U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-454/88013(DRSS); 50-455/88013(DRSS)

Dockets No. 50-454; 50-455 Licenses No. NPF-37; NPF-66

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

Facility Name: Byron Station, Units 1 and 2

Inspection At: Byron Station, Byron, Illinois

Inspection Conducted: August 1-12, 1988

Inspectors: D. E. Miller for — 9-13-88 Date

W. B. Grant — 9/13/88 Date

K. A. Paul — 9/13/88 Date

W. J. Slawinski for — 9-13-88 Date

J. E. House for — 9/13/88 Date

Approved By: L. R. Greger, Chief
Facilities Radiation Protection
Section — 9-13-88 Date

Inspection Summary

Inspection on August 1-12, 1988 (Reports No. 50-454/88013(DRSS); 50-455/88013(DRSS))
Areas Inspected: Special, announced team inspection of the operational radiation protection, radwaste management, and nonradiological chemistry programs including: health physics organization, management controls, and qualifications (IP 83522); chemistry organization and management controls, (IP 83522); external exposure controls, personal dosimetry, and assessment

(IP 83524); internal exposure controls and assessment (IP 83525); respiratory protection controls (IP 83525); radiological survey and RWP programs (IP 83526); control of radioactive materials and contamination (IP 83526); ALARA (IP 83728); solid radioactive waste (IP 84522); liquids and liquid radioactive wastes (IP 84523); primary coolant chemistry (IP 84523); gaseous radioactive wastes (IP 84524); effluent control instrumentation (IP 84723; 84724); transportation of radioactive materials (IP 86721); air cleaning systems (IP 84724); nonradiological confirmatory measurements (IP 79701); chemistry QA/QC program (IP 79701); and the water chemistry control program (IP 79701). Also reviewed were past open items, audits, and an NRC Information Notice.

Results: Overall, the radiation protection, radwaste management, and nonradiological chemistry programs are adequate. Some implementation problems have occurred during the early operational period, but the licensee has responded to these problems positively and prospects are for continued improvement of these programs with time. No violations or deviations were identified. Several program weaknesses were noted by the inspectors and discussed with the licensee.

DETAILS

1. Persons Contacted

S. Barrett, Rad/Chem Supervisor
D. Berg, Nuclear Safety
W. Bielasco, Station Health Physicist
D. Bump, QA Inspector
L. Bushman, ALARA Coordinator
F. Hornbeak, Senior Staff Engineer
T. Joyce, Production Superintendent
T. Kovach, Radiation Protection Director, Corporate
W. McNeill, Lead Rad/Chem Foreman
W. Pirnat, Regulatory Assurance
J. Schrage, Health Physicist, Corporate
M. Snow, Regulatory Assurance Supervisor
F. Willich, Senior QA Inspector
S. Wilson, Station Chemist
D. Winchester, QA Superintendent
E. Zittle, Regulatory Assurance

P. Brochman, NRC Senior Resident Inspector

The above individuals attended the exit meeting on August 12, 1988. In addition to the above individuals, the inspectors contacted other licensee and contractor personnel during the team inspection.

2. General

This specialist team inspection began on August 1, 1988. Reviewed were the operational health physics, solid radwaste management, and nonradiological chemistry programs. Also reviewed were past open items, audits, and an NRC Information Notice. Several tours of licensee facilities were made to review posting, labeling, access and contamination controls, and to observe health physics aspects of work in progress. Several independent direct radiation and contamination surveys were performed by team members. Special attention was given to program areas where weaknesses were previously identified by the NRC and others. Additional weaknesses noted by the inspectors during this inspection concern RP foreman time in the RCA (Section 4), proceduralization of R-key issue (Section 7.d), whole body counts performed during outprocessing (Section 8), use of CAM in fuel building during spent fuel movement (Section 8), use of mini-purge when containment is open (Section 9), whole body counts when hand frisker cannot find reason for IRT or IPM-7 alarm (Section 12), portal and hand and foot monitor calibration procedures (Section 12), potential for loss of control of contaminated tools (Section 14), better quantification of continuous noble gaseous effluent (Section 19), and improved establishment of personal contamination event causes (Section 13).

One purpose of the team inspection was to assess the adequacy of implementation of the radiation protection, radwaste, and nonradiological chemistry programs when these programs are challenged by outage maintenance and refueling conditions.

The organization structure, qualifications of personnel, management controls, proposed staffing levels, and upper management support appears adequate to maintain quality radiation protection, radwaste management, and nonradiological chemistry programs. The effect of the proposed rad/chem department split on these programs will be assessed during future inspections.

In addition to the weaknesses indicated above, minor problems were identified with the content of some specific procedures; the licensee committed to correct the problems. Corrective actions for previously identified concerns by the NRC and others appear to have been adequately addressed in a timely manner except for development of a method for and quantification of continuous noble gaseous effluent releases from the auxiliary building vents; the licensee committed during this inspection to expedite corrective actions addressing this matter.

3. Licensee Action on Previous Inspection Findings and Open Items

(Closed) Open Item (454/87003-03; 455/87003-03): Specific corrections for instrument background count rates were omitted from calibration procedures for liquid and gaseous effluent monitors. Calibration procedures for all the effluent radiation monitors have been revised to include specific corrections for instrument background. This item is considered closed. See Section 20.

(Closed) Open Item (454/88007-04): Review of corporate report of the I-131 release in containment. A draft report of the event was reviewed by the inspectors during this inspection; no problems were noted. See Section 8.

(Closed) Open Item (454/88007-05): Review licensee action regarding weaknesses identified during the April 6, 1988 I-131 release in containment. The licensee revised Procedure BAP 700-5 "Utilization of Portable Air Filtration/Ventilation Equipment" to include a diagram of a typical HEPA/carbon portable ventilation unit setup which uses hose clamps for all hose connections. A new procedure, BRP 1620-3, "Setup and Operation of Portable Air Filtration/Ventilation Equipment" has been written and is referenced in BAP 700-5. BRP 1620-3 Revision 00, provides adequate setup instruction, precautions, and pre-use inspection for portable ventilation equipment. This item is considered closed. See Section 8.

(Closed) Open Item (454/88007-06): Review licensee's procedure for correlating whole body count results to airborne intakes (MPC-hours). The licensee's procedure has been revised to incorporate ICRP-30 parameters (see Section 8). This matter is considered closed.

(Closed) Open Item (454/87013-01; 455/87012-01): Licensee to improve the nonradiological QA/QC program by use of charts, multiple standards, and improved testing of RCTs. The licensee has implemented statistically based control charts for all assays and uses multiple point calibrations where possible. New equipment that accommodates multiple point calibrations has been acquired and will be used when test development is completed. A review of the RCT testing program indicates that all RCTs are tested twice yearly and corrective actions are taken when acceptance criteria are not met.

(Closed) Open Item (454/87036-01; 455/87035-01): Licensee to prepare and send split samples to Brookhaven National Laboratory for analysis. BNL has received and analyzed the samples. All analytes (Table 1) were in agreement.

(Closed) Open Item (454/87034-01; 455/87041-01): Plan for improving HP staff stability. This matter is discussed in Section 4.

(Open) Open Item (454/87034-02): Unit 1 fuel transfer tunnel hot spots identified during fuel movement. The licensee plans to control access to the area by installation of plastic webbing, posting, and a flashing beacon as a warning device. The access controls will be installed prior to the Unit 1 refueling outage in September 1988 and, if necessary, similar controls instituted for Unit 2 prior to its initial refueling. This item remains open pending completion of the proposed modifications.

(Closed) Open Item (454/87034-03): RWP access authorization allowed unauthorized workers to enter containment and the steam generator platform during the initial Unit 1 refueling outage. The licensee has strengthened outage job planning and oversight to ensure similar problems to not reoccur. Manpower devoted to outage related steam generator work will be strictly controlled and tracked by the licensee.

4 Organization and Management Controls (IP 83522)

The licensee's organization and management controls for the radiation protection and radwaste programs were reviewed, including changes in the organizational structure and staffing, effectiveness of procedures and other management techniques used to implement these programs, experience concerning self-identification and correction of program implementation weaknesses, and effectiveness of audits of these programs.

Organizational changes were discussed in Inspection Reports No. 50-454/87044(DRSS); 50-455/87042(DRSS). Since that December 1987 inspection, one radiation protection (RP) foreman was assigned to a new instrument foreman position, and an RCA coordinator position has been established and filled by an engineering assistant. One health physicist position remains unfilled.

During November 1988, the licensee plans to permanently assign rad/chem technicians to either radiation protection or chemistry technician positions. The remainder of the rad/chem department organizational

structure will remain unchanged pending resolution of any problems associated with the technician reassignments; then, some management changes are contemplated. These changes will be reviewed during future inspections.

