

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-352/95-01
50-353/95-01

Docket Nos. 50-352
50-353

License Nos. NPR-39
NPR-85

Licensee: Philadelphia Electric Company
Correspondence Control Desk
P.O. Box 195
Wayne, PA 19087-0195

Facility Name: Limerick Nuclear Generating Station, Units 1 and 2

Inspection At: Limerick, Pennsylvania

Inspection Conducted: January 9-13 and February 6-10, and 15, 1995

Inspector: *R. L. Nimitz*
R. L. Nimitz, CHP, Senior Radiation Specialist

3/09/95
date

Approved by: *R. Bores*
R. Bores, Chief, Facilities Radiation
Protection Section

3/09/95
date

Areas Inspected: Areas reviewed included previous findings, planning and preparation for the Unit 2 outage, program changes and enhancements, oversight of program activities, organization and staffing, training and qualifications, control of overtime, efforts to maintain radiation exposures as low as is reasonably achievable (ALARA), calibration of radiation detection and monitoring instrumentation, external and internal exposure controls, and radioactive material and contamination controls. The inspection principally focused on the adequacy and implementation of radiological controls for the Unit 2 refueling outage.

Results: The overall results of the inspection indicated that an effective radiological controls program was implemented. Performance based observations of on-going radiological controls activities indicated very good oversight and control of these activities. The performance achieved by the ALARA program was noteworthy particularly as it related to adaptation of innovative techniques to reduce personnel occupational radiation exposure. Overall external and internal occupational exposure controls and radioactive material and contamination controls were considered effective. Appropriately trained and qualified personnel were overseeing outage radiological control activities. Supervisor and management oversight of radiological work

activities was considered generally very good. Two non-cited violations of radiation protection procedures were identified. Several observations were made relative to posting of the drywell and instruction of workers entering therein.

DETAILS

1.0 INDIVIDUALS CONTACTED DURING THE INSPECTION

1.1 LICENSEE PERSONNEL

- 1,2 P. Berry, Manager, Technical Support
- 1,2 R. Boyce, Plant Manager
- 1,2 M. Christinziano, Radiation Protection Manager
- 1,2 D. Helwig, Vice-President, Limerick Generating Station
- C. Hetrick, Radiological Engineer
- 2 J. Kantner, Experience Assessment
- L. Parlato, Physicist
- J. Risteter, Manager Radiological Engineering
- G. Robinson, Senior Instructor, Common Programs
- 1,2 G. Stewart, Engineer-Experience Assessment
- 1,2 S. Taylor, Radiological Engineering Manager

1 Denotes those individuals attending the exit meeting on January 13, 1995.

2 Denotes those individuals attending the exit meeting on February 10, 1995.

The inspector also contacted other licensee individuals during the course of this inspection.

1.2 NRC PERSONNEL

- 1 A. Bryant, General Engineer
- T. Easlick, Resident Inspector, Limerick Station
- 1 D. Mannai, Resident Inspector, Susquehanna Station
- 1,2 N. Perry, Senior Resident Inspector, Limerick Station

1 Denotes those individuals attending the exit meeting on January 13, 1995.

2 Denotes those individuals attending the exit meeting on February 10, 1995.

1.3 OTHERS

- 1 S. Mangi, Nuclear Engineer, Pennsylvania Bureau of Radiation Protection

1 Denotes those individuals attending the exit meeting on January 13, 1995.

1.4 INFORMATION MEETING

In addition to the above licensee contacts, an informational meeting was held with the licensee at the Limerick Site on February 15, 1995. The primary purpose of the meeting was to review and discuss the licensee's high radiation area posting practices for the Unit 2 drywell. Also discussed were the licensee's methods of instructing workers who enter the drywell relative to the provisions of 10 CFR 19.12.

The individuals that attended the meeting were as follows.

Licensee Personnel

M. Christinziano, Manager, Radiation Protection, Limerick Station
D. DiCello, Manager, Radiation Protection, Peach Bottom Station
W. Harris, Radiological Engineer
G. Stewart, Engineer-Experience Assessment
S. Taylor, Radiological Engineering Manager

NRC Personnel

R. Bores, Chief, Facilities Radiation Protection Section
L. Eckert, Radiation Specialist

2.0 PURPOSE AND SCOPE OF INSPECTION

The inspection was an announced inspection of the radiological controls program prior to and during the Unit 2 refueling outage. Areas reviewed during the inspection are important to health and safety and included the following.

