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 ATLANTA, GEORGIA 30323

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Report Nos.: 50-338/92-12 and 50-339/92-12

Licensee: Virginia Electric and Power Company
 Glen Allen, VA 23060

Docket Nos.: 50-338 and 50-339 License Nos.: NPF-4 and NPF-7

Facility Name: North Anna 1 and 2

Inspection Conducted: April 20-24, 1992

Inspectors: *A. T. Boland* 5/18/92
 A. T. Boland Date Signed

for *E. B. Pharr* 5/18/92
 E. B. Pharr Date Signed

Approved by: *J. P. Potter* 5/18/92
 J. P. Potter, Chief Date Signed
 Facilities Radiation Protection Section
 Radiological Protection and Emergency
 Preparedness Branch
 Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, unannounced inspection of the licensee's radiation protection (RP) program involved review of health physics (HP) activities including program organization and staffing, self-assessment programs, RP training, operational and administrative controls, internal and external exposure monitoring and assessments, radioactive material and contamination controls, and ALARA program implementation. In addition, actions related to two recent licensee events and receipt of selected Information Notices (INs) were reviewed.

Results:

The licensee's radiological protection program activities were adequate to protect the health and safety of plant workers. Routine external and internal exposure programs were effectively implemented. Personnel exposures, with the exception skin dose associated with a hot particle event (Paragraph 5.b), were less than 10 CFR Part 20 limits. Identified program strengths included the Advanced Radiation Worker and Contractor HP

Technician training programs, initiatives to reduce respiratory protection usage and increase engineering controls, good material control, and overall excellent housekeeping practices. A weakness regarding the failure to control access to locked high radiation areas (Demineralizer Alley and the 262' elevation of containment) was identified.

The following non-cited violation (NCV) was identified:

- Licensee identified violation for the failure to limit access to areas with general area dose rates in excess of 1000 mR/hr. NCV of Technical Specification 6.12.2 with licensee corrective actions completed prior to the end of the onsite inspection (Paragraph 8.a).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- J. Breeden, Supervisor, Radiological Analysis
- E. Dreyer, Supervisor, Health Physics Technical Services
- *R. Evans, Jr., Health Physics Supervisor - Operations
- H. Hay, Supervisor, Quality (Corporate)
- *G. Kane, Station Manager
- J. Kortse, Staff Engineer
- H. Moyers, Health Physics Shift Supervisor
- D. Mullins, Senior Health Physics Technician
- N. Nichol森, Senior Staff Health Physicist
- T. Peters, Supervisor, Exposure Control
- C. Smith, ALARA Coordinator
- *J. Smith, Manager, Quality Assurance
- *A. Stafford, Superintendent, Radiation Protection
- *J. Stall, Assistant Station Manager, Nuclear Safety and Licensing
- *W. Thornton, Director, Health Physics and Chemistry Services (Corporate)

Other licensee employees contacted included engineers, technicians, and office personnel.

Nuclear Regulatory Commission

- *M. Lesser, Senior Resident Inspector
- *Attended April 24, 1992, Exit Meeting

2. Organization and Staffing (83750)

The inspector reviewed and discussed with licensee representatives changes made to the RP organization since the last NRC inspection of this area conducted July 22-26, 1991, and documented in Inspection Report (IR) 50-338, 339/91-12. Cognizant licensee representatives stated that although a few minor personnel changes had been implemented, the overall reporting chain and management structure of the RP Program has remained unchanged.

Current North Anna HP staffing included 39 HP technicians and 14 specialists allocated to the onsite RP organization. At the time of the onsite inspection, the inspector was informed that one technician and one specialist position were vacant. Licensee representatives stated that 7 permanent contractor technicians were maintained on staff to support routine activities and provided augmented supervisory coverage during outages. All other supervisory and staff positions allocated to the RP group were filled.

During discussions with licensee training representatives, the inspector was informed that currently two HP technicians were in initial training status. The technicians had recently completed the first cycle of HP technician training, which involved six months of classroom theoretical instruction, and successful completion of Advanced Radiation Worker (ARW) and Emergency Preparedness training. For the remainder of the 42 month initial training process, the two technicians will be performing inplant activities to include completion of required Job Performance Measures (JPMs) and self-study training.

During the recently completed Unit 2 outage, licensee representatives stated that approximately 56 senior technicians and 21 junior technicians were hired to supplement the routine HP staff. The training and qualifications of these contractor employees is discussed in Paragraph 3.a.

Overall, the inspector did not note any concerns regarding the HP organization and staffing. The staffing appeared stable and the minor personnel changes did not appear to adversely impact conduct of RP activities.

No violations or deviations were identified.

3. Radiation Protection Training and Qualifications (83750)

10 CFR 19.12 requires, in part, that the licensee instruct all individuals working in or frequenting any portion of a restricted area in the health protection aspects associated with exposure to radioactive material or radiation; in precautions or procedures to minimize exposure; in the purpose and function of protection devices employed; in the applicable provisions of the Commission regulations; in the individual's responsibilities; and in the availability of radiation exposure data.

The inspector reviewed the licensee's training program for ARWs and contractor HP technicians, as well as continuing training for HP technicians.

a. Contractor HP Technician Training

Nuclear Standard TRNS-2704, Contractor Training and Qualification, Revision (Rev.) 0, dated February 7, 1992, describes the requirements for determining, verifying, and documenting the qualifications of contractor employees to perform functions which could potentially affect nuclear safety and plant performance.

