U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-352/84-45

Docket No. 50-352

License No. CPPR-106 Priority - Category B

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Limerick Generating Station

Inspection At: Limerick, PA

Inspection Conducted: August 20 - September 14, 1984

Inspectors:

Marie Miller — 11/27/84
M.T. Miller, Radiation Specialist — date

Bruce H. Carson — 11/28/84
B. H. Carson, Radiation Specialist — date

J. J. Kottan — 11/28/84
J. J. Kottan, Radiation Laboratory Specialist — date

R. L. Nimitz — 11/27/84
R. L. Nimitz, Senior Radiation Specialist — date

R. L. Nimitz for — 11/27/84
R. J. Serbu, Health Physicist, RPS, NRR — date

Approved by:

W. J. Pasciak — 11/30/84
W. J. Pasciak, Chief, BWR Radiation Safety Section — date

Inspection Summary: Inspection on August 20 - September 14, 1984 (Report No. 50-352/84-45

Areas Inspected: Routine, announced preoperational inspection of the licensee's Radiological Control Program, including Chemistry, Radiation Protection, Radioactive Effluent Control, Radioactive Waste Management and System Testing. Areas reviewed included: status of previously identified items, organization, selection, training and qualification, audits, exposure control and ALARA, surveillance, facilities and equipment, effluent and process monitoring and sampling, analytical analysis capabilities, and radiological control systems pre-operation test results. The inspection involved 365 inspector hours onsite by four NRC region-based inspectors and one headquarters-based inspector.

Results: No violations were identified. However, outstanding items that should be resolved prior to fuel load or other power mode milestones were identified.

DETAILS

1.0 Licensee Personnel

S. Daltroff, Vice President, Electrical Production, (Corp)
R. Ulrich, Superintendent, Nuclear Generation Division (Corp)
*W. Knapp, Director, Radiation Protection Section (Corp)
*G. Leitch, Station Superintendent
*D. Dubiel, Senior Health Physicist
*J. Wiley, Senior Chemist
*C. Endriss, Regulatory Engineer
*A. MacAinsh, Quality Assurance Site Supervisor
D. Brent, Test Director
*C. Harmon, Quality Assurance Engineer
B. Hempstead, Startup Group Supervisor (Bechtel)
R. Leddy, Physicist, Plant ALARA
W. Lewis, Test Director
J. Lucas, System Test Engineer
F. Molohon, Physicist, Respiratory Protection & Protective Clothing
J. Monaghan, Shift Supervisor
T. Mscisz, Health Physicis Supervisor
*G. Murphy, Technical Support Health Physicist
N. Nunn, Startup Engineer (Bechtel)
F. Otto, Test Director
J. Sabados, Supervisory Chemist
J. Scone, Dosimetry Technical Assistant
*R. Titolo, Applied Health Physicist
C. Wilson, Test Director

Other licensee or contractor employees were also contacted or interviewed during this inspection.

*denotes attendance at the exit interview on September 14, 1984.

2.0 Purpose

The purpose of this preoperational inspection was to determine if the licensee's Radiological Controls Program was consistent with regulatory requirements and commitments made in the Final Safety Analysis Report (FSAR) with respect to the following program elements:

- Chemistry
- Radiation Protection
- Radioactive Effluent Control
- Radioactive Waste Management
- System Testing

3.0 Status of Previously Identified Items

3.1 (Closed) Follow-up Item (352/84-05-01): Establish administrative procedures which describes station Radiation Protection Organization and methods for interfacing with corporate Radiological Controls Organization. This item is discussed in section 4.1 of this report.

3.2 (Closed) Follow-up Item (352/84-05-02): Establish qualification criteria and training program for Radiological Controls Organization. This item is discussed in section 5.1 and 5.2 of this report.

3.3 (Closed) Follow-up Item (352/84-05-03): Provide equipment, facilities and instruments as described in FSAR Chapter 12.5.2. This item is discussed in section 11.1 of this report.

3.4 (Closed) Follow-up Item (352/84-05-04): Develop and implement external exposure monitoring program. This item is discussed in section 8.1 of this report.

3.5 (Closed) Follow-up Item (352/84-05-05): Develop and implement exposure evaluation and records program. This item is discussed in section 8.1 of this report.

3.6 (Closed) Follow-up Item (352/84-05-06): Develop and implement internal exposure control and bioassay program. This item is discussed in section 8.2 of this report.

3.7 (Closed) Follow-up Item (352/84-05-07): Develop and implement respiratory protection program. This item is discussed in section 8.3 of this report.

3.8 (Closed) Follow-up Item (352/84-05-08): Provide restricted area access procedures. This item is discussed in section 10.1 of this report.

3.9 (Closed) Follow-up Item (352/84-05-09): Develop and implement inplant surveillance program. This item is discussed in section 10.2 of this report.

3.10 (Closed) Follow-up Item (352/84-05-10): Develop and implement ALARA program for operating and outage conditions. This item is discussed in section 9.2 of this report.

3.11 (Closed) Follow-up Item (352/84-05-11): Implement General Employee Training. This item is discussed in section 6.0 of this report.

3.12 (Closed) Follow-up Item (352/84-05-12): Review Solid Waste System preoperational testing program. This item is discussed in section 13.2 of this report.

3.13 (Closed) Follow-up Item (352/84-05-13): Review Liquid Radioactive Waste System and preoperational testing program for liquid waste system. This item is discussed in section 13.1 of this report.

3.14 (Closed) Follow-up Item (352/84-05-14): Review Gaseous Radioactive Waste System and preoperational testing program. This item is discussed in section 13.3 of this report.

3.15 (Closed) Violation (352/84-20-01): Licensee failed to adhere to HP Procedures. The inspector noted that the licensee had taken prompt corrective actions to address adherence to HP procedures. Review of the HP instrumentation indicated proper calibration and adequate operability checks were being performed. This item is closed.

4.0 Radiological Controls Organization and Staffing

The inspector examined the Radiological Controls Organization and Staffing with respect to criteria contained in the following:

- Final Safety Analysis Report (FSAR) Chapter 12.5, "Health Physics Program"
- FSAR Chapter 13, "Conduct of Operations"
- Technical Specification 6.2 "Organization"
- Limerick Generating Station Health Physics Group Organization, dated September 14, 1983.
- Electric Production Department Limerick Generating Station Functional Organization Chart
- Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Reasonably Achievable," Revision 3.

The evaluation of the licensee's performance in this area was based on:

- examination of applicable documentation (e.g. FSAR)
- discussions with cognizant licensee personnel
- observations by the inspector.

4.1 Station Radiation Protection Organization and Staffing

The licensee has established a Radiation Protection Organization. The organization is adequate to support fuel load and routine operations.

Within the scope of this review the following matters which should be addressed by the licensee were identified:

- The licensee's proposed Technical Specifications do not depict the unit Staff or Support Health Physicist. Consequently, the selection and qualification requirements of proposed Technical Specification 6.3, "Unit Staff Qualifications," do not clearly apply to these individuals. The licensee should revise the proposed Technical Specification to identify this staff.

