UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

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Report Nos.: 50-325/94-06 and 50-324/94-06

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 Nuclear Power Plant

Inspection Conducted: March 7-10, March 20-21, April 6-7, 1994, and via telephone conversations on April 26, 1994

Inspector: _____ 5-20-94
N. G. Mc Neill, Radiation Specialist Date Signed

Accompanying Personnel: R. B. Shortridge

Approved by: _____ 5/23/94
T. R. Decker, Chief Date Signed
Radiological Effluents and Chemistry Section
Radiological Protection and Emergency Preparedness Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, announced inspection was conducted in the areas of the organization of the Chemistry/Effluent Department and Radioactive Waste Group, status of the Hydrogen Water Chemistry (HWC) Program, transportation of solid radioactive material, contaminated onsite soil, the Annual Radiological Environmental Operating Reports, and records for decommissioning planning.

Results:

The Chemistry Department and the Radwaste Group were staffed by knowledgeable, competent personnel (Paragraph 2).

The licensee planned to utilize HWC on both units. Unit 2 was operating at 20 standard cubic feet per minute (scfm) and Unit 1 was increased from 20 scfm to 40 scfm (Paragraph 3).

Radioactive material processing and shipping was conducted in a competent, professional manner (Paragraph 4).

The licensee continued to move cautiously before removing some slightly-contaminated soil from the Protected Area (Paragraph 5).

The licensee will develop a system to identify and maintain events/incidents significant with respect to decommissioning planning (Paragraph 6).

The Annual Environmental Radiological Monitoring Report for 1993 and for previous years was reviewed and found to meet Technical Specification (TS) requirements (Paragraph 7).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. Lopriore, Manager, Regulatory Affairs
*W. Neely, Senior Specialist, Chemistry
*C. Robertson, Manager, Environmental and Radiation Control (E&RC)
*R. Schlichter, Lead Assessor, Nuclear Assessment Department
G. Worley, Supervisor, Radiation Control

Other licensee employees contacted during this inspection included engineers, operators, technicians, and administrative personnel.

Nuclear Regulatory Commission

P. Byron, Resident Inspector
D. Nelson, Resident Inspector
*R. Prevatte, Senior Resident Inspector

*Attended exit interview

2. Organization (84750)

Technical Specification (TS) 6.2.2 describes the licensee's onsite facility organization. The inspector reviewed the licensee's organization, staffing levels, and lines of authority as they related to the Environmental and Chemistry (E&C) Department and Radioactive Waste Group to verify that the licensee had not made organizational changes which would adversely affect the ability to control radiation exposures or radioactive material.

Both groups were organized within the Environmental and Radiation Control (E&RC) Unit, under direction of the E&RC Manager. Although there were no structural changes in the referenced groups, some personnel changes had occurred due to promotions, resignations, and personnel rotations. The E&C Manager, who reported directly to the E&RC Manager, directed a staff of thirty-two, including an aide, four specialists, three supervisors, twenty-two technicians, and two contractors. The Radiation Control (RC) Manager reported directly to the E&RC Manager and had three primary areas of responsibility, including the handling and shipping of radioactive materials. In addition to preparing the normal radwaste shipments, this group was also responsible for receiving the empty spent fuel casks from the Harris plant and assuring that they may be released from the Brunswick site upon loading of the spent fuel, prior to transport to Harris.

The inspector concluded that the licensee's E&C and Radwaste Management organizations and personnel therein were capable of effectively discharging their duties as related to chemistry/effluents and radioactive waste management and that TS requirements were satisfied.

No violations or deviations were identified.

3. Hydrogen Water Chemistry (HWC) (84750)

The inspector reviewed the status of the licensee's HWC Program. The licensee continued to operate Unit 2 under HWC during Fuel Cycle 10, as referenced in Paragraph 16.c of Inspection Report (IR) 50-325, 324/92-06. The program was originally established to mitigate the phenomenon of Intergranular Stress Corrosion Cracking (IGSCC) of the reactor coolant system (RCS). However, since its introduction, high dose rates were built up during plant operation, especially in the piping of the reactor's recirculation system. The licensee was evaluating the trade off between the benefits of reduced IGSCC versus the disadvantages of higher doses to plant personnel as additional operational experience is gained. The Hydrogen Injection System for Unit 2 was fully operable at the time of this inspection. The Hydrogen Injection System for Unit 1 had been installed by Plant Modification (PM) 86-080 and was operational. Turnover to Operations took place in late December 1992, upon completion of walkdown packages and full-final operability of the Unit 1 Hydrogen Injection System was expected within a week, as only one signature was needed for final closure.