The inspector discussed with licensee representatives the theoretical test, site orientation training, and JPM evaluations as required for ANSI 3.1 qualified contractor HP technicians. Licensee representatives stated that senior technicians were required to complete the theoretical test with at least a 70 percent grade prior to proceeding with the two day site orientation training. The orientation to site-specific radiological work practices emphasized selected practices, as well as selected generic station administrative procedures, and required a successful completion of a written examination with a 70 percent grade. Further, the inspector discussed and reviewed with licensee representatives the JPMs used to evaluate and to certify a worker's ability to perform specific tasks.

The inspector reviewed resumes and verified compliance with ANSI 3.1 requirements for selected contract HP technicians. The inspector also reviewed training records for these selected ANSI-qualified contract technicians and verified successful completion of the theoretical examination, site orientation training and the associated examination, and JPMs, which included conducting routine radiation and contamination surveys, hot particle surveys, containment surveys, and providing radiological work coverage.

The program for contract HP technician training appeared comprehensive and was considered a HP program strength.

No violations or deviations were identified.

b. HP Technician Continuing Training

The inspector reviewed the HP continuing training program. The inspector noted that the training program was designed to upgrade skills, as well as maintain employees knowledgeable of plant modifications and procedures, and familiarity with relevant industry experience and technological changes. The inspector was informed that course content was influenced by assessments that are performed annually. The HP group provided their suggestions and recommendations for training topics during these assessments.

The inspector reviewed the 1992 HP continuing training schedule and noted that the 160 hours of scheduled training included such topics as new instrumentation, procedure revisions, Emergency Plan and Monitoring Team training, industry events, plant systems, and 10 CFR 20

revisions. Licensee representatives stated that the next cycle of continuing training would include a discussion of the Unit 2 refueling barrier incident (Paragraph 8.a).

No violations or deviations were identified.

c. Advanced Radiation Worker (ARW) Training

The inspector reviewed and discussed ARW training with cognizant licensee representatives. The inspector noted that ARW training had been separated into two levels with Level 1 training geared towards workers requiring access to high radiation areas (HRA) for the purpose of walkdowns, planning, minor testing, and sampling; whereas Level 2 was designed for workers requiring HRA access for the purpose of performing system or component maintenance in the area.

The inspector reviewed course outlines and noted that the two day Level 1 training qualified workers to use selected radiation monitoring instrumentation to determine gamma radiation dose rates, to access HRAs and locked HRAs without continuous HP coverage, and to package and transport radioactive material in selected situations. In addition to these Level 1 tasks, during a four day training period, Level 2 workers were qualified to use selected radiation monitoring instrumentation to determine beta radiation dose rates, to obtain samples for determining airborne radioactivity concentrations, and to document radiological survey data on the appropriate HP forms. Licensee representatives stated that half of the training time was spent in the classroom covering fundamentals while the remainder of training involved practical and actual inplant exercises.

The inspector was informed that at the time of the onsite inspection, 374 workers were ARW qualified. Whereas previously each worker was receiving ARW retraining annually, the licensee's revised ARW training program required complete retraining every three years with plant identified needs discussed and implemented during the two year period prior to retraining.

The inspector considered the ARW training program to be appropriately inclusive, in depth of radiation protection topics, and a strength to the overall HP program.

No violations or deviations were identified.

4. Self-Assessment Program (83750)

Technical Specification (TS) 6.5.2.8 requires that audits of plant activities be performed under the cognizance of the Management Safety Review Committee and that the audits encompass, in part, the following: (a) the conformance of plant operation to the provisions contained within the TSS and applicable licensee conditions at least once every 12 months; and (2) the performance of activities required by the Operational Quality Assurance Program to meet the criteria of Appendix B to 10 CFR Part 50 at least once every 24 months.

During the onsite inspection, the inspector reviewed the most recent Quality Assurance (QA) Audit of the RP Program conducted August 21 through September 25, 1991, and documented in QA Report 91-13. The audit was conducted jointly for North Anna and Surry and included an evaluation of the internal and external exposure control program, the radiological survey program, instrumentation, contamination control, radiological material control, and instrumentation. The audit also included an evaluation of inconsistencies between the Surry and North Anna RP Programs. The audit was determined to be detailed and included substantive findings and recommendations for program enhancements. Review of selected audit findings revealed that corrective actions were both appropriate and timely. Further, the inspector noted that audit personnel had appropriate radiation protection backgrounds, with several of the auditors previously holding positions in the licensee's RP organization. Licensee representatives stated that the next RP program audit was scheduled for July 1993.

In response to initial concerns regarding the frequency of RP QA audits, licensee representatives stated that the guidance contained in ANSI N18.7-1976/ANS 3.2 was used for establishing the audit frequency of once every two years as delineated in the Quality Assurance Topical Report. The inspector determined the audit frequency met the licensee's minimum requirements in this area.

In addition to the required biennial audit, the inspector also reviewed selected QA surveillances of Storage Warehouse 9, followup evaluations from the 1990 RP Assessment, and fourth quarter 1991 self-assessment reports. In general, these programs appeared to be fostering improvements in RP, particularly with respect to Warehouse 9. The fourth quarter 1991 assessment report identified cumulative station radiation exposure as an area for which further improvement was needed.

