 in Group 1 of SBD, RCCA B-8 in Group 1 of CBC, and RCCA B-6 in Group 2 of CBB were mechanically stuck at the bottom of the core. Technical Specifications (3.1.3.1) require that the control rods be operable only in Modes 1 and 2

therefore the event was not reportable. RCCA's B-12 and L-3 became free during attempts to withdraw the control rods. The vendor indicated that the most probable cause for the stuck rods was due to differential thermal expansion causing mechanical binding. This binding occurs when a control rod is energized at the bottom of the core and a plant cooldown occurs. In the process of troubleshooting the rod drops of RCCA P-8, the plant was cooled down to allow access to the CRDM cable connectors. The vendor provided the licensee with a procedure to free the stuck control rods by cycling the lift pole of the CRDM repeatedly. The procedure successfully freed the two stuck control rods. All control rods were subsequently verified operational by cycling them from full in to full out as discussed in paragraph 2.b.(3) above. The reactor was critical on July 23, 1985, at 0130.

c. Event Followup by Inspector

On the second occurrence of rod drop problems with RCCA P-8 on July 8, 1985, Region III questioned the licensee as to the extent of the troubleshooting actions which had been implemented. As a result of these communications and with the assistance of the resident inspector staff the licensee indicated the extent of their corrective actions. The corrective actions described appeared to be comprehensive. A regional inspector was dispatched to the site to review the adequacy of these actions and the troubleshooting procedures following the startup of the reactor. In the process of this special inspection several weaknesses and inspector concerns were identified (these are discussed in paragraph 2.d.). Prior to the completion of this inspection, a third occurrence of RCCA P-8 rod drop occurred on July 13, 1985. The licensee's investigation into the root cause of this rod drop substantiated the inspectors concerns with respect to the licensee's troubleshooting methods. These concerns were identified to the licensee during the exit interview of July 19, 1985, at which time the inspector identified specific recommendations for further consideration (described in paragraph 2.d.). As a result of the licensee's corrective actions for the rod drop problems, four RCCA's became mechanically bound on July 13, 1985. Further investigation by the inspector into these events identified a programmatic weakness in the licensee's quality assurance program which is considered to be a violation of NRC requirements. This violation was discussed with the licensee during the exit interview of July 26, 1985 and is documented in paragraph 2.e.

d. Identified Weaknesses and Concerns

During the course of the initial inspection the inspector identified that the programmatic methodology for troubleshooting the operational occurrence was under utilized and did not provide for a comprehensive review and understanding of the problem as it had occurred. Specifically, Work Requests B19826 and B20166 and the associated

Deviation Reports 6-1-85-193 and 6-1-85-206 did not contain sufficient detail to determine the exact nature and sequence of the troubleshooting actions taken in response to the first and second events. The operator's logs were also reviewed with similar results. Because there were no other sources of information used to document the troubleshooting actions, it was necessary to interview the personnel involved in the maintenance activities to determine the exact nature and extent of the corrective actions taken. During these interviews it was determined that there were significant discrepancies between the perceived nature of the corrective actions by the licensee's management as communicated to Region III and the actual corrective actions taken. Neither Work Request identified that the cable connectors inside of containment were inspected. However, discussions with the licensee's staff indicated that based upon the vendor's recommendations following consultation after the June 24 and July 8 occurrences, the cabling connectors inside containment were inspected. These discussions indicate that on June 24, 1985, all the connectors were verified hand tight and that on July 8, 1985, all the connectors were physically disassembled, cleaned and inspected with the exception of the CRDM connector which was difficult to access. It was reported to the NRC following the second occurrence and prior to restart that all connectors had been physically disassembled, cleaned and checked. Following the third rod drop, the licensee disassembled the connector at the CRDM and found the pin for the movable gripper coil to be improperly seated. The improper makeup of this connector has been determined to be the cause of all three operational occurrences.