The current RP foreman staffing is five. Most weekend and some backshift hours are not staffed with an RP foreman; during these hours at least one ANSI N18.1-1971 qualified RP technician is on duty. According to licensee personnel, demands on the time of RP foremen severely restrict the amount of time they spend performing supervision/observation of work and monitoring radiological conditions/postings within the RCA. They also frequently are unable to attend optional training such as scheduled RP technician retraining. As a result, foremen appear to be becoming less conversant with plant conditions and technical aspects of their jobs and must rely more upon the technician's judgements in these areas. This change appears to have caused frustration for both technicians and foremen. This matter was discussed with the licensee during the inspection and at the exit meeting (Open Item 454/88013-01; 455/88013-01). According to licensee representatives, the licensee plans to have an engineering assistant perform some administrative duties, that are now assigned to RP foremen, during the upcoming outage. There are no other current plans.

Discussed in a previous Inspection Report (454/87034; 455/87041) were licensee short-term plans to stabilize staffing and reduce turnover. Since then, staff turnover has become less prevalent. This improved stability is in part due to the continuing presence of three contract HPs. During this inspection, the inspectors discussed future staffing plans with station and corporate representatives. The representatives described proposed long-term plans for organizational and other changes which should provide better advancement potentials for degreed and nondegreed persons, improved continuing training for RP foremen and HPs, and task assignments which should relieve degreed HPs from some menial tasks.

The inspectors reviewed selected managerial and qualification aspects of the department and found that:

- Formal job descriptions have been developed for the station health physicist, health physicists, health physics foremen, health physics engineering assistants, the station TLD coordinator, and the station TLD engineering assistant. Performance appraisals which include performance planning (objectives), six-month reviews, and annual performance assessments are performed on persons holding the positions listed above.

- A formal performance appraisal system for radiation protection technicians has been developed but not yet fully implemented. The licensee plans to fully implement the system soon. The system, developed at Byron Station, appears to contain comprehensive evaluation criteria.

- The department's internal communications appear adequate. Communications include weekly meetings between departmental supervisors, professionals, and technicians to discuss any matter pertinent to the department; individual attendees are encouraged to participate. The meetings are audio taped so that persons not present (on backshift, etc.) can listen to the tapes later. During interviews with various department personnel, the inspectors learned of no significant existing communications problems.

- All supervisors and foremen meet or exceed the qualification requirements listed in ANSI N18.1-1971 for the positions they hold.

The licensee's method for self-identification and correction of program implementation weaknesses includes the Radiation Occurrence Report system, quality assurance audits, and assessments conducted by the corporate health physics department. The inspectors selectively reviewed licensee corrective actions for weaknesses, findings, and observations identified by the self-identification programs; the corrective actions generally appear timely and adequate. The audits and assessments are generally thorough, of adequate extent, and performed by qualified auditors/assessors.

No violations or deviations were identified.

5. Chemistry Organization and Management Controls (IP 83522)

The organization and staffing of the chemistry group were reviewed, including changes made since the last inspection. The Station Chemist and Radwaste Coordinator have exchanged positions. The Station Chemist manages the chemistry group and reports to the Rad/Chem Supervisor. Chemistry is divided into two functional groups, Analytical and Operational Chemistry, with each having a group leader who reports to the Station Chemist. Four engineering assistants responsible for instrumentation, procedures, and quality assurance programs report to the Analytical Group Leader. The Operational Chemistry Group Leader has two chemical engineers, a mechanical engineer and an engineering assistant reporting to him. This group monitors water chemistry parameters and water processing for the plant. In addition, two laboratory foremen report to the Station Chemist and are in charge of the RCTs who perform all analyses. The overall management structure of the laboratory appears to be well designed and capable of maintaining chemistry parameters within the EPRI limits.

As stated in Section 4, the division of RCTs between health physics and chemistry is planned to occur in November 1988. Chemistry is expected to have 17 RCTs on a permanent basis after the split. Individual RCTs have chosen or been assigned to one of the two groups.

No violations or deviations were identified.

6. Stationmen Training (IP 83522)

A station health physicist recently presented a rad/chem staff developed radiation protection training course to stationmen to provide the workers with practical training relative to their responsibilities for laundry, decontamination, and radwaste. The stationmen assumed responsibility for general plant decontamination activities from contract laborers in 1987. No radiation protection related training, other than that provided in NGET, was previously provided to stationmen. The course consisted of about six hours training covering the following topics:

- Review of laundry operations and procedures, PC collection, and monitoring.
- Decontamination activities including decontamination and survey methods/techniques and instrument use.
- Radwaste (DAW) collection, processing, packaging, related equipment operations and vehicle loading.

The course, provided to about 50 (all) stationmen in June and July 1988, included a 30-question written exam reinforcing the practical aspects of the training. Also, certification (task demonstration and sign-off) cards were developed and are in various stages of completion. The licensee plans to have all stationmen trained and certified by mid-September 1988. According to the licensee, their Production Training Center is developing a formal training program for stationmen.

Based on the course outline and discussions with the instructor and several stationmen, the course appears to provide the workers with the basic practical understanding necessary to adequately fulfill their responsibilities.

No violations or deviations were identified.

7. External Exposure Controls, Personal Dosimetry and Assessment (IP 83524)

The licensee's external exposure control and personal dosimetry programs were reviewed including changes 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. The radiological survey and RWP programs are discussed in Section 10.

a. Area Monitor and Portable Survey Instrument Calibrations

Applicable procedures and calibration records for selected area and portable monitors were reviewed, including beta-gamma and neutron monitoring and electronic digi-dose instruments. A computer program

tracks instrument status and weekly printouts are generated; calibration assignments are made by the rad/chem staff. RCTs are assigned to the licensee's calibration facility on weekly rotations.

Portable instruments in use are typically calibrated quarterly; digi-dose instrument response and alarm functions are checked semiannually. Nonsafety-related area radiation monitors are calibrated on 18-month cycles. Out-of-service instruments are stored in the calibration facility and are available for use as needed. Portable beta-gamma instruments are bench calibrated using a J. L. Shepard (cesium-137) beam calibrator. The output of the calibrator is determined with a calibrated NBS traceable R-Chamber. Neutron instruments are bench calibrated with a californium-252 source.

The inspectors reviewed recent calibration records of 20 selected area monitors and portable survey instruments. Quality assurance testing of self-reading dosimeters (performed at six-month intervals) was also reviewed. No significant problems or concerns were noted. The licensee's inventory, control and calibration program appears good.

b. Personal Dosimetry Program

Technical problems (related to the TLD reader) that delayed implementation of the licensee's inhouse TLD program have been resolved. The station's inhouse whole body (beta/gamma) TLD program began in April 1988, replacing the vendor supplied film badge program. A vendor continues to supply and process neutron and extremity (finger ring) dosimetry. The licensee's TLD program is NVLAP accredited through 1989 for ANSI-N13.11 Categories I-VIII. Although the NVLAP accreditation includes mixtures of fission neutrons and high energy photons, the licensee continues to rely on vendor supplied Neutrak film (and timekeeping) for neutron dose determinations. A licensee study is underway to compare neutron exposures measured by vendor film, licensee TLD, and timekeeping. The licensee plans to ultimately cancel the vendor supplied neutron monitoring service and reduce reliance on timekeeping for anticipated low exposure activities.

The inspectors reviewed the licensee's dosimetry program to verify compliance with Form NRC-5 requirements for beta (skin) and whole body deep dose determination. The dosimetry program employs a 4-element TLD; one element with tissue equivalent absorber thickness of 14 mg/cm^2, two with 300 mg/cm^2, and one with 1000 mg/cm^2. An algorithm corrects beta (skin) exposures to correspond to dose delivered through a tissue equivalent absorber thickness of 7 mg/cm^2. The beta dosimetry calibration (transmission factors) is based on beta particles from thallium-204 (0.76 and 0.24 MEV maximum and average energies, respectively). According to the licensee, preliminary results from a plant specific beta spectrum study

indicates that the energy spectrum used for TLD analyses is proper and corresponds to the plant's spectrum. This licensee study is continuing.

The inspectors selectively reviewed aspects of the licensee's interstation TLD comparison studies and determination of TLD element correction factors. Element correction factors are determined annually for all TLDs in accordance with station procedure BRP 1840-3; no problems were noted.

The station's criteria for and use of extremity monitoring and multiple badging was reviewed; no problems were noted. The licensee recently revised (relaxed) their criteria for requiring extremity monitoring to include a 200 mrem threshold.

c. Dose Tracking System

The station's daily dose accountability/tracking system and their SRD/TLD comparison program were reviewed. Each individual who receives exposure during a day is required to complete an exposure timecard for that day. The timecards are typically collected daily (Monday through Friday) during normal operations and shiftly (Monday through Saturday) during major outages. Timecard information is input to a computer program which compiles the data for further evaluations and control of personnel exposures. The rad/chem department reviews timecards and/or daily exposure update printouts to ensure accuracy and to ensure that dose approvals are not exceeded or are otherwise duly authorized by RWP and rad/chem supervision. Whole body dose equivalents in excess of 100 mrem daily and/or 300 mrem weekly must be specifically authorized for each job by designated rad/chem personnel. Higher levels of authorization are required for exposures in excess of these administrative limits. The computer program identifies individuals when predesignated levels are exceeded. Workers less than 19 years old and those with quarterly or annual exposures that exceed the predesignated values are placed on alert lists. Exposures to individuals on alert lists are tracked more closely and are reviewed daily by rad/chem supervision.