The inspector reviewed station deviation reports (DRs) related to the RP area for the period September 1, 1991, through April 20, 1992. For the period, approximately 41 reports had been identified by the licensee. Evaluation of selected reports noted no significant trends or indicators of RP problems. Several DRs were discussed in detail with licensee representatives and are addressed in the appropriate topical sections of this report. For the cases reviewed, reports were properly documented and corrective actions were timely.

No violations or deviations were identified.

External Exposure Controls (83750)

10 CFR 20.101 requires that no licensee possess, use, or transfer licensed material in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter a total occupational dose in excess of 1.25 rem to the whole body, head and trunk, active blood forming organs, lens of the eyes, or gonads; 18.75 rem to the hands, forearms, feet and ankles; and 7.5 rem to the skin of the whole body.

10 CFR 20.101(b)(3) requires the licensee to determine an individual's accumulated occupational dose to the whole body on an NRC Form-4 or equivalent record prior to permitting the individual to exceed the limits of 20.101(a).

a. Multibadge/Extremity Exposure Monitoring

The inspector reviewed 1992 first quarter external exposure records for workers involved with Radiation Work Permit (RWP) 92-2-1279 associated with the manual pulling of two steam generator tubes and HP coverage of such activities. Following discussions with licensee personnel, the inspector was informed that workers performing these outage activities were provided with multiple dosimetry due to the non-uniform radiation fields in the work area. For the selected records reviewed the maximum whole body, skin, and extremity doses during the quarter were 1.584 rem, 1.714 rem, and 1.714 rem, respectively. The inspector noted that individuals had exceeded 1.25 rem to the whole body in a calendar quarter. Following further review the inspector verified that the licensee had documentation of the individuals' prior exposure on a NRC Form-4 and had appropriately granted the individuals an exposure extension based on annual and lifetime cumulative exposures.

The inspector concluded that the licensee monitored whole body and extremity doses adequately and these exposures were within 10 CFR 20 limits.

No violations or deviations were identified.

b. Exposure to Skin

Licensee Health Physics Procedure HP-6.1.20, Personnel Contamination Monitoring and Decontamination, dated November 1, 1990, requires that a skin dose assessment be initiated if skin particle contamination greater than 100,000 disintegrations per minute (dpm) is detected. Procedure HP 6.1.21, Contaminated Skin Dose Assessment, dated November 1, 1990, details guidance for determining skin dose due to surface contamination.

The inspector reviewed a March 28, 1992, hot particle contamination event involving an HP technician providing job coverage for Unit 2, "A" steam generator tube pulling activities. The hot particle was detected by a whole body frisker upon exiting the RCA, and was located on the technician's forehead. The particle was easily removed and was visible to the naked eye. The initial skin dose estimate from the hot particle was calculated by the licensee as 49.433 rem and 17.155 μ Ci-hours based on an isotopic analysis of the particle and a 3.22 hour exposure time (primary contributors were Zirconium-95 and Niobium-95). The duration of exposure was conservatively determined based on the period from which the technician assisted two steam generator maintenance workers in removal of their outer clothing and when the particle was removed from his forehead. Due to the initial skin dose assessment of greater than 30 rem, the licensee appropriately made a 24-hour NRC notification in accordance with 10 CFR 20.403(b)(1).

Subsequent reassessment of the dose to the skin was performed by the licensee to account for the large particle size, approximately 400 μ m in diameter and 50 μ m thick, and self-absorption of the betas by the particle. Beta absorption factors were determined experimentally by attenuating the beta emissions from the particle using plastic foils, calculating absorption coefficients for each range of low, medium, and high energy beta, and applying the factors to the ratio of each energy range at the surface of the particle. The resultant self-absorption was determined to be 59.6 percent, with a final skin dose estimated to be 21.242 rem. Comparison with the draft VARSKIN-2 computer model by the licensee yielded a skin dose of

approximately 17.9 rem. In addition, the licensee calculated the deep dose from the particle to be 69 mrem, and the dose to the lens of eye, assumed to be 3 centimeters from the particle, to be 7.7 mrem. The inspector verified that these doses as well as the reassessed skin dose were recorded in the technician's exposure record.

Evaluation of the licensee's initial and followup assessments, immediate corrective actions implemented for increased hot particle control, and calibration of the multichannel analyzers for hot particle geometry were considered appropriate by the inspector. Although the licensee exceeded the 7.5 rem quarterly limit for the skin of the whole body, the dose was less than the NRC hot particle beta emission criterion of 75 μ Ci-hours, used for enforcement consideration (Information Notice 90-48).

The inspector reviewed 6 other cases of skin contaminations requiring the performance of dose assessment for the period January 1 through April 20, 1992. From the records reviewed, a maximum skin dose of 1.8 rem was assigned for a crane communicator during Unit 1 fuel movement. The licensee's followup surveys and assessment activities for the selected cases were in accordance with approved procedures.

No violations or deviations were identified.

c. Thermoluminescent Dosimetry Program

10 CFR 20.202(c) requires, in part, that dosimeters used to comply with 10 CFR 20.202(a) shall be processed and evaluated by a dosimetry processor holding current accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) for the types of radiation for which the individual is monitored.

The inspector reviewed the licensee's dosimetry program and noted that the program was NVLAP accredited in four categories, II, IV, V, VII. The inspector also noted that NVLAP representatives had performed an onsite evaluation of the licensee's program as part of the TLD accreditation process within the past two years. Licensee representatives stated that plans were currently underway to change TLD vendors with full program implementation scheduled for January 1993. The inspector was informed that accreditation in each of the eight categories was expected for the new TLD system.