- previous inspection findings
- planning and preparation for the Unit 2 outage
- program changes
- program oversight activities
- organization and staffing
- training and qualifications
- control of overtime
- maintenance of personnel occupational radiation exposure as low as is reasonably achievable
- calibration of radiation monitoring instruments
- external and internal exposure controls
- radioactive material and contamination controls
- general plant tour observations

3.0 PREVIOUS INSPECTION FINDINGS

During NRC Combined Inspection Number 50-352/94-27; 50-353/94-27, (Report dated December 13, 1994) the NRC identified weaknesses in the licensee's selection and training program for radiation protection supervisors. As discussed in the previous inspection report, the licensee took immediate corrective actions to ensure appropriately qualified individuals were acting in supervisory positions. On February 10, 1995, the licensee provided a letter to the NRC detailing long-term corrective actions to ensure individuals acting in supervisory positions met minimum qualification and were adequately trained to make informed decisions in the areas they supervised.

The inspector did not have any additional questions on this matter at the time of the inspection. The licensee's program improvements will be reviewed during a subsequent inspection.

4.0 PLANNING AND PREPARATION FOR THE UNIT 2 OUTAGE

The inspector selectively reviewed the licensee's planning and preparation for the Unit 2 refueling outage. The review included the licensee's planning and preparations to reduce personnel occupational radiation exposure to as low as is reasonably achievable (ALARA). Items reviewed included the following.

- increase in staffing
- special training, including use of mock-ups
- ALARA reviews of work packages
- development and tracking of ALARA goals
- oversight of contractor radiological controls personnel
- implementation of ALARA measures
- radwaste reduction efforts

The evaluation of the licensee's performance in this area was based on discussions with cognizant personnel, review of documentation, and inspector observations during tours of the station. During the inspection, the inspector selectively reviewed the planning and preparation for the following Unit 2 work tasks.

- control rod drive removal/replacement
- 2B recirculation pump seal replacement
- low power range monitor replacement
- 13A reactor water clean-up valve work
- 31A recirculation pump discharge isolation valve work
- construction of scaffolding inside the Unit 2 condenser bay with the reactor at power
- removal of reactor cavity biological shielding with the reactor at power
- main condenser work
- in-board main steam isolation valve (MSIV) work

The inspector's review indicated the licensee implemented effective planning and preparation for Unit 2 refueling outage. The following positive observations were made.

- The licensee implemented reasonable occupational exposure goals for the Unit 2 outage work activities.
- The licensee visited other power reactor facilities, including European facilities, to identify potential enhancements for use at the Limerick Station.
- The licensee used an industry peer group consisting of radiological controls personnel from other power reactor stations to perform a review of the licensee's radiological controls program enhancements.

- The licensee developed and implemented extensive pre-job plans for work activities. The pre-job plans extensively used lessons learned from previous outages.
- The licensee identified the numbers of additional support personnel needed for the outage and pre-identified the training and qualifications to be provided to these individuals.
- The licensee identified the duties and responsibilities of radiological controls personnel for the outage. The duties and responsibilities were clearly outlined in "Field Guides" placed at each in-plant radiological control point. The guides included job performance standards for radiological control activities.

The following observation was brought to the licensee's attention.

- The inspector reviewed the following post-outage ALARA radiological controls reports.
 - 1R04 Outage Report, dated August 21, 1992
 - 2R02 Outage Report, dated May 25, 1993
 - 1R05 Outage Report, dated September 1, 1994

The inspector noted that ALARA recommendations were not consolidated and tracked to ensure all appropriate recommendations were implemented.

The licensee indicated this matter would be reviewed.

The inspector's overall review indicated that the licensee performed effective planning and preparation for the Unit 2 outage.

No safety concerns or violations were identified.

5.0 CHANGES AND ENHANCEMENTS

The inspector reviewed changes at the licensee's facility in the area of radiological controls since the previous inspection. Areas reviewed were:

- organization and staffing,
- procedures and programs, and
- facilities and equipment.

The inspector made the following observations.

Organization and Staffing

- No changes that would adversely affect the organization were identified. A new Field Operations Health Physics Supervisor was selected in December 1994. The licensee now has filled all field operations supervisor positions (six total).

Procedures and Programs

- The licensee implemented two new radiological controls posting initiatives. The first involved enhancement of radiological controls postings throughout the radiological controlled area (RCA). The enhancement provides for 1) clear direction to workers regarding protective clothing dress-out requirements to enter areas within the station and 2) clear identification of the specific radiation work permit on which personnel must be signed in to enter areas.

The second posting enhancement involved the posting of radiological area maps at the main access control points and identification of minimum radiological controls interface requirements needed to enter areas. These were considered good initiatives.