- FSAR Chapter 13, "Conduct of Operations," should be revised to remove chemistry program development and implementation responsibilities from the Senior Health Physicists defined responsibilities.

- FSAR Chapter 13, "Conduct of Operations," provides no description of the responsibilities and reporting chains of Applied and Technical Support supervisory personnel below the Applied and Technical Support Health Physicist.

- No station administrative procedures have been established which describes the Radiation Protection Organization. The licensee should establish a clear description of the organization, and the methods of interfacing with the Corporate Radiological Controls Organization.

Based on the above findings, the licensee's Radiation Protection Organization was considered adequate to support fuel load, however the above matters will be reviewed during a subsequent inspection (352/84-45-20).

In addition, within the scope of this review, the following recommendations for improvement were identified:

- The Health Physics technicians of the field operations group are directed through a hierarchy of three line supervisors. In two cases, this results in two supervisors each directing only one other supervisor. The licensee should consider restructuring the field operations organization to more fully utilize each supervisor.

- All technical support functions are supervised through speciality physicists by one technical support supervisor. This results in a number of diverse disciplines reporting to one individual. Because the expertise needed to oversee each discipline is considerable, the licensee should consider restructuring the technical support organization to limit the number of disciplines that the technical support supervisor is responsible for supervising. This should result in more effective oversight of technical support functions.

- Provide additional clerical support in the area of Operational Radiation Protection. The clerical support would provide assistance in maintaining radiation, contamination survey and airborne radioactivity data, and radiation work permits.

4.2 Radioactive Waste Management Organization and Staffing

Within the scope of the review, the following was identified:

- The licensee's Radioactive Waste Management Organization had not been established or staffed.

Based on the above finding, the above item should be completed prior to initial criticality:

- Establish and implement a Radioactive Waste Management Organization (352/84-45-05).

4.3 IE Bulletin 79-19

The inspector noted that an inplant Radioactive Waste Control Program as required by IE Bulletin 79-19 had not been implemented.

Based on the above finding, the following item should be resolved prior to initial criticality:

- Implement limited inplant Radioactive Waste Control Program and implement a training program to support the Rad Waste Control Program as specified by IE Bulletin 79-19 (352/84-45-09).

In addition, the following item should be resolved prior to exceeding five percent power:

- Fully implement a program for radioactive waste management which meets the requirements of IE Bulletin 79-19 (352/84-45-16).

4.4 Chemistry Organization and Staffing

The inspector reviewed the licensee's chemistry organization with respect to staffing and structure as outlined in the FSAR. All management positions are staffed. Corporate support chemists are onsite and assisting in effluent and process monitor calibrations. Chemistry staffing, both at the management and technician level, is adequate for fuel loading.

4.5 Radiation Protection Organization (Corporate)

Within the scope of the review, the following was identified:

- The licensee has not established a defined Corporate Radiological Controls Organization. The licensee should consider establishment of such an organization.

Based on the above findings, the licensee's Radiological Controls Corporate organization was considered adequate to support fuel load, however, the above item will be reviewed during a subsequent inspection (352/84-45-21).

4.6 Definition of Position Responsibilities, Authorities and Reporting

The inspector examined the Radiological Controls Organization to determine if each position and its concurrent responsibilities, authorities and reporting chain were clearly described and that individuals were aware of these matters as they relate to their position.

Examination found that the licensee has defined the responsibilities, authorities and reporting chain of each individual in the organization except for clerical staff. These matters are included in Station Superintendent signed documents titled "Position Guides."

Within the scope of this review, the following recommendation for improvement was identified:

- Provide copies of the applicable Position Guide to each individual to ensure that the individual is fully aware of his positions responsibilities, authorities and reporting chain.

- Establish limited "Position Guides" for clerical personnel, particularly in the area of external dosimetry.

5.0 Selection, Qualification and Training

The selection, qualification, and training of Radiological Controls personnel was reviewed with respect to criteria contained in the following:

- Technical Specification 6.4, "Training and Qualification" (Proposed)

- ANSI/ANS 3.1, 1978, "Selection, Qualification and Training of Personnel for Nuclear Power Plants"

- Procedure H.P. 100, Revision 0, "Health Physics Technician Selection, Training and Qualification"

- NTS-005, Revision 0, "Health Physics/Chemistry Technician Training."

The licensee's performance in the area was based on review of documentation and discussions with cognizant personnel.

5.1 Selection/Qualification

The licensee has included selection criteria in "Position Guides."

Review of the guides identified the following matters requiring licensee attention:

- The Position Guide for the Applied Health Physicist does not clearly identify the minimum experience needed by an individual to fill the position of Applied Health Physicist. Also, the individual currently filling the position does not possess the minimum experience specified in Technical Specifications. The licensee should revise the position guide to clarify the position experience requirements and establish appropriate administrative controls over the Applied Health Physicists pending his meeting minimum qualification requirements.

- No experience requirements are specified in Position Guides for Physicists. The licensee should specify minimum experience needed by personnel inorder to enter the various physicists positions (e.g. Radwaste, Respiratory Protection, etc.).

The above matters will be reviewed during a subsequent inspection (50-352/84-45-22).

5.2 Training

Within the scope of the review, the following matters requiring licensee attention were identified:

- No evaluation has been performed to identify the extent of radiation protection procedure training required by each member of the radiation protection organization. The licensee should identify the minimum procedures that each position is responsible for implementing, and identify the procedural training needed.

- No uniform evaluation/acceptance criteria has been established to evaluate an individual's knowledge of procedural requirements. The licensee should establish a program with objective evaluation/acceptance criteria to evaluate an individual's knowledge of procedural requirements.

- No program has been established to provide limited plant systems training with respect to the radiological hazards associated with each system. The licensee should provide such training to upgrade radiation protection personnel awareness of the radiological hazards associated with plant systems.

- No training program has been established for Radiological Controls Supervisory personnel.

Based on the above findings, the following item should be completed prior to fuel load:

- Complete training and qualification of the Radiation Protection staff (352/84-45-01).

The above matter will be reviewed during a subsequent inspection prior to fuel load.

In addition, the following matter requiring licensee attention was identified:

- A Retraining Program for Radiological Controls personnel had not been established. This should be established by first refueling.

The above matter will be reviewed during a subsequent inspection (50-352/84-45-23).

6. General Employee/Radiation Worker Training

The licensee's General Employee/Radiation Worker Training was reviewed with respect to criteria contained in the following:

- 10 CFR 19.12, "Instruction to Workers"
- Regulatory Guide 8.27, March 1981, "Radiation Protection Training for Personnel at Light-Water-Cooled Reactors"
- Final Safety Analysis Report Chapter 12, "Radiation Protection"
- Regulatory Guide 8.13, Revision 1, "Instructions Concerning Prenatal Radiation Exposure"
- Regulatory Guide 8.29, July 1981, "Instructions Concerning Risks From Occupational Radiation Exposure."

The evaluation of the licensee's performance in this area was based on inspector observations during attendance of a General Employee Training Program, review of applicable documentation and discussions with cognizant licensee personnel.