Exposure records of plant and contractor personnel were selectively reviewed for 1988 to date. No exposures greater than 10 CFR 20.101 or licensee administrative limits were noted. Approximately 1500 persons are currently issued TLDs.

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

d. High Radiation Area Access Controls

Technical Specification 6.12.2 requires that high radiation areas greater than 1 R/hr be provided with locked doors to prevent unauthorized entry; keys are maintained under the administrative

control of the shift foreman on duty and/or health physics supervision, and doors remain locked except during periods of access by personnel under an approved RWP (except under certain conditions when RWPs are not required).

Pursuant to station procedures, high radiation area keys (R-keys) are controlled by the shift engineer and a key log is maintained for documenting each key issuance and return. Keys are required to be returned when the work is complete or at the end of each work shift, whichever is sooner. Procedures prohibit key exchange or transfer from person to person. Key numbers are unit specific prefixed and lock cores are unique to prevent wrong unit errors. The shift engineer accounts for all signed-out keys at the end of each shift. These are good practices. According to procedure BAP 330-5, the shift engineer or assigned shift foreman must give authorization before the requestor is permitted to be issued an R-key. According to the licensee, the authorization is normally accomplished by requiring the requestor to record on the key log the area to be entered and RWP number. Rad/chem personnel indicated that shift engineers normally contact them directly to verify that the individual is on an appropriate RWP. This authorization process has reportedly worked satisfactorily to date. However, to eliminate potential problems, assure consistency, and to ensure that technical specification high radiation area access control requirements are met, it appears desirable to define and proceduralize acceptable key issue authorization methods. This matter was discussed at the exit meeting and will be reviewed during a future inspection (Open Item 454/88013-02; 455/88013-02). The licensee committed to strengthen methods for verifying an individual is authorized to be issued an R-key.

No violations or deviations were identified.

8. Internal Exposure Control and Assessment (IP 83525)

The licensee's internal exposure control and assessment programs were reviewed, including: changes in facilities, equipment, personnel respiratory protection training, and procedures affecting internal exposure control and personal 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.

The licensee uses a Canberra/RMC standup "FASTSCAN" whole body counter (WBC). The WBC consists of two 4" x 4" x 16" NaI detectors in a linear configuration parallel to the axis of the subject; the detectors are shielded from background radiation in all directions. The procedures for operating the WBC were available at the counting facility and the WBC operators interviewed were aware of the procedural requirements for whole body counting and reporting criteria. Review of the licensee's whole body count records indicated that no exposures in excess of the

40 MPC-hour control measure occurred during 1987 and 1988 to date. A weakness was noted, however, concerning lack of specific mechanisms to ensure that whole body counts are performed during out-processing to meet procedural requirements. This matter was discussed with the licensee who indicated the matter will be reviewed and programmatic changes made where necessary. (Open Item 454/88013-03; 455/88013-03)

During a previous inspection (Inspection Report No. 50-454/88007), it was noted that licensee procedure BRP-1340-6, Calculation of MPC-Hours and Organ Dose Based on Whole Body Count Data from Acute Uptakes is based primarily on ICRP-2 methodology and consequently attempts to utilize models derived for chronic intakes to estimate actual acute intakes. During a recent incident involving iodine-131 intakes, the licensee predicted lower MPC-hour exposures than would be estimated using ICRP-30 methodology. The ICRP-30 methodology is more appropriate for predicting acute internal exposures and is acceptable for determining compliance with NRC regulatory requirements.

Since the iodine-131 incident, the licensee's corporate staff revised the CECo generic procedure incorporating ICRP-30 methodology (SRP 1340-2) to compute MPC-hours from acute intakes using WBC data. The inspectors' review of this procedure indicated that MPC-hour computations for iodine-131 based on whole body count data for counting performed less than ten hours after a suspected intake would underestimate exposure by about one third. However, the procedure also requires that MPC-hour calculations be made on whole body count data taken at 72 hours after the suspected intake. In addition, the procedure requires that if a positive iodine-131 whole body count is measured at 72 hours after intake, thyroid-specific calibration factors be used for more accurate analysis. No problems were found in the use of the procedure to compute MPC-hours for several other radioisotopes. Based on the inspector's review, it appears the revised procedure can adequately be used to estimate MPC-hours from whole body count results for acute uptakes.

The inspectors also reviewed the licensee's WBC procedure BRP 1340-5, Quality Control Program For Whole Body Counting. It appears the requirements of this procedure including energy calibration checks, background counts, and log reviews are met. The most recent yearly calibration of this system, performed by the vendor (Canberra/RMC) on June 16, 1988, were reviewed by the inspectors; no problems were noted.

Air sample data were selectively reviewed. Air samples appear to be taken, counted, and evaluated in accordance with procedure BRP 1360-1, Air Sampling of Suspected and Known Airborne Radioactivity Areas, and procedure BRP 1360-2, Containment Air Sampling During a Refueling Outage. The procedures appear adequate for use in determining air sample results, placement, and type. Special air samples are collected to establish RWP requirements and job conditions, and it appears the licensee adequately uses air sample results to establish RWP requirements for use of respirators and protective clothing.

The inspectors noted that although constant air samplers (CAMs) are required for use in the containment during outage conditions, none are used on the fuel building main floor during fuel movement. The inspectors discussed with the licensee the desirability of using CAMs in the fuel building during outage conditions when containment hatches are open and fuel transfers occur to detect increased airborne concentrations and alert workers of changing conditions. This matter was discussed at the exit meeting and will be reviewed at a future inspection. (Open Item 454/88013-04; 455/88013-04)

No violations or deviations were identified.

9. Respiratory Protection/Engineering Controls (IP 83525)

Selected aspects of the licensee's respiratory protection/engineering controls program were reviewed, including respirator accountability, cleaning and maintenance, fit-testing, and training; results of the review are discussed below. Also, workers wearing respirators were observed to be following proper procedures for their use including donning and removal.

Workers' NGET cards indicate their respiratory protection qualifications. This includes medical evaluation, required training, and types of respirators they are qualified to wear. To obtain a respirator, a worker must show his NGET card to the RCT at the issue point. The RCT reviews the card to determine if the worker is qualified to wear the respirator requested. The RCT is required by procedure BRP 1310-1 to initial the Respirator Equipment Log Sheet to certify that the recipient is qualified and a respirator is issued. The inspector noted that all of the log sheets reviewed had been initialed; no unreturned or unused respirators were observed in the plant.

A check of respirators that were ready for issue indicated that adequate attention is given to respirator inspection and maintenance. However, full face respirators stored for distribution in one of several bins were piled up to five high which could cause undesirable distortion of the respirator. This observation was discussed with the licensee who corrected the problem and indicated permanent steps will be taken to preclude facepiece distortion during storage.

Observations of fit-testing indicated that RCTs performed the tests in accordance with procedural requirements. A contractor engineering assistant who oversees the fit-testing program adequately described to an inspector the test booth system and test methodology. The fit-test equipment is periodically checked, calibrated, and routine maintenance is performed as required. Selected quantitative fit-test results are reviewed by radiation protection management. The station's respiratory program requires that all workers who wear respirators must receive initial and periodic retraining; discussions with several workers being fit-tested indicated training had been received. Training adequacy was not specifically reviewed.

The licensee uses two 1000 cfm portable ventilation units in containment for venting steam generators during outage conditions. Other portable units are used in the radwaste and decon facilities and other locations as needed. Use is also made of glove boxes and containment structures. The inspectors noted that no specific mechanism such as an RWP requirement or procedure check list is utilized to ensure the containment structure portable ventilation unit (other than the steam generator ventilation systems) are started before work begins. This matter was discussed at the exit meeting. (Also see Section 14.)

During a previous inspection (Inspection Reports No. 50-454/88007; 50-455/88007) several licensee weaknesses were identified concerning an inadvertent release of iodine-131 into the containment atmosphere as a result of an inadequate temporarily installed portable ventilation system. To correct these weaknesses, the licensee revised procedure BAP 700-5, Utilization of Portable Air Filtration/Ventilation Equipment to include a diagram of a typical HEPA/carbon portable ventilation unit setup which uses hose clamps for all hose connections. New procedure BRP 1620-3, Setup and Operation of Portable Air Filtration/ Ventilation Equipment provides setup instructions, precautions, and requires pre-use inspections; the procedure references BAP-700-5.