- The licensee has initiated a program to provide for uniform protective clothing (scrubs) to be worn while in the RCA during the outage at Unit 2. The scrubs provide for ease of dress-out and limit potential contamination of personnel clothing. This was considered a good initiative.
- The licensee has initiated the use of work centers within the RCA. Three such centers were located in Unit 2 at the diesel airlock (217' reactor building) and the 217' and 269' elevations of the turbine building. The work center is an area in the RCA to which workers initially go at the start of their work shift to drop off their lunches, muster and obtain their work assignments. At break time and lunch the workers go to the appropriate work center. Entry into the work center area could be either directly from outside the RCA into the work center or directly into the work center from the RCA. Workers who enter from the RCA would be required to perform personnel contamination monitoring as if they were exiting the RCA even though the area would be a small confined area within the RCA. The areas were provided with plexiglass or fencing restrictions to prevent workers from inadvertently transferring potentially contaminated material into the work control center from the RCA.
- The licensee modified the radiation work permit (RWP) program to directly incorporate the RWP into the work order program. Workers now are provided the basic radiological control instructions via the work order program. Additional information is provided via pre-job briefing packages and postings at job locations

Facilities and Equipment:

- The licensee has initiated the use of an electronic dosimetry system that provides for real-time monitoring of personnel radiation exposure. When a worker enters the radiological controlled area (RCA), the dosimetry system software automatically

checks the records of the individual to ensure all applicable training is current, the individual is authorized to enter the RCA on the indicated RWP, and that the individual has the appropriate radiation exposure available before reaching an administrative limit. When the individual checks out of the RCA (logs out), the electronic dosimetry system provides for automatic updating of personnel exposure records. The electronic dosimetry device has multiple alarm options. The inspector noted that at the entrance to the RCA the licensee provided a picture of a worker showing proper wearing of the device.

- The licensee implemented the use of the new access control/radiological control field office at the 217-foot elevation of the Unit 2 turbine building. The facility was considered an excellent initiative to improve access control.

The following observations relative to the above changes were brought to the licensee's attention.

- Regarding the work control centers, the inspector noted that some work centers require workers, prior to entering the RCA, to place their lunches in a clean green bag, carry it through the RCA, remove it from the clean bag and then place it in the work center. The clean bags would be collected and subsequently monitored for contamination after a number of them were collected. The inspector questioned the adequacy of this practice to preclude inadvertent contamination of the lunches. For example, the inspector noted that personnel traversing the RCA may interact with personnel who may be contaminated or may encounter contamination.

The licensee indicated the lunches are removed from the transport bags and placed into the work center. Personnel would frisk for contamination prior to entering the area. Also, the transport bags would be frisked after several have been accumulated. In addition, the work centers are surveyed for radioactive contamination during each shift. The licensee indicated these actions would preclude intake of contamination by personnel. The inspector did not have any additional questions on this matter.

- Regarding the worker pictured at the RCA access point as an example to other workers as to how to properly wear protective clothing and dosimetry, the inspector noted that the worker appeared to be wearing his electronic dosimetry backwards (i.e., the electronic dosimeter was turned front to back). The dosimeter, according to the licensee, is to be worn in a certain manner. The licensee reviewed this matter and concurred with the inspector's observation. The licensee initiated actions to correct the pictures at the RCA entrances. During the inspection a revised picture was placed at the RCA entrances depicting proper wearing of the dosimetry.

The inspector's overall review indicated that the licensee implemented a number of very good initiatives to enhance the overall performance and capabilities of the radiation protection program.

No safety concerns or violations were identified.

6.0 OVERSIGHT OF PROGRAM ACTIVITIES

The inspector selectively reviewed the licensee's efforts to oversee radiological controls program performance.

The evaluation of the licensee's performance in this area was based on discussions with personnel, review of various documents, and observations of in-field activities and conditions.

The following documents were reviewed.

- Limerick Quality Assurance Division Surveillance Reports for 1995
- Performance Enhancement Program (PEP) documents and findings for 1995
- Limerick Generating Station Personnel Contamination Reports- 1994 Year End Summary
- Health Physics 1994 Radiological PEP Issues Executive Summary
- Health Physics 1994 Year End Report, dated January 12, 1995
- Review of Industry Regulatory Events with Radiation Protection Significance, dated December 27, 1994

The inspector's review indicated the following.

- The licensee maintained and implemented a diverse selection of program oversight and evaluation methods.
- The licensee implemented performance-based surveillance of on-going radiological work activities, including outage activities.
- The licensee evaluated long-term performance relative to identification of initiatives for program enhancement.
- The licensee collected and evaluated reports of industry radiological controls incidents to identify initiatives/actions to preclude occurrence of the incidents at the Limerick Station.
- Corrective actions on self-identified events were timely and comprehensive.
- The licensee extensively evaluated personnel contamination events to identify areas for enhancement.

No violations or safety concerns were identified. The licensee implemented an effective program to oversee the radiological controls program.

7.0 ORGANIZATION AND STAFFING

The inspector reviewed the organization and staffing of the onsite radiological controls organization. The review was with respect to criteria contained in applicable Technical Specifications and licensee administrative documents.