Within the scope of this review the following was noted:

- The General Employee Training Program meets commitments specified in the Final Safety Analysis Report.
- The instructors observed were qualified, experienced and enthusiastic.

- General Employee Training Facilities were considered good.
- Lesson plans were used when presenting the course.
- Course content was consistent with applicable requirements.
- The General Employee Training Program was considered adequate to support fuel load and routine operations.

The following recommendations for improvement were identified:

- Provide/use more visual aides, particularly for explaining use of Radiation Work Permits and radiological survey maps.
- Discuss potential disciplinary action for violation of radiological control procedures.
- Include additional discussion on the use of engineering controls to minimize airborne radioactivity.
- Shorten teaching segments to improve class attention. Some segments were in excess of 1.5 hours. This should improve class attention.

7.0 Audits

The licensee's Audit Program, as it relates to Radiological Controls, was reviewed with respect to criteria contained in the following:

- Technical Specification 6.5, "Audits"
- Philadelphia Electric Company Quality Assurance Plan

The following procedures were selectively reviewed:

- QADP-5, "Procedures for Performance of QA Division Audits," Revision 4
- QADP-6, "Quality Assurance Division Audit Program - Preoperational and Operational Phases, Revision 9
- QADP-8, "Procedure for Preparation and Use of Audit Check Lists," Revision 6
- QADP-9, "Procedure for Control of Apparent Deficiencies and Audit Follow-up Required Items," Revision 10

- QADP-30, "Procedure for Limerick Generating Station Start-up QC Surveillances," Revision 1
- QADP-101, "Quality Control (QC) Inspection Program," Revision 0
- QADP-101.1, "Conduct of QC Inspection Activities."

The following audits were selectively reviewed:

- Audit No. AL84-07, HPC, "ALARA, Dosimetry, Implementing Procedures for H.P," dated February 20, 1984
- Audit No. AL83-43, TR, "Training of Health Physics and Instrument and Control Technicians," dated November 2, 1983
- American Nuclear Insurers - Nuclear Liability Inspection - June 19-21, 1984, dated July 16, 1984
- 1984 INPO Audit - Assistance Visit
- August 1984 Audit - Hydro-Nuclear Inc.

The licensee's performance in this area was based on review of applicable documents (referenced above), discussion with cognizant licensee personnel, and observations by the inspector.

Within the scope of this review, the following matter requiring licensee attention was identified:

- The licensee individuals performing audits of the Radiological Controls Program are not qualified in accordance with the Quality Assurance Plan. The individuals have little experience in the area of Radiological Controls.

The licensee representatives stated that Corporate Radiological Controls personnel would be utilized in the performance of future audits.

Based on the above findings, the following item should be resolved prior to fuel load:

- Provide qualified personnel to perform audits of the Health Physics Program in accordance with ANSI Standard 45.212, as referenced in your Quality Assurance Plan (352/84-45-02).

The above matter will be reviewed prior to fuel load.

8.0 Exposure Control

8.1 External Dosimetry Program

The inspector reviewed the licensee's external dosimetry program with respect to proposed Technical Specifications, regulatory requirements, and accepted industrial standards. The licensee's performance relative to these criteria was determined from discussions with the Support Health Physicist and his staff and review of selected procedures including:

- HP-102, Administrative Dose Limits, Guidelines and Notification Requirements, Revision 1
- HP-600, Investigation, Evaluation and Reporting of Known or Suspected Abnormal Exposures or Exposure Discrepancies, Revision 0
- HP-603, Guidelines for Placement of Dosimetry on Plant Personnel, Revision 0
- HP-610, Issuance and Control of Routine and Emergency Dosimetric Devices, Revision 0
- HP-614, Quality Control Checks of Supplying TLD Vendor, Revision 0
- HP-616, Use of Direct Reading Dosimeter, Revision 1
- HP-618, Determination of Neutron Exposure, Revision 0
- HP-619, Preparation, Administrative Review and Dissemination of Personnel Exposure Record Reports, Revision 0
- HP-621, Use of Special Purpose Dosimetry, Revision 0
- HP-636, Direct Reading Dosimeter Reporting, Evaluation and Correction, Revision 0.

Within the scope of this review, the following findings were identified.

The licensee had implemented the major aspects of an Exposure Dosimetry Program which would be adequate to support fuel load. The licensee's program provided a two element thermoluminescent dosimeter to estimate gamma and beta dose epxosures and direct reading dosimeters for daily gamma exposure estimation. Procedures in the HP-600 Series addressed neutron exposure determination, issuance, placement and exposure record management, exposure reporting requirements and quality assurance program implementation.

However, the inspector identified numerous procedural deficiencies requiring licensee corrective action prior to achieving Initial Criticality. The licensee had not adequately addressed placement of whole body

dosimetry or adequately describe the terms whole body, extremity and skin with regard to dosimetry placement. In addition, the procedural steps to evaluate high energy photon exposures, beta and neutron exposures were incomplete, and neutron dosimetry was not available. The licensee's exposure reporting procedure did not address quarterly exposure reporting requirements.

Improvements in the quality assurance program were also identified that require resolution prior to exceeding 5% power, including, statistical analysis of the gamma correction factor, establishment of a program for periodically checking the beta response of the TLD, and acceptability of the neutron flux to dose rate conversion factors utilized to determine personnel neutron exposure. Guidance for exposure to minors was also not addressed.

Based on the above findings, the following item should be completed prior to initial criticality:

- Revise procedures and provide appropriate dosimetry to adequately address administrative control of external exposures, beta and neutron exposure evaluation, and high energy photon exposures (325/84-45-10).

In addition, the following item should be completed prior to exceeding 5% power:

- Develop a program to evaluate beta dosimetry and neutron dosimetry for routine plant operations and complete procedures which address guidance for exposure to minors (352/84-45-14).

The above matters will be reviewed during a subsequent inspection prior to initial criticality.

8.2 Internal Dosimetry

The inspector reviewed the licensee's internal dosimetry program with respect to proposed Technical Specifications, regulatory requirements, and accepted industrial standards. In addition, the inspector verified the capability of the licensee to adequately perform radiological bioassay using a whole body counting system. A whole body counting phantom containing radioactive sources traceable to the National Bureau of Standards (NBS) was provided to the licensee for analysis. The phantom duplicated the nuclides and the organ burdens that the licensee might encounter during normal operation. The phantom was analyzed using the licensee's normal methods and equipment.

The licensee currently has two whole body counting systems in service: a moving bed system and a stand-up counter system. The moving bed system will be used during routine operations by the licensee. The stand-up

counter is being supplied by a vendor and includes an operator/technician. The stand-up counter will be rented from a vendor during periods of high use such as outages. The results of the intercomparisons are presented in Table I. The lung results are based on an average of five measurements, and the GI tract results are based on an average of two measurements.