The licensee uses a 3000 cfm mini-purge containment exhaust system during outage conditions. When operating, the system appears to have sufficient capacity to maintain containment pressure negative with respect to surrounding areas during those times when containment is open. During this inspection, it was noted there are no specific requirements for health physics to be notified when the mini-purge system is isolated or altered. To preclude degraded radiological conditions, and to ensure contamination control measures are considered when containment air flow is altered during outage conditions, health physics should be so notified. This matter was discussed at the exit meeting. (Open Item 454/88013-05; 455/88013-05)

No violations or deviations were identified.

10. Radiological Survey and Radiation Work Permit (RWP) Programs (IP 83526)

The licensee's routine general area and RWP survey programs and the implementation and effectiveness of the RWP program in controlling radiological work were reviewed, including: effectiveness of survey methods, practices, equipment, and procedures; adequacy of review and dissemination of survey data and RWPs; management techniques used to implement the programs; and experience concerning self-identification and correction of program implementation weaknesses. Observations and relevant aspects of these programs are discussed below.

Survey Program

a. Routine and RWP Surveys

Routine surveys are performed to assess transferable contamination, airborne radioactivity, general radiation levels, and to evaluate the effectiveness of general radiological controls. Routine surveys

in radiologically controlled areas normally consist of exposure rate and transferable contamination surveys. Large area smears (1000 cm^2) are performed on floors and large objects. Air samples are collected and analyzed prior to performance work in contaminated areas during active work in a contaminated area, or as otherwise deemed necessary. Routine surveys in uncontrolled areas normally consist of transferable contamination surveys. RCTs survey and collect (24-hour) air samples in various levels of the auxiliary and fuel handling buildings daily so that the entire building is surveyed each week. Auxiliary building cubicles routinely entered are also surveyed as described above; those cubicles not routinely entered are surveyed monthly or as needed.

Horizontal surfaces above six feet from floor level are not routinely surveyed. During the inspection, the licensee issued guidance to the plant staff regarding access to such areas. Other routine daily surveys include step-off-pads and spot-checks of the protective clothing stored in bins. Uncontrolled areas are surveyed weekly or at less frequent intervals.

The inspectors selectively reviewed routine area and RWP survey results for 1988 to date. Areas exhibiting elevated radiation levels or removable contamination greater than 1000 dpm/100 cm^2 (beta-gamma) are posted accordingly and identified on the survey forms. Areas exhibiting smearable levels greater than 22,000 dpm/ 100 cm^2 are posted as "Potential Airborne Radioactivity Areas." No problems were noted; the licensee's routine area and RWP survey program appears adequate. RWP surveys are discussed further below.

b. Hot Spot Survey and Identification Program

Hot spots are procedurally defined as areas on piping or equipment where the dose rate exceeds five times the ambient or general area exposure rate and are greater than 100 mrem/hr on contact.

In July 1988 the licensee developed and implemented a hot spot tracking procedure to identify and track hot spots; included is a mechanism to investigate and evaluate methods to reduce or eliminate the elevated radiation levels. Identified hot spots are labeled, resurveyed weekly (if accessible) and the survey information is forwarded to the ALARA and operations groups for review and recommendation. Hot spots reduced (via shielding, flushing, etc.) to non-hot spot status are identified (labeled) as such and continue to be resurveyed and trended in the licensee's tracking system. Approximately 20 hot spots have been identified thus far. The program appears to be working well.

c. Unconditional Release Surveys

Surveys of material and equipment released from the controlled areas are performed by rad/chem personnel in accordance with applicable procedures and NRC requirements. Survey instrumentation and release

criteria comply with NRC regulations and guidance (IE Circular 81-07 and Information Notice 85-92). Unconditional release tags accompany the items released. No significant problems were identified.

RWP Program

To establish controls for radiologically controlled area entries and work, the licensee utilizes Type I and Type II RWPs. A Type I (General) RWP is required for all routine work in the radiologically controlled area where personnel are not expected to exceed a whole body dose of 50 mrem per day and is valid for a maximum of one year from January 1. A Type II (Specific) RWP is required for all work in radiologically controlled areas where personnel are expected to exceed a whole body dose of 50 mrem per day or involving significant contamination or airborne radioactivity and is valid for the duration of the job.

To maintain better control of active RWPs, all active Type II RWPs are deactivated each day and reactivated by review and written (initialled) approval by the job foreman, operating supervision (unless otherwise noted) and a rad/chem foreman. Active Type I's are reviewed and approved weekly by the rad/chem foreman. This appears to be a good practice. Type II RWP work areas are surveyed prior to job initiation and survey results verified daily while work is in progress. Work areas of active RWPs are resurveyed once a week while work is in progress. The inspectors selectively reviewed Type I and II RWPs generated in 1988 to date, including survey verification forms and resurvey records. No significant problems were noted. The licensee attaches the latest survey record to all Type II RWPs. One Type II RWP job for changeout of a seal injection filter was reviewed and observed by an inspector; no problems were noted.

The licensee's standing (Type I) RWP program was revised (expanded) in 1987 to be more specific and includes a "Daily Job Protective Equipment Requirement for Long Term RWPs" form. This form better delineates the protective clothing requirements for certain specific jobs performed under the broad scope RWP. This includes certain valve, pump and electrical maintenance jobs that require more specific or stringent protective clothing requirements than other activities conducted under the Type I RWP. All Type I RWPs are signed by the worker at least annually; in addition, workers on certain RWPs (as noted above) sign a daily tracking sheet which provides the licensee a better awareness of plant activities. The licensee currently has about 30 active (standing) Type I RWPs. The licensee appears to maintain good controls and effectively manages these RWPs.

The licensee's RWP program appears generally good for controlling radiological work and tracking exposures.

No violations or deviations were identified.

11. Maintaining Occupational Exposures ALARA (IP 83728)

The licensee's program for maintaining occupational exposures ALARA was reviewed, including: ALARA group staffing and qualifications; changes in ALARA policy and procedures and their implementation; ALARA considerations for maintenance and refueling outages; worker awareness and involvement in the ALARA program; establishment of goals and objectives, and effectiveness in meeting them. Also reviewed were management techniques used to implement the program and experience concerning self-identification and correction of program weaknesses. Observations and relevant aspects of the licensee's ALARA program are discussed below.

a. Staffing

The inspectors reviewed the ALARA organization, the qualifications and experience of its members, and the management support provided to the program.

The ALARA group is currently staffed by an ALARA coordinator, a radiological engineer, an ALARA planner and a full-time Radiation Evaluation Program (REP) coordinator. Since previously reported (454/87034; 455/87041), a maintenance mechanic formerly part of the ALARA group returned to maintenance and was replaced by the current ALARA planner. Future staffing goals include a mechanical maintenance planning interface/liaison position within the ALARA group. For the upcoming Unit 1 refuel outage, the ALARA group will be augmented with a contract work planner to cover backshift contractor activities.

The current ALARA staff appears to have the qualifications, experience, and dedication necessary to implement an effective ALARA program. The current location of the ALARA group in the station organization, the management support, and the station planning and maintenance group working relationship with the ALARA group all appear conducive to a good ALARA program. Proposed rad/chem organizational changes anticipated to take place in early 1989 could change the location of the ALARA group in the station organization. This matter will then be the subject of further review.

b. Training and Worker Involvement

The station's ALARA group provides informal job specific ALARA training to contractors and station groups involved in certain high exposure potential tasks. Steam generator mock-up training is provided to rad/chem technicians and those work groups involved in steam generator testing, repair, and related job support. The inspectors reviewed the steam generator mock-up training provided prior to the April 1988 steam generator leak repair mini-outage; no problems were noted. The training appeared to be thorough and well organized.

In 1987, an ALARA awareness/communications videotape was provided to each station department. Informal station safety meeting and pre- and post-job tailgate ALARA sessions are also held. Formal ALARA training, other than steam generator mock-up training, is generally not provided.

In 1988, the licensee discontinued use of the formal ALARA suggestion program and deleted relevant corporate and implementing station procedures concerning the program due, according to the licensee, to the lack of worker interest and budget cutbacks which eliminated award incentives. The program apparently will continue to be maintained as an informal station suggestion program without reference to procedures. It is desirable to continue an ALARA suggestion program and encourage/promote its use.

c. Radiation Evaluation Program (REP)

Subsequent to the Unit 1 refuel outage in 1987, a full-time REP coordinator was added to the ALARA group. This appointment appears to strengthen the overall ALARA and health physics programs through increased utilization of the REP program and expansion of its capabilities.

The REP program consists of an expansive data-base of historical exposure information and allows further accumulation and tabulation of such data to enhance job planning and dose tracking programs. The REP program at Byron Station is utilized extensively to provide person-rem/person-hour information on past and present work conducted by various work groups. The program is also used extensively for primary and secondary dosimetry comparisons to identify trends anomalies, and potential problem groups and individuals. The program includes a recently implemented worker dose card trac verification and investigation program.