The inspector evaluated licensee performance in this area by review of applicable documentation, discussions with cognizant individuals, and independent observation of on-going work activities during tours of the facility. The inspector also reviewed the Unit 2 Refueling Outage Organization to evaluate the method of licensee oversight of contracted radiological controls personnel.

The inspector's review indicated that the licensee implemented a well defined and staffed Unit 2 outage radiological controls organization. There was generally very good supervisory and management oversight of work activities. The inspector noted that the licensee established and provided radiological control point information manuals at radiological controls points. Among other items, the manuals provided organization descriptions, personnel responsibilities, personnel authorities, and limitations. The manuals also contained personnel qualification information which identified which tasks specific personnel were qualified to perform. The inspector also noted that the manuals contained, where appropriate, lessons learned and descriptions of previously identified concerns or problems associated with selected work areas. The use of these manuals was considered a very good licensee initiative.

No safety concerns or violations were identified.

8.0 CONTROL OF OVERTIME

The inspector reviewed the licensee's oversight and control of overtime for radiological controls personnel. The review was against criteria specified in the following documents.

- Technical Specification 6.2.2, "Unit Staffing"
- A-C-40, "Working Hour Restrictions"
- Plant Division Overtime Guidelines, dated January 1, 1995
- Health Physics Overtime Offering Sequence, dated January 4, 1995

The evaluation of the licensee's program was based on review of overtime sheets and discussions with cognizant personnel.

The inspector's review indicated the licensee closely tracked and monitored overtime relative to Technical Specification requirements. The licensee conservatively tracked the overtime, but did not make allowance for shift turnover time. No individual was identified that exceeded overtime guidelines for safety related work activities.

The following observation was brought to the licensee's attention.

- The licensee's overtime program allowed for a Radiation Protection Supervisor to approve overtime that was associated with non-safety related activities. The inspector noted that although, no overtime limits had been exceeded, the licensee's administrative procedures did not clearly identify what constituted safety related activities. Approval of overtime for safety related activities was authorized by only selected individuals (i.e., Plant Manager and those designated by the Plant Manager to approve safety-related overtime). The inspector noted three individuals had exceeded 80 hours in a seven-consecutive-day period, but that the work time was not associated with safety related work. The licensee acknowledged the observation and indicated the matter would be reviewed and overtime guidelines enhanced, if appropriate.

No violations were identified.

9.0 TRAINING AND QUALIFICATION

The inspector reviewed the training and qualification of radiological controls contractor personnel supporting Unit 2 refueling outage work activities. The inspector also reviewed the training and qualification of radiation workers performing radiological work activities during the outage.

The inspector evaluated the licensee's performance in this area by review of resumes and training records, discussions and with cognizant personnel and observations of on-going activities.

The following observation was brought to the licensee's attention.

- On February 7, the inspector toured the refueling floor. The inspector requested a briefing as to the meaning of a tic-tack-toe like listing of radiation survey values depicted on the radiation survey for the refueling floor. The inspector noted that the senior radiation protection technician at the control point was not able to correctly identify the location of the various radiation dose rates indicated in the tic-tack-toe like matrix. The inspector and technician obtained and referred back to the original survey to identify the correct dose rate locations. The licensee subsequently added a legend to the large map to explain locations of the radiation survey values on the matrix. The inspector's review of other control points did not identify

similar concerns. The inspector did not have any further questions on this matter.

No safety concerns or violations were identified.

10.0 ALARA PROGRAM

The inspector reviewed selected aspects of the licensee's ALARA Program. The principal focus of the review was the evaluation of the licensee's efforts to maintain personnel occupational radiation exposures ALARA.

The inspector reviewed this area against general guidance and criteria contained in the following documents.

- 10 CFR 20.1101, Radiation Protection Program
- 10 CFR Part 20.1702, Use of Other Controls
- Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be As Low As Is Reasonably Achievable
- Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable

The evaluation of the licensee's performance was based on discussions with cognizant personnel, independent inspector observations during tours of the station, observations of on-going work activities (as appropriate), and review of documentation.

The inspector reviewed ALARA planning and implementation for the following work activities.

- control rod drive removal
- 2B recirculation pump seal replacement
- low power range monitor replacement
- 13A reactor water clean-up valve work
- 31A recirculation pump discharge isolation valve work
- construction of scaffolding inside the Unit 2 condenser bay with the reactor at power
- removal of reactor cavity biological shielding with the reactor at power
- main condenser work
- main steam isolation valve work
- non-destructive evaluation of various reactor vessel nozzles

The inspector's review indicated the licensee established a Unit 2 outage occupational exposure goal of 104 person-rem. As of February 15, 1995, the licensee sustained an accumulated exposure of 103.2 person-rem. The inspector's review indicated overall very good conformance with established goals.

The inspector noted, among others, the following ALARA initiatives.