The inspector reviewed the licensee's whole body counting procedures and internal dosimetry procedures. The procedure for operation of the vendor supplied and operated stand-up counter was reviewed and approved as required by the proposed Technical Specifications. The procedures for the licensee's moving bed whole body counter were not yet finalized and reviewed and approved. In addition the licensee had not yet developed a procedure for using bioassay data to assess individual intakes of radioactivity by exposed individuals as required by 10 CFR 20.103. The licensee had not made any provision for the assessment of individual intakes of alpha emitters, which may be present, from bioassay excreta analysis data or whole body counting data. The inspector stated that the final completion of the licensee's whole body counting procedures, completion of a procedure to implement 10 CFR 20.103, and completion of a procedure to assess any alpha emitter intakes would be reviewed prior to fuel load.

Based on the above findings, the following item should be completed prior to initial criticality:

- Develop and implement internal dosimetry procedures to address 10 CFR 20.103 assessments, excreta analysis, evaluation of intake of alpha emitters, and finalize procedures for whole body counting (352/84-45-11).

The above matters will be reviewed during a subsequent inspection prior to initial criticality.

8.3 Respiratory Protection Program

The inspector reviewed the licensee's Respiratory Protection Program with respect to regulatory requirements and guides, accepted industry standards and applicable IE Information Notices. The licensee's performance relative to these criteria was determined from discussions with the Support Health Physicist and Respiratory Protection Physicist, review of documentation, including the licensee's Respiratory Protection Policy Statement; and examination of respiratory protection facilities and equipment. In addition, the following procedures were selectively reviewed:

- HP-501, Respiratory Protection Training Program, Revision 0
- HP-508, Personal Protective Equipment Packaging and Shipment to Off-site Cleaning Facility, Revision 0

- HP-509, Receipt of Personal Protective Equipment from Laundry Facility, Revision 0

- HP-511, Receipt and Inspection of New Respiratory Protection Equipment, Revision 0

- HP-512, Issue and Control of Personal Protective Equipment.

Within the scope of this review, the following findings were identified:

The licensee had established an acceptable Respiratory Protection Policy Statement and receipt inspected NIOSH certified respiratory protective equipment. The licensee also provided the essential implementation procedures, including medical evaluation to permit issuance of respirators to limit the inhalation of airborne radioactive material. However, the program had not been fully established, which prohibited the licensee from making allowance (i.e., assuming protection factors) when estimating individual exposures.

The following remaining matters were identified requiring licensee attention prior to exceeding 5% power.

- Establish control over vendor activities for respirator cleaning and maintenance and approve vendor program;

- Provide General Respiratory Protection Training (GRT) and fit test all individuals prior to issuance of any respirators, excluding emergency escape units;

- Provide engineering controls and/or portable ventilation units to limit exposure as stated in Respiratory Protection Policy Statement

- Establish and implement procedures for inspection and maintenance of breathing air manifolds; and

- Review the adequacy of radioactive contamination checks for breathing air systems.

In addition, the inspector noted the resignation of the Respiratory Protection Physicist. This created a vacancy that should be quickly filled to ensure continued program development.

Based on the above findings, the following item should be completed prior to exceeding 5% power.

- Complete development and implement a Respiratory Protection Program, including the use of engineering controls (352/84-45-13).

9.0 ALARA

9.1 Design and Equipment Selection

The inspector reviewed the licensee's commitment in the FSAR Sections 11 and 12, including the design review outlined in Section 12.1.2.4; the ALARA design review of the Limerick facility conducted during construction as performed by Bechtel Power Corporation under Job Rule G-37 (8031-JR-G-37, Rev. 4), "Job Rule for Field Engineering Participation in ALARA Program;" and the PECo ALARA Walkdown Guide for Limerick. The inspection also included a review of the JR-G-37 procedure, checklist, and areas identified for ALARA review. The areas and scope of review were consistent with FSAR commitment and RG 8.8 guidance. The inspector cross checked selected facility layouts with FSAR layouts and Bechtel and Limerick ALARA walkdown efforts. No discrepancies were noted. Several noteworthy design changes have been incorporated into the Limerick facility specifically to reduce occupational doses: a control rod drive removal hatch with sliding doors and a shielded CRD work area with a shielded storage area; hinged, swing-out shielding on reactor penetration piping; platform and stairways in drywell located specially for maintenance; TIPS room shield wall extensions to prevent streaming; wide use of reach rods; extensive use of decontaminable coatings in areas of potential contamination; an area/cubicle photo program for later maintenance.

Based on the above findings, the licensee's ALARA preoperational Design and Equipment Review was considered adequate.

9.2 Maintaining Occupational Exposure ALARA

The inspector reviewed the licensee's ALARA program including management policy, assignment of responsibilities and authorities, procedures and standards, indoctrination and instruction, and design and equipment selection. Review criteria include the Limerick FSAR, Chapter 12, Regulatory Guide 8.8 "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Station Will Be As Low As Reasonably Achievable," and Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposure As Low As Is Reasonably Achievable".

Within the scope of the inspection, the following matters were identified:

- No violations were identified, however, significant personnel and procedural development efforts and resource procurement are needed to assure implementation of an effective ALARA program in accordance with commitments in the Limerick FSAR. At the time of inspection all ALARA procedures were in draft form, including the rules and guidelines containing the corporate management ALARA policy. At the time of this review the utility had essentially no capability

to implement ALARA engineering controls at Limerick, and limited capability to implement ALARA through procedural and programmatic efforts.

The licensee stated that the Director, Radiation Protection Section was in the process of more clearly defining the corporate radiation protection/ALARA functions and developing formal programs for such areas as audit, procedures review, and technical support. The licensee indicated that all levels of management would have specific goals for radiation protection/ALARA. However, specific goals consistent with RG 8.8, Section c.1.b had not yet been established. Licensee corporate personnel indicated that this would be accomplished as operational experience was gained.

The inspector also noted that the "ALARA Coordinator" function at Limerick was fulfilled by the Physicist, Plant ALARA position. This position conducts equipment and design reviews, reviews and implement ALARA procedures and methods and provides radiation protection/dose reduction inputs into tasks. The assignment of responsibilities and authorities at Limerick generally met R.G.8.8 and 8.10 criteria and commitments in the Limerick FSAR Chapter 12. However, the administrative load for the current plant ALARA staff during operations will significantly affect their ability to perform effective ALARA reviews.

Work planning and preparation procedures had not been established, and no engineering controls procedures had been developed. The Limerick ALARA procedures, since they were in draft form, do not meet the licensee's commitment in Chapter 12.1 and 12.5 to establish an ALARA program. The lack of engineering controls also does not meet 10 CFR 20.103(b), which requires that process or engineering controls be used to limit exposure to radioactive materials where respiratory protection might be needed.

Based on the above finding, the following matter requiring licensee attention was identified:

- Establish and implement an ALARA Program in accordance with RG 8.8 and RG 8.10 prior to the first refueling outage (352/84-45-19).

In addition, the following recommendations should be considered for improvement:

- Develop a routine work planning and scheduling program which provides sufficient lead time and work control to incorporate pre-work ALARA reviews and radiological engineering controls;

- Develop expertise in the use of and capability to train HP personnel and crafts personnel in the field use and functional checks of the various engineering controls;

- Provide additional clerical personnel to support Plant ALARA staff.

