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

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Report Nos.: 50-325/92-06 and 50-324/92-06

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 1 and 2

Inspection Conducted: March 9-13, 1992

Inspectors: Eldan D. Testa 4/13/92
E. D. Testa Date Signed

A. T. Boland 4/13/92
A. T. Boland Date Signed

D. A. Seymour 4.10.92
D. A. Seymour Date Signed

Approved by: J. P. Potter 4/13/92
J. P. Potter, Chief Date Signed
Facilities Radiological Protection
Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

D. W. Jones 4/10/92
For T. R. Decker, Chief Date Signed
Radiological Effluents and Chemistry
Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

W. H. Rankin 4/13/92
W. H. Rankin, Chief Date Signed
Emergency Preparedness Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This announced inspection was conducted to assess the licensee's Radiological Control Program and practices, Emergency Preparedness Program, and Radiological Effluents Program. The inspection included a review of progress made to reduce person-rem dose; evaluation of the licensee's current organization and program initiatives for reducing radiation dose; review of ALARA goals to bring the site's collective dose to within industry averages; and evaluation of the licensee's management awareness, involvement in, and support for the Radiological Control Program and Radiological Effluents Program. Also evaluated was the overall operability of the licensee's process and effluent monitors, and plant chemistry. In addition, the inspector evaluated the Emergency Preparedness Program with respect to the Emergency Plan and implementing procedures, organization and management control, offsite interface, Emergency Plan training, emergency facilities and equipment, and the independent audit program.

Results:

In the areas inspected, one repeat violation involving the failure to provide Emergency Plan retraining in accordance with the Emergency Plan and procedures was identified. The inspector noted that management was supportive of dose reductions and had established challenging dose reduction goals. This included a development of a dose reduction strategy to reduce collective dose as well as the out-of-core source term. In addition, the licensee had proactive programs aimed at reducing radiological effluents and plant discharges. Radiation monitors did not typically experience undue or lengthy periods of inoperability and were receiving adequate attention and support from Maintenance and Instrumentation and Control. However, there were examples of monitors associated with plant modifications that experienced lengthy periods of inoperability due to the complex nature of getting a plant modification approved, designed, budgeted and implemented. With the exception of the training violation in the area of Emergency Preparedness related first aid retraining, the inspector noted that the licensee had established an effective Emergency Preparedness Program.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*R. Baldwin, Senior Specialist, Corporate Emergency Preparedness
*C. Blackmon, Manager, Special Projects
*M. Bradley, Manager, Nuclear Assessment Department (NAD)
*S. Callis, Onsite Licensing Representative
*J. Davis, Manager, Radiation Control
*P. Dorosko, Manager, Cooling and Turbine Systems Engineering
*S. Floyd, Manager, Regulatory Compliance
*R. Godley, Manager, NRC Compliance
*B. Hart, Specialist, NAD
*J. Henderson, Manager, Radiation Control Support
*M. Highsmith, Specialist, Emergency Preparedness (EP)
*J. Holder, Manager, Outage Management and Modifications
*B. Houston, Senior Specialist, EP
*R. Indelicato, Manager, Corporate EP
*P. Jenny, Manager, EP, Robinson
*T. Jones, Senior Specialist
*R. Knight, Specialist
*B. Leonard, Manager, Training
*C. Lewis, Project Services Unit Manager
*H. Lindsey, System Engineer
*C. Logan, Brunswick County Emergency Management
*P. Mazzola, Manager, Support Training
*D. Moore, Manager, Maintenance
*R. Morgan, Plant General Manager (Acting)
*R. Polk, Licensed Operator Requalification Program
*C. Price, Contact Scheduler, Maintenance and Environmental and Radiation Control (E&RC)
*D. Proctor, Training Scheduler
*P. Quidley, Manager, Site Workforce Control Group (SWCG)
*G. Raker, Specialist, NAD
*C. Robertson, Manager, E&RC
*B. Saburn, Specialist, Technical Training
*P. Sawyer, Manager, Radiation Control (RC), (Acting)
*R. Smith, Manager, RC Operations
*P. Snead, Manager, ALARA
*R. Starkey, Jr., Vice President, Brunswick Nuclear Project
*J. Terry, RC Project Specialist
*R. Way, Senior Engineer, Quality Assurance
*B. White, Manager, Environmental and Chemistry (E&C)

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

Nuclear Regulatory Commission

*P. Byron, Resident Inspector

*Attended exit interview.

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. Radiation Protection Organization (83750)

The E&RC group reported directly to the Plant Manager, providing a direct line of communication for radiation protection matters between the persons responsible for plant radiation protection and the person in charge of all plant activities. Four sub-units (RC, Support; ALARA; RC, Operations; and E&C) reported to the E&RC Manager. The Manager of RC, Operations had a staff of four RC supervisors and a total of approximately thirty HP technicians. The ALARA Manager had two specialists, one technician and an aide reporting to him. The Manager of RC, Support had two specialists and three supervisors reporting to him. Approximately 23 HP technicians supported his staff. The Manager of E&C had a staff consisting of three supervisors, two specialists, one technician and one aide. Approximately 23 technicians supported this staff. Two additional project specialists reported to the E&RC Manager; one project specialist in RC and one project specialist in E&C. The total E&RC staff consisted of about 108 managers, supervisors, technicians, and administrative personnel Since the last NRC inspection conducted in August 1991 and documented in Inspection Report (IR) No. 50-325,324/91-23, one RC supervisor was added to the staff, and two technicians were detailed on temporary assignment to the Site Work Force Control Group (SWFCG). The assignment of the two technicians to the SWFCG staff was done to assist maintenance in their planning activities. The organization appeared to be functioning effectively and no deficiencies were noted.

