U. S. NUCLEAR REGULATORY COMMISSION OFFICE OF INSTRUCTION AND ENFORCEMENT

REGION III

Reports No. 50-454/89015; 50-455/89017

Docket Nos. 50-454; 50-455

Licenses No. NPF-37: NPF-66

Licensee: Commonwealth Edison Company Post Office Box 767 Chicago, Illinois 60690

Facility Name: Byron Station, Units 1 and 2

Inspection At: Byron Station; Byron, Illinois

Inspection conducted: June 12-20, 1989

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Inspector: D.E. miller/for

Approved by: N. &. Millifor M. Schumacher, Chief Radiological Controls and Chemistry Section

Inspection Summary:

Inspection on June 12-20, 1989 (Reports No. 50-454/89015(DRSS); No. 50-455/89017(DRSS))

Areas Inspected: Routine, unannounced inspection of the radiological protection program during power operation including licensee action on previous inspection finding (IP 92701), changes in the organization, audits and appraisals, training and qualification of personnel, external and internal exposure control, control of radioactive materials and contamination, surveys and monitoring, and ALARA (IP 83750).

Results: The licensee's radiation protection program appears effective and adequate to protect the health and safety of plant workers and the public. No violations or deviations were identified.

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7-7-89 Date

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DETAILS

1. Persons Contacted

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*S. Barrett, Health Physics Services Supervisor S. Bell, Health Physicist
*L. Bushman, ALARA/Operations Group Leader
*W. Carl, Health Physicist
S. Fletcher, RP Instrumentation
*S. Kraus, QA auditor
J. Miller, Mechanical Maintenance Group Foreman
R. Munson, ALARA Analyst
*K. Petrowski, CECo GO, Health Physicist
*R. Pleniewicz, Station Manager
*G. Schwartz, Production Superintendent
*M. Snow, Regulatory Assurance Supervisor
*T. Tulon, Assistant Superintendent, Maintenance
*R. Ward, Technical Services Superintendent
*D. Wozniak, PWR Projects
*E. Zittle, Regulatory Assurance Staff

*W. Kropp, NRC Senior Resident Inspector *R. Sutphin, NRC Project Inspector

The inspectors also contacted other licensee representatives.

*Denotes those present at the exit meeting.

2. General

This inspection was conducted to review aspects of the licensee's radiation protection program during power operations, and the licensee's response to previous inspection findings. During plant tours, the inspector noted that area postings, access controls, and housekeeping were good.

3. Licensee Actions on Previous Inspection Findings (IP 92701)

(Closed) Open Item (454/88013-02; 455/88013-02): Improve high radiation area access control by defining and proceduralizing an acceptable key issue authorization method. The licensee has revised procedures BAP 1450-2, "Access to High Radiation Areas," and BAP 330-5, "Lock and Key Control," to include high radiation area key control using the back of the dose control card to document key issuance and return, RWP number, date, initial and time. This matter is considered closed.

(Closed) Open Item (454/88013-03; 455/88013-03): Need for better assurance that employees and visitors in the process of terminating are whole body counted. The licensee now requires that PACs work groups have exit whole body counts (WBC) prior to receiving their last pay check. Contractor work groups are also required to have WBC prior to leaving, but this is difficult to control. The licensee has enhanced efforts to impose additional controls. This item is considered closed. (See Section 8)

(Closed) Open Item (454/88013-06; 455/88013-06): Whole body counting for persons who alarm the gate house portal monitor but for whom subsequent personnel frisks do not detect contamination. The licensee has revised BRP 1470-1, "Routine Personnel Decontamination," to require a whole body count for personnel who alarm the gate house portal monitor and no external contaminated is found by frisking. This matter is considered closed.

(Closed) Open Item (454/88013-08; 455/88013-08): The licensee has no positive control/accountability over issuance, distribution, storage, and return of contaminated tools/equipment. The licensee has written a procedure for control/accountability of tools and equipment in the radiologically controlled area (RCA); the procedure, BRP 1440-1, "Material Release from the Radiologically Controlled Areas," provides guidelines for the conditional and unconditional release of tools, trash, and other materials from the RCA. This matter is considered closed. (See Section 9).

(Closed) Open Item (454/88013-12; 455/88013-12): Improve/expand the review of personal contamination event causal factors and revise the PCR forms to aid in evaluating personnel contamination problems and to enhance data trending. Procedure BRP 1470-1, "Routine Personnel Decontamination," was revised to provide guidance to RPTs concerning methods of determining the cause of a personal contamination event. A review of PCRs indicate a greater percentage of causes are determined.

