



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report Nos.: 50-325/88-23 and 50-324/88-23

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket Nos.: 50-325 and 50-324

License Nos.: DPR-71 and DPR-62

Facility Name: Brunswick 1 and 2

Inspection Conducted: June 20-24, 1988

Inspector: C. H. Bassett 7/20/88
Date Signed

Approved by: C. M. Hosey 7/20/88
Date Signed
C. M. Hosey, Section Chief
Division of Radiation Safety and Safeguards

SUMMARY

Scope: This routine, unannounced inspection was conducted in the area of radiation protection including: organization and management controls; training and qualifications; internal exposure control; control of radioactive material; solid waste; transportation, and licensee action on previous inspection findings.

Results: No violations or deviations were identified. The licensee's radiation protection program was assessed to be adequate in the areas covered during the inspection. A positive licensee initiative was noted dealing with the installation of radiation monitoring systems beyond minimum NRC requirements. The systems, which are intended to reduce radiation exposure, feature remote radiation monitors located in areas of high radiation background which read out at a central location in an area with low background. Licensee personnel can check radiation levels in monitored areas before entering for tours or work.

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REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *E. Bishop, Acting Plant Manager
- *G. Cheatham, Manager, Environmental and Radiation Control
- *K. Enzor, Director, Regulatory Compliance
- *T. Harris, Project Specialist, Nuclear Regulatory Compliance
- *J. Henderson, Supervisor, Radiation Control
- C. Homes, Specialist, Technical Training
- *L. Jones, Director, Quality Assurance/Quality Control
- *R. Poulk, Project Specialist, Nuclear Regulatory Compliance
- R. Queener, Principal Specialist, Radiation Control
- *J. Terry, ALARA Project Engineer, Radiation Control
- *L. Tripp, Supervisor, Radiation Control
- G. Worley, Radwaste Foreman, Radiation Control

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

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- *W. Levis, Resident Inspector

*Attended exit interview

Acronyms and initialisms used throughout this report are listed in Paragraph 13 of this report.

2. Organization and Management Controls (83722)

a. Organization

The licensee is required by Technical Specification (TS) 6.2.2 to implement the facility organization specified in TS Figure 6.2.2-2. The responsibility, authority and other management controls necessary for establishing and maintaining a health physics program for the facility are outlined in Chapters 12 and 13 of the Final Safety Analysis Report (FSAR).

The inspector reviewed the plant organization and reviewed planned changes with the Environmental and Radiation Control (E&RC) Manager to determine whether the changes would affect the degree of support received from other members of management and the lines of communication and authority. It appeared that the support for the maintenance of an effective radiation control program would continue.

b. Staffing

Technical Specification 6.2 specifies minimum staffing for the plant. FSAR Chapters 12 and 13 also give further details on staffing for the facility.

The inspector reviewed the health physics organization and staffing with the E&RC Manager. The attrition rate and current staffing levels were discussed and it was noted that four technician slots are currently open in the Radiation Control group. These positions were vacated by personnel who were transferred or promoted to other positions in the plant organization. The inspector also noted that the licensee used contractor Health Physics (HP) technicians during the last outage but did not retain any contractors after the outage was completed.

c. Controls

The inspector reviewed the licensee's program for identifying and correcting radiological and safety related problems. The main tool used for this purpose is the Radiation Safety Violation (RSV). Licensee representatives indicated that every person has the responsibility to correct any individual who is conducting work in a manner contrary to proper radiological controls and the As Low As Reasonably Achievable (ALARA) program. One means a person can use, if another person does not adhere to proper procedures, is to write an RSV. The RSV then goes to Radiation Control (RC) where it is reviewed by an RC Supervisor who establishes a severity level (I, II or III with I being the most severe) and recommends corrective action. The supervisor of the individual who did not follow proper radiation controls must then respond in writing to the RSV. This response is reviewed by the Manager, E&RC for severity level III violations while severity level II violations require a response to the Plant General Manager. The response to a severity level I violation is reviewed by the Site Vice President who must also approve the corrective actions taken.