The inspector reviewed position goals and job expectations with RC management, professional staff, and technicians and found all levels to be knowledgeable of goals and aware of job expectations. The RC organization appeared to be staffed with knowledgeable, professional, and inquisitive personnel who are team players.

No violations or deviations were identified.

3. Radiation Protection Training and Qualifications (83750)

Technical Specification (TS) 6.3 states that the minimum education, experience, and qualifications of key supervisory and professional personnel shall met or exceed the criteria outlined in ANSI N18.1-1971. Administrative Procedure, Volume 1, Book 1, Operating Manual, Revision 31, dated August 1, 1991, in part, describes the responsibility of Brunswick supervisory personnel. E&RC technicians, line supervisors, and managers within the E&RC group, as well as the E&RC manager, had position descriptions which outlined the minimum qualifications criteria along with the responsibility and functions for the respective positions.

The inspector selectively reviewed resumes of several E&RC staff members. The inspector noted that the positions chosen for review were filled by qualified individuals in that the requirements of ANSI N18.1, as well as the position descriptions, were adequately fulfilled.

a. Continuing Training

The inspector also reviewed the licensee's Continuing Training program for the E&RC group. The ALARA Manager and RC, Operations Manager were selected to attend a three month training course on plant systems operation and design. These positions, during the interim, will be filled by a Senior Specialist in the ALARA area and a Supervisor in the RC, Operations area. This demonstrated the licensee's determination to provide continuing training. Removal of these two key staff members may reduce the E&RC group's effectiveness if not closely monitored. The inspector's concern in this area was discussed with the attendees at the exit meeting.

b. Mockup Training Facility

The inspector toured the new mockup training facility and discussed future training opportunities that this facility will provide. Cognizant training personnel informed the inspector that they had visited other utilities to determine the needs and requirements for their training facility. Training personnel stated that the plan for the facility was to incorporate a system with capabilities for leaks and air line hoods in an attempt to duplicate plant conditions. The training department had already acquired radio control instruments that would aid simulating changing

radiological conditions. The inspector also viewed the equipment currently stored in a warehouse which will be incorporated into the facility to provide better coordinated mockups and realism to enhance HP training.

c. Corporate Training

The inspector discussed the radiation protection and ALARA training provided to the CP&L Corporate Nuclear Engineering Department (NED) and HP group. Licensee representatives informed the inspector that plant design modifications were normally engineered by Corporate NED engineers and designers. These design engineers were required to adhere to the design guide incorporating ALARA, Document No. ED-DG-001, Rev. 1 dated April 10, 1990, for all design and engineering related work. Additional ALARA guidance was available in the Radiation Control and Protection Manual, plant procedures and as otherwise specified by the Corporate HP group. The inspector reviewed the design guide and found that it was suffieciently detailed and had incorporated numerous useful tabulations and diagrams that would support good ALARA design.

No violations or deviations were identified.

4. Exposure Control (83750)

a. External and Internal Exposure Control

10 CFR 20.101 requires that no licensee shall 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 rems to the whole body, head and trunk, active blood forming organs, lens of eyes, or gonads; 18.75 rems to the hands, forearms, feet and ankles; and 7.5 rems to the skin of the whole body.

10 CFR 20.202 requires each licensee to supply appropriate monitoring equipment to individuals who enter restricted areas and receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in 10 CFR 20.101(a).

BSEP Corporate policy for the management of external exposure control practices is found in the CP&L Radiation Control and Protection Manual, Revision 18, dated July 19, 1991. Section 5.0 establishes the administrative exposure limits for personnel. The

limits were consistent with the federal requirements detailed in 10 CFR 20.101(a).

The licensee was performing whole body counts with a Nuclear Data chair system. Thermoluminescent dosimeters (TLDs) were read using a Panasonic TLD processing system. The inspector noted that the licensee planned on installing a rapid scan standup screening whole body counter. Persons showing positive results from the standup rapid scan would be counted in the whole body chair. The inspector noted that the licensee had originally expected to have the rapid scan standup whole body counting system installed after the September outage. This installation has not yet occurred.

b. Exposure Review

Management was informed of radiation exposures on a daily basis during the morning planning meeting. Exposure information was additionally reviewed and tracked by the plant ALARA staff and committee. The inspector reviewed the mechanism that informed management of personnel exposures and the procedures for exposure investigation and found it to be adequate. At the time of the inspection, the plant had experienced eight personnel contamination events (PCEs) for 1992 to date as of this inspection. This was below the established goal for this time frame. The collective exposure for the site in 1991 was 777.7 person-rem which represented a 50 percent improvement over the 1990 exposure. The exposure for 1991 represented the lowest exposure total for the two unit operation in the history of the site. This improvement was indicative of the progress made in controlling outage scope and plant ALARA efforts coupled with management support. This information is summarized below:

Table 1

Historical Statistical Summary of Person-Rem Exposure

Year:	1980	1981	1982	1983	1984	1985
Person-Rem:	3839	2642	3793	3472	3260	2804
Year:	1986	1987	1988	1989	1990	1991
Person-Rem:	1909	1419	1747	1786	1548	778

Exposure for the Brunswick site was dominated in 1991 by the completion of the Unit 1 refueling/recirculation pipe replacement outage and the Unit 2 fall refueling outage.