(Closed) Violation (454/88021-01; 455/88018-01): A radioactively contaminated snubber was found outside the controlled area; the incident was not promptly reported to the Radiation Chemistry Supervisor nor was a timely Radiation Occurrence Report written. The inspector reviewed implementation of the corrective actions listed in the licensee's letter of response dated January 5, 1989. The corrective actions have been implemented and appear adequate. No further problems were identified.

(Closed) Violation (454/88021-02; 455/88018-02): A shipment of limited quantity radioactive material was made without "radioactive" marking and without the required notice with the package. The inspector reviewed implementation of the corrective actions listed in the licensee's letter of response dated January 5, 1989. The corrective actions have been implemented and appear adequate. No further problems were identified.

4. Changes (IP 83750)

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The inspector reviewed changes in the organization, personnel, facilities, equipment, programs, and procedures that could affect the occupational radiation protection program.

In March 1989 the Radiation/Chemistry Department split into the Radiation Protection Department and the Chemistry Department. A new position, Health Physics Services Supervisor (HPSS), was created to head the Radiation Protection Department. Reporting to the HPSS are the ALARA/Operations Group Leader, the Technical Health Physics Group Leader, the GSEP Coordinator and the six Radiation Protection Foremen. The position of lead foreman was abolished and the former lead foreman is now the RCA coordinator; the former RCA coordinator is now a foreman. The Technical Health Physics Group Leader, who was the former lead Health Physicist, is the Radiation Protection Manager (RPM). All supervisors and foremen meet or exceed the qualification requirements listed ANSI N18.1-1971 or Regulatory Guide 1.8, September 1975.

An inspector concern discussed in previous inspection reports (454/88013; 455/88013 and 454/88021; 455/88018) was lack of time allotted to RP foremen to perform supervision/observation of work and to monitor radiological conditions/posting within the RCA. During the September/October 1988 outage, engineering assistants were assigned some of the foremen's administrative duties which allowed more time for the foremen to be in the plant supervising. This apparently worked well. The current organization assigns a foreman to those administrative duties allowing the remaining five foremen to be in the plant supervising. All of the above changes should strengthen the RP department. The administrative foreman change should keep the foremen more aware of plant conditions. No problems were noted.

The inspector reviewed Radiation Occurrence Reports (RORs), written in 1989 to date. Five RORs were written through June 13, 1989, including a deliberate violation by a radwaste supervisor and a radwaste worker of a radiation rope barrier intended to prevent egress from the Auxiliary Building during back shift hours. Disciplinary action including time off and a letter in their personnel file resulted from a review of the event by the Personnel Error Board.

No violations or deviations were identified.

5. Audits and Appraisals (IP 83750)

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The inspector reviewed station quality assurance (QA) audits of the radiation protection program conducted since the last inspection. Extent of audits, qualification of auditors, and adequacy of correction actions were reviewed.

Four audits of radiation protection were conducted during this period. The areas reviewed included radiation protection procedures, radiation measuring instruments, posting, high radiation area control, personnel dosimetry and protective clothing. The extent of the audits and qualifications of the auditors appeared adequate. Corrective actions for findings appeared to be timely and adequate.

No violations or deviations were identified.

6. Training and Qualification of Personnel (IP 83750)

The inspector reviewed the education, experience qualification, and training of selected members of the radiation protection organization.

An inspector concern discussed in a previous inspection report (454/88013; 455/88013), was that because of administrative and other duties the rad/chem foremen could not participate in training which was scheduled for technicians. As a result, the foremen were becoming less conversant with plant conditions and the technical aspects of their jobs. In order to correct this weakness, the licensee has scheduled quarterly in-house retraining for foremen and will attempt to send them to specialized training offsite such as the Oak Ridge HP course.

No violations or deviations were identified.

7. External Exposure Control (IP 83750)

The licensee's external exposure control program was reviewed, including: change in facilities, equipment, personnel, and procedures; adequacy of the dosimetry program to meet routine and emergency needs; dose tracking capabilities; required records, reports, and notifications; effectiveness of management techniques used to implement these programs, and experience concerning self-identification and correction of program implementation weaknesses.

Exposure records of plant and contractor personnel were selectively reviewed for 1989 to date. No exposures greater than 10 CFR 20.101 and licensee administrative limits were noted.

The dose tracking system appears to be adequately developed and is being implemented satisfactorily and in accordance with relevant procedures. No problems were noted.

No violations or deviations were identified.