The inspector reviewed the RSVs written for 1988. Of the seventeen that had been written, one had been combined with another and two were found to be invalid resulting in fourteen RSVs to date for 1988. Twelve of the fourteen RSVs were classified as severity level III and dealt primarily with minor procedural compliance items. One RSV was a severity level II problem concerning protective clothing requirements. One severity level I violation had been identified dealing with the failure of a contractor employee to disclose his prior exposure for the quarter.

It was noted that the majority of the RSVs had been written by RC personnel. While some dealt only with symptoms of the problem, it was noted that others were directed at the root cause of the problem and were oriented toward ALARA concerns. The corrective actions

taken as a result were generally adequate. It was also noted that management had emphasized using RSVs to document problems noted and to evaluate both the radiation protection program and the corrective actions to improve the program.

No violations or deviations were noted.

3. Training and Qualifications (83723)

a. General Employee Training (GET)

The licensee is required by 10 CFR 19.12 to provide basic radiation protection training to workers. Regulatory Guides 8.13, Instruction Concerning Prenatal Radiation Exposure, 8.27, Radiation Protection Training for Personnel at Light-Water-Cooled Nuclear Power Plants, and 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, outline topics that should be included in such training.

The inspector reviewed the GET training program and content with licensee representatives. Recent changes have been made in the organization which provides for a technical training specialist and two training assistants to conduct GET and related training courses. Changes have also been implemented in the content of the program to incorporate more safety/industrial hygiene type material, as well as basic radiation safety. The GET program is also being revised to include training and information on the effects of "hot particles" and ways to control them. It was noted that the initial GET training requires sixteen hours of classroom time which also includes a practical factors demonstration by each student.

b. Radioactive Waste Training

Technical Specification 6.3 requires that each member of the RC staff meet or exceed the minimum qualifications of ANSI Standard N18.1-1971. Paragraph 4.5.2 of ANSI N18.1 states that technicians in responsible positions are to have a minimum of two years of working experience in their speciality.

The inspector reviewed the training and qualifications of those personnel working in the Radioactive Waste (Rad Waste) group. They progress through the portion of the Craft and Technical Development Program that applies to radiation control technicians. The training program is divided into ten steps that require six months each to complete. Specific training in Rad Waste handling and transportation of radioactive material is also covered in the training program. Continued specific training is provided by the Rad Waste foreman, as new issues develop, and is also received annually from a vendor who provides a course dealing solely with the regulations and procedures concerning transportation of radioactive material.

Through records review and discussions with licensee representatives, the inspector determined that the qualifications and

experience level of the Rad Waste RC technicians appear to be commensurate with their job assignments and responsibilities.

c. Advanced Radiation Worker Training

The licensee gave Advanced Radiation Worker training, designated GET Level III training, for approximately two years from 1984 to 1986. The course did not qualify personnel to provide their own job coverage but was designed as a one week course given to supervisors, lead technicians and planners to make them more aware of all aspects of radiation control and ALARA. The course was discontinued and is currently being redesigned in order to make it more job specific and thus more applicable to the individual and his position.

No violations or deviations were identified.

4. Internal Exposure Control and Assessment (83725)

a. Engineering Controls

10 CFR 20.103(d)(1) requires that the licensee use process or other engineering controls to the extent practicable to limit concentrations of radioactive materials in the air to levels below those which delimit an airborne radioactivity area as defined in 20.203(d)(ii).

During plant tours, the inspector observed various engineering controls employed to limit the concentrations of airborne radioactive materials. These controls included the use of permanently installed and temporary ventilation systems, containment enclosures and high efficiency particulate air (HEPA) filter units.

b. Air Sampling

10 CFR 20.103(a) establishes the limits for exposure to individuals to concentrations of radioactive materials in air in restricted areas. This section also requires that suitable measurements of concentrations of radioactive materials in air be performed to detect and evaluate the airborne radioactivity in restricted areas.