Eighty-six percent of site exposure was accumulated during these outages. This information is summarized below:

TABLE 2

Percent of Exposure by Year

	1990	1991
Outage	93	86
Non-Outage	7	14

The Brunswick site goal for 1991 was 1100 person-rem. The 777.7 person-rem represented a 29 percent reduction from the goal. All major work groups finished 1991 at or below their respective exposure budget. As of December 31, 1991, the site contaminated area and total square footage was running a little over seven percent, which represented approximately 43.3 thousand square feet.

During 1991 there were total of 203 E&RC event reports. One-hundred and thirteen represented concerns, 70 represented violations, and 20 were made as commendations. The inspector reviewed selective event report write-ups and determined that the reporting system was effective in identifying problems and provided a positive mechanism for commending those persons who made positive suggestions to the RC Program.

The inspector reviewed hot particle event data and noted that there were 48 total hot particle events logged. Analysis indicated that there were no overexposures associated with the hot particle events.

No violations or deviations were identified.

5. Radiation Protection Surveillance Program (83750)

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 regulations, and (2) are reasonable under the circumstances to evaluate the extent of radioactive hazards that may be present.

CP&L Radiation Control and Protection Manual, Section 5.15, Radiation Monitoring, contained the Corporate policy on the performance of radiation surveys.

The inspector selectively reviewed recently performed surveys of general, high radiation, and contaminated areas

of the Radiological Controlled Area (RCA). All surveys were found to be thorough and complete, and appropriately reviewed by E&RC supervision.

The inspector reviewed the inventory and calibration records for survey instruments used to perform radiation and contamination surveys. All instruments checked were found to have been recently calibrated and all were functional.

In addition, the inspector selectively performed contamination checks by obtaining smears and having those smears counted. Smears were taken in the Hot Shop step off pads, Snubber Refurbishing Room, and Tool Storage Warehouse. All results of the independent surveys showed count rates less than minimum detectable activity.

No violations or deviations were identified.

6. Maintaining Exposures As Low As Reasonable Achievable (ALARA) (83750)

The inspector reviewed the Brunswick Nuclear Project ALARA Committee Orientation and Training Manual, dated 1992. The manual contained organizational information for the ALARA committee, exposure awareness information, ALARA fundamentals information, exposure savings suggestions, and a summary of ALARA procedures. The inspector found the training manual to be informative and a good reference document for ALARA committee members.

The 1991 Unit 2 outage was completed with a total outage exposure of 468.1 person-rem which was less dose than any previous refueling outage at Brunswick. The outage had a planned duration of 77 days. Although the outage had an actual duration of 116 days, it was still one of the shortest refueling outages at this site. Exposure for plant modifications and major projects accounted for only 20 percent or 93.5 person-rem of the total outage exposure.

Drywell radiation levels were the highest ever encountered at the site at the beginning of the outage period. Survey data was gathered during the operating cycle at various points during forced shutdowns. The upward trend in drywell radiation levels was tied to the operation of Hydrogen Water Chemistry (HWC). As a result of the upward level in drywall radiation levels, the use of HWC was discontinued. Radiation levels dropped to values slightly higher than those seen at the beginning of the 1990 Unit 1 outage. These levels, however, were still twice the previously encountered radiation levels in previous Unit 2 refueling outages. A supplemental fuel pool cooling system was used to assist in the removal of decay heat, thus allowing

earlier decontamination of the recirculation system. During the outage, feedwater check valve replacements were made with a new valve design using non-cobalt alloy seats. This eliminated a source of cobalt introduction into the system.

The average daily measured exposure was 4.0 person-rem per day. This compared quite favorably with a target goal of 7.1 person-rem per day.

The licensee estimated that ALARA related efforts resulted in an exposure savings of 555 person-rem. This exposure reduction was attributed to the following five efforts: (1) chemical decontamination saving 331 person-rem, (2) shielding saving 198 person-rem, (3) Drywell Coordinators saving 15 person rem, (4) remote cameras saving 7.5 person-rem, and (5) nozzle flushes saving 3.5 person-rem; for a total savings of 555 person-rem.

Chemical decontamination of the recirculation system was the most effective and significant dose reduction project performed during the outage. The LOMI solvent process was used and included, for the first time, a decontamination of the reactor annulus. The improved decontamination technique yielded combined exposure savings of 331 person-rem. Overall, decontamination factors were found to be 10.7 for contact readings and 6.6 general area dose reduction. The total amount of activity removed was 76 curies which was approximately double the activity removed in the 1990 Unit 1 outage.

The use of temporary lead shielding installed in the Unit 2 reactor building (RB) and drywell resulted in exposure savings of approximately 198 person-rem.

The licensee used contract ALARA incentives to improve performance of major work scope activities. Each of the incentive clauses included bonuses for the contractor if they completed their projects below the agreed upon goal. The incentive clauses also contained penalties that contractors would pay to the licensee for exceeding the dose estimates by greater than ten percent. The licensee estimated that actual exposure reduction for projects related to ALARA incentives was 30 person-rem below the total of the original exposure goals.

The licensee was actively and aggressively pursuing the replacement of control rod drive blades with new cobalt-free blades. In addition, the licensee was studying refurbishment of control rod blade pins and rollers to reduce the cobalt introduced into the system.

The licensee set aggressive, long range, radiation controls for the upcoming five year period. This information is summarized below:

Table 3

Long Range Radiation Control Goals for BSEP

Year:	1992	1993	1994	1995	1995
Person-Rem:	700	600	870	500	530

The inspector was provided a demonstration of the surrogate tour. It was noted during the exit that this addition should help provide for future ALARA dose reductions by enabling the licensee to do better pre-job briefings and better engineering for plant modifications. The licensee had installed a surrogate tour work station in the Corporate offices for engineering use. The licensee was waiting for receipt of the second surrogate tour package for the other unit in the near future.