8. Internal Exposure Control and Assessment (IP 83750)

The licensee's internal exposure control and assessment program was reviewed, including: changes in facilities, equipment, personnel, and respiratory protection training; procedures affecting internal exposure control and personnel assessment of individual intakes relative to regulatory requirements; required records, reports and notifications; effectiveness of management techniques used to implement these programs, and experience concerning self-identification and correction of program implementation weaknesses.

A review of the licensee's whole body count records indicated that no exposures in excess of the 40 MPC-hour control measure occurred during 1988 and 1989 to date. The licensee has imposed additional controls to ensure that most terminating workers are whole body counted (WBC) during out-processing. There is very little problem with personnel who follow the normal termination process. However, workers who quit unexpectedly are not always available for WBC, nor is there a permanent solution. This matter appears to have been adequately addressed. No problems were noted.

No violations or deviations were identified.

9. <u>Control of Radioactive Materials and Contamination, Surveys and Monitoring</u> (IP 83750)

The inspector reviewed the licensee's program for control of radioactive materials and contamination, including: adequacy of supply, maintenance, and calibration of contamination survey and monitoring equipment; procedures; adequacy of review and dissemination of survey data, and effectiveness of methods of control of radioactive and contaminated materials.

As discussed in a previous inspection report (50-454/88021; 50-455/88018), the licensee has essentially stopped permitting tools to be taken in and out of the RCA. The only tools that are allowed to be taken out of the RCA are specialty tools, such as measuring and test equipment, which were exempted prior to being taken in. Since the end of the outage, the egress control station at the 401' elevation in the Auxiliary Building is manned by a staff radiation protection technician on the day shift only; it is posted as "No Exit" for the other two shifts; entry and exit is then through the 426' elevation control point only. According to licensee personnel, the closing of the RCA caused considerable difficulty with the movement of tools and equipment at first; however, now it appears to work well.

Several tool and equipment cages, tool cabinets, and about 40 gang boxes located throughout the Auxiliary Building are used for storage of contaminated and potentially contaminated tools and equipment. Tools and equipment which are used for work on contaminated systems or in contaminated areas are surveyed, decontaminated if necessary, and returned to these storage locations. Tools and equipment are not allowed to be taken out of the RCA on a routine basis. Radiation protection personnel survey the tools and equipment in gang boxes on a monthly frequency; so far, there is no evidence that tools/equipment are being returned to these storage areas without being surveyed and decontaminated. However, the practice of having locked storage containers for possible contaminated tools and equipment that are not controlled by radiation protection is not a good practice. The feasibility of a large caged central storage area for RCA tools and equipment was discussed at the exit meeting.

The licensee has installed and is using an automatic laundry monitor. The monitor has 20 plastic scintillation detectors (10 above the moving belt and 10 below it) plus eight NaI gamma detectors under the belt The detectors are set to alarm at about 73,000 dpm (33 nanocuries) beta and about 220,000 dpm (100 nanocuries) gamma. Laundered coveralls are monitored inside out. All protective clothing is dry cleaned and then monitored. If an article of clothing does not pass the monitor, it is wet washed; if it does not pass after a wet wash it is disposed of as DAW. No problems were noted.

The inspector selectively reviewed Personnel External Contamination Records (PECRs), event trending, and summary data for 1989. One hundred thirteen personnel contamination events were reported during 1989 through June 13. In response to an inspector concern (454/88013-12; 455/88013-12), the licensee has significantly improved their reporting of causal factors on PECRs. Procedural guidance has been provided to RPTs to help them identify the cause of personnel contamination. Of the PECRs reviewed by the inspector, all were attributed to specific causes.

No violations or deviations were identified.

10. Maintaining Occupational Exposures ALARA (IP 83750)

The inspector reviewed the licensee's program for maintaining occupational exposure ALARA, including: ALARA group staffing and qualifications; changes in ALARA policy and procedures, and their implementation; ALARA consideration for maintenance and refueling outages; worker awareness and involvement in the ALARA program; establishment of goals and objectives, and effectiveness in meeting them.

The ALARA/operations staff consists of a Group Leader, an ALARA Engineer (HP), an ALARA Analyst, the REP Coordinator, the RCA Coordinator, and two health physicists. The current ALARA/operations staff appears to have the experience, qualifications, and dedication necessary to implement an effective program. One of the HPs in the group has recently completed SRO license training; therefore, his knowledge of plant systems significantly adds to the group's expertise.

Total station dose for 1988 was about 460 person-rem, which was under the station goal of 475. The 1989 dose to date is about 140 person-rem including 130 person-rem for the Unit 2 refueling outage.