The inspector reviewed selected results of general in-plant and job specific air samples taken during the period since the last inspection in February 1988. The air sample log indicated that the airborne radioactivity had seldom been above twenty-five percent (25%) of the Maximum Permissible Concentration (MPC) of radionuclides specified in 10 CFR Part 20, Appendix B, Table 1, Column 1. In those instances when the MPC was in excess of one, it was noted that the resultant exposure to those individuals in the area of the air sample did not exceed two MPC-hours for an eight-hour period nor ten MPC-hours in seven consecutive days.

During plant tours and observation of work in progress, the inspector noted RC technicians performing air sampling in support of various jobs. It was noted that the air samples were being taken in the breathing zone of the workers as required. The inspector also noted other work areas which had permanently installed sample lines that would allow sampling the air in the workers' breathing zone. These areas included the Rad Waste processing area in the Rad Waste Building and the waste sorting area located in the Low Level Waste Handling Building.

c. Intake Assessments

10 CFR 20.103(a) requires the licensee to perform appropriate bioassays to detect and assess intakes of radioactivity.

The inspector reviewed selected results of whole body counts of licensee and contractor personnel and the licensee's assessment of individual intakes of radioactive material since the previous inspection. Through records review and discussions with licensee representatives, it was determined that, during 1988, no personnel required intake evaluations due to receiving an exposure of greater than forty MPC-hours in one week. It was also noted that the licensee had investigated two internal contamination events that had occurred during the latter part of the last refueling outage which were documented in E&RC Experience Report 88-02 and in Operating Experience Report (OER) 88-045. The inspector reviewed these reports and determined that they were adequate and that the MPC-hours which had been calculated as a result were appropriate.

No violations or deviations were identified.

5. Control of Radioactive Material and Contamination, Surveys and Monitoring (83726)

a. Surveys

The licensee is required by 10 CFR 20.201(b) and 20.401 to perform surveys and to maintain records of such surveys necessary to show compliance with regulatory limits. Survey methods and instrumentation are outlined in FSAR Chapter 12, while TS 6.8 and 6.11 provide requirements for adherence to written procedures. Radiological control procedures further delineate survey methods and frequencies.

During tours of the facility and while observing jobs in progress, the inspector examined radiation level and contamination survey results as recorded on survey maps. The inspector observed RC technicians performing radiation and contamination surveys and noted that proper radiological and ALARA techniques were used. The inspector also performed independent radiation level surveys of selected areas using NRC equipment and compared the results with

licensee surveys. The inspector examined licensee radiation protection instrumentation and verified that the calibration stickers were current.

b. Personal Contamination and Release Surveys

The inspector reviewed the procedure which specifies the criteria for personnel frisking and releasing items from the Radiation Control Area (RCA), E&RC-0110, Monitoring Personnel for Contamination, Volume VIII, Revision 011, dated June 17, 1988. While touring the plant and surrounding areas, the inspector observed individuals exiting contaminated areas and the RCA. It was noted that a whole body frisk was required after exiting a contaminated area while only a partial frisk consisting of surveying the face, hard hat, hands, trouser knees and feet was required at the RCA exit.

The inspector also noted that individuals who have successfully completed GET Level I and II training are allowed to survey their own personal hand-carried items, as well as such items as four-wheeled carts, oxygen bottles and other equipment and take them out of the RCA. When the inspector questioned this practice, the licensee indicated that, since GET trained individuals are qualified to monitor themselves, they should also be qualified to survey their own personal items and other clean equipment with which they work. Any item which was found to be contaminated was to be placed in yellow plastic and transported to the tool decontamination room or to a contamination control area. RC personnel would then be required to survey the item for release. Items with inaccessible surfaces were also to be surveyed by RC technicians and any items leaving the site, other than hand-carried personal items, were required to be surveyed by RC as well.

c. Posting and Control of Radioactive Material

10 CFR 20.203 specifies the posting and control requirements for radiation areas, high radiation areas and airborne radioactivity areas. This section also requires that each container of licensed radioactive material bear a durable, clearly visible label identifying the contents and also should contain such information as the radiation levels of the the container.