The inspector reviewed dose rate trending associated with hot spots. These were trended on a system that was called the "Most Wanted Hot Spots." The "Most Wanted Hot Spots" were assigned a priority ranking for attention. It appeared that hot spots were identified and were adequately tracked.

The inspector pointed out during the exit that the Plant Performance Summary and Maintenance's definition of rework, and the definition of rework developed by a Rework Project Quality Team were significantly different. The Project Quality Team defined rework in a much broader and more consistent manner than the Maintenance Plant Performance Summary Indicator The Plant Performance Summary Indicator for rework was so narrowly defined that much of the rework was not captured and therefore the indicator did not adequately nor accurately measure the amount of rework performed.

The inspector reviewed contamination control concerns in the Unit 1 and Unit 2 Reactor Buildings (RB) and the Turbine Buildings (TB). These concerns were prioritized and assigned as time and maintenance man-power become available. Some of the tracked concerns required unit shutdown or load reductions. This was factored into the prioritization of the concerns.

The inspector reviewed the 17-foot elevation painting plan options job scope performed by the ALARA group and found it sufficiently detailed. The options provided useful input into the management decision-making process. The inspector

reviewed the Condensate Storage Tank (CST) Ground Contamination Prevention Project Change Form that detailed the methods for containing future leaks and or spills in the CST pump areas. The Project described buildings with concrete floors which would catch any small leaks or spills that might occur. This project was initiated when ground contamination around the Unit 1 and Unit 2 CSTs was found. The areas of contamination were located in and around the CST pumps and at the manway on the Unit 1 CST.

No violations or deviations were identified.

7. Radiation Protection Procedures (83750)

The licensee used radiation work permits (RWPs) to implement the requirements of the CP&L Radiation Control and Protection Manual. Procedure E&RC 0230, Issue and Use of Radiation Work Permits, provided an explanation of the radiological work conditions which required the use of a RWP, the types of RWPs, and criteria for issuing, approving and using the RWP.

RWP pre-submittal forms were normally required to be completed by the job coordinator and presented to E&RC personnel at least 24 hours prior to the scheduled start of the work. Jobs that involved major scope activities were routinely presented to E&RC personnel significantly in advance of this time restraint. The pre-submittal form requested information about the opening of potentially contaminated systems, grinding, welding, and radiography; and if the work was located near the spent fuel pool, in high radiation areas, or in highly contaminated areas. The licensee has reviewed this process and has continued to make changes so that this system will provide a better planning tool. A new revision to the pre-submittal form was outlined to the HP technicians during this inspection. This revision included a logic diagram which detailed the flow and decision points for the pre-submitted form. In order to assist maintenance with planning and scheduling, two HP technicians were temporarily assigned to the SWFCG.

The inspector reviewed procedures for Operations, Maintenance and Training relative to the licensee's Traversing Incore Probe Systems (TIPS). The following procedures were reviewed in detail:

Procedures Number	Title
1-OP-09.1	Traversing Incore Probe System Operating Procedure, Rev. 17
2-OP-09.2	Traversing Incore Probe System Operating Procedure, Rev. 17

OPM-RE008	Cleaning and Inspection of TIP Systems, Rev. 0
1 MST-TIP 41R	TIP PCIS Group 2 Logic System Functions Test, Rev. 3
2 MST-TIP 41R	TIP PCIS Group 2 Logic System Functions Test, Rev. 5
OCM-RE0008	TIP Detector Replacement
E&RC-0040	High Radiation Area Control, Rev. 6

The inspector noted the E&RC procedures required workers in a restricted high radiation area, which included the TIP room/boxes, to complete the High Radiation Area Key Checkout Form. This form required approval for entry by an RC Supervisor, continuous HP coverage, obtaining a special RWP, and attendance at a documented pre-job briefing. Successful replacement of Gamma TIPS June 25-28, 1991, was observed and reported in IR No. 50-325, 324/91-20 (Par. 4(f)).

It was noted by the inspector that 1-OP-9.1 and 2-OP-9.2 procedure revisions were extended to April 16, 1992. These procedures will be reviewed at a later time.

No violations or deviations were identified.

8. Facility Tours (83750)

During this inspection, the inspector toured selected areas of the Unit 1 and Unit 2 RBs, TBs, the outside storage areas and yard. The inspector observed facility operations and selected work activities to evaluate the implementation and effectiveness of the licensee HP program. The following specific radiation protection issues and concerns were noted and discussed with licensee representatives.

a. Instrumentation

Selected survey meters and continuous air monitors in use were observed to be operable, calibrated and source checked. In addition, background radiation levels at the survey locations were found to be in an acceptable range. The inspector independently verified the accuracy of a sampling of the background radiation levels.

b. Notice to Workers

10 CFR 19.11(d) requires that a licensee post Form NRC-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 licensee activities. During the inspection the inspector

verified that NRC Form-3 was posted properly at various plant locations.

c. Facilities

The inspector toured the Hot Shop Decontamination Facility and the new Radwaste Storage Warehouse and noted the following. The decontamination facility was located across a walkway from the whole body friskers and provided an opportunity for contaminated material to be tracked across the walkway. The hot shop was located in the same facility and also provided the same opportunity. These observations were discussed with the licensee at the exit. During the tour the inspector noted that approximately eigthy-five 55 gallon drums of contaminated oil waste were stored in the new Radwaste Warehouse. The licensee indicated that because these storage drums were sealed and that activities involving opening these drums did not occur within the warehouse, there was not a fire hazard. The licensee further stated that the oil reclamation unit was very effective and provided quick cleanup. There were plans to operate this facility in the near future to clean up the contaminated oil.