The inspector informed licensee representatives that the TLD program revisions and full NVLAP certification for all eight categories was considered a dosimetry program enhancement.

No violations or deviations were identified.

d. Dose to the Lens of the Eye

10 CFR 20.401(a) requires, in part, that each licensee maintain records in accordance with the instructions contained in NRC Form-5, Current Occupational External Radiation Exposure. NRC Form-5 requires that when the lens of the eye is not protected by shields with a tissue equivalent absorber thickness of 700 mg/cm² the whole body dose is to include the dose delivered through a tissue equivalent absorber thickness of 300 mg/cm².

Health Physics Procedure, HF 5.1.51, dated December 22, 1988, establishes the methods to evaluate the beta radiation response of TLD badges being used for whole body dose monitoring, and to determine applicable factors necessary in monitoring beta dose at 300 mg/cm² depth in tissue. In an effort to evaluate the beta spectrum available for personnel exposures, the procedure requires that during outages where steam generator access is implemented dose rate measurements be taken on the primary side of an unshielded steam generator manway diaphragm and at the manway opening. Following calculation of the ratios of beta to gamma dose rates, determinations are to be made as to whether the measurements indicate a significant change in the beta spectrum since the previous evaluation. Indication of a significant change requires evaluations of TLD response to beta radiation and changes to the whole body dose algorithm, as appropriate.

The inspector reviewed the licensee's program for accounting for beta dose to the lens of the eye. In particular the inspector reviewed beta survey results performed during the 1992 Unit 1 outage which indicated a change in the beta spectrum from previous outages. Accordingly, the licensee initiated an evaluation of TLD response to beta radiation. The licensee exposed ten specially prepared TLDs at the steam generator manway to approximately 1000 millirad (mrad) beta dose and then processed the badges using the current beta dose algorithm. The inspector determined that the licensee's methodology was adequate for determining the TLD response to beta radiation by way of evaluating the fraction of beta dose delivered at 300 mg/cm² to the

beta dose delivered to the skin. Following evaluation of the TLD response, the licensee amended the algorithm for whole body dose determination to account for the change in beta dose to the lens of the eye. The current factor being used by the licensee is 4 percent, as compared to the previous 5 percent.

The inspector noted that the licensee's algorithm for whole body dose assessment accounted for penetrating gammas, neutrons, any additional calculated dose, and the calculated fraction of the beta skin dose as determined as contributing to lens of the eye dose. For selected exposure records reviewed, the inspector verified that the calculated beta skin dose fraction contributing to the lens of the eye dose was added to all whole body dose measurements. Following discussions with dosimetry personnel, the inspector was informed that the whole body dose algorithm did not account for any lens of the eye shielding. The inspector informed the licensee that the methodology used for determining the TLD's response to beta radiation and for adjusting the whole body dose algorithm to account for beta dose to the lens of the eye was appropriate.

No violations or deviations were identified.

6. Internal Exposure Controls (83750)

10 CFR 20.103(a)(1) states that no licensee shall possess, use, or transfer licensed material in such a manner as to permit any individual in a restricted area to inhale a quantity of radioactive material in any period of one calendar quarter greater than the quantity which would result from inhalation for 40 hours per week for 13 weeks at uniform concentrations of radioactive material in air specified in 10 CFR Part 20, Appendix B, Table 1, Column 1.

a. Respiratory Protection

10 CFR 20.103(c)(2) permits the licensee to maintain and to implement a respiratory protection program that includes, at a minimum: air sampling to identify the hazard; surveys and bioassays to evaluate the actual exposures; written procedures to select, fit and maintain respirators; written procedures regarding the supervision and training of personnel and issuance of records; and determination by a physician prior to the use of respirators, that the individual is physically able to use respiratory protective equipment.

The inspector reviewed records for selected employees signed in on RWP 92-2-1279 for work associated with steam generator tube pulling and workers who obtained and used respiratory protection without properly complying with issuance procedures as documented in DR N-92-0646. The inspector verified that each worker had successfully completed General Employee Training (GET), was trained to use respiratory protective equipment, fit-tested, and medically qualified in accordance with appropriate requirements.

No violations or deviations were identified.

b. Engineering Controls

During discussions with licensee representatives the inspector was informed that during the 1992 Unit 1 and Unit 2 outages the licensee made a conscious effort to lessen respirator usage and expand engineering controls to limit airborne radioactivity concentrations. Additional portable ventilation units were purchased, and tent enclosures and glove boxes were constructed and/or purchased. Licensee representatives stated that successful implementation of the engineering controls resulted in a decrease in overall respirator usage during the outages by approximately 25 to 30 percent.

Licensee representatives stated that reduced respirator requirements were initially met by intolerable work groups refusing to perform jobs unless issued respiratory protection. Also, the licensee noted a significant increase in the number of PCEs, particularly facial, during the first quarter of 1992. As a result of these initial setbacks, the HP group introduced the philosophy for reducing respirator usage and discussed proper radiological work habits during pre-job briefings for all high radiation area jobs as well as other jobs with increased radiological risks. Also, the licensee purchased safety glasses head straps and face shields which discouraged and/or prevented face touching and aided in avoiding facial contaminations.