10.0 Control of Radioactive Materials and Contamination, Surveys, and Monitoring

10.1 General

Radioactive material and contamination control, and in-plant surveys and monitoring programs were reviewed against the requirements of 10 CFR 20.201, "Surveys"; 10 CFR 20.203, "Caution signs, labels, signals and controls"; 10 CFR 20.401, "Records of surveys, radiation monitoring and disposal"; licensee commitments in the FSAR Chapter 12; and the criteria in RG's 8.2, 8.7 and 8.8. Licensee procedures reviewed included:

- HP-200 Routine Survey Program and Schedule
- HP-210 Radiation Survey Techniques
- HP-211 Contamination Survey Techniques
- HP-212 Airborne Contamination Monitoring CAM's
- HP-213 Airborne Activity Survey Technique
- HP-214 Air Sample Analysis and Evaluation
- HP-215 Establishing and Posting Controlled Areas
- HP-310 Radiation Work Permits
- HP-401 Control, Accountability, Maintenance and Repair of Health Physics Instrumentation
- HP-423, 426, 427, 428, 446 Operation of "X" Air Sampler
- HP-812 Area Decontamination Technique
- HP-813 Tool and Equipment Decontamination
- HP-817 Personnel Contamination Monitoring
- HP-818 Personnel Decontamination
- HP-400 Control Accountability, Maintenance and Repair of Health Physics Instrumentation
- HP-421 Operation of the Eberline PING-1A Radiation Monitoring System
- HP-422 Operation of the Eberline Model 1M-1 Iodine Monitor

Within the scope of the inspection the following matters were identified:

- No violations were identified, however, deficiencies in several areas were noted and improvements are required prior to exceeding 5% power. Survey frequency and scope was generally adequate, except for a need for routine neutron and alpha surveys, and expansion of the routine surveillance program to include unauthorized areas. Additional consideration of IE Bulletin 80-10 was also needed to assure control of radioactive materials in uncontrolled areas.

10.2 Radioactive Material and Contamination Control

The inspector reviewed procedures related to radioactive material (RAM) and contamination control. The basic procedure for radioactive material control, HP-810, "Radioactive Material Control" was in draft form at the time of inspection, and will be reviewed during a future inspection. The licensee had developed procedures for decontamination of areas, tools and equipment, and personnel. These procedures appear adequate, but the associated decontamination facilities were not in place. All materials, tools, and equipment to be removed from a controlled area will be surveyed by HP Techs. Only personal items maybe surveyed and released by employees. All employees leaving the restricted area will be required to perform a whole body frisk and exit through beta/gamma sensitive portal monitors.

10.3 In-Plant Surveys and Monitoring

The inspector reviewed the Limerick survey program for compliance with the requirements of 10 CFR 20.201, 20.203, and 20.401; the criteria of RG 8.2 and ANSI N13.2-169, and FSAR commitments. The licensee program includes routine and special surveys for alpha, beta, gamma and neutron radiations, including the capability for surveillance and measurements of dose rates, contamination levels, and airborne particulates, iodines and noble gases. Frequency of surveys generally appeared adequate for controlled aras. However, several situations were identified that were not discussed in the licensee's procedures. Additional surveys of areas where radioactive materials could be located were not addressed. Such areas include: tool cribs, lockers, dumpsters, site dump, warehouse areas, rugs, and contractor areas as discussed in IE Circular 81-07, " Control of Radioactivity Contaminated Material." Additional surveys should be routinely performed around high radiation areas to verify that conditions are not changing and controls are effective. Systems and components which could potentially become contaminated should be radiation surveyed periodically to monitor for buildup of radioactivity. Routine neutron surveys had not been established to meet the requirements of 10 CFR 20.201. Alpha surveillance is not specified as a routine survey in HP-200 or other procedures to meet the requirements of 10 CFR 20.201.

The inspector noted that survey logs met the criteria of RG8.2 and 8.7. Survey maps were under development and will be reviewed during a subsequent inspection.

10.3.1 Reviews of Surveys

Section 6.3 of HP-200 provides for a periodic review of routine surveys, but does not provide adequate guidance on the extent of review, actions to be taken, or responsibilities of supervisors and managers when unusual or "out-of-specification" conditions are found in surveys per Reg Guide 8.7, and as discussed in IE Bulletin 80-10. An adequate level of management review was not provided by procedure.

10.3.2 Radiation Work Permit (RWP)

The inspector reviewed HP-310, "Radiation Work Permits," supporting survey procedures, and interviewed licensee personnel. Criteria which firmly establish when special surveys would be required in lieu of current surveys was not provided. Conditions where a special survey would be required before and during task performance were not outlined. The "Breech Survey" procedure is essential to RWP use, but had not been finalized. No guidance was provided to determine the degree of HP Tech coverage for a task. In addition, HP-310 should include criteria for assigning technician coverage on a fulltime, part-time, or unlimited basis.

Based on the above findings, the following items should be resolved prior to fuel load:

- Establish methodology to ensure Operations Shift personnel will be cognizant of significant radiological hazards at on-going work areas, and that Health Physics shift personnel will be informed of planned operation activities that may significantly change the radiation environment (352/84-45-03)

- Establish procedures to address high radiation area control during fuel handling accidents (352/84-45-04).

In addition, the following items should be resolved prior to exceeding 5% power:

- Revise procedures to adequately address IE Bulletin 80-10 including the following concerns:

  - specify appropriate LLD to be met as criteria for initiation of further review;

  - provide instructions for notifying supervision of potentially contaminated systems; and

- initiate required reviews prior to continued operation of contaminated systems (352/84-45-17).

- Expand the routine radiological surveillance program to provide assurance that radioactive materials are not located in unauthorized areas (e.g. lockers, contractor trailers, tool storage areas, dumpsters, carpets); and specify criteria for RWP coverage by personnel (352/84-45-18).

In addition, to the above items the following improvements to the Surveillance Program should be addressed:

- Establish a routine neutron and alpha survey program;

- Establish criteria for performing special surveys for RWP use;

- Finalize HP-216, "Breech Surveys", to assure adequate contamination surveys.

- Establish a routine survey program to include verification of boundary dose rates for high radiation areas and hot spots.

- Complete development of survey maps.

The above matters will be reviewed during a subsequent inspection (352/84-45-24).

11.0 Facilities and Equipment

11.1 Radiation Protection Facilities and Equipment

The inspector reviewed the licensee's onsite Radiation Protection facilities and equipment with respect to that described in FSAR Chapter 12.5.2, "Facilities, Equipment, and Instruments." These were also reviewed for ALARA design considerations in accordance with the criteria of RG 8.8.

The licensee's provisions relative to this criteria were determined from discussions with the Applied Health Physicist, tour of the facilities including field office, access control stations, counting room, instrument storage, decontamination facility and balance of plant.

Within the scope of this review, the following matters were identified.

- Facilities and equipment described in the FSAR for the Limerick Station were either in place or planned for installation. Implementation of the access control program was not completed. ALARA design considerations appear to have been incorporated into facilities where appropriate.