During the tour the inspector observed that visual and audio coverage of the whole body frisker counting area did not occur between the hours of 7:30 p.m. and 6:30 a.m.. During these hours, remote TV cameras and audio were available to the technician working at the RWP sign-in area. The inspector also noted that there were no telephones or other communication capabilities located in the whole body frisk area where a person experiencing difficulties could call or otherwise notify the appropriate persons. The licensee informed the inspector that during this time frame people were instructed to report to the HP window located in the office portion of the plant within the Administration Building. The licensee agreed to review and evaluate this concern.

d. General Comments

The inspector noted during the tour that there appeared to be a large number of valves and pipes awaiting work in the hot tool shop area. This created a cluttered appearance and may be an industrial safety concern because of additional handling of the pumps and valves. In addition this has the potential to cause unnecessary additional radiation dose to personnel. This material would have to be relocated prior to any major work activity in that area.

During the tour, the inspector observed and pointed out to accompanying personnel the apparent inconsistencies associated with the location of step off pads (clean) and rope barriers.

Some of the step off pads were located inside the rope and some outside the rope. The inspector noted that the inconsistencies could lead to worker confusion and possible clean area contamination.

No violations or deviations were identified.

9. Emergency Plan and Implementing Procedures (82701)

Pursuant to 10 CFR 50.47 (b)(16). 10 CFR 50.54(q), and Appendix E to 10 CFR Part 50, this area was reviewed to determine whether changes were made to the program and to assess the impact of these changes on the overall state of the EP Program.

Since the previous inspection of this area conducted February 4-8, 1991, and documented in IR No. 50-325, 324/91-03, the licensee implemented Revision 31 to the Emergency Plan, dated April 1, 1991. The inspector confirmed that the revision was submitted to NRC within 30 days of the effective date, as required, and was subsequently approved by the NRC with no problem areas noted. Significant changes included addition of the requirement for performance of augmentation drills every 24 months and inclusion of the Emergency Action Levels (EALs) into the Emergency Plan. The inspector noted that the incorporation of these two changes satisfied licensee commitments previously identified and documented in IR No. 50-325, 324/91-03.

The inspector was informed that since the incorporation of Revision 31 to the Emergency Plan, no changes had been made to the EAL scheme. However, licensee representatives stated that a working group comprised of Shift Technical Advisors had been established to evaluate the new NUMARC EAL scheme. Although no final decision regarding the implementation of NUMARC EALs had been made, the inspector noted that efforts to assess and formulate a basis document were a positive initiative.

The inspector discussed with licensee representatives previous poor performance related to the timeliness of followup notifications to offsite agencies identified during both exercises and actual events. Licensee representatives stated that an evaluation of this area determined the implementation problems to be caused by cumbersome procedures, and, in early 1991, the appropriate procedures were modified to incorporate a logic flowchart to facilitate

completion of required notifications. The inspector determined that training was provided to the Emergency Communicators on the new procedures following the procedural revisions. Overall, final corrective actions associated with notifications appeared to be effective in that no deficiencies were noted in this area for an August 1991 actual event or the 1991 annual exercise.

The inspector reviewed the licensee's program for verifying shift staffing and augmentation capabilities as committed in Section 3.2 of the Emergency Plan. On January 16, 1992, the licensee performed an unannounced, off-hours drill (initiated at approximately 3:40 a.m.) requiring personnel to travel to the site; the first drill of this type conducted at Brunswick. Review of the documentation associated with the drill revealed that the licensee appropriately staffed and activated the Technical Support Center (TSC), the Operational Support Center (OSC), and the Emergency Operations Facility (EOF) within the required time limits.

In addition, the inspector reviewed selected records for monthly staffing/pager drills conducted since October 1991. These drills involved the notification of selected personnel for staffing the TSC and OSC and obtaining their estimated arrival times to the plant site. For the drills reviewed, the response times projected by the personnel were within the required time limits to augment the onshift staff. Based on the review of the monthly drills and the unannounced augmentation drill, the inspector did not note any concerns regarding the licensee's ability to meet the shift staffing and facility activation requirements.

The inspector reviewed records of actual emergency declarations made by the licensee since the last inspection of this area in February 1991. Only one such event had occurred on August 17, 1991, related to the approach of Hurricane Bob. Documentation of the event revealed that the licensee made an appropriate and timely Notification of Unusual Event declaration upon notification of the hurricane warning, and initial and followup notifications to offsite agencies were completed in accordance with the applicable procedures.

No violations or deviations were identified.

10. Emergency Plan Organization and Management Control (82701)

Pursuant to 10 CFR 50.47(b)(1) and (16) and Section IV.A of Appendix E to 10 CFR Part 50, this area was inspected to determine the effects of any changes in the licensee's Emergency Response Organization (ERO) and/or management

control systems on the EP Program to verify that such changes were properly factored into the Radiological Emergency Plan (REP) and plant emergency procedures (PEPs).