The station recently developed and implemented a person-rem/person-hour tracking system designed to identify when RWP exposure and person-hour estimates are approached. If certain pre-job estimates are approached, the involved RWP is flagged and an investigation conducted to determine the cause and necessary course of action. Completed investigation forms were reviewed by the inspectors and discussed with the licensee; no problems were noted. The tracking system appears to be a valuable tool for refining job planning and exposure histories and for identifying and correcting problems during the job process.

d. ALARA Reviews and Job Planning

Formal ALARA action reviews are required when the total dose equivalent for a planned job is expected to be at least one person-rem, for planned work including prolonged (greater than one hour) occupancy in an airborne radioactivity area, and for entries under the reactor cavity. ALARA reviews are also normally completed

for jobs involving working dose rates greater than 500 mrem/hr, for entries inside the missile barrier at greater than 10% power, and as deemed necessary for modification to radioactive and related systems.

The inspectors selectively reviewed completed ALARA action reviews and related RWPs for 1988 to date. Approximately 90 ALARA reviews were completed in 1988 through July. No significant problems were noted. It appears the licensee has applied certain lessons learned from the 1987 Unit 1 refuel outage to the unanticipated Unit 1 steam generator repair mini-outages conducted in April and June 1988. The ALARA aspects of the April 1988 outage were reviewed by the inspectors. Dose savings were achieved through better planning and more efficient use of workers. No significant ALARA program problems were noted for the 1988 mini-outages. However, the licensee identified certain work activities warranting improvement including: the need for specific guidelines for steam generator platform setup; the desirability of expanding use of job specific RWPs to better organize, plan and control specific tasks; and improvements in manway access controls, audio communications and visual surveillance on platforms.

As previously discussed (454/87034; 455/87041), the total dose for the station's first refuel/maintenance outage far exceeded that initially projected. The unusually high dose appears to have been due to the large scope of work performed including a number of unexpected jobs added during the outage. Lessons learned pertaining to scheduling, planning and more efficient use of workers should result in a more (dose) efficient operation during future outages. Better planning, tracking and evaluation of outage work is expected to result from the addition of the health physicist (radiological engineer) and REP coordinator to the ALARA group. Lessons learned during the 1987 refuel outage, some of which were applied during the 1988 mini-outages, are described below:

- Obtain more precise and detailed job scope information from work groups.
- Limit the number of workers in radiologically controlled areas through contract discussions and RWP restrictions.
- Immediately shield high dose areas and perform post-shielding evaluations to determine effectiveness.
- Write more task specific RWPs to better control and delineate job requirements.
- Work more closely with planning and scheduling groups particularly for additional initially unplanned work.

e. Goals and Objectives

Total station dose for 1987 was 769 person-rem which exceeded the station goal of 490. The majority of this dose (about 725 person-rem) resulted from Unit 1 refuel outage activities. The initial station

exposure goal for 1988 was 475 person-rem but was recently increased to about 520 because of exposure expended (81 person-rem) during the unanticipated April and June 1988 mini-outages. Thus far through July 17, 1988, about 92 person-rem has been expended. The exposure goal for the Unit 1 (ten-week) refuel outage, scheduled to commence on September 2, 1988, is 400 person-rem. Goals have also been established for plant contaminated areas and are described in Section 12.

To achieve 1988 exposure goals, the previously described lessons learned will be implemented for the upcoming outage. According to the licensee, outage activities will be better organized using an "Integrated Outage Package" currently being developed by the station and primary contractor. The package includes an incentive program for work quality and exposure limitations and scheduling, and place the overall responsibility for completion of most work activities with one primary vendor. The licensee videotaped several 1987 outage work activities and continues to expand their photo library. These will be used to enhance performance of future similar jobs.

The station's ALARA program appears to be adequately established and is functioning satisfactorily. Continued improvements are expected in the program provided staffing remains stable and management support continues.

No violations or deviations were identified.

12. Control of Radioactive Materials and Contamination (IP 83526)

The licensee's program for control of radioactive materials and contamination was reviewed, including adequacy of supply, maintenance, and calibration of contamination, survey, and monitoring equipment; effectiveness of survey methods, practices, equipment, and procedures; adequacy of review and dissemination of survey data; and effectiveness of methods of control of radioactive and contaminated materials. Control of potentially contaminated tools is discussed in Section 14.

The station's main ingress and egress control point for the radiologically controlled area (RCA) is on the 426' level of the auxiliary building; it is entered from the turbine building. A second control point, used primarily by contractors, is located on the 401' level of the auxiliary building; ingress and egress to/from this control point is also the turbine building. Whole body friskers (IPM-7s) are located at both control points. During non-outage periods, RCTs are stationed at the main control point during all shifts, and at the second control point during the day shift only; during outage periods, both control points are always manned. RCTs are instructed to respond to alarming IPM-7s and workers are instructed to contact health physics if personal contamination is suspected. Persons who wear protective clothing (PCs) are required to perform whole body frisks after removing PCs at the step-off-pad and before personal clothing is donned; then they are required to be frisked by an IPM-7 before leaving the RCA. A final personal survey is made upon leaving the site with

portal monitors (IRTs) located in the gatehouse. The practice of having an RCA egress control point which is not manned increases the potential for loss of contamination control because it relies on individuals to strictly follow station procedures. This matter was discussed at the exit meeting; tool control was also discussed (Section 14).

The inspectors reviewed the operation, alarm setpoint methodology and calibration procedures for the seven IRT portal monitors located in the auxiliary building and gatehouse. Calibrations are performed every six months using a cesium-137 source. The most recent calibrations were reviewed by the inspectors; weaknesses in the calibration procedure concerning use of the calibration sources were noted. This matter was discussed at the exit meeting (Open Item 454/88013-07; 455/88013-07). The detectors are set to alarm, with a high degree of confidence, at about 500 nanocuries. The MDAs range from 150-200 nanocuries. The alarm setpoint was noted to be higher than at other CECo stations using IRTs. The IRT vendor recently visited Byron Station to evaluate the suitability of these instruments to respond (alarm) at lower levels of activity correspondent to IRTs located at other stations. The results of this evaluation were not known by the licensee during this inspection. The inspectors noted that procedures concerning health physics responsibilities for alarming portal monitors do not require a whole body count for persons alarming the gatehouse portal monitor and for whom subsequent personal frisks do not detect contamination. Unless a whole body count is performed, internal contamination or hidden hot particles may not be identified. This matter was discussed at the exit meeting (Open Item 454/88013-06; 455/88013-96).

The inspectors reviewed records and relevant procedures for calibration of the Nuclear Enterprise IPM-7 whole body friskers and HFM-7A hand and foot contamination monitors. The calibrations are performed at six month intervals using nominal 2-3 nanocuries cesium-137 (100 cm^2 area) standards. The detectors are set to alarm at 5000 dpm/100 cm^2. The inspectors reviewed calibration records for selected monitors. With the exception of minor calculational discrepancies noted in the HFM-7a calibration results, it appeared the monitors are calibrated at required frequencies and in accordance with procedural requirements. The calculation errors were discussed with licensee personnel during the inspection; no further followup appears necessary.

The station's ALARA program includes provisions for dose reduction by minimizing contaminated areas. The ALARA group reviews survey records to determine the status of area contamination and establishes daily decontamination priorities with the stationman foreman. A computer printout of mechanical maintenance work requests is consulted to determined the status of leak repairs. Once a month the ALARA group calculates the quantity of plant (auxiliary, fuel handling, and radwaste building) contaminated areas and tracks the data. The station's goal for 1988 is to maintain plant contaminated areas to less than 5000 square feet at any given time (including outage and non-outage periods). This goal was achieved in January through March and in July, but was exceeded during the 1988 mini-outages in April through June. A peak of about

8000 square feet was calculated for April 1988. It appears that contaminated area goals may be exceeded routinely during refuel/ maintenance outages unless manpower and management support for this program is increased. In addition, to further improve contamination controls, it appears desirable to develop and maintain a leak identification, reduction, and tracking program similar to that recently developed for radiological hot spots. This matter was discussed with licensee representatives.

The licensee's machine shop for work on contaminated materials is equipped with ventilation systems to prevent migration of loose contamination and control airborne contaminants. In addition, temporary enclosure and portable ventilation systems can be installed around equipment used for work on radioactive materials. The licensee has two equipment/tool decontamination facilities, one of which uses Freon. Both facilities are provided with permanent enclosures and ventilation systems. On the Freon unit, the ventilation system starts automatically when the Freon is used. On the other, ventilation is manually started by workers using the enclosure; there is no specific mechanism to ensure the system is initiated. This matter was discussed with the ALARA coordinator who indicated actions to correct this matter will be considered.

Protective clothing is laundered at the licensee's facility by stationmen using four dry-cleaning and two wet wash machines. To date, laundry is not routinely sent to a commercial laundry for wet washing; plans to use the commercial laundry for the Fall 1988 outage have been cancelled. Surveys of the processed laundry are performed by stationmen using hand held friskers. The licensee has ordered an automated laundry monitor employing gas flow proportional detectors. Until the new monitor is installed and operational, hand held frisking will continue to be used to identify hot particles and levels of contamination which do not exceed the procedural limits. During this inspection, laundered protective clothing located in storage bins was surveyed by the inspectors; none were found to exceed procedural limits.