The inspector discussed with licensee representatives the overall successful implementation of the respirator usage reduction program during the outages. In particular the inspector reviewed licensee efforts in increasing engineering controls during the decontamination of the Unit 2 reactor cavity seal ring. Initial surveys indicated maximum smearable contamination levels of 16 rad per general area smear,

beta contamination; 2 rem per general area smear, gamma contamination; and maximum contact dose rates of 1.5 rem per hour (rem/hr). Following an initial decontamination attempt with strippable paint, the ring was covered with herculite and the particular area which was to be decontaminated was enclosed within a movable glove box with a HEPA unit connection. Upon completion of the decontamination efforts general contamination levels were reduced to 2000 dpm and general area dose rates were approximately 5 mrem/hr. The effectiveness of the engineering controls that were implemented was evidenced by the fact that no PCEs occurred and no airborne radioactivity was detected by general area air sampling during the job.

The inspector also discussed the reduction in radiation exposure as a result of decreasing the respirator and bubble hood usage on the steam generator lower platform, particularly during eddy current probe changeouts. Licensee studies indicated that when the job was performed using face shields rather than bubble hoods the probe changeout time was reduced by 13 minutes per change while exposure was reduced by approximately 125 mrem per change. The inspector was informed that approximately 60 percent of the probe changeouts were performed using face shields during the Unit 2 outage.

The inspector informed licensee representatives that their initiatives in reducing radiation exposures through decreased respirator usage and increased engineering controls during potential airborne radioactivity activities were considered enhancements to the exposure control program.

No violations or deviations were identified.

c. Whole body Counting and Exposure Tracking

10 CFR 20.103(a)(3) requires, in part, that the licensee, as appropriate, use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed individuals.

Procedure HP-6.1.20, Personnel Contamination Monitoring and Decontamination, dated November 1, 1990, requires that for facial contamination events exceeding 1000 dpm or determination of positive nasal swabs that special bioassays be performed. Procedures HP-5.2B.11, dated

October 1, 1985, and HP-5.2B.20, dated October 1, 1985, provide guidance for bioassay evaluation and calculation of intakes based on bioassay results, respectively.

The inspector reviewed selected records for the period January 1 through March 31, 1992, for individuals reported to have positive facial contamination. For the cases evaluated, special whole body analyses were conducted in accordance with procedural requirements. The maximum intake noted by the inspector was approximately 1.12 percent Maximum Permissible Body Burden (MPBB) for Cobalt-60 which corresponded to 7.18 Maximum Permissible Airborne Concentration - hours (MPC_a -hrs).

The inspector reviewed the licensee's methodology for tracking MPC_a -hr assignments based on either airborne radioactivity measurements or bioassay results. For the first quarter 1992, the inspector noted that MPC_a -hrs were tracked for personnel based on sampling 7-consecutive day period, as required by 10 CFR 20.103(b)(2). As of March 31, 1992, the maximum 7-day cumulative MPC_a -hr assignment was 9.6, below that requiring evaluation. However, during the record review, the inspector noted that when MPC_a -hr calculations were performed for an individual using air sampling and followup bioassay analysis related to the same exposure period that both MPC_a -hr values were assigned to the individual for tracking purposes. The inspector discussed with licensee representatives that although this method of assigning both values was conservative, an assessment of which value represents the most accurate reflection of exposure should be determined and assigned for each case. Licensee representatives agreed to evaluate this methodology for revision.

Based on the above, the inspector concluded that no internal contaminations in excess of 5 percent MPBB or the 40 MPC_a -hr control limit requiring an evaluation had been identified for calendar year 1991 or year-to-date 1992.

No violations or deviations were identified.

d. Instrumentation

The inspector reviewed calibration records and quality control (QC) checks for the licensee's standup whole body counting system. The counter was last calibrated May 22, 1991, following movement of the counter from

the In-process Center to Dose Control Office located just outside the plant protected area. In addition, the inspector reviewed recently performed daily energy calibrations using Europium-152, efficiency checks, and background checks as well as historical data for the period August 1991 to present. The inspector noted no concerns regarding system stability, and calibration and QC checks were conducted in accordance with licensee approved procedures.

No violations or deviations were identified.

7. Operational and Administrative Controls (83750)

a. Radiation Work Permits (RWPs)

The inspector reviewed selected routine and outage RWPs for appropriateness of the radiation protection requirements based on work scope, location, and conditions.

In particular, the inspector reviewed RWP 92-2-1279, Cut and Removal of Tubes from "A" Steam Generator Hot Leg. The RWP, as well as its associated pre-job briefing, appropriately addressed radiological concerns and provided for appropriate HP monitoring and surveying throughout the job. Pre-job ALARA reviews contained appropriate ALARA recommendations, and the inspector verified that workers using the RWP attended the pre-job briefing. In general, the RWPs reviewed required proper protective clothing, respiratory protection, and dosimetry. The inspector noted that the ALARA committee performed post-job reviews which included recommendations for improvements.

The inspector found the licensee's program for RWP implementation to adequately address radiological protection concerns, and to provide for proper control measures.

No violations or deviations were identified.

b. Termination Reports

10 CFR 20.408(b) and 10 CFR 20.409(b) require that the licensee make a report to the Commission, and notify the individual involved, of the radiation exposure of each individual who has terminated employment. The report is to be furnished within 30 days after the individual's exposure is determined by the licensee or 90 days after the date of termination of employment or work assignment, whichever is earlier.

The inspector reviewed selected records for contractors associated with steam generator tube pulling activities and verified that all were issued termination letters within 30 days following their termination date.