Details

Area Radiation and Airborne Radioactivity Monitors

Mobile Airborne Radioactivity Monitors and Area Radiation Monitors were available to monitor for particulate, gases, and iodines as described in the FSAR. These included constant air monitors (CAMs), high and low volume portable air samplers, lapel samplers and mobile area radiation monitors. Procedures were provided for the use and calibration of all equipment, and alarm setpoints and alarm actions were described in these procedures. Calibration procedures had not been developed, however, a vendor will perform calibrations until the licensee calibration facility is operative. The licensee had ARM's installed in the fuel storage area in lieu of criticality monitors, and will file for an exemptions under 10 CFR 70.24(a)(1).

Portable Survey, Sampling, and Contamination Monitoring Instruments

The inspector reviewed instrument storage facilities and verified that adequate procedures for issue and use had been developed. Adequate types of instruments were available for alpha, beta, gamma, neutron surveys, including high to low range radiation surveys, and contamination and airborne radioactivity surveys, as described in the FSAR. Exact counts of instruments available and in use or on-hand inventories were not provided as requested. Therefore, the inspector could not determine if the number of calibrated, useable instruments was adequate for fuel load/initial criticality. The licensee will use friskers and gaseous proportional portal monitors to monitor for contamination. Final calibration of the portal monitors was underway during the inspection. Instruments will be stored and issued from the HP Field Office in the Turbine Building. Final storage, issue, and calibration facilities are still under development.

Protective Clothing and Equipment

The variety of protective clothing and equipment available and storage facility were consistent with the FSAR (12.5.2.2.7). This includes coveralls, shoe covers, gloves and liners and head covers. Use of these is governed by procedure HP-510, "Selection and Use of Anti-Contamination Clothing," and discussed in GET. Clothing and respirator issue will be per HP-512, "Issue and Control of Personal Protective Equipment", from a convenient area in the turbine building, near the plant entry way and HP field office.

Based on the above findings, the following item should be resolved prior to initial criticality:

- Implement personnel access/contamination control program and complete installation of the appropriate provisions (i.e., access control point, portal monitors, frisker stations, equipment/personnel decontamination room, and health physicist field office and assure appropriate quantity of calibrated instruments (352/84-45-12).

The above matter will be reviewed during a subsequent inspection prior to fuel load.

11.2 Chemistry Facilities and Equipment

The inspector toured the plant including the chemical laboratories and counting room, liquid and airborne effluent and process radiation monitors, selected ventilation systems, and various process systems. The licensee has completely equipped the chemistry laboratories and counting room and all instrumentation necessary to support fuel loading and startup has been installed and is operational. All four of the detectors for the gamma spectrometer system have been calibrated. The process and effluent radiation monitors have been installed and are partly calibrated.

Based on the above findings, chemistry facilities and equipment were considered adequate to support fuel load and routine operations.

12.0 Effluent and Process Sampling and Monitoring

12.1 Effluent Sampling and Monitoring

The inspector reviewed the licensee's effluent sampling and monitoring program with respect to the licensee's proposed technical specifications, regulatory requirements, and accepted industrial standards. The inspector examined the licensee's liquid effluent monitor and reviewed the licensee's liquid effluent monitor calibration data. The licensee calibrated the liquid effluent monitor over the range of the monitor using sources in geometries which duplicated the actual counting geometry of the liquid effluent monitor. The inspector also reviewed the licensee's procedures for sampling, analysis and control of radioactive liquid effluent releases. The licensee has written procedures for sampling and analysis of liquid radioactive effluents, but a procedure for the control of liquid effluent releases had yet to be written in final form and approved. The inspector stated that the completion and implementation of the procedure for the control of liquid radioactive effluents was a fuel load item.

The inspector examined the licensee's airborne effluent radiation monitors and reviewed the licensee's program for the sampling, analysis, and control of airborne radioactive effluent releases. The inspector also examined the gaseous process radiation monitors and reviewed the calibration of the gaseous process radiation monitors. The airborne effluent radiation monitors were calibrated by the vendor of the radiation monitors, and the licensee was using check sources supplied by the vendor

to verify the calibration constants. Both the calibration sources and the check sources are traceable to the National Bureau of Standards. The north and south stack normal range airborne effluent monitors have a particulate, iodine and gaseous detector channel, and also the particulate filter and charcoal cartridge can be removed from the particulate and iodine detectors respectively and taken to the laboratory for analysis. The licensee has not yet finalized the location and method to be used for taking gaseous grab samples and tritium grab samples from the north and south airborne effluent stack monitors, and has not completed and implemented procedures for sampling from the stacks. The inspector stated that the completion and implementation of stack sampling procedures was a fuel load item, and this area would be reviewed prior to fuel load. In addition, the inspector noted that the licensee did not have documented collection efficiencies versus flow rates for the charcoal cartridges to be used in the north and south stack airborne effluent radiation monitors. The licensee stated that the vendor of the charcoal cartridges would be contacted in order to obtain the collection efficiency data.

The inspector noted that the licensee plans to have chemistry personnel enter data into the licensee's computer system used for offsite dose calculations (RMMS system) in order to demonstrate compliance with the technical specification effluent release limits. However, discussions with chemistry personnel indicated that the chemistry personnel could not enter routine data into the system, a procedure had not been written for entering the data into the system, and chemistry personnel had not been trained in the use of the system. The licensee stated that a procedure would be written and implemented in this area, and training would be given to chemistry personnel.

Based on the above findings, the following item should be completed prior to loading fuel:

- Upgrade the Effluent Control Program to address the following:

  -- Provide charcoal collection efficiency data for the effluent monitors;

  -- Provide for adequate sampling from the gaseous effluent and process monitoring system;

  -- Develop and implement a procedure for control of liquid effluent releases; and

  -- Develop procedure(s) and complete training for entering effluent data into RMMS to assure compliance with Technical Specifications (352/84-45-06).

The above matters will be reviewed during a subsequent inspection prior to fuel load.

12.2 Process Sampling and Monitoring

The inspector reviewed the licensee's process sampling and monitoring program with respect to the licensee's proposed technical specifications, regulatory requirements, and accepted industrial standards. The inspector examined the licensee's liquid process monitors and reviewed the liquid process monitor calibration data. The licensee calibrated the liquid process monitors using sources of various strengths in geometries which duplicated the actual counting geometrics of the process monitors. The inspector also reviewed the licensee's procedure for liquid process sampling. In addition, the inspector examined the radwaste sample station, the reactor building sample station, the reactor water cleanup sample panel, the turbine building sample panel, and the condensate sampling panel.

The inspector examined the licensee's gaseous process monitors. The licensee has not yet calibrated the gaseous process monitors but plans to perform the calibrations by circulating radioactive gas through the process monitor detector chamber. A review of the licensee's procedures for gaseous process sampling indicated that the licensee planned to perform sampling of process gases from the gaseous process monitors. However, the licensee's current procedure required that modifications be made to the monitors so that samples could be taken. After discussions with the licensee, the inspector determined that the licensee was considering modifying the proposed sampling procedure by sampling at the "quick disconnect" fittings used for collecting particulate and iodine samples.