The organization and management of the EP Program were reviewed and discussed with a licensee representative. The routine EP organization continued to consist of an EP Coordinator (EPC) who reported to the Manager of Regulatory Compliance and was supported by an EP Specialist and an administrative assistant. The licensee stated that the Manager of Regulatory Compliance had recently undergone a personnel change, and the new manager had been in the position for only a short time. Although the inspector noted that this position appeared to have a high turnover rate, the immediate change did not appear to adversely impact the management or implementation of the EP Program.

The inspector discussed with the licensee plans for general program direction and overall management support. The licensee noted that emergency planning performance indicators (such as management involvement, offsite agency contacts, open action items, and human resource effectiveness) were tracked and reported to management on a monthly basis. In addition, the inspector was informed that long term program goals, projected through 1993, had been established to focus resources where needed to improve overall EP program performance. The inspector noted that the goals included the planned upgrade of the EP Training Program. The specific goals were tracked and the licensee appeared to be conforming to the established milestones. Recent dedication of resources to the EP program included creation of the Senior EP Training Specialist position and support for the Brunswick County Emergency Operations Center (EOC) and offsite siren system upgrades. Based on the above indicators, management support appeared adequate to support EP program implementation and future improvements.

The inspector reviewed with licensee representatives the support provided to the site by the Corporate EP staff. Current Corporate activities, in addition to routine exercise planning and coordination, that will impact the Brunswick site included: the development of procedures for scenario development, exercise planning and controller/evaluator training; establishment of a dose assessment working group tasked to ensure consistency between site and Corporate dose programs; and conduct of a survey of industry good practices for incorporation into EP programs. In addition, Corporate personnel stated that periodic reviews of selected plant activities were conducted. In 1992, one aspect of the reviews will include evaluation of the training qualifications for randomly selected ERO members.

Overall, discussions with licensee and Corporate personnel indicated that good communications existed between the various CP&L sites and Corporate on lessons learned and good practices and general support was considered satisfactory.

No violations or deviations were identified.

11. Offsite Interface (82701)

Pursuant to 10 CFR 50.47 (b)(1) and (15) and Appendix E to 10 CFR Part 50, this area was reviewed to determine whether the licensee maintained an adequate interface with offsite response organizations.

Section 6.1.1 of the Emergency Plan and PEP-04.3, Revision 8, dated March 23, 1988, describes the training program for offsite organizations including hospital, fire, ambulance, rescue squad, and police personnel. These organizations are to receive initial and annual retraining addressing notification procedures, basic radiation protection principles, expected support roles, and site access procedures, as applicable. The inspector reviewed and discussed with licensee representatives Offsite Support Organization training conducted since the last NRC inspection of this area during October 7-11, 1991, and documented in IR No. 50,325, 324/91-28. The licensee had provided training to Boiling Spring Lakes Volunteer Fire Department, Southport Fire and Rescue, and Yaupon Beach Volunteer Fire Department. Documentation of the various training sessions indicated that the scope and content was appropriate and the required topics were addressed. The inspector noted that participation in the training by support personnel appeared satisfactory.

In response to a previous NRC concern regarding the lack of detailed documentation describing the content of offsite training conducted, the licensee formulated an Offsite Training Checklist. The checklist appeared to provide a satisfactory framework for planning, conducting and documenting the training. Although the checklist had not yet been implemented in late 1991, the offsite support training reviewed by the inspector and discussed previously was well documented and included the information necessary to ensure compliance.

The inspector held discussions with licensee representatives regarding the coordination of emergency planning with offsite agencies. Written agreements existed with those offsite support agencies specified in the Emergency Plan, and the letters of agreement included in Appendix B of the Plan had been renewed within the past two years, as required.

The inspector determined through discussions with a Brunswick County Emergency Services official that there were no significant problems related to the interface with and support provided by the licensee. The official stated that the ongoing relationship with the licensee was supportive and periodically occurring issues were adequately resolved.

During the interview, the inspector toured the new Brunswick County EOC being constructed in response to FEMA findings regarding the space, equipment, ventilation, and furnishing inadequacies associated with the current EOC arrangements. The new EOC appeared to be a significant upgrade and included many equipment and logistical enhancements. The inspector was informed that the facility was scheduled for completion by April 15, 1992, which is prior to the dress rehearsal and NRC/FEMA graded exercise on June 2, 1992. The Brunswick County representative appeared satisfied with the support provided by Carolina Power and Light for the EOC upgrade as well as the Alert and Notification System (ANS) upgrade, conduct of training, and exercise coordination.

No violations or deviations were identified.

12. Emergency Plan Training (82701)

Pursuant to 10 CFR 50.47 (b)(2) and (15), Section IV.F of Appendix E to 10 CFR Part 50, and Section 6.0 of the Emergency Plan, this area was inspected to determine whether the licensee's key emergency response personnel were properly trained and understood their emergency responsibilities.

TS 6.8.1.e requires, in part, that written procedures be implemented and maintained for Emergency Plan implementation.

Section 6.1.1 of the Emergency Plan states that the Emergency Plan training program provides for initial training and annual refresher training of emergency response organization personnel.

The specific training requirements for emergency response personnel were defined in PEP 04.3, Performance of Training, Exercises, and Drills, Revision 8; Training Instruction (TI) 306, Emergency Plan Training, Revision 2; and Health Physics Instruction RC-EM-6, Revision 6.