On December 3, 1992, a meeting of the Brunswick Elevated Exposure Rate Task Force was held. The inspector reviewed the information presented by a General Electric (GE) presentation about optimum Boiling Water Reactor (BWR) water chemistry. Optimum BWR water chemistry simultaneously addressed BWR chemistry, materials, waste, and operational issues. Specific objectives considered included: no new IGSCC initiation or growth; yearly exposure less than 100 man-rems; reduction in dry well dose rates; reduction in radwaste volume to less than 100 cubic meters; and no fuel clad corrosion issues. It was noted that concentrating on the changing of one of the objectives could have a negative impact on one or more of the others. For example, by applying HWC to reduce IGSCC, operating and shutdown dose rates would increase.

To achieve optimum BWR water chemistry, four major elements were required:

- Reduce and control iron input to vessels
- Minimize radwaste generated by water treatment
- Control of Co-60 in reactor water
- Implement "low impact" IGSCC mitigation

Each element was discussed in detail. For the first three, both currently-available technology as well as future/developing technologies were discussed. The last element referenced to IGSCC protection without adversely affecting the other parameters. This element illustrated the use of HWC plus additional measures such as the addition of depleted zinc oxide and/or the application of noble metal coatings to stainless steel and/or other alloys. Studies and tests of these two synergistic measures were in progress and were expected to be completed by the end of 1993.

In addition to information presented by GE, the inspector also reviewed information presented by the Electric Power Research Institute (EPRI) in December 1992. EPRI was establishing a committee to revise present BWR water chemistry guidelines. The committee's first meeting was scheduled for February 24, 1993, at which time topics such as zinc injection, chromate recommendations, "soft" shutdown, and HWC issues were to be discussed. Also, on the agenda was consideration that the committee would produce a single guideline, covering both Normal Water Chemistry (NWC) and HWC. It was also noted that in-core HWC tests would not be completed until 1994, and that there was the possibility of an interim NWC guideline in 1993 (with the final in 1994).

At the time of the initial inspection visit, March 7-10, 1994, the inspector discussed the progress of the HWC program to date. Unit 2 was injecting at a steady state at 20 standard cubic feet per minute (scfm) of hydrogen and preparations were continuing to raise Unit 1 from 20 scfm to 40 scfm. The system and hardware to inject and monitor HWC was discussed in previous inspections (IR 50-325, 324/93-56). The primary question which faced the licensee was whether the increased protection offered by increased HWC (20 vs 40) would increase dose rates to unacceptable levels.

The inspector returned to the site on two occasions during which time the increase to 40 scfm from 20 scfm was to be accomplished. On both occasions the operators experienced problems with the system and the procedures and aborted the plans to increase injection rate to 40 scfm. On the first occasion, March 20-21, 1994, licensee personnel noted that background readings on affected area monitors were higher than expected and would therefore affect the net increases due to the increased hydrogen injection rates. The test was aborted and the procedures amended to reflect the range of background readings which are normally found due to normal variences in the doses. The test was rescheduled for April 6-7, 1994. On that date, the inspector again observed activities associated with the increased injection from 20 scfm to 40 scfm. In this instance, another problem was encountered during the progression through the procedure. The operators planned to increase hydrogen injection in a manual operation mode, in 2 scfm increments, up to 40 scfm. The incremental increases would allow time for Health Physics (HP) personnel to monitor dose rate in affected areas and report any problems to the operators. This operation was underway when the system reached an internal automatic preset trip level at 25 scfm (20 scfm +/- 5 scfm) and tripped the system.

The licensee rescheduled the test of the increased injection, and accomplished the test series on April 15, 1994. System injection was increased to 40 scfm from 20 scfm in 2 scfm increments in the manual mode and in the automatic mode. The system trip was also activated to ensure its operability and no problems were encountered during this series. The licensee reported to the Region that dose rates had increased by a factor of about 2 times normally (i.e., 20 scfm injection) expected. The licensee stated that they believed these levels would still be well within ALARA goals that Brunswick had set. Some period of time would be necessary to evaluate the actual effect that the increased injection rates would have on dose rates for the plant overall. This evaluation would be completed prior to evaluation of planned increased injection rates (from 20 scfm to 40 scfm) for Unit 2.