- The licensee effectively implemented the total effective dose equivalent (TEDE) concept. The licensee effectively used decontamination and other process and engineering controls to limit airborne radioactivity. Virtually all major work activities were performed without use of respiratory protection equipment. Based on review of personnel exposure records for airborne radioactivity, no significant intakes or widespread low level intakes of airborne radioactivity occurred.
- The licensee purchased a mock-up of the 2B recirculation pump discharge isolation valve for training purposes. Also, the adequacy of repair techniques was evaluated.
- The licensee used a local draining technique for draining the 2B reactor recirculation pump just prior to seal replacement. This practice allowed for maximum shielding of the pump bowl and provided for keeping the pump seal surfaces wet during seal package removal.
- The licensee installed standardized drywell shielding packages.
- The licensee established Drywell Radiation Sources Booklets to familiarize personnel with radiation sources in the drywell.
- The licensee used roving radiation protection technicians within the drywell to monitor on-going operations. The rovers were equipped with radio headsets and maintained continuous communications with control point personnel. Similar headsets were used on the refueling floor.

The inspector reviewed the licensee's planning and preparation for implementation of hydrogen water chemistry (HWC). The inspector noted that industry experience has indicated that use of hydrogen water chemistry could result in increased radiation dose rates in plant areas. The licensee was evaluating the expected dose rate increases and the need for additional shielding. A radiological assessment of implementing HWC was performed by the licensee's contractor. The licensee was evaluating the assessment. The inspector's discussions with licensee personnel indicated HWC would most likely be implemented later in 1995. The licensee plans on closely monitoring the potential increased onsite and offsite radiation dose rates.

Based on the above review, the inspector concluded that the licensee implemented effective exposure controls to minimize unnecessary radiological exposure. Exposure goals were reasonable, ALARA controls were implemented, and lessons learned (as appropriate) from previous outages were implemented. The licensee's overall ALARA planning was considered of high quality.

No safety concerns or violations were identified.

11.0 INSTRUMENT CALIBRATION AND USE

The inspector reviewed the licensee's program for calibration and checking of portable radiation survey instruments. The inspector also reviewed the calibration and use of the licensee's newly acquired (September 1994) electronic personnel dosimetry system. The evaluation of the licensee's performance was based on discussion with cognizant personnel and review of the calibration and testing program.

The inspector reviewed the calibration and checking program for portable radiation monitoring instruments program against criteria contained in ANSI-N323, 1978, "Radiation Protection Instrumentation Test and Calibration".

The inspector's review indicated the licensee's calibration and checking program was generally consistent with the guidance in the standard and of good quality. The following observation was brought to the licensee's attention.

- The inspector noted that the licensee's program does not discuss all calibration uncertainties discussed in the ANSI standard. For example, the licensee's program documents do not discuss uncertainties of radiation source calibration. The inspector noted that the ANSI standard indicates a source calibration acceptance standard of $\pm 2\%$. The licensee was using $\pm 5\%$.

The licensee indicated this matter will be reviewed.

The inspector reviewed the calibration and checking of the licensee's new electronic dosimetry system against criteria contained in NRC Regulatory Guide 8.28, "Audible Alarming Dosimeters", August 1981. The system was installed in December 1994 and placed in full use in January 1995. At the time of the inspection, the licensee was phasing in use of the dosimeters but was continuing to maintain and provide workers with pocket ionization chambers. However, the licensee was using the electronic dosimeters for routine live-time exposure monitoring purposes. The inspector's review indicated the following.

- The licensee issued a comprehensive specification to the vendor when the devices were purchased. The licensee used ANSI N42.17A-1989, "Performance Specifications for Health Physics Instrumentation-Portable Instrumentation for Use in Normal Environmental Conditions", and ANSI N13.27-1981, "Performance Requirements for Pocket-sized Alarm Dosimeters and Alarm Ratemeters", to develop the specification. The specification includes comprehensive calibration and evaluation of the devices.
- The licensee performed site acceptance testing of the devices. The testing included down-loading of data, testing of dose rate alarms, and testing of accumulated exposure alarms.

- The licensee evaluated the device against applicable national standards and regulatory guides. The licensee established a systems use guide and modified procedures to provide for use of the device. The licensee also concluded that controls were needed to ensure the devices were not used in high noise environments.
- The licensee provided training of radiation protection personnel and radiation workers on use of the device.

The inspector's review identified the following violation.

- The licensee's health physics instrumentation program (HP-400, Revision 12) specifies in Section 6.5 that when offsite calibrations are performed, the licensee will ensure that the calibration facilities are on the Evaluated Vendor list. The inspector's review indicated the calibration vendor used for initial calibration of the electronic dosimeters was not on the Evaluated Vendor list.