Based on the above finding, the following item should be completed prior to loading fuel:

- Provide for adequate sampling from the process monitoring system (See item 352/84-45-06).

The above matter will be reviewed during a subsequent inspection prior to fuel load.

12.3 Capability Test Results

Test samples were submitted to the licensee in order to evaluate the licensee's capability to measure radioactivity in effluents. The test samples were prepared by the NRC reference laboratory, DOE Radiological and Environmental Sciences Laboratory (RESL), and duplicated the types of samples and nuclides that the licensee would encounter during operation. The test samples were analyzed by the licensee using the licensee's normal methods and equipment.

The results of the test sample measurements comparison indicated that all of the measurements were in agreement under the criteria used for intercomparison of results (See Attachment 1). The intercomparison data is listed in Table 2. The inspector had no further questions in this area.

13.0 System Preoperational Testing

The inspector examined licensee preoperational testing of the following systems:

- Liquid Radioactive Waste System
- Solid Radioactive Waste System
- Gaseous Radioactive Waste System & Process Monitoring & Sampling
- Area Radiation Monitoring System
- Control Room Emergency Ventilation System
- Reactor Building Recirculation System
- Standby Gas Treatment System

The review was with respect to criteria contained in the following:

- Final Safety Analysis Report, Chapter 14, Initial Tests Program

- Regulatory Guide 1.68, Revision 0, "Preoperational and Initial Start-up Test Programs for Water Cooled Power Reactors"

- Limerick Generating Station, Unit 1, Technical Specification (Proposed)

The evaluation of the licensee's performance relative to these criteria was determined by review of test procedures, review of test data, review/walk-down of systems and discussions with cognizant licensee representatives.

13.1 Liquid Radioactive Waste System Preoperational Testing

Documents Reviewed

1P-69.1, "Equipment Drain Collection and Storage"
1P-69.3A, "Liquid Radioactive Waste,"

The licensee had not completed the pre-operational testing of the Liquid Radwaste System. During the inspection, the inspector verified through visual inspection that the major components of the Liquid Radioactive Waste System, as described in the FSAR, were installed. These components included: floor drain and equipment drain collection subsystem, and laundry waste and chemical waste subsystem.

Based on the above findings, the following item should be resolved prior to fuel load:

- Complete Preoperational test procedures 1P-69.1 and 1P-69.3A and resolve and remaining open test exceptions (352/84-45-08).

The above matter will be reviewed during a subsequent inspection, prior to fuel load.

13.2 Solid Radioactive Waste System Testing

The licensee had been unable to complete Preoperational Test 1P-68.1A, "Solid Radioactive Waste". The major impediments were three design problems, namely the inability to pump resin from the Spent Resin Tank to the Waste Sludge Tank, to process resin through the centrifuge (attributed to an instrumentation panel flow control device), and to properly secure the capping device on the Solid Waste Shipping container. The licensee attempted several design changes, but to date, had been unsuccessful. The licensee expects to resolve these design problems and forecasts completion of the test by September 29, 1984. The inspector walked-down the entire Solid Waste System and verified that the major components, as described in the FSAR were installed with the exception of the above noted design changes.

The above matter will be reviewed during a subsequent inspection prior to fuel load (352/34-45-25).

13.3 Gaseous Radwaste & Process Monitoring Sampling Preoperational Testing

The inspector reviewed the licensee's preoperational tests which are required by the FSAR. Procedure P-79.2D, Liquid Process Radiation Monitoring, was completed with one test exception (low flow to the B RHR monitor) which is minor in nature. This test covered the RHR, radwaste discharge, service water, and reactor enclosure cooling water monitors. The lower energy discriminator for these monitors was set at 60keV and were calibrated using Cs-137. Procedure P-79.2C, Main Steam Line Radiation Monitoring, which was completed on August 11, 1984, was reviewed. There were no test exceptions to this procedure. Procedure P-72.1, Offgas System, was also reviewed. The entire offgas waste system, as built, was compared to the FSAR P & IDs. No deviations from the FSAR were noted. Procedure P-72.1 was not completed at the time of this inspection. This test procedure will be reviewed when completed prior to initial criticality (352/84-45-26).

Procedure P-79.2F, Process Radiation Monitoring, which includes the airborne process radiation monitoring was completed on August 20, 1984 without any test exceptions. Procedure P-79.2A, Process Radiation Monitoring, which includes the airborne effluent radiation monitors has not yet been completed. The inspector examined both the effluent and process airborne radiation monitors and noted they were installed in accordance with FSAR descriptions. Pre-operational test procedure P-79.2A will be reviewed when completed prior to initial criticality (352/84-45-28). Procedure P-76.1, Process Sampling was completed on August 15, 1984 with four test exceptions. The resolution of these test exceptions will be reviewed prior to achievement of five percent power (352/84-45-27).

13.4 Area Radiation Monitoring System Preoperational Testing

Documents Reviewed

- Preoperational Test Procedure 1P-79.1, Rev. 0

- ARM System Calibration Procedures
  RT-11-00375
  RT-11-00376
  RT-11-00377

- ARM System Description, Location, and Functions

- Operator actions associated with the ARM system.

The inspector performed a walkdown of the ARM system, verifying that each location contained a detector, indicator and local alarms. The inspector noted that the locations and monitoring ranges were as specified in the FSAR, Chapter 12.3.4. Control room alarms, indicators and recorders were also verified to be consistent with the FSAR.

Preoperational Testing of the ARM Systems: The inspector reviewed Preoperational Test Procedure (1P-79) and test results following the licensee's completion of the preop test. Testing included alarm indicator and trip testing; input, output and recorder functional testing; and pulse injection for high range scale testing; and radiation response and saturation testing using actual sources. The documentation reviewed indicated that all ARM system components and functions had been satisfactorily tested and no discrepancies were noted, other than the inoperative high voltage power supply noted above. The test had been approved on August 20, 1984.

ARM System Calibration. The inspector reviewed calibration procedures and records, interviewed the System Test Engineers and I&C Engineer, and checked for calibration stickers on detectors. It appears that all ARM system components have been appropriately calibrated, however, no calibration records were available for ARM-43, and calibration stickers were missing from several readouts in the Aux Equipment Control Room. Licensee personnel indicated that calibration stickers had been applied to all the Aux Equipment Room ARM meters, but apparently had fallen off due to recent temperature and humidity excursions and sticker design deficiencies.

Based on the above findings, the following item should be resolved prior to exceeding five percent power:

- Verify that adequate documentation records are available for the ARM System (352/84-45-15). The above matter will be reviewed during a subsequent inspection.

13.5 Control Room Isolation and Purge System Preoperational Testing

Documents Reviewed

- 1P-32.2, "Control Room Isolation and Purge"
- T.T. 1.13, "Filter Testing"
- T.T. 1.10, "AM Balance"

Findings

The testing of this system is on-going. No test deficiencies were identified in the test data/methodology used.