During tours of the plant, the inspector observed the licensee's posting and control of selected radiation, high radiation and airborne radioactivity areas. The inspector also checked the security of selected locked high radiation areas, all of which were found locked as required. Containers of licensed radioactive material were also checked to verify that they were properly labeled.

It was noted that the licensee used several methods to denote the radiation levels on containers. Some containers had the radiation level information indicated on a white label which is placed on the

container when it is issued for use by another organization other than RC. Other containers had the required radiation level information written on the container itself with a marking pen while still other containers had the information written in a space provided on a radioactive material sticker attached to the container. When this observation was brought to the attention of the licensee, they agreed that a standardized method of marking the radiation level on each container was needed and agreed to standardize the marking method.

d. Area and Personnel Contamination

The inspector discussed with licensee representatives the extent of plant contamination and the number of personnel contamination events to date. The licensee is currently maintaining approximately 63,700 square feet or 15% of the radiation control area as contaminated. This total is down slightly from the 1987 year-end figure of 66,400 square feet of contaminated area and down significantly from the 1986 average total of 94,000 square feet.

The licensee indicated that, as of June 1, 1988, there had been 48 skin and 196 clothing contaminations including those occurring during the refueling outage earlier in the year. During 1987, there had been 71 skin and 276 clothing contamination events, also including those that occurred during a refueling outage.

6. Program for Maintaining Exposures As Low As Reasonably Achievable (ALARA) (83728)

a. Radiation Monitoring Systems

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 ALARA.

During tours of the facility, the inspector noted the use of radiation monitoring systems in various areas including the Unit 1 Reactor Building, the Unit 2 Turbine Building, the Radwaste Building and the Radwaste solidification and dewatering area. Each of these systems consists of a series of strategically placed radiation detectors with detector racks or readouts in an area with a low dose rate. An individual required to enter a specific area is able to readily check the dose rate(s) in the area where he will be working and in the areas through which he will be passing to get to the work area. The system in the Turbine Building is also coupled with a camera at each detector location thus allowing a visual check of the area as well. Steam leaks and water leaks can be seen on the remote monitor located with the detector readouts, and operations, maintenance and/or RC personnel can determine the working environment as well as the radiation levels present in the work area prior to actually entering the area.

The inspector reviewed the licensee's calculations on exposure reduction and exposure savings in the Radwaste Building as a result of installing one of these radiation monitoring systems. The figures indicated that reductions up to ninety percent (90%) have been noted in some areas with a significant decrease in person-rem expenditure reported. The licensee indicated that this person-rem savings was the result of personnel being more cognizant of the work area radiation levels and the reduction in the number of surveys required in the various high background areas.

b. Exposure Goals and Expenditure

The inspector reviewed the licensee's goals and objectives for 1987 and 1988, and the progress toward those goals. A goal of 1209 person-rem had been established for 1987, which included one refueling outage. Primarily due to unscheduled maintenance work, the licensee expended 1419 person-rem for 1987. The 1988 person-rem goal is 1540 which includes two scheduled outages. As of June 1, 1988, 1029 person-rem had been expended; somewhat above the projection of 894 person-rem. The licensee indicated that, although the current exposure total is above what was projected, they feel they can meet the goal by stressing ALARA considerations during daily operations and by limiting both the length of the upcoming outage and the scope of the work as well.

No violations or deviations were identified.

7. Solid Waste (84722)

- a. 10 CFR 20.311(d)(1) requires that licensees prepare all waste such that the waste is classified in accordance with 10 CFR 61.55 and meets the waste characteristic requirements specified in 10 CFR 61.56.

The licensee is currently sampling waste streams annually, but they are assessing the feasibility of sampling only on an "as required" basis based upon the monthly results of plant reactor coolant analysis. Four waste streams are currently being sampled annually: reactor water cleanup (RWCU) system resin, bead resin, powder resin and lubricating oil. Samples are sent to a vendor for analysis and the results reviewed and verified by the corporate staff. The corporate staff then develops the site-specific scaling factors from these results. Licensee representatives indicated that no significant variability in relative concentrations based upon the results of the sampling has been observed during 1988.