Procedures which were observed by the inspector included:

- PM Test Procedure No. 93-044-06, "Unit 1 Hydrogen Water Chemistry Startup to 20 SCFM," Revision 0
- PM Test Procedure No. 93-044-06, "Unit 1 Hydrogen Water Chemistry Startup to 40 SCFM," Revision 1
- Special Procedure No. SP-86-096, "E and RC Activities During Hydrogen Water Chemistry Test, " Revision 000
- Special Procedure No. 1SP-94-005, "Assessment of the Radiological Impact of a Hydrogen Injection Rate of 40 SCFM," Revision 0

While the inspector found no problems were identified with the actual procedures nor with the injection system and equipment operation, several questions remained unanswered at the time of the inspection. These issues were raised with the licensee during the telephone conference on April 26, 1994. Of interest was what effect the operation over time will have on cumulative dose rates. The effect of operation of Unit 2 at the higher injection rate of 40 scfm in addition to Unit 1 operating at that same rate will have to be determined. The operation of the system will be reviewed in future inspections after a period of extended use. The overall effect of the Hydrogen Water Injection system at the higher rates and it's effect on ALARA commitments will require close review by the Region.

No violations or deviations were identified.

4. Transportation of Radioactive Waste (86750)

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.

10 CFR 20.311 requires the licensee who transfers radioactive waste to a land disposal facility to prepare all waste so that the waste is classified in accordance with 10 CFR 61.55 and meets the waste characteristics requirements of 10 CFR 61.56. It further establishes specific requirements for conducting a quality control (QC) program and for maintaining a manifest tracking system for all shipments.

The inspector reviewed the licensees's solid waste management program for wastes generated from the Brunswick Steam Electric Plant (BSEP) operations. The review included the following: adequacy of implementing procedures to classify and characterize the wastes; preparation of the manifest and marking of packages; overall performance of the process control and quality control programs; and the adequacy of required records, reports, and notifications.

a. Radioactive Materials Shipment Documentation Packages

The inspector reviewed all of the shipping manifest and records of shipments which occurred in the time frame of November 15 through December 5, 1993. These shipments included:

- Shipment No. 93-278, "Dewatered Resin to Chem-Nuclear, Barnwell, SC, November 16, 1993"
- Shipment No. 93-280, "Contaminated Laundry to INS, Corp., Columbia, SC, November 17, 1993"
- Shipment No. 93-279, "Sea/Land Containers to SEG, Inc., in Oak Ridge, TN, November 18, 1993"
- Shipment No. 93-271, "Fissile Material, n.o.s., (Fuel Cask), to Carolina Power and Light (Shearon Harris Plant) by CSX Railway, November 23, 1993"
- Shipment No. 93-286,"Dewatered Resin to Chem-Nuclear, Barnwell, SC, November 23, 1993"
- Shipment No. 93-287, "Contaminated Laundry to INS, Corp., Columbia, SC, November 24, 1993"
- Shipment No. 93-288, "Contaminated GE Camera Equipment to Susquehanna Station, PA, November 24, 1993"
- Shipment No. 93-289, "Dry Active Waste to SEG, Inc., in Oak Ridge, TN, November 30, 1993"
- Shipment No. 93-290, "Dewatered Resins to Chem-Nuclear, Barnwell, SC November 30, 1993"
- Shipment No. 93-291, "Contaminated Laundry to INS, Corp., Columbia, SC, December 1, 1993"

- Shipment No. 93-292, "Dewatered Resin to Chem-Nuclear Barnwell, SC, December 2, 1993"

The inspector concluded that the licensee had good programs in place for the handling and shipping of radioactive material and that they were effectively implemented. The licensee's procedures provided sufficient detail and guidance to allow technicians to properly package, classify, and prepare shipping manifests for radioactive waste. In all cases examined the shipping paperwork and survey results appeared to meet all regulatory requirements.

b. Burial Site Shipments Performance

The inspector called Burial Site representatives of the State of South Carolina and discussed the licensee's performance on shipments to the burial site in Barnwell, SC. The State personnel reviewed the file for the licensee and indicated a good performance for all shipments received for the calendar year (CY) 1993 and for CY 1994 to date. No problems had been identified with any shipments received by the site.

No violations or deviations were identified.

5. Contaminated Soil (84750)

Paragraph 10 of IR 50-325, 324/91-29 and Paragraph 17 of IR 50-325, 324/92-25 refer to an effort by the licensee to remove slightly contaminated soil which had accumulated for the last dozen years in the plant's drainage basins as well as additional soil resulting from the lowering of the grade of certain areas within the Protected Area. The licensee intended to transfer the material from inside the Protected Area to inside a fenced and posted Radioactive Materials Area on its property for use as stabilization material on the inside slope of the dike surrounding the Storm Drain Collection Pond (SDCP). The inspector reviewed the status of the effort.

On June 5, 1992, the licensee sent a detailed memorandum, with numerous attachments showing the results of analysis of soil samples taken at various locations within the Protected Area and of the material in the Storm Drain Collection Basin (SDCB), applicable portions of the plant's Liquid Effluents TSs (including the Bases), applicable portions of the plant's Updated Final Safety Analysis Report (UFSAR), etc. to NRR for review and comment. NRR responded by asking for additional information, which the licensee supplied. In late December 1992, the Radiological Protection Branch of NRR completed its review of the matter and concurred with CP&L that no 10 CFR 20.302 application for alternate disposal was necessary. Therefore, the transfer of material could begin at the convenience of the licensee.