No violations or deviations were identified.

c. Notices to Workers

10 CFR 19.11(a) and (b) require, in part, that the licensee post current copies of Part 19, Part 20, the license, license conditions, documents incorporated into the license, license amendments, and operating procedures, or that a licensee post a notice describing these documents and where they may be examined.

10 CFR 19.11(d) requires that a licensee post NRC Form-3, Notice to Employees. Sufficient copies of the required forms are to be posted to permit licensee workers to observe them on the way to or from licensed activity locations.

Administrative Procedure ADM-20.32, 10 CFR 19 Posting Requirements, dated November 3, 1988, establishes the licensee's program for compliance with the above stated posting requirements. The procedure requires that the notices be posted at the entry to the Turbine Building, the Machine Shop, and at the Radiological Control Area (RCA) access point. During the inspection, the inspector verified that NRC Form-3 as well as a reference noting the location and availability of other required information was posted properly at the Turbine Building and RCA entrance, as required. Although no postings were provided at the central security access point, which is used by all personnel entering the plant protected area, the inspector noted that postings were provided in sufficient number of locations for access by employees.

No violations or deviations were identified.

8. Control of Radioactive Material and Contamination, Surveys, and Monitoring (83750)

a. Locked High Radiation Areas

TS 6.12.2 requires that areas accessible to personnel with radiation levels greater than 1000 mR/hr be provided with locked doors to prevent unauthorized entry in addition to the requirements of TS 6.12.1. Procedure HP-8.0-60, Radiological Posting and Access Control, dated September 8, 1991, implements the

requirements of TS 6.12.1 and 6.12.2, and further states that areas are defined using general area radiation levels or radiation measurements at 12 inches from the source.

The inspector reviewed two events associated with locked high radiation area access controls which occurred during Unit 2 refueling operations. The high radiation areas related to the events were created during fuel transfer operations due to a small, unshielded gap between the fuel transfer canal and the containment wall.

The first event, on March 22, 1992, involved the failure to secure a high radiation area gate on the 262' elevation of the Unit 2 containment during fuel movement operations. The unlocked gate, near the electrical penetration area, was discovered approximately one hour following initiation of fuel movement by an HP containment rover. The HP Office and Refuel Operator were notified, and the area was immediately surveyed, checked for personnel, and posted and secured as required. During the period in which the gate was unlocked, four irradiated fuel bundles were transferred. All other required barriers were secured prior to fuel movement.

Subsequent surveys by the licensee on March 23, 1992, revealed that dose rates of 10-12 R/hr were measurable in the area during fuel transfer with a transit time for each bundle of approximately 1.67 minutes. Maximum dose rates were determined to persist for approximately 48 seconds. Review of the surveys and a walkdown of the area in question by the inspector indicated that these maximum dose rates were obtained off the main walkway, over a hand rail, and down 3 feet along an I-beam between the cable trays and the containment wall. Dose rates along the walkway were approximately 500 mR/hr.

Review of the licensee's evaluation as well as discussions with the technician responsible for initially securing the refueling barriers revealed: no procedural checklist was available defining the specific barriers to be erected and secured; the technician had never performed this function in Unit 2, although he performed the task in Unit 1; and no independent verification of barrier status was performed by operations or HP personnel.

Although the unlocked area with dose rates greater than 1000 mR/hr was accessible to personnel, the inspector

noted that all workers in containment were required to wear digital alarming dosimeters which would have alerted workers to high dose rates or exceeding a preset accumulated dose limit. Review of the doses for personnel working in containment during the period in question revealed that doses were consistent with work being performed. The maximum dose recorded during the period was 104 mrem for a steam generator worker. In addition, no work was scheduled or known to be performed in the area in question.

Corrective actions implemented by the licensee included the following:

- The Operations Procedure 2-OP-4.1, Controlling Procedure for Refueling, was revised to include a checklist of the specific barriers to be secured, and to require independent verification of installation by the Refuel Operator and the HP Shift Supervisor. The corresponding Unit 1 procedure was similarly revised prior to the end of the onsite inspection.
- RWP 92-2-1214 was revised to include a checklist of the specific barriers to be secured, and required verification of barrier status by the HP Supervisor once each shift.
- Training was provided to personnel regarding the procedural changes. In addition, the licensee plans to incorporate this event into the HP continuing training program.
- Recommendations regarding the installation of shielding for the transfer canal gap were proposed; however, no decision had been made at the time of the onsite inspection.

Based on the above, the inspector informed licensee representatives that the failure to limit access to an area with dose rates in excess of 1000 mR/hr was a violation of TS 6.12.2 (Violation 50-338, 339/92-12-01).

The second event occurred on March 24, 1992, when elevated dose rates were identified on a scaffold platform located on the 216' elevation of the Unit 2 containment during fuel transfer operations. Initial surveys indicated general area dose rates of 2.5-3.2 R/hr on top of the scaffold ladder; however, subsequent surveys and query of the technician responsible for the survey determined that the actual location of the

measurement was approximately 6 inches from the containment wall. Dose rates at approximately the midpoint of the scaffold platform were determined to be 100 mR/hr. Barriers were immediately erected and locked. Further, surveys of the area determined that the dose rate at 12 inches from the containment wall was approximately 500 mR/hr.

The scaffold was erected on March 19 to support welding work, and all work was completed prior to initiation of fuel movement on March 22. Licensee representatives stated that no further work was scheduled to be performed in the area, and a request had been initiated to remove the scaffold upon completion of the work (seven days were allowed for removal). The inspector noted that had new work been initiated on the scaffolding, RWP 92-2-1162 would have required a HP radiation survey.