The licensee uses a vendor-supplied computer program (WASTETRAK) which processes input information obtained from a package of waste to determine the package's waste classification and transportation type. The program identifies non-gamma emitters based on the scaling factors developed by the corporate staff for the particular waste stream from which the waste was generated. The program accounts for

the generation of daughter products, calculates radiation levels and activity contents as a function of time and generates a form for use in preparing shipping papers.

b. Manifests

10 CFR 20.311(b) requires that each shipment of radioactive waste to a licensed land disposal facility be accompanied by a shipment manifest and specifies required entries on the manifest.

The inspector reviewed selected records of radioactive waste shipments performed during 1988, and verified that the manifests had been properly completed.

No violations or deviations were identified.

8. Transportation (86721)

10 CFR 71.5 requires that licensees who transport licensed material outside the confines of its plant or other place of use, or who deliver licensed material to a carrier for transport, shall comply with the applicable requirements of the regulations appropriate to the mode of transport of the Department of Transportation (DOT) in 49 CFR Parts 170 through 189.

The inspector reviewed selected records of radioactive waste and radioactive material shipments performed during 1988. The shipping manifests examined were prepared consistent with 49 CFR requirements. The radiation and contamination survey results were within the limits specified for the mode of transport and shipment classification and the shipping documents were being completed and maintained as required.

No violations or deviations were identified.

9. Action on Previous Inspection Findings (92702)

(Closed) Violation 325, 324/88-09-01, Failure : Maintain Access to a High Radiation Area Locked

A previous inspection identified that the licensee had failed to lock the access to the Unit 2 East Fuel Pool Heat Exchanger room which had radiation levels present in excess of 1,000 millirem per hour. The inspector reviewed the licensee's response dated April 15, 1988, and determined that the licensee had terminated the employee responsible for this event and had conducted training of other operations personnel concerning the problem as indicated in the response.

10. Allegation Followup (99014)

a. RII-87-A-0097

The alleged stated that, in March 1988, he was working for Industrial Mechanical Service out of Hilderbran, North Carolina (NC). The company was a subcontractor for Carolina Power and Light Company (CP&L) and was retained to repair a Cleaner Brooks boiler that had become contaminated at the Brunswick facility. While working on the boiler, the alleged and his crew became contaminated. While everyone else was able to be decontaminated by means of showering, the alleged was not and allegedly received, as a result of the incident, an exposure of 34 rem. The alleged indicated that he was then escorted offsite by maintenance personnel and set off the alarms of the exit portal monitors as he passed through. Once offsite, the alleged was housed in a motel room for several days by CP&L, not allowed back onsite and finally terminated without receiving a whole body count. The alleged also stated that CP&L had dumped contaminated boiler parts at a junkyard in Wilmington, NC, thus exposing the public to uncontrolled radioactive material.

b. Discussion

The inspector discussed these allegations with licensee representatives. Because these alleged problems had occurred nearly ten years ago, no licensee employee could remember the incident or the specific contractor personnel involved. The inspector interviewed several people involved with the boiler repair and with RC coverage of the job. Everyone interviewed indicated that the contamination levels were not so high as to be memorable and no one could remember an incident in which a person was internally contaminated. Some hand contaminations had occurred but no one could recall anything else.

Through interviews and a review of licensee records (including personnel records and whole body count results, special radiation work permits [RWPs], contamination survey records, air sample results, personnel contamination records and NRC Inspection Reports), the following facts were established:

- (1) RWP records indicate that the alleged worked for CP&L at the Brunswick facility from February 12 through 15, 1979.
- (2) RWP and personnel records show that the alleged worked with a crew of four other individuals who were employed by a company named Applied Engineering from Greensboro, NC.
- (3) Personnel records indicate that of the five people on the Applied Engineering subcontract crew, two individuals (including the alleged) did not receive exit or termination whole body counts (WBC). Of the other three who did receive a WBC, no

internal exposure greater than a total of 1.9 percent of a Maximum Permissible Body Burden (MPBB) (1.3% of Cobalt-60 and 0.6% Manganese-54) was received.