Discussions with the licensee determined that before beginning the transfer of any material, the fence surrounding the SDCP would be completely checked for any breaches, degradation, and/or posting

inadequacies. The licensee expected that this effort would be completed within a few weeks and that the transfer would begin shortly thereafter.

The inspector reviewed the status of contaminated soil onsite and found that no changes had occurred since the time of the last inspection. The inspector concluded that the licensee was proceeding in an appropriate manner on the issue.

No violations or deviations were identified.

6. Decommissioning Planning Records (84750)

10 CFR 50.75(g) requires, in part, that licensees maintain "records of information important to the safe and effective decommissioning of the facility in an identified location until the license is terminated by the Commission." Furthermore, information considered important by the Commission for decommissioning is identified as "records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site" and that the records "must include any known information on identification of involved nuclides, quantities, forms, and concentrations." Also identified are "as-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination."

During Inspection 92-25, the inspector requested the licensee's decommissioning planning records to verify compliance with the regulations and held discussions with the licensee's Records Management Supervisor to determine program status/effectiveness. The inspector determined that while the subject information was in the licensee's document control vault, in the form of microfiche and drawings, it was not segregated into one readily identifiable area nor was a listing identifying pertinent information for decommissioning planning available. Timely retrieval and proper classification of documentation (both existing and future) could not be guaranteed. The licensee planned to evaluate and develop a system/program patterned after that in place at one of CPL's other nuclear power plants.

During the current inspection, the inspector interviewed plant personnel and concluded that no new progress had been made in the area of identifying relevant decommissioning records. Due to current plant activities taking precedence, this issue will be reviewed in future inspections.

No violations or deviations were identified.

7. Radiological Environmental Monitoring Program (84750)

TS 3.12.1 specifies that the licensee shall conduct a Radiological Environmental Monitoring Program (REMP) and defines how the program shall be conducted. The purpose of the REMP is to measure any

accumulation of radioactivity in the environment and to assess trends, to determine whether this radioactivity is the result of operations at the plant, and to assess the potential dose to the off-site populations based on the cumulative measurements of any plant-originated radioactivity via the monitoring of specific elements of exposure pathways, and to detect unanticipated pathways for the transport of radionuclides in the environment.

TS 6.9.1.7 states the format and content requirements for the Report.

The inspector reviewed the format and content of the 1993 Radiological Environmental Monitoring Report for 1993. At the time of the inspection, the final report was not due and could only be reviewed in its draft form. The report indicated no measurable effect which could be detected in environmental samples attributable to the plant operation. From an historical data viewpoint, data from previous reports and events relative to the environmental impact of the plant were reviewed.

In only one instance were any samples analyzed as part of the environmental monitoring program which indicated levels above background which could tentatively be associated with plant activities. These samples, which contained low levels of Cesium-137 detected in samples of vegetation and soil (beach sand), were collected some distance northeast of the plant. This data was explained in detail in the licensee response to NRC IE Bulletin No. 80-10, which was directed at the potential for an unmonitored pathway for release of radioactive material due to operation of a contaminated auxiliary boiler subsequent to February 22, 1980. The licensee's response to this bulletin, CPL No-81-119, dated January 22, 1981, details the licensee efforts to characterize the potential release.

The licensee's response and subsequent Annual Radiological Environmental Reports have confirmed minimal releases occurred. The concentrations of Cesium-137 detected ranged from 464 pCi/kg to 4730 pCi/kg for vegetation samples and lesser values for soil samples. Samples taken in the years since have shown far lower levels detected in the expected background counting region. The licensee stated that these levels could be explained as normal background due to weapons testing and the like. While this is true and the data the licensee presented showing concentration of low levels of radionuclides in some plant species is credible, it appears nevertheless that releases did occur which were measurable offsite. These low levels correspond to licensee dose calculations which showed maximum calculated releases were a small fraction of 10 CFR 50, Appendix I limits. The Semiannual Effluent Reports were amended to reflect these maximum theoretical releases.

No violations or deviations were identified.

8. Exit Interview

The inspection scope and results were summarized with those licensee personnel indicated in Paragraph 1 and through a conference call with licensee personnel on April 26, 1994. The inspector described the areas inspected and discussed the inspection results, including likely informational content of the inspection report with regard to documents and/or processes reviewed during the inspection. The licensee did not identify any such documents or processes as proprietary. Dissenting comments were not received from the licensee.