The inspector reviewed the above violation relative to NRC's Enforcement Policy (10 CFR Part 2, Appendix C., Section VII.B.1) for NRC identified violations and concluded that the violation met the criteria for not issuing a Notice of Violation (non-cited violation). The inspector noted that the violation was of minor safety significance since the licensee's staff performed comprehensive oversight of the calibration and testing of the device, procedures were immediately changed to preclude recurrence, the violation was not willful, and there was no precursor to the violation which would have resulted in preventative actions to preclude this violation.

The inspector's review of the implementation of the electronic dosimetry program identified the following additional observations which were brought to the licensee's attention.

- Although the licensee had developed a systems-use guide and provided minor procedure revisions for use of the devices, there was limited procedure guidance for actual operation, use or calibration and checking of the dosimeters.

The licensee subsequently issued procedures for operation and use (HP-UG-11, Operation of the RAD-51 Electronic Dosimeters) and calibration (HP-UG-10, Verification/Calibration of RAD-51 Electronic Dosimeters) of the dosimeters.

- The inspector's discussions with radiation protection technicians indicated limited understanding of the actual limitations on use of the electronic dosimeter.

The licensee placed in the above discussed use procedure (HP-UG-11) a comprehensive listing of dosimeter capabilities and

limitations. Personnel were trained on the new procedures as appropriate.

- There was no apparent administrative program in-place that controlled introduction of new instruments and equipment into the site radiation protection program. Such a program would provide for establishment of appropriate procedures and training of personnel prior to placement in-service of the new instruments and equipment.

The licensee indicated this matter would be reviewed.

12.0 EXTERNAL AND INTERNAL EXPOSURE CONTROLS

12.1 GENERAL

The inspector reviewed the implementation and adequacy of radiological controls at Units 1 and 2. The inspector's review principally focused on review of outage work activities at Limerick Unit 2.

The inspector toured the radiologically controlled areas of the plant and reviewed the following elements of the licensee's external and internal exposure control program.

- posting, barricading and access control, as appropriate, to radiation, high radiation, and airborne radioactivity areas
- high radiation area access point key control
- personnel adherence to radiation protection procedures, radiation work permits, and good radiological control practices
- use and placement of dosimetry devices
- use of respiratory protection equipment
- installation, use and periodic operability verification of engineering controls to minimize airborne radioactivity
- records and reports of personnel exposure
- assessment of internal exposure (as appropriate) and maintenance of individual derived air concentration (DAC)-hour tracking logs
- quality control of whole body counting equipment
- adequacy of radiological surveys to support pre-planning of work and on-going work
- adequacy of supply, maintenance, calibration, and performance checks of survey instruments
- hot particle controls

The review was with respect to criteria contained in applicable licensee procedures and 10 CFR Part 20, "Standards for Protection Against Radiation".

The evaluation of the licensee's performance was based on discussions with cognizant personnel, independent inspector observations during tours of Units 1 and 2, observations of on-going work activities, and review of documentation. The inspector reviewed on-going work activities and made radiation surveys, as appropriate, to verify

radiological survey information and evaluate the adequacy of radiological controls.

12.2 FINDINGS (GENERAL)

The inspector's review indicated generally very good radiological controls were implemented for the work activities reviewed. Radiological surveys and controls were appropriate for the tasks reviewed by the inspector. Technicians and workers were knowledgeable of radiological conditions at their work locations.

The inspector noted that the licensee provided expected radiological conditions for work areas to inform workers as to the radiological conditions to be encountered.

12.3 FINDINGS (SPECIFIC)

12.3.1 Adherence to Radiation Work Permits and Radiation Protection Procedures

The following violation associated with adherence to radiation protection procedures was identified.

- At about 10:00 a.m. on February 6, 1995, the inspector noted that an individual was working on reactor N8 nozzle on the 277' elevation of the drywell. General area radiation dose rates in the location were 800 mR/hr. Subsequent inspector and licensee review indicated the individual had expected to work on an N17 nozzle on the 296' elevation of the drywell, but due to other considerations had moved to the N8 nozzle to perform "flapping" without informing radiation protection personnel. The worker had been briefed on the radiation dose rates at the 277 nozzle and had been briefed a week earlier on the N8 nozzle radiation dose rates. The inspector noted that these observations were identified both by the inspector and a licensee radiological controls technician accompanying the inspector. The inspector noted that the individual was aware of the radiation dose rates in the area and was wearing an integrating alarming dosimeter.

The inspector noted that the individual and his supervisor did not adhere to their radiation work permit (LG O 95-08, Revision 0), which required personnel to notify radiation protection personnel prior to "flapping" and when moving to a new job location. This was considered a violation of licensee Procedure A-C-100, "Radiation Protection Program". Procedure A-C-100 requires in Section 5.4.2, that workers obey posted, oral, and written radiological control instructions and procedures, including instructions on radiation work permits. The inspector noted that failure to adhere to radiation protection procedures was a violation of Technical Specification 6.11, which requires adherence to radiation protection procedures.