No violations or deviations were identified.

13. Personal Contamination Events (IP 83524)

Station procedures require completion of a "Personnel External Contamination Record" (PECR) when contamination (excluding noble gas and radon daughters) greater than 100 cpm above background is detected with an HP-210 or equivalent. Noble gas and radon daughter contamination events are recorded on separate forms. To aid in the identification of personnel contamination and discrete particles, the station purchased and made operational a Nuclear Enterprises Model CM-7 portable gas flow proportional detection system. The system is used to pinpoint contamination after initial identification with an HP-210 or whole body frisker and reportedly has a cesium-137 detection efficiency of about 50% and a 100 cm^2 probe surface area.

The inspector selectively reviewed PECRs and event trending and summary data for 1988 to date and discussed the identification, investigation, and corrective action program with the licensee. Seventy-seven personnel contamination events were reported for 1988 through August 5. The majority of these events occurred in April and June coincident with steam generator repair mini-outages. Of the 77 events in 1988, approximately 80% were not attributed to a specific cause and were noted as "other" on the PECR. The inspectors noted that about 15% of these "other" events occurred in supposedly clean areas and were not related to any specific activity or entry into a posted contamination area. It appears desirable to expand/improve the review of personal contamination event causal factors and revise the PECR forms to aid in evaluating potential contamination control problems and enhance data trending. This matter was discussed at the exit meeting and will be reviewed during a future inspection (Open Item 454/88013-12; 455/88013-12).

The inspector selectively reviewed the licensee's investigation of personal contamination incidents involving minute discrete radioactive particles (hot particles) recorded during 1988 to date. Nineteen incidents were reported during this period. The licensee conducts an investigation of each event including interviews with the individual involved and a review of related work activities. A skin dose assessment is performed for all hot particle events. The licensee's method of calculating skin dose for the soles of the feet and palms of the hand, described in procedure BRP 1470-4, does not appear to follow the guidance listed in IE Information Notice No. 86-23, Excessive Skin Exposures Due to Contamination with Hot Particles. This matter was discussed with the licensee and will be further reviewed during a future inspection. (Open Item 454/88013-13; 455/88013-13)

No violations or deviations were identified.

14. Facilities and Equipment (IP 83527)

The facilities and equipment used by the licensee for radiation protection activities were reviewed to determine whether they are adequate to support the radiation protection program. Facilities and equipment are also discussed in other sections of this report.

The inspectors reviewed the licensee's radiological control program for tools and equipment which are stored, distributed, and returned to the hot tool storage locations. The inspectors reviewed procedure BRP-1450, "Contaminated Tool Surveys," tool storage location survey results, and performed direct and indirect surveys of stored tools and equipment. No problems were noted.

Several tool and equipment cages, tool cabinets, and gang boxes located throughout the auxiliary building are used for storage of contaminated and non-contaminated tools/equipment. Tools and equipment which are used for work on contaminated systems or in contaminated areas are stored, distributed from, and returned to these locations. None of the tools/ equipment stored in these locations are allowed to be used in or transferred to a radiologically uncontrolled area without required

surveys being performed. Tools/equipment used on contaminated systems or in contaminated areas are required to be surveyed before return to their storage locations. Other than procedure BRP-1450 which refers to tool/surveys, no procedures address tool/equipment storage, distribution, and accountability.

As a result of the inspector's review, apparent weaknesses were noted, including: (1) There are no procedures or specific mechanisms to ensure positive control over the issuance, distribution, and return of contaminated and non-contaminated tools/equipment used in the RCA. Without stronger controls and specifically designated facilities for tool/equipment return, survey, decontamination, and storage, the probability of allowing potentially contaminated material into non-contaminated controlled areas is increased. (2) Tools/equipment are allowed to be taken into and out of the RCA on a routine basis. Although the tools are required to be surveyed before transfer from the RCA, this practice increases the probability of allowing potentially contaminated material into a radiologically uncontrolled area, especially at the 401' auxiliary egress control point which is only manned during the day shift. This matter was discussed at the exit meeting (Open Item 454/88013-08; 455/88013-08).

15. NRC Information Notice (IP 92701)

No. 88-22: Disposal of Sludge from Onsite Sewage Treatment Facilities at Nuclear Power Stations.

Currently, Byron Station stores sewage treatment plant sludge onsite in 55-gallon drums. The sludge is contaminated with very low levels of Co-58 and Co-60. Byron Station holds an Illinois EPA permit for onsite land application of sludge, but due to the low level contamination the station must also obtain the approval of the Illinois Department of Nuclear Safety, since Illinois is an Agreement State, prior to onsite land application of sludge. Byron Station is proceeding in accordance with NRC Information Notice No. 88-22.

16. Solid Radioactive Waste (IP 84522)

The licensee's solid radioactive waste management program was reviewed, including: determination whether changes to equipment and procedures were in accordance with 10 CFR 50.59; adequacy of implementing procedures to properly classify and characterize waste, prepare manifests, and mark packages; overall performance of the process control and quality assurance programs; adequacy of required records, reports, and notifications; and experience concerning identification and correction of programmatic weaknesses.

Licensee representatives and records indicate that in 1987 the licensee made seven shipments of DAW and 37 shipments of filters and dewatered/solidified resins. In 1988 to date, 17 shipments of solidified or dewatered resins have been made. Compacted and uncompacted DAW is usually packaged in 55-gallon drums; occasionally uncompacted DAW is packaged in metal bins (96 ft^3). A waste sorting table has been ordered and will be utilized to separate clean trash from DAW to minimize the

DAW to be compacted. The licensee is also investigating the reduction of radwaste through the utilization of launderable bags, rags, and mops. There is an aggressive Radwaste Volume Reduction Program in effect with a committee which meets monthly to discuss and suggest methods to effectively reduce radwaste volume. An onsite vendor representative performs dewatering/solidification of filtering and demineralization waste in vendor supplied metal liners and high integrity containers (HICs). Licensee QA/QC personnel verify that the dewatering/ solidification meets NRC and burial site requirements.

The inspectors reviewed the status of the radwaste Volume Reduction System (VRS). This system is described in Inspection Report No. 50-454/86034; 50-455/86029. Mechanical problems continue to prohibit operation of the VRS. Maintenance and engineering staffs continue to work on these problems. Operation of the VRS is not anticipated in the near future.

Classification and shipping of solid radwaste appear to have been performed in accordance with regulatory requirements and licensee procedures.

No violations or deviations were identified.

17. Liquids and Liquid Radioactive Wastes (IP 84723)

The licensee's reactor liquids and liquid radwaste management programs were reviewed, including: determination whether changes to equipment and procedures were in accordance with 10 CFR 50.59; determination whether reactor liquids meet chemical and radiochemical requirements; determination whether liquid radioactive waste effluents were in accordance with regulatory requirements; adequacy of required records, reports, and notifications; determination whether process and effluent monitors are maintained, calibrated, and operated as required; and experience concerning identification and correction of programmatic weaknesses.

The inspectors reviewed selected records of radioactive liquid effluent sampling and analysis for 1988 and the semiannual effluent reports for 1987. The pathways sampled and the analyses performed appear to comply with Technical Specification Table 4.11-1. Total liquid radioactive effluent (excluding tritium) in 1987 was 2.48 curies, which is a significant reduction from 4.03 curies released in 1986. No problems were identified during the review of selected records. The records indicate that releases were maintained within applicable limits.

No violations or deviations were identified.

18. Primary Coolant Chemistry (IP 84523)

The licensee's reactor coolant chemistry results for 1987 and 1988 to date were selectively reviewed to determine compliance with technical specification analysis requirements and surveillance frequencies. The inspectors reviewed primary coolant system data for chloride, fluoride,

boron, lithium, dissolved oxygen, pH, conductivity and dose equivalent I-131. The inspectors also reviewed secondary system data for gross actively determination. The selective review and discussion with licensee personnel indicated that all parameters for the primary system reviewed remained less than applicable technical specification limits.

No violations or deviations were identified.

19. Gaseous Radioactive Waste (IP 84524)

The licensee's gaseous radwaste management program was reviewed, including determination whether changes to equipment and procedures were in accordance with 10 CFR 50.59; determination whether gaseous radioactive waste effluents were in accordance with regulatory requirements; adequacy of required records, reports, and notifications; determination whether process and effluent monitors are maintained, calibrated, and operated as required; and experience concerning identification and correction of programmatic weaknesses.

The inspector reviewed selected records of radioactive gaseous effluent sampling and analysis, and the semiannual effluent reports for 1987. The pathways sampled and analyses performed appear to comply with the requirements of Technical Specification Table 4.11-2.