The inspector determined that although dose rates in excess of 1000 mR/hr were identified in the vicinity of the scaffold, general area dose rate criteria requiring the area to be secured were not met in that 12 inches from the wall the dose rate was 500 mR/hr. Licensee representatives also informed the inspector that the area with the maximum dose rates was accessible only if a worker climbed the ladder and leaned sideways from the ladder toward the containment wall, exposing the head to the radiation stream. Further, the inspector was informed that the entire 216' level of containment was posted and controlled as a high radiation area at the time of the event, in accordance with procedures.

Licensee corrective actions associated with the second event included cessation of fuel movement to investigate the status of all refueling barriers and potentially elevated dose rates, and the RWP 92-2-1214 checklist, 2-OP-4.1, and 1-OP-4.1 were revised to include verification that restricted areas are not breached by ladders, scaffolding, or other access devices. The licensee also proposed painting the floors, walls, and overhead of the refueling barrier zones to warn workers of transient high doses. The licensee's response and corrective actions associated with this event were considered satisfactory, and no violations of NRC requirements were identified.

In addition to the above, the inspector reviewed the licensee's recent past performance related to locked high radiation area access controls. On October 7, 1991, the licensee identified an instance in which a locked high radiation area door in the Demineralizer

Alley was found unsecured. The licensee initiated DR N-91-1472 and conducted an investigation of the event. The licensee determined that a worker who had accessed the area to label a valve had failed to secure the area during performance of his work as well as upon exit. Surveys noted general area dose rates in two of the cubicles to be approximately 2 R/hr. Evaluation of station doses for the day revealed a maximum exposure of 9 mrem. The licensee determined the root cause to be personnel error, and the individual was coached on the requirements regarding high radiation areas. The inspector informed licensee representatives this failure to control access to a locked high radiation area was an additional example of a violation of TS 6.12.2.

Although two examples of a violation of TS 6.12.2 were identified, the inspector determined that the events were sufficiently different in circumstance and root cause to not be considered repetitive. The inspector informed the licensee that because action in self-identifying and correcting the two occurrences met the criteria specified in Section V.G of the NRC Enforcement Policy, the violation would not be cited.

One licensee identified non-cited violation of TS 6.12.2 was identified.

b. Surveys

10 CFR 20.201(b) requires each licensee to make or cause to be made such surveys as (1) may be necessary for the licensee to comply with the regulations and (2) are reasonable under the circumstances to evaluate the extent of radiological hazards that may be present.

Health Physics Procedure 8.0.20, Radiological Survey Criteria and Scheduling, dated November 4, 1991, establishes the licensee's program for conducting routine surveys and monitoring of various plant locations. Review of the licensee's current survey scheme, dated September 30, 1991, verified that the an appropriate system for the conduct of daily, weekly, semi-monthly, quarterly, and annual surveys had been established consistent with procedural criteria and the level of radiation hazards present. The inspector also noted that the survey schedule had been approved by management, as required.

The inspector reviewed the licensee's log of routine surveys performed in 1992 and determined that surveys were being conducted at the required frequency.

Evaluation of selected surveys posted at the RCA entrance found them to be current and appropriately documented. Further, the inspector noted that the licensee had instituted the posting of current surveys adjacent to high radiation areas within the plant to provide additional access to radiological information for workers entering these areas. During plant tours, the inspector noted the supplemental surveys to be informative and consistent with the data posted at the RCA entrance.

During facility tours, the inspector independently verified radiation levels in various auxiliary building locations and other areas of the RCA. The inspector noted that in all cases, areas were posted and safeguarded in accordance with the radiation hazards present.

No violations or deviations were identified.

c. Area and Personnel Contamination

The licensee maintained approximately 96,000 square feet (ft²) excluding containment, as radiologically controlled. As of April 24, 1992, the contaminated area tracked by the licensee was approximately 2545 ft², of which 515 ft² was contaminated due to ongoing maintenance activities. This equates to about 2.6 percent contaminated floor space. During tours, the inspector observed a very clean plant, good material control, and overall excellent housekeeping practices.

As of April 20, 1992, approximately 117 personnel contaminations (PCEs) had occurred in 1992 compared to a prorated goal of 123 for the same period. Discussions with licensee representatives and review of 1992 monthly PCE reports revealed that although the overall goal for PCE occurrence was met, an increase in the number of head, face, and neck contaminations was experienced. As discussed in Paragraph 6.b this was primarily attributed to decreased respirator usage as well as increased outage work scope and 0.03 percent failed fuel. Licensee management focus on PCE reduction was evident by the continued implementation of one-on-one sessions with each worker who becomes contaminated.

No violations or deviations were identified.

d. Radiation Detection and Survey Instrumentation

During facility tours, the inspector noted that in-use survey instruments and whole body friskers within the RCA were operable and displayed current calibration stickers. In addition, background radiation levels at survey locations were observed to be within an acceptable range.

No violations or deviations were identified.

9. Program for Maintaining Exposures As Low As Reasonably Achievable (ALARA) (83750)

10 CFR 20.1(c) states that persons engaged in activities under licenses issued by the NRC should make every reasonable effort to maintain radiation exposures as low as reasonably achievable.