No violations or deviations were identified.

11. Deviation Report (DR) Review (IP 93702)

Through discussion with licensee personnel and review of records, the following deviation report was reviewed to determine that reportability requirements were fulfilled, that timely corrective action was taken, and that corrective action to prevent recurrence had been accomplished:

(Cloved) DR No. 06-02-89-010: Hydrogen fire in 2A SI Accumulator. This event was classified by the licensee as a Potentially Significant Event (PSE).

Event Description

On January 16, 1989, at 1640 hours, a radiation protection technician (RPT) was directed to collect an air sample of the 2A accumulator atmosphere. As the sampler was lowered through the manway, the atmosphere in the accumulator ignited. A rush of warm gas and a small cloud of smoke existed the manway for about five seconds, accompanied by considerable noise and vibration.

The RPT was not contaminated and the only apparent adverse physical effect on the RPT was "ringing ears" for several hours after the incident. No damage to plant structures was immediately evident. All containment entries were denied until air sample results were analyzed and found satisfactory. Air sample results from all levels of containment indicated that the containment atmosphere was supportive of life and was not combustible. At 1815 hours, routine controlled access to the containment was restored.

The entire sequence of events apparently began on January 13, 1989, with Unit 2 in cold shutdown and the Reactor Coolant System (RCS) depressurized and degassed in preparation for opening the RCS for refueling. The 2A SI accumulator was drained to the reactor coolant drain tank (RCDT) in order to repair a leak in the accumulator manway. The drain lineup was maintained in accordance with procedure BOP SI-6, Revision 3, and out-of-service procedure 055-89-2-0579. The manway cover was removed, which opened the accumulator volume to containment building atmosphere. On January 15, the isolated RCS loops were drained to the RCDT.

At 0310 hours on January 15, 1989, the containment continuous air monitors alarmed, indicating an increase in airborne radioactivity in the containment atmosphere. At 0315 hours, radiation protection supervisors required that all personnel in the containment wear respiratory protection equipment. At 0410 hours, two high efficiency particulate air (HEPA) filter units were started to filter the atmosphere at a total flow rate of about 1500 cubic feet per minute. In spite of this action, the containment airborne particulate activity continued to increase. A search for the source of the airborne activity was initiated.

At 0410 hours on January 16, a contract worker who had been working on the 2A accumulator manway repair alarmed the whole body frisker (IPM-7) as he exited the containment. After showering, a whole body count revealed that the source of contamination was xenon-133, a noble gas. At 0430 hours, a second contract worker involved in the manway repair alarmed the IPM-7. Evidently, the source of containment airborne activity was the accumulator manway. A health physics foreman requested licensed operators to assist in identification of the source of noble gas in the accumulator. At 0740 hours, Unit 2 entered the Refueling Operations Mode (Mode 6) as reactor vessel head detensioning commenced. At 0800 hours on January 16, during the course of the investigation to determine the source of the radiation, a RPT detected gas flow exiting the accumulator manway and a portable radiation instrument indicated 800 mrad/hour beta. Due to the changing radiation conditions, the applicable Radiation Work Permit (RWP) was terminated and access to the accumulator was restricted by roping and posting the area. At 1015 hours, licensed operators started the 2B containment charcoal filter unit in an effort to lower airborne activity levels. By 1300 hours, licensed operators had confirmed that the drain path between the accumulator and the RCDT had remained open, which provided a vent path from the RCDT atmosphere to the accumulator and ultimately to the containment atmosphere. The licensed operators isolated the vent path and periodic radiation surveys indicated that radiation levels at the accumulator manway trended downward.

At about 1640 hours on January 16, an RPT attempted to obtain an air sample from the accumulator and an apparent hydrogen burn ensued.

Apparent Causes

It is believed that the open path between the RCDT and the 2A accumulator allowed waste gases from other systems connected to the RCDT to migrate to the 2A accumulator. Specifically, all four isolated RCS loops were drained to the RCDT from January 14-16. Although the RCS had been degassed, residual hydrogen remained dissolved in the coolant, some of which was stripped from solution either while transiting to the RCDT or while stored in the RCDT. This hydrogen, along with other gases stripped from the coolant, migrated to the accumulator through the open drain path. An additional possible source of hydrogen may have been the Waste Gas System which is connected to the RCDT vapor space and normally functions to remove waste gases from the RDCT. Because the RCDT vapor space was open to containment atmosphere via the accumulator, reverse flow from the Waste Gas System to the RCDT may have occurred.