Within the scope of the review the following matters requiring licensee attention were identified:

- Six test exceptions are outstanding for procedure 1P-32.2
- Four Technical Specification surveillance procedures (STs) have not been established
- System flow balancing has not been completed
- Control Room pressure test data was unavailable for review
- Laboratory testing of iodine retention for charcoal adsorbers has not been completed (Technical Specification 4.7.2, d1, d2, d3)
- Airflow capacity for Train A (OAS-143) does not meet acceptance criteria
- Test data does not clearly indicate that all chlorine detectors were calibrated

Based on the above findings, the following item should be resolved prior to fuel load:

- Complete testing of the safety related ventilation systems to ensure system meets Technical Specification requirements for surveillance (352/84-45-07).

13.6 Reactor Building Recirculation System Preoperational Testing

Documents Reviewed

1P-34.1, "Reactor Enclosure HVAC System"

Findings

The testing of this system is on-going. No testing deficiencies were identified in the data/methods reviewed.

Within the scope of this review, the following matters requiring licensee attention were identified:

- Five test exceptions are outstanding. These exceptions include performance of system final air balance, in-place leak testing of filters and adsorbers, and laboratory testing of adsorber iodine retention capabilities.

- Several Technical Specification surveillance procedure (STs) have not been established.

- The licensee appeared to be using an inappropriate charcoal adsorber iodine retention efficiency for in-place leak testing. The efficiency used is applicable to systems with humidity control. The Reactor Building Recirculation System is not supplied with humidity control devices. The licensee should review and resolve the matter.

- The licensee's testing of the Reactor Building Recirculation System will be reviewed during a subsequent inspection prior to fuel load (50-352/84-45-29).

13.7 Standby Gas Treatment System Preoperational Testing

Documents Reviewed

- 1P-70.1, "Standby Gas Treatment System"

Findings

The testing of this system is on-going. No deficiencies were identified during a review of the procedure.

Within the scope of the review, the following matters requiring licensee attention were identified:

- Clear open test exception for the Standby Gas Treatment System Preoperational Test

- Complete in-place filter/adsorber testing

- Complete system flow balancing

The licensee's testing of the Standby Gas Treatment System will be reviewed during a subsequent inspection prior to fuel load (50-352/84-45-30).

14.0 Exit Interview

The inspector met with the licensee representatives (denoted in section 1.0) on September 14, 1984. The inspector summarized the purpose, scope and findings of the inspection. In addition, matters requiring resolution prior to fuel load were specifically identified.

At no time during the inspection was written material provided to the licensee by the inspector.

TABLE 1

Type of Counting System: Moving Bed

Isotope	Organ	NRC Value	Licensee Value	Licensee Value / NRC Value
Cs-137	Lung	99	122	1.23
Co-60	Lung	93	112	1.20
Cs-137	GI Tract	89	161	1.80
Co-60	GI Tract	84	146	1.74

Type of Counting System: Stand-up Counter

Isotope	Organ	NRC Value	Licensee Value	Licensee Value / NRC Value
Cs-137	Lung	99	222	2.24
Co-60	Lung	93	148	1.59
Cs-137	GI Tract	89	212	2.38
Co-60	GI Tract	84	188	2.24

*NOTE: All values in nanocuries.

TABLE 2

Sample	Isotope	NRC Value	Licensee Value	Comparison
		Results in Microcuries per Milliliter		
RESL spiked liquid 4-26-84 licensee's Ge detector #1	Cs-137	(1.30±0.03) E-5	(1.48±0.11) E-5	Agreement
	Co-60	(1.25±0.03) E-5	(1.54±0.09) E-5	Agreement
	Ce-144	(5.53±0.10) E-6	<4.7 E-6	No Comparison
	H-3	(7.30±0.21) E-5	(8.37±14%) E-5	Agreement
	Sr-89	(2.01±0.04) E-4	(2.16±5%) E-4	Agreement
	Sr-90	(3.29±0.10) E-5	(3.35±5%) E-5	Agreement
	Fe-55	(2.56±0.26) E-5	(3.8 ±14%) E-5	Agreement
RESL spiked liquid 4-26-84 licensee's Ge detector #2	Cs-137	(1.30±0.03) E-5	(1.59±0.12) E-5	Agreement
	Co-60	(1.25±0.03) E-5	(1.64±0.09) E-5	Agreement
	Ce-144	(3.53±0.10) E-6	<4.1 E-6	No Comparison
RESL spiked liquid 4-26-84 licensee's Ge detector #4	Cs-137	(1.30±0.03) E-5	(1.62±0.12) E-5	Agreement
	Co-60	(1.25±0.03) E-5	(1.62±0.09) E-5	Agreement
	Ce-144	(3.53±0.10) E-6	<5.2 E-6	No Comparison

Note: The licensee uses a vendor laboratory for H-3, Sr-89, Sr-90, and Fe-55 analyses.

Sample	Isotope	NRC Value	Licensee Value	Comparison
		Results in Total Microcuries		
Charcoal Cartridge 1-15-82 licensee's Ge detector #2	Ba-133	(6.2±0.9) E-2	(6.6±0.2) E-2	Agreement
Charcoal Cartridge 5-10-83 licensee's Ge detector #4	Cd-109	(3.42±0.05) E-2	(3.2±0.3) E-2	Agreement
	Co-57	(9.80±0.12) E-4	(9.9±1.1) E-4	Agreement
	Cs-137	(9.74±0.05) E-3	(9.8±0.6) E-3	Agreement
	Co-60	(9.84±0.05) E-3	(1.00±0.04) E-2	Agreement
Particulate Filter 2-22-84 licensee's Ge detector #1	Ce-144	(3.46±0.02) E-2	(3.4±0.2) E-2	Agreement
	Cs-137	(1.50±0.02) E-2	(1.51±0.08) E-2	Agreement
	Mn-54	(1.47±0.02) E-2	(1.44±0.07) E-2	Agreement
	Co-60	(2.68±0.02) E-2	(2.65±0.09) E-2	Agreement

TABLE 2 (Cont.)

Results in Gammas per Second

	Energy (keV)			
Ra-226	186	82±8	82±	Agreement
Particulate	242	176±16	169±	Agreement
Filter	295	440±40	429±	Agreement
licensee's Ge	352	846±85	803±	Agreement
detector #1	609	1065±100	970±	Agreement
	1120	352±35	330±	Agreement
	1238	140±14	125±	Agreement
	1765	363±40	347±	Agreement

Attachment 1

Criteria for Comparing Analytical Measurements

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgement limits are variable in relation to the comparison of the NRC Reference Laboratory's value to its associated uncertainity. As that ratio, referred to in this program as "Resolution", increases the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement must be considered acceptable as the resolution decreases.

$$\text{Resolution} = \frac{\text{NRC REFERENCE VALUE}}{\text{REFERENCE VALUE UNCERTAINTY}}$$

$$\text{RATIO} = \frac{\text{LICENSEE VALUE}}{\text{NRC REFERENCE VALUE}}$$

Resolution	Agreement
<3	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

NOTE: Applies to Table 2 only.