During the 1987 Unit 1 refueling outage, the licensee identified leaking fuel rods and replaced them. The licensee also made a concerted effort by repair/modification to minimize gaseous leaks into containment, which necessitate containment venting. This has contributed to a marked decrease in noble gas releases, which were reported as 3785 curies in 1986 and 1298 curies in 1987. The 1987 quarterly breakdown is as follows: 128 curies during the first quarter; 564 curies during the second quarter; 77 curies during the third quarter; and 529 curies during the fourth quarter. The calculated offsite dose associated with these releases remained less than one percent of applicable technical specification limits.

Noble gas releases are quantified by radiation protection personnel based on analyses of samples collected prior to batch releases from waste gas decay tanks and containment venting. However, no quantifications have been made for continuous (non-batch) releases from the auxiliary building vents.

Daily gas grab samples from the auxiliary building vents are collected in a 250 cc Marinelli flask and analyzed on a GELI system; the detected activity is frequently at or near the Lower Limit of Detection (LLD). Although this LLD meets the technical specification requirement, use of a larger flask would increase detection sensitivity and provide for better estimation of actual release rates. If the grab sample detects activity, and would result in greater than one curie for the day, the release is quantified and is added to the batch releases for that time period. Daily graphing of one-minute averages of the station vent noble gas release rates (from effluent monitor recorded count-rate) are

currently being graphed. However, quantification of possible continuous release from this pathway other than those determined from the gas grab samples and planned batch releases have not been made. The quantification of these continuous effluents has been hampered by a malfunctioning background subtraction feature of the station vent noble gas monitor due to software problems. As noted during previous inspections (454/87003-01; 455/87005-01), the software problem has been pursued with the instrument vendor and modifications have been attempted but without success. The latest modification which is expected to correct the problem is scheduled to be completed in early 1989. In the interim, the licensee has committed to review the daily graph of one-minute averages of the station vent noble gas release rates to quantify the continuous release, and if warranted to revise previous effluent reports. This matter was discussed at the exit meeting and will be reviewed during a future inspection (Open Item 454/87003-09; 455/87005-09).

No violations or deviations were identified.

20. Effluent Control Instrumentation (IP 84723, 84724)

Calibration records for two liquid monitors and four noble gas monitors were reviewed. The liquid monitors are the liquid radwaste effluent monitor and the turbine building fire and oil sump monitor. The noble gas monitors are the two plant vent monitors (high and low range) and two containment purge monitors. Calibrations were adequate and timely. The calibration procedures for noble gas monitors were selectively reviewed. It was noted that the calibration procedures have been revised to address background considerations; this closes an inspector concern (Section 3) about the calibration procedures not addressing background considerations.

The setpoints for the above monitors were reviewed. No problems were identified.

No violations or deviations were identified.

21. Transportation of Radioactive Materials (IP 86721)

The licensee's transportation of radioactive materials program was reviewed, including determination whether written implementing procedures are adequate, maintained current, properly approved, and acceptably implemented; determination whether shipments are in compliance with NRC and DOT regulations and the licensee's quality assurance program; determination if there were any transportation incidents involving licensee shipments; adequacy of required records, reports, shipment documentation, and notifications; and experience concerning identification and correction of programmatic weaknesses.

Records of radioactive material shipments made during 1987 and 1988 to date were reviewed. In 1987, the licensee made 44 shipments of radioactive waste as Low Specific Activity (LSA) materials in exclusive use vehicles. In 1988 to date, 17 such shipments were made. No problems

with shipment documentation and quality control/assurance were identified. Shipments of radioactive material appear to have been made in accordance with the requirements of 10 CFR 61, 49 CFR 170-179 and licensee transportation procedure BRP 1520-1, Revision 4, Offsite Shipment of Radioactive Material.

No violations or deviations were identified.

22. Air Cleaning Systems (IP 84724)

Technical specifications require filter testing of the control room emergency makeup ventilation system, non-assessible filter exhaust plenum of the auxiliary building ventilation system, and the fuel handling building exhaust filter plenum. The inspector reviewed records of tests of these air cleaning systems and discussed testing procedures with personnel from the technical staff ventilation group responsible for performance of the tests. The review included both in-place tests of HEPA filters and iodine adsorbers units as well as laboratory tests of activated carbon samples. Surveillance testing of the above systems has been timely, and test results have met acceptance criteria. Also, records of hours of filter usage show that the 720-hour technical specification limit was not reached between the routine required 18-month surveillance tests.

No violations or deviations were identified.

23. Nonradiological Confirmatory Measurements (IP 79701)

Chemistry samples were submitted to the licensee for analysis to evaluate the laboratory's capabilities to monitor nonradiological chemistry parameters in various plant systems with respect to various technical specification and other regulatory and administrative requirements. These samples had been prepared, standardized, and periodically reanalyzed (to check for stability) for the NRC by the Safety and Environmental Protection Division of Brookhaven National Laboratory (BNL). The samples were analyzed by the licensee using routine methods and equipment.

The samples were diluted by licensee personnel as necessary to bring the concentrations within the ranges normally analyzed by the laboratory, and run in triplicate in a manner similar to that of routine samples. The results are presented in Table 2 and the criteria for agreement in Attachment 1. These criteria for agreement are based on comparisons of the mean values and estimates of the standard deviations (s.d.) of the measurements. Consideration was given to the fact that the uncertainties (s.d.) of the licensee's results were not necessarily representative of the laboratory's because they were obtained by one analyst over a short period of time. Consequently, when the licensee's s.d. was less than that of BNL, and a disagreement resulted, the BNL value was substituted for that of the licensee in calculating the s.d. of the Ratio Z (S_z in Attachment 1).

The licensee also prepared two samples to be split with BNL. To these were added analytes supplied by the inspectors. Reactor water was spiked with the anions, chloride, and sulfate, and a sample of condensate was spiked with copper and iron ions. The licensee will determine the analytes in each and the results will be sent to Region III for comparison with the values determined by BNL. This will be followed under Open Item 454/87003-10; 455/87005-10.

The licensee analyzed ten materials at three concentrations each. Of the initial 30 analyses, 20 were in agreement and ten were in disagreement. Following minor calibration changes four analyses (disagreements) became agreements resulting in 24 of 35 for 86 percent agreements.

Colorimetric assays - hydrazine, silica and ammonia exhibited several disagreements. All three hydrazine concentrations exhibited a negative bias of 4 to 11 percent and were in disagreement. A new calibration curve was prepared covering a narrower range that would coincide with the concentrations being measured. Subsequent reanalysis using this curve produced agreements in the medium and high standards with the low standard showing a 5.5% bias and still in disagreement. This assay tends to exhibit good precision so that a small bias can result in a disagreement. The middle ammonia sample was in disagreement having a negative bias of 4%, although the precision was better than that of BNL. Following reassay, the sample came into agreement. High level silica was in disagreement with a negative bias of 4.5%. Again the standard deviation of the licensee was smaller than that for BNL indicating good precision. A review of the standard curves for these assays suggested that improved accuracy might be obtained by narrowing the concentration range of the calibration curve. Preparation of new curves with fresh calibrators could also improve performance, as a given curve may be used for a period of several months. Analytical problems with these assays appear to be of a minor nature involving calibration.

All three chloride concentrations (Ion Chromatography) were in disagreement, each having a positive bias ranging from 6% to 21%. Several possible causes were discussed with the licensee including contamination and faulty calibrators. The middle concentration of fluoride (Ion Selective Electrode) was in disagreement. All three levels (fluoride) demonstrated a negative bias of 7% to 11%. Fluoride, chloride, and sulfate are to be analyzed by Ion Chromatography using the gradient elution system in the near future. The low boron standard was in disagreement having a negative bias of 3%. Reanalysis of a second boron standard resulted in an agreement. The licensee's precision in this assay was better than that of BNL.

The licensee attempted to measure sodium in the presence of lithium using Graphite Furnace Atomic Absorption Spectrophotometry but was unsuccessful. The low results (about 30% of expected values) indicated a significant problem - possibly interference - with this assay. The licensee has agreed to investigate the cause of the discrepancies, especially chloride and sodium. This will be followed under Open Item 454/88013-11; 455/88013-11.

No violations or deviations were identified.

24. Implementation of the QA/QC Program in the Laboratory (IP 79701)

The Chemistry Laboratory Quality Assurance Program as specified by Nuclear Station Division Chemistry Quality Control Manual, NSDD-S25, was reviewed. The licensee has implemented statistically based control charts for all assays, uses independent controls for all assays and has multiple point calibration curves for instruments except the isocratic ion chromatograph which uses a single calibration point plus an independent control as a performance check. The licensee has upgraded equipment that can accommodate multiple point calibration curves which will be operational in the near future.

The RCT testing program, BAP 539-50, Revision 2, June 20, 1988, requires RCTs to be tested twice annually (NSDD S-25 requires annual testing) and a review of records for the past year indicates that the required testing was performed. Acceptance criteria are used to determine whether or not an RCTs results are acceptable. The criteria are based on a percentage instead of statistically derived standard deviations. A review of selected documents indicated that RCTs not meeting the acceptance criterion were retested and found to meet the criterion. The licensee's procedure requires retraining on those assays that an RCT fails twice.