An evacuated glass bomb grab sample had been collected from the accumulator atmosphere at 1340 hours on January 16 and was to be analyzed for radioactive xenon content. Instead, at 1700 hours, the grab sample was analyzed for combustible constituents. The analyses indicated 7.6 percent hydrogen and 9.6 percent oxygen. The analyses of a similar post-incident grab sample indicated less then 0.1 percent hydrogen and 14.5 percent oxygen. These results support the conclusion that a rapid hydrogen burn had occurred inside the accumulator. An inspection of the air sampler determined that ignition occurred inside the air sampler and continued through the filter assembly to the accumulator atmosphere. The hydrogen concentration in the accumulator was sufficient to support combustion, which was initiated by the electro-mechanical operation of the air sampler.

Maintaining the open drain path between the accumulator and the RCDT was not contrary to the "Lowering SI Accumulator Level Operating

Procedure" (BOP SI-6, Revision 3). Additionally, the out-of-service procedure, implemented to allow the manway liner repair, required that the accumulator drain valve remain open.

Corrective Actions

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As previously stated, licensed operators isolated the vent path from the RCDT to the accumulator during the day shift on January 16.

At 2145 hours on January 16, service air was used to dilute the accumulator atmosphere. Surveys of the accumulator after dilution indicated that the atmosphere was not combustible, contained 20.7 percent oxygen and no radiation was detected.

The standardized out-of-service procedure, utilized to remove the accumulator from service, was revised to require isolation from the RCDT following the draining operation.

12. Licensee Event Report (LER) Review (IP 92700)

Through discussion with licensee personnel and review of records, the following event report was reviewed to determine that reportability requirements were fulfilled, that timely corrective action was taken, and that corrective action to prevent recurrence had be accomplished:

(Closed) LER No. 454/88009: Automatic Fuel Handling Building Booster Fan Actuation Due to High Radiation Condition Caused by a Radioactive Particle.

On October 21, 1988, at 1437 hours, with Unit 1 in cold shutdown (Mode 5), the Fuel Building Isolation - Radioactivity High and Criticality Area Radiation Monitor (ORE-AR055) interlocked and alarmed on the RM-11 Radiation Monitor Display Console in the Main Control Room. The monitor measured 8 millirem/hour; its interlock caused an automatic start of the OA Fuel Handling Building Booster Fan which is an Engineered Safety Failure (ESF) actuation.

The cause of the ESF actuation was an increase in the FHB area radiation levels caused by a radioactive hot particle trapped in the filter of a pump being used to transfer borated water from the fuel transfer canal (FTC) to the spent fuel pool (SFP).

The pumping operation commenced at approximately 0700 hours on October 21, 1989, using a submersible pump and portable filter assembly. Temporary radiation shielding had been installed on the portable filter assembly which was located on the SFP crane platform above the pool. The radiation dose rate on the filter assembly was measured at 160 millirem/hour after the start of pumping operation and a shiftly dose rate surveillance was initiated on the filter assembly. After the ESF actuation, pumping operations were immediately stopped and radiation dose rates in the area were measured. Contact dose rates on the filter housing were 5-16 Rem/hour. General area dose rates in the FHB ranged between 5-13 millirem/hour. Personnel access to the SFP area was controlled to limit radiation exposure while the filter on the pump assembly was changed. When the filter housing was disassembled, a radioactive hot particle measuring 85 Rem/hour was detected. The filter element and floor coverings (from the filter work) were bagged and placed in a shielded drum. The filter housing and general area were surveyed to verify the removal of all particles.

Corrective action was to install a remote reading radiation monitor with alarm capability on the filter housing to permit continuous monitoring of dose rate. The maximum contact dose rate measured during the remaining pumping operation was 200 millirem/hr. This item is considered closed.

No violations or deviations were identified.

13. Surveillance - Plant Tours (IP 83750)

During several tours of the plant, the inspector noted that no person was observed violating a procedural requirement, radiation postings and controls were in accordance with requirements, friskers were operable, and calibrated radiation detection equipments were used by HP personnel. The inspector collected smears on floor and horizontal surfaces on all accessible levels of the auxiliary and fuel handling buildings. None of the smears showed removable contamination greater levels than counter background. No problems were noted.

No violations or deviations were identified.

14. Exit Meeting (IP 30703)

The inspector met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on June 20, 1989, to discuss the scope and findings of the inspection. The inspector also discussed the likely information content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any such documents/processes as proprietary. The inspector specifically discussed the concern about gang boxes in the auxiliary building containing potentially contaminated tools/equipment. (Section 9).