The inspector reviewed the license's program to maintain occupational exposures ALARA. During discussions with licensee representatives the inspector was informed that the cumulative dose for 1991 was approximately 629 rem which exceeded the licensee's original annual goal of 513 rem. Due to three forced outages and increased work scope during the July 1991 scheduled Unit 1 outage, the licensee revised the annual goal for 1991 to approximately 630 rem. The licensee's cumulative dose goal for 1992 is 979 rem. For the first quarter of 1992, the licensee accumulated approximately 450 rem during the time period that the licensee had a forced Unit 1 outage and a scheduled Unit 2 refueling outage. The inspector was informed that general area dose rates in certain areas of the Unit 2 containment building were as much as 50 percent greater than expected due to 0.03 percent failed fuel associated source term problems. Based on the inspector's review of the 1992 outage work scope and associated exposures, the licensee was informed that their program for maintaining personnel exposures ALARA during outage activities appeared to be functioning adequately.

The inspector discussed with licensee representatives a 1988 ALARA suggestion, 88-014, submitted on April 6, 1988, related to HRAs created in the containment buildings during spent fuel transfers. The suggestion discussed and provided cost-benefit analyses for three types of shielding for construction around the spent fuel transfer tube. According to the suggestion, shielding the transfer tube would reduce/eliminate man-hours for HRA barricade construction, radwaste generation due to barricades, and interruption and delays of outage jobs due to HRA levels during spent fuel movements. The most expensive of the three shielding types

was estimated to cost \$8300 for implementation with a projected annual man-rem savings of 900 mrem. Since the suggestion was submitted in April 1988, final decision for the Station ALARA Committee's (SACs) acceptance/rejection had been pending since August 1988 awaiting an Engineering Work Request (EWR) evaluation. The inspector noted two requests by the ALARA group in February 1990 and June 1991 for EWR evaluation. The inspector discussed with HP and licensee management the need for final decision on the ALARA suggestion especially in relation to the recent TS violation involving HRA access control during spent fuel transfers (Paragraph 8.a).

In addition, the inspector reviewed and discussed the licensee's Five Year Source Term Reduction Plans, to include Resistance Temperature Detector removal, stellite valve replacements, chemical decontamination, and removal of abandoned/inoperative equipment, particularly the waste solids area pump skid. For the waste solids pump skid, the inspector noted that since 1979 seven work orders and EWRs had been requested for pump upgrades/replacement. The inspector was informed by ALARA representatives that undue exposure was accumulated each year due to maintenance activities and manual operation. The inspector encouraged licensee management to pursue timely implementation of source term reduction initiatives.

No violations or deviations were identified.

10. Onsite Followup of Written Reports of Non-routine Events (92700)

- a. (Closed) Licensee Event Report (LER) 50-339/92-008-00: Contamination by Hot Particle Resulted in Exceeding Skin of Whole Body Dose Limit. The inspector reviewed the licensee's initial assessment, reporting, and followup evaluations associated with the March 28, 1992, hot particle event. As discussed in detail in Paragraph 5.b of this report, the licensee's evaluations and actions appeared appropriate with respect to the event.
- b. (Closed) LER 50-339/92-006-00: Refueling Barrier to a High Radiation Area not Locked. The inspector reviewed the event details, the licensee's evaluation, and corrective actions associated with the failure to limit access to an area of the Unit 2 containment which experienced transient dose rates ranging from 10 to 12 R/hr during irradiated fuel movement. As discussed in detail in Paragraph 8.a of this report, the failure to secure the area to limit access during fuel transfer was identified as a non-cited violation of TS 6.12.2.

11. Information Notices (92701)

The inspector determined that the following INs had been received by the licensee and reviewed for applicability.

- IN 90-81: Fitness-For-Duty
- IN 90-82: Requirements for Use of NRC Approved Transport Packages for Shipment of Type A Quantities of Radioactive Material
- IN 91-10: Summary of Semiannual Program Performance Reports on Fitness-For-Duty (FFD) in the Nuclear Industry
- IN 91-35: Labeling Requirements for Transporting Multi-Hazard Radioactive Materials
- IN 91-36: Nuclear Plant Staff Working Hours
- IN 91-37: Compressed Gas Cylinder Missile Hazard
- IN 91-39: Compliance with 10 CFR Part 21, "Reporting of Defects and Non-compliance"
- IN 91-40: Contamination of Nonradioactive System and Resulting Possibility for Unmonitored, Uncontrolled Release to the Environment
- IN 88-63, Supplement 2: High Radiation Hazards from Irradiated Incore Detectors and Cables
- IN 91-60: False Alarms of Alarm Ratemeters Because of Radiofrequency Interference
- IN 91-65: Emergency Access to Low-Level Radioactive Waste Disposal Facilities
- IN 91-76: 10 CFR Parts 21 and 50.55(e) Final Rules
- IN 91-77: Shift Staffing at Nuclear Power Plants

12. Exit Interview (83750, 92701, 92700)

The inspection scope and results were summarized on April 24, 1992, with those persons indicated in Paragraph 1 above. The general program areas reviewed and the non-cited violation identified during this inspection and listed below were discussed in detail. Licensee representatives acknowledged the inspector's comments and no dissenting comments were received.

The inspector informed licensee representatives that although proprietary information was reviewed during this inspection, such material would not be included in the report.

Item Number

Description and Reference

50-338, 339/92-12-01

Non-Cited Violation: Failure to limit access to areas with dose rates in excess of 1000 mR/hour as required by TS 6.12.2. Licensee corrective actions completed prior to the end of the onsite inspection (Paragraph 8.a).