The inspector reviewed the above violation relative to NRC's Enforcement Policy (10 CFR Part 2, Appendix C., Section VII.B.2). The inspector noted that the licensee took the following corrective actions.

- The individuals (contractors) were removed from the area of the N8 nozzle. The worker and supervisor were counseled.
- A work stand-down for the affected contractor organization was initiated at 1:00 p.m. on February 6, 1995. Limerick station management met with contractor management and workers to discuss expectations regarding adherence to procedures and the keeping of radiation protection personnel informed of work activities. Other contractor organizations were also informed of the event and the need to keep radiation protection personnel informed of work activities.
- The event was incorporated into the Performance Enhancement Program (PEP). A PEP issue was initiated on February 6, 1995.
- Action was taken to incorporate the event into the vendor (contractor) training program.
- An action item was initiated to review the adequacy of radiological controls job performance standards.

Based on the above, the inspector concluded that the licensee took immediate and intermediate corrective actions to preclude recurrence. The licensee also initiated several long-term corrective actions. The inspector noted that the failure to adhere to procedures was not willful and that radiation dose rates in the area (N8 nozzle) had not increased since the previous week for which the contractor had been briefed. The inspector concluded that the above corrective actions and circumstances (i.e., no apparent potential for a significant personnel exposure) met the criteria for non-issuance of a Notice of Violation identified in 10 CFR Part 2, Appendix C., Section VII.B.(2).

12.3.2 Posting of High Radiation Areas and Instructions to Workers

Regarding posting of high radiation areas, the inspector reviewed the licensee's posting of individual high radiation areas within the Unit 2 drywell, and the adequacy of instructions to workers. This matter was reviewed during the inspection and further discussed during the informational meeting described in Section 1.4 of this report.

- The inspector noted that 10 CFR 19.12 requires that workers, working in or frequenting a restricted area be kept informed of radiation in such portions of the restricted area and of precautions or procedures to minimize exposure. 10 CFR 19.12 requires that such instructions be commensurate with potential

radiological health protection problems in the restricted area. A method of informing workers of the presence of high radiation areas is the posting and barricading of such areas.

The inspector also noted that Technical Specification 6.12 requires that each high radiation area in which the intensity of radiation is greater than 100 millirem/hr but less than 1000 millirem/hr be barricaded and conspicuously posted. The inspector also noted that the licensee's procedure (HP-C-215, Revision 1, Section 7.5.2) requires that each entrance to or access point to a high radiation area be provided with appropriate warning signs.

The inspector further noted that NRC Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas in Nuclear Power Plants", specifies in Section 2.5, that if access control to a high radiation area is located beyond the immediate boundaries of the high radiation area, individual high radiation areas should be posted separately to identify the actual areas of concern. The licensee controls access to the drywell at the drywell entrances and roving radiation protection personnel are used in the drywell for local control. The licensee provides extensive briefing to workers on the radiological conditions to be encountered at the workers' work locations.

Regarding the above posting directions, the inspector noted that the licensee posted the access point to the drywell as a high radiation area. The inspector noted that, due to extensive licensee shielding efforts, it appeared that only selected areas within the drywell actually exhibited radiation dose rates greater than 100 millirem/hr. The inspector noted that the licensee did post various components and pipes with signs which stated "Source of Radiation - Minimize Time in Area". The licensee identified "low dose wait areas" in the drywell on maps and via postings hung in the drywell. The licensee also provided general area dose rate readings for each elevation on a posting at the entrances to the drywell. The postings indicated the following on February 6, 1995.

- elevation 303' - 4mR/hr to 280 mR/hr
- elevation 296' - 4mR/hr to 600 mR/hr
- elevation 286' - 4 mR/hr to 180 mR/hr
- elevation 277' - 10 mR/hr to 800 mR/hr
- elevation 238' - 2-1600 mR/hr

During the inspection, the inspector made the following observations relative to the licensee's posting practices within the drywell.

- Only the entrances to the drywell were posted as high radiation areas.

- The licensee marked numerous pipes and components as "sources of radiation".
- A "source of radiation" sign was missing from a piping run on elevation 296'. General area radiation dose rates were about 110 mR/hr. A sign was subsequently placed at the location.
- The inspector encountered an area on the 277' elevation with readily accessible radiation dose rates of about 200 mR/hr, however, the location did not have a clearly visible "source of radiation" sign.
- There was no apparent clear definition as to what constituted a "source of radiation". Also, it was not clear as to how a worker would, during transit of a component marked "source of radiation", be aware of dose rate gradients that could be encountered.
- Two individuals in route to their work locations were not able to provide the inspector an indication as to the radiation dose rates the individuals would be traversing to get to the work location. The inspector's measurements indicated dose rates in the immediate vicinity to be traversed were about 110 mR/hr. The workers were very knowledgeable of the expected dose rates at their work location.
- A "low dose wait area" sign was observed on the floor in the drywell. The sign was re-hung.
- The licensee indicated workers would be alerted to higher radiation dose rates as they pass through the drywell via increases in "beeping rates" of their personnel electronic dosimeters. During the inspector's tours of the drywell, the inspector was not able to discern any significant audible change in beeping rates.