Selected lesson plans, self-study modules, and examinations were reviewed; and personnel responsible for conducting Emergency Plan training were interviewed. The inspector determined that the licensee continued to implement a self-study based Emergency Plan training program rather than a

performance based program, as discussed during previous NRC inspections. The inspector was informed that a Training Upgrade Plan had been developed by the licensee to assess and implement needed program improvements. In general, the Plan provided for a complete evaluation of current training scope and methodologies and included development of classroom and performance based training. To facilitate the upgrade plan, a new position had been approved which would be dedicated to the upgrade activities and conduct of the training program. At the time of the inspection, EP training was a part-time function of the Brunswick Training Unit supplemented by the EPC. Although continued focus in this area was needed, the licensee's improvement efforts were considered a positive step toward a more comprehensive and effective EP training program.

Training records were reviewed for randomly selected members of the ERO. The inspector selected training records based on the March 4, 1992, site Emergency Organization Roster and the HP Emergency Response Notification List, dated February 6, 1992. When personnel training expiration dates in records were compared with position assignments, the inspector noted several discrepancies related to first aid training of E&RC technicians. Further evaluation by the licensee and inspector revealed 9 of 77 technicians' training in first aid had expired. Specifically, the retraining frequency for those individuals exceeded the Red Cross three year training criteria required to maintain qualification. Expiration for the identified individuals ranged from less than one month to 13 months.

In addition, one Corporate individual, designated to fill the position of Environmental Monitoring Supervisor/Environmental Field Coordinator, had not received Sea Breeze training as required. Corporate staff revealed that the individual had been identified during a November 1991 internal audit. In response to the audit finding, the individual was provided Sea Breeze training in January 1992; however, the individual failed to pass the examination. In neither instance, after the audit nor the failed training, was the individual removed from the on-call list. Licensee representatives stated that initially this individual was exempted from training due to his routine job duties associated with providing environmental monitoring training. The inspector noted that the procedure allowed a training exemption for teaching a course; however, this individual had not instructed the Brunswick-specific Sea Breeze course. The licensee acknowledged that the exemption was inappropriate and not in accordance with procedures. The inspector informed licensee management that the failure to conduct Emergency Plan training in accordance with

PEP-04.3 and TI-306 was a violation of TS 6.8.1.e (Violation 50-325, 324/92-06-01).

The significance of the failure to conduct required training was discussed in detail. Licensee representatives emphasized that although the Emergency Plan required all E&RC technicians to receive first aid training, chemistry technicians (seven of the nine identified deficiencies) were typically not called upon to provide this function. Although the inspector noted that the lack of the identified training did not reflect a significant degradation to the level of safety afforded to plant personnel, the licensee was informed that the failure to conduct the training as currently required in the Plan was significant in that it was reflective of repetitive failures to implement effective corrective actions for previously identified violations.

Recent enforcement actions concerning the failure to conduct Emergency Plan training are as follows:

- In September 1989, 25 examples for the failure to provided initial and/or retraining were identified and documented as a violation (50-325, 324/89-31-04).

- In February 1991, two examples for the failure to maintain current qualification of ERO members were identified and documented as a non-cited violation (50-325, 324/91-03-03).

- In October 1991, 93 examples of deficient Emergency Plan training were identified and documented as a repeat violation (50-325, 324/91-28-01).

Subsequent to the repeat violation in October 1991, the licensee performed a detailed root cause analysis and the following corrective actions were initiated: (1) a comprehensive audit of the training program was performed which identified the 93 training discrepancies; (2) special classes were conducted to qualify all personnel with expired training; (3) a comprehensive ERO listing and tracking system was developed; and (4) a new procedure, RCI-11.0, was developed which described the maintenance of the ERO, formalized the monthly training audit program, provided for notification of management of delinquent training, required deletion of personnel from the ERO if training was not completed by the last day of the month in which training was due, and required that failure to complete training within 30 days of the anniversary date would result in suspension of access to the Protected Area.

Discussions with EP personnel and a review of pertinent documentation revealed that the above described corrective

actions were in place at the time of this inspection. The inspector noted that monthly training audits and updates to the ERO listing were being performed; however, the audits did not include verification of first aid qualification, even though first aid was tracked as a required course. Licensee personnel responsible for the audit expressed thei awareness of the first aid training requirement and stated that the omission of the training requirement from the audit was an oversight. In addition, discussions with the E&RC and maintenance contact scheduler, who was responsible for tracking and scheduling all training for the E&RC staff, revealed that first aid was being tracked by E&RC as an [illegible]ree year requirement. However, the scheduler was [illegible]hat the first aid training was required by the Emer[illegible] Plan, and therefore, it had not received the pr[illegible]ctention and processing afforded to other EP

[illegible]he licensee's corrective action for the previous [illegible]s appeared generally effective in correcting major [illegible]ng implementation problems, the overall actions were not comprehensive as they did not address all program areas.

In response to the noted training discrepancies, the licensee took the following immediate corrective actions during the onsite inspection:

- Adverse Condition Reports were initiated for both the site and Corporate training discrepancies.

- The nine E&RC technicians were removed from the Emergency Organization.

- Sea Breeze training was initiated and successfully completed by the one Corporate staff member on March 10, 1992.

- First aid training was initiated for the E&RC technicians. Eight technicians had completed the training by March 13, 1992, with the final technician completing the training on March 20, 1992.

- The computer program for tracking and auditing the ERO training was revised to add an additional field for tracking first aid qualifications.

- Actions were initiated to revise the Corporate HP Training Instruction to state that any individual with expired training or failing a module would be removed from the roster. This was scheduled for completion by May 1, 1992.

- A NAD audit was scheduled to review 100 percent of the training records for the ERO.