No violations or deviations were found.

25. Water Chemistry Control Program (IP 79701)

An inspector reviewed the secondary water systems including in-line monitors and computerized data handling systems. CECo PWR secondary water chemistry is controlled by NOD-CY.1, Revision 0, March 22, 1988. This document delineates chemistry parameters and appears to be consistent with the EPRI guidelines for PWR secondary water chemistry. In most instances, the corporate goals are more conservative than allowed by the EPRI guidelines. The document states that one of its goals is to maximize the life of steam generators. A review of selected records indicate that chemistry parameters are maintained below action levels during power operation. Data from October 1987 through June 1988 suggests that overall performance for Unit 2 steam generator appears to be improving with operation time.

The licensee has considerable data collection capability. In-line monitors are connected to data loggers which provide real time data from the secondary water systems. The data loggers can be down loaded onto a PC and the data manipulated via software such as Lotus 123. This system is still under development and will provide both real time and retrospective data handling capability. NOD-CY.1 outlines management responsibility for secondary water systems chemistry parameters and should insure that data is disseminated from chemistry to operations and station management.

No violations or deviations were found.

26. Exit Meeting

The inspectors met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on August 12, 1988, to discuss the scope of the team inspection and the findings. The inspectors also discussed the likely informational content of the inspection report regarding documents and processes reviewed by the inspectors during the inspection. The licensee did not identify any such documents/processes as proprietary. The following matters were discussed specifically by the inspectors:

a. The demands on RP foremen time restricts the amount of time available for them to be in controlled areas observing ongoing work and radiological conditions and to receive training. The licensee stated that they would try to free-up the foremen more so that these functions can be accomplished. (Section 4)

b. Procedural weaknesses concerning R-Key issue. The licensee stated that the R-Key issue method would be improved/strengthened. (Section 7.d)

c. Use of CAMs in the fuel building during fuel handling. The licensee stated they would review the matter. (Section 8)

d. The need to notify radiation protection if mini-purge is shut down while containment is open. (Section 9)

e. The apparent need to ensure whole body counts are performed under certain conditions when the gatehouse IRT alarms. (Section 12)

f. Weaknesses in portal monitor calibration procedure. The licensee stated that the procedure would be strengthened. (Section 12)

g. The need to improve personal contamination event review to better determine cause. (Section 13)

h. The perceived weaknesses regarding issuance, distribution, and return of hot tools/equipment. The licensee stated that they are reviewing methods to strengthen the tool/equipment control program. (Section 14)

i. The lack of adequate controls to ensure that temporary ventilation systems are operating before work in area being ventilated. (Sections 9 and 14)

j. The lack of full-time health physics coverage at the 401' auxiliary building egress point. (Sections 9 and 14)

k. Need to improve quantification of continuous noble gaseous releases via the auxiliary building vents. The licensee stated that these quantifications would be improved. (Section 19)

TABLE 1

NONRADIOLOGICAL INTERLABORATORY SPLIT SAMPLE RESULTS

BYRON NUCLEAR GENERATING STATION

			Concentrations, ppb			
Analyte	Matrix[a]	Analysis Method[b]	NRC[c] Y ± SD	Licensee[c] X ± SD	Ratio Z ± SD	Comparison ± 2SD
F-	SGB	SIE	65 ± 0	64.6 ± 2.25	0.994	A
Cl-	SGB	IC	52 ± 0.2	60.2 ± 8.8	1.158	A
Sulfate	SGB	IC	61.1 ± 2.3	69.4 ± 5.5	1.136	A
Fe	RC	DCP	500 ± 14	507 ± 8.5	1.014	A
Cu	RC	DCP	533 ± 2	531 ± 2.5	0.996	A

a. Matrix:
RC Reactor Coolant
SGB Steam Generator Blowdown

b. Analysis Method:
IC Ion Chromatography
SIE Specific Ion Electrode
DCP Direct Coupled Plasma

c. See Attachment 1 for acceptance criterion.

d. Comparison:
A Agree
D Disagree

TABLE 2

NONRADIOLOGICAL INTERLABORATORY TEST RESULTS

BYRON NUCLEAR GENERATING STATION, UNITS 1 AND 2

AUGUST 1-5, 1988

Analyte	Analysis Method[b]	Dilution 1:x	NRC y ± SD (n)	Licensee x ± SD (n)	Ratio z ± SD	Comparison[c] ± 2SD
			Concentration, ppb			
Fluoride	SIE	250	90.0 ± 8.0(7)	80.0 ± 0.0(3)	0.889 ± 0.119	A
		250	169.0 ± 1.6(7)	157.7 ± 2.5(3)	0.993 ± 0.017	D
		250	331.2 ± 6.8(7)	305.0 ± 22.9(3)	0.921 ± 0.072	A
Chloride	IC	4000	4.63 ± 0.025(7)	5.63 ± 0.26(3)	1.216 ± 0.057	D
		4000	9.33 ± 0.075(7)	10.03 ± 0.12(3)	1.075 ± 0.016	D
		4000	19.13 ± 0.30(8)	20.32 ± 0.09(3)	1.062 ± 0.023	D*
Sulfate	IC	2000	9.75 ± 0.70(7)	9.65 ± 0.45(3)	0.990 ± 0.085	A
		2000	19.15 ± 1.35(7)	20.2 ± 0.40(3)	1.055 ± 0.077	A
		2000	39.0 ± 1.15(9)	42.25 ± 0.50(3)	1.083 ± 0.043	A*
Lithium	DCP	20	985.0 ± 20(7)	975 ± 0.6(3)	0.990 ± 0.020	A
		20	1500 ± 35(7)	1517 ± 7.0(3)	1.011 ± 0.024	A
		20	2065 ± 50(7)	1978 ± 37(3)	0.958 ± 0.029	A
Iron	AAS	1000	18.6 ± 0.5(7)	19.5 ± 0.7(3)	1.048 ± 0.047	A
		2000	19.9 ± 0.3(6)	19.5 ± 0.4(3)	0.980 ± 0.025	A
		2000	29.3 ± 0.8(7)	29.7 ± 2.0(3)	1.014 ± 0.074	A
Copper	AAS	1000	20.0 ± 0.3(7)	20.3 ± 0.4(3)	1.015 ± 0.025	A
		2000	20.2 ± 0.8(7)	20.0 ± 0.5(3)	0.990 ± 0.046	A
		2000	30.0 ± 0.8(7)	30.4 ± 1.1(3)	1.013 ± 0.046	A
Silica	SPEC	1000	52.8 ± 2.8(7)	50.3 ± 1.5(3)	0.953 ± 0.058	A
		1000	104.0 ± 4.0(7)	101 ± 1.0(3)	0.971 ± 0.039	A
		1000	157 ± 2.0(7)	150 ± 1.0(3)	0.955 ± 0.018	D*
Hydrazine	SPEC	1000	19.9 ± 0.3(7)	19.0 ± 0(3)	0.955 ± 0.021	D*
		1000	49.9 ± 0.5(7)	45.0 ± 1.0(3)	0.955 ± 0.021	D
		1000	100 ± 1(7)	88.7 ± 1.5(3)	0.887 ± 0.017	D
	(repeat)	1000	19.9 ± 0.3(7)	21.0 ± 0(3)	1.055 ± 0.022	D
	(repeat)	1000	49.9 ± 0.5(7)	51.0 ± 0.6(3)	1.022 ± 0.016	A
	(repeat)	1000	100 ± 1(7)	101 ± 0.6(3)	1.010 ± 0.012	A

TABLE 2

			Concentration, ppm			
Boron	Titr.	1	1040 ± 10(7)	1007 ± 5(3)	0.968 ± 0.011	D
		1	3100 ± 100(7)	2978 ± 2.5(3)	0.961 ± 0.031	A
		1	5000 ± 90(7)	4897 ± 3.5(3)	0.979 ± 0.018	A
		2	520 ± 5(7)	510 ± 0.8(3)	0.981 ± 0.013	A*
Ammonia	SPEC	100	1.04 ± 0.05(8)	0.96 ± 0.003(3)	0.923 ± 0.044	A
		100	3.01 ± 0.03(8)	2.89 ± 0.01(3)	0.960 ± 0.014	D*
		100	4.92 ± 0.23(6)	4.84 ± 0.002(3)	0.984 ± 0.046	A
		100	3.01 ± 0.03(8)	2.94 ± 0.003(3)	0.977 ± 0.014	A*

a. Value ± standard deviation (s.d.); n is number of BNL analyses.
The number of licensee analyses is three unless otherwise noted.

b. Analytical methods: Titr - titration
IC - Ion chromatography
Spec - Spectrophotometric
SI - Specific ion electrode
AAS - Atomic absorption Spectroscopy (furnace)

c. A Agreement
D Disagreement
A+ Borderline Agreement

*Substituted the BNL uncertainty for licensee's uncertainty.