The inspector identified to the licensee in the first exit interview that a principle cause for the failure to identify the cause for the rod drops and the communication of erroneous information to the NRC following the second occurrence was believed to be due to the inadequate documentation of the corrective actions taken in response to the occurrences. The inspector believes that the licensee's management was not aware of the true extent of the corrective actions taken because the Work Requests used to document the maintenance performed did not contain sufficient and detailed information. The inspector recommended that the licensee consider reinforcing its program to require more detailed information be recorded on the Work Requests. Furthermore, the inspector recommended that the Potential Significant Event Screening Criteria (BAP 1250-A1) be revised to require the classification of a Potential Significant Event if multiple failures occur with inconclusive troubleshooting actions. In the event of a determination of a Potentially Significant Event, BAP 1250-A2, "Significant Event Reporting Guidelines," presently requires more extensive records than a Work Request. The inspector's underlying concern is that inadequate documentation existed to permit a thorough understanding of the corrective actions taken and that this resulted in delaying the identification of the root cause for the rod drops and the communication of inaccurate information to the NRC.

e. Item of Violation

In the process of investigating the problems with the mechanically stuck control rods the inspector requested a copy of the Deviation Report which would document the circumstances surrounding the operational occurrence. Discussions with the licensee's management staff at first suggested that the report was not initiated due to personnel error. Further discussions with the licensee's management staff indicate their belief that a Deviation Report was not required to be initiated. A review of the Byron Administrative Procedures which implement the requirements of Commonwealth Edison's Quality Assurance Manual and therefore the requirements of 10 CFR 50 Criterion II indicate that this is incorrect and as such is considered to be a violation of NRC requirements.

10 CFR 50, Appendix B, Criterion XVI, requires that measures be established to assure that conditions adverse to quality such as deviations are promptly identified and corrected. Commonwealth Edison's Quality Assurance Manual similarly makes this requirement in Quality Requirement 16.0 and furthermore requires in Quality Requirement 15.0 that the Station Technical Staff investigate and issue a Deviation Report when a deviation from normal operation of a reactor and its associated equipment occurs. Quality Procedure 15-52 implements these requirements and defines a deviation as a departure from accepted equipment performance or a failure to comply with administrative controls or NRC requirements which results in, or could, if uncorrected, result in a failure of an item to perform as required by Technical Specifications or approved procedures. This procedure categorizes deviations as either Reportable or Non-Reportable Events and delineates specific requirements for the initiation, investigation and evaluation of deviations. Quality Requirement 15-52, paragraph A.2 indicates that deviations which are non-reportable events and consist of items that represent a significant deviation from accepted normal operation of the reactor and associated equipment are required to be processed under the requirements of this procedure. Paragraphs A.2.a and A.2.b provide additional guidance as to the type of problems which should be included in this category. These include equipment malfunctions or errors which cause a unit derating and recurring problems, which taken alone, do not meet this criterion, but which have the potential for causing a unit derating outage.

Discussions with the Station's management staff have indicated that the Station interprets paragraph A.2 to require a Deviation Report be initiated only for those Non-Reportable Events which represent a significant deviation from normal operation and which meet the additional requirements of paragraphs A.2.a and A.2.b. The NRC staff has reviewed the requirements of the CECo Quality Assurance Manual and the specific requirements of this implementing procedure and have concluded that a deviation is not limited to the conditions of paragraphs A.2.a and A.2.b. Furthermore, mechanically stuck control rods are considered to be a significant deviation from

normal operation and have the potential to extend a unit derating outage. Therefore, the lack of the initiation of a Deviation Report for the operational occurrence of July 13, 1985, whether due to personnel error or conscious decision is a violation of the requirements of 10 CFR 50, Criterion XVI, as implemented by the CECo Quality Assurance Manual and Byron Administrative Procedures (454/85033-01(DRS)).

In the process of investigating the circumstances of the operational occurrence of July 13, 1985, concerning the mechanically stuck control rods, the inspector was made aware by the licensee's staff that the licensee's vendor, Westinghouse, had encountered mechanically stuck control rods at other facilities provided with Westinghouse rod control systems. The mechanical binding is believed to be due to differential thermal expansion caused by a plant cooldown while the control rods were energized on the core bottom. The licensee indicated that the Byron cooldown procedure did not contain a precaution to preclude a recurrence of the same event in the future. The inspector is presently pursuing whether Westinghouse has identified this operational precaution to all other applicable facilities and whether the issue should be considered generic in nature. This determination will be followed separately. The inclusion of this operational precaution into Byron's Operational Procedures will be followed as an open item (454/85033-02(DRS)).

No additional violations or deviations were identified. However, a portion of this area requires further review and evaluation and is considered to be an open item.

3. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee or both. An open item disclosed during the inspection is discussed in Paragraph 2.e.

4. Exit Interview

The inspectors met with licensee representatives denoted in Paragraph 1 at the conclusion of the inspection on July 19, 1985, and again on July 26, 1985, following an additional inspection into licensee actions to free the stuck control rods. The inspectors summarized the purpose and scope of the inspection and the findings. The licensee acknowledged the statements made by the inspector with respect to the open item and the violation. The inspectors also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents/processes as proprietary.