- (4) RWP records also indicate that three licensee employees worked the same job that the subcontractor personnel did. Personnel records show that two of these three licensee personnel did not receive a WBC in 1979. The third person received a total of 8.5% (isotopes not identified) of an MPBB.
- (5) Personnel records indicate that the highest exposure, as recorded by the licensee's permanent thermoluminescent dosimeters, for the alleged was 107 millirem whole body exposure for the exposure period which was February. The other subcontractor personnel received whole body exposures ranging from 0-260 millirem for the exposure period. The licensee personnel involved in the same job during the same time period received exposures ranging from 0-479 millirem for the February exposure period.
- (6) Personnel contamination records do not indicate that the alleged was contaminated. The licensee stated that not all contaminations were recorded and the procedure in effect during that time period did not require decontamination unless contamination levels above 0.1 millirem per hour (mr/hr) beta-gamma or 50 disintegrations per minute (dpm) alpha with no transferable contamination were reached.
- (7) None of the air sample results taken in support of the boiler repair during the time period that the alleged worked at Brunswick showed airborne radioactivity in excess of the airborne radioactivity limits.
- (8) The highest contamination level noted on surveys taken between February 12 and 15 was 37,248 dpm per one hundred square centimeters (dpm/100 cm²) inside the "upper mud room" or upper mud tank room of the Auxillary Boiler Building.
- (9) The highest radiation level noted on survey records taken during the time period in question was 80 mr/hr inside the boiler.
- (10) Contaminated items released from the Brunswick site were not only taken to Wilmington, NC, but to other locations as well. This incident was extensively investigated by the NRC and the State of North Carolina and the contaminated items were retrieved and taken back to the Brunswick site.

c. Finding

The allegation was partially substantiated in that the alleged apparently did not receive a termination whole body count. This may

have resulted because, at the time, CP&L had only one mobile WBC unit which was transferred back and forth between the Brunswick and Robinson sites. The licensee indicated that, although not a good practice, it was not unusual for personnel to leave without receiving a termination WBC. Also contaminated items, possibly including boiler parts, were released from the Brunswick site. However, an extensive and exhaustive effort was made to find and recover all the contaminated material. These recovery actions were discussed and reported in NRC Inspection Report Numbers 50-325/80-18 and 50-324/80-15 dated August 4, 1980. The allegation of receiving 34 rem could not be substantiated from records review or from interviews with licensee personnel.

Enforcement action was taken by the NRC for violation of regulatory requirements dealing with the uncontrolled release of radioactive material from the plant. No other regulatory requirements or limits were violated or exceeded based on the data available.

12. Exit Interview

The inspection scope and results were summarized on June 24, 1988, with those persons indicated in Paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed above. No dissenting comments were received from the licensee. Proprietary information is not contained in this report.

Licensee management was informed that the violation discussed in Paragraph 9 is considered closed.

13. Acronyms and Abbreviations

ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
CP&L	Carolina Power and Light Company
dpm	Disintegrations per minute
dpm/100 cm ²	Disintegrations per minute per one hundred square centimeters
DOT	Department of Transportation
E&RC	Environmental and Radiation Control
FSAR	Final Safety Analysis Report
GET	General Employee Training
HEPA	High Efficiency Particulate Airborne (filter)
MPC	Maximum Permissible Concentration
MPC-hr	Maximum Permissible Concentration-hour
MPBB	Maximum Permissible Body Burden
mR/hr	Millirem per hour
NC	North Carolina
OER	Operating Experience Report
PCs	Protective Clothing
RC	Radiation Control

RCA	Radiation Control Area
RSV	Radiation Safety Violation
RWCU	Reactor Water Cleanup System
RWP	Radiation Work Permit
TLD	Thermoluminescent Dosimeter
TS	Technical Specification
WBC	Whole Body Count