The licensee indicated the above matters would be reviewed. The inspector indicated the licensee's posting practices will be reviewed during a future inspection.

Licensee representatives informed the inspector that the purpose of the "source of radiation" signs was to inform workers of sources of radiation. Workers were to quickly go by these sources to get to their work locations. The workers were provided detailed instructions regarding their work area dose rates. The licensee believed that since workers would quickly traverse the areas and get to their work locations, more detailed briefings on the area they would be traversing were not needed. The licensee identified the areas that were considered a source of radiation by use of the "source of radiation" sign and coloring of components

on survey maps to indicate sources. The maps were provided to workers.

The licensee documented this practice in a radiation protection position. The licensee's position paper included guidance and references to NRC Health Physics Positions outlined in NUREG/CR-5569, "Health Physics Positions Data Base".

The inspector reviewed the licensee's position paper and compared the licensee's position to NRC radiological controls program guidance contained in NUREG/CR-5569.

The inspector's review indicated the licensee's practice regarding posting of high radiation areas and instructions to workers appeared to be consistent with the general guidance provided by the NRC.

No violations were identified.

13.0 RADIOACTIVE MATERIAL CONTROL AND CONTAMINATION CONTROL

The inspector reviewed the adequacy and effectiveness of radioactive material, contaminated material, and contamination controls at Unit 1 and 2. The inspector principally focused on review of the following matters.

- personnel frisking practices
- use of proper contamination control techniques at work locations, including control of hot particles
- posting and labeling (as appropriate) of contaminated and radioactive material
- efforts to reduce the volume of contaminated trash including steps to minimize introduction of unnecessary material into potentially contaminated areas
- adequacy of contamination surveys to support planning for and support of on-going work

The evaluation of the licensee's performance in this area was based on independent observations by the inspector, discussions with cognizant personnel, and review of documentation including training records.

The inspector's review indicated the licensee implemented effective radioactive material and contamination controls.

The following observation was made.

- The inspector noted that the licensee averaged about 224 total personnel contaminations for each of the years during the period 1992- 1994. Of the total, the licensee averaged about 134 personnel contaminations during the three outages which occurred during the same period. The inspector noted that for 1995, and as of February 15, 1995, the licensee had sustained a total of 35

personnel contaminations (31 during the Unit 2 outage). The inspector noted that as of February 15, 1995, the major outage radiological work activities were complete. Consequently, it was unlikely that additional numbers of personnel contamination would be encountered under current conditions.

The inspector noted that for 1994 and 1995, none of the skin contaminations resulted in any significant skin dose. A number of the skin contaminations were expected due to the licensee's efforts to reduce total effective dose equivalent.

The inspector reviewed the licensee's actions on self-identified contamination control issues. The licensee's actions on these issues was good.

No safety concerns or violations were identified.

14.0 GENERAL PLANT TOUR OBSERVATIONS

The inspector toured the station during the inspection. The following observations were made.

- The inspector's observations indicated that overall, the station exhibited very good housekeeping. Areas were clean, well lit and orderly. The inspector noted however, based on a February 9, 1995 tour, some exceptions to this overall good performance in the drywell. The inspector observed water puddles on the floor on the lower elevations and insulation sheeting was stacked precariously. The inspector was struck by a piece of falling metal insulation. The inspector noted some tools at unoccupied locations.

The licensee indicated housekeeping tours were routinely preformed as well as general housekeeping. The licensee indicated the observations were reflective of transient conditions and housekeeping would be addressed during closure of the drywell for plant start-up.

- On February 9, 1995, the inspector observed an individual attempting to lift a pressurized acetylene tank with a rope to an overhead area. The inspector considered the mode of lifting to be questionable and informed a radiation protection supervisor. The supervisor immediately halted the activity and informed the on-site safety group. The questionable lifting practices were discussed in subsequent outage meetings.

15.0 Exit Meetings

The inspector met with licensee representatives (denoted in Section 1.0) on January 13 and February 10, 1995. The inspector summarized the purpose, scope and findings of the inspection.

During the exit meeting on February 10, 1995, the licensee indicated that current high radiation area posting practices for the drywell were believed to be in accordance with NRC guidance. The licensee also indicated safety related overtime was closely controlled. The licensee further indicated the few questionable drywell housekeeping observations were reflective of transient conditions only.