On March 21, 1992, the licensee informed the inspector of the results of the independent audit which included an evaluation of training records for 727 members of the ERO as well as Corporate response personnel. The following additional training discrepancies were identified:

- A Maintenance Foreman had not received OSC training following his promotion into the position, approximately 13 months ago. He had been scheduled for training prior to this NRC inspection and completed the required training on March 16, 1992, as scheduled.

- Two Corporate HP personnel had not participated in a drill or real event during 1991, as required. The inspector noted that the procedure did not require the individuals to be removed from the ERO due to lack of participation; however, they were required to completely repeat initial training. The licensee stated that initial training had been attended by the individuals in 1992.

The licensee stated that additional corrective actions would be implemented, as necessary, following completion of the root cause analysis.

Discussions with licensee personnel following the onsite inspection revealed that the Nuclear Assessment Department (NAD) had conducted evaluations of the licensee's compliance with Emergency Plan Training requirements. Recent evaluations included review of personnel participating in the 1991 exercise as well as a selective review of approximately 40 ERO members following the October 1991 repeat violation. In both cases, no discrepancies were found; however, licensee representatives stated that the audit did not include compliance with the first aid training requirements. The inspector noted that more aggressive use of the NAD in comprehensively reviewing identified weak areas may have precluded repetitive noncompliances in Emergency Plan training implementation.

One repeat violation for the failure to conduct Emergency Plan Training was identified.

13. Emergency Facilities and Equipment (82701)

Pursuant to 10 CFR 50.47 (b)(8); and 10 CFR Part 50, Appendix E, Section IV.E; this area was reviewed to determine whether adequate emergency facilities and equipment to support the emergency response were provided and maintained.

The inspector toured the various onsite emergency response facilities including the Control Room, TSC, OSC, and EOF. The inspector observed each of the facilities to be as described in Section 5.0 of the Emergency Plan, and concluded that they appeared adequate to support an emergency response. The facilities appeared to be maintained in a state of operational readiness, and the licensee maintained procedures for facility activation, as appropriate. Licensee representatives stated and the inspector observed that no significant changes had been made to the facilities since the previous NRC inspection of this area during October 7-11, 1991.

During the walk through of the TSC and EOF, the inspector reviewed and discussed with licensee representatives previously identified problems associated with the emergency ventilation system. The inspector observed that the "as built" system was accurately reflected on ventilation system drawings, and that appropriate corrective actions had been completed to protect vulnerable drain lines located in walkways. In addition, the inspector reviewed Periodic Test (PT) Procedure PT-93.0, dated March 5, 1992, which had been revised to include NRC concerns addressed during NRC inspection 50-325, 324/91-21, as well as recent system modifications. The procedure required a positive pressure test be performed once every 18 months. Initially, the inspector expressed concern regarding the frequency and the acceptance criteria for the periodic test (i.e, achieve a slight positive pressure). Licensee representatives stated that the testing requirements were similar to those for the Control Room contained in the TSs. The inspector verified that the criteria were the same, and determined the procedure and testing methodology to be acceptable and in accordance with NUREG-0696 guidance.

A licensee representative stated that a full PT, including the positive pressure test, had not been performed on the TSC and EOF ventilation system since the February 1991 Engineering Evaluation Assessment was conducted demonstrating system operability. The inspector requested and observed a qualitative test of the system which verified that a positive pressure could be achieved in the TSC work area. The licensee agreed to notify the Resident Inspector

of the next PT so that procedure implementation and the results could be fully evaluated by NRC.

Section 6.1.2.1 of the Emergency Plan required that communications drills be conducted monthly to test the readiness of the communications network between the plant, State and county governments within the 10-mile Emergency Planning Zone (EPZ) and the NRC. During the onsite inspection, the inspector observed the performance of the monthly communications test. The test included use of: the Selective Signaling System to the state and county warning points and Emergency Operations Centers and the Coast Guard; the VHF radio used for backup communications; the HP Network; and the Emergency Notification System. During the test, problems were noted with the volume level associated with the Selective Signaling link to the Coast Guard; however, the licensee was able to contact the Coast Guard successfully using an alternate communications method. The licensee promptly initiated corrective actions in accordance with procedures, and the inspector was advised prior to the end of the inspection that the problems had been resolved.

Section 4.4.6 of the Emergency Plan described the licensee's Alert and Notification System (ANS). The ANS consisted of 34 fixed sirens (29 in Brunswick County and five in New Hanover County). Licensee representatives stated that no changes in the number or location of sirens were required in 1991; however, due the construction of a new residential development, future additions may be required. The inspector was further informed that a siren system upgrade program had been approved for both Brunswick and New Hanover Counties to increase system reliability. The system would enable the licensee to verify system operability using a feedback mechanism. The current schedule for completion of Brunswick's upgrade was the end of 1993, with New Hanover County's upgrade expected to be complete by the end of 1992.

The inspector reviewed documentation of the annual full cycle test of the ANS conducted on November 1, 1991. During the test problems were identified for several of the sirens. The inspector noted that the corrective actions were pursued promptly and the affected sirens were placed into service that evening with retesting completed on November 2, 1991. The inspector reviewed documentation to FEMA dated November 26, 1991, certifying greater than the required 90 percent operability for 1991. Licensee representatives informed the inspector that actual operability was greater than 98 percent.

No violations or deviations were identified.

14. Emergency Planning Independent and Internal Audit Program (82701)

Pursuant to 10 CFR 50.47(b)(14) and (16) and 10 CFR 50.54(t), this area was inspected to determine whether the licensee had performed an independent review or audit of the EP Program, and whether the licensee had a corrective action system for deficiencies and weaknesses identified during exercises and drills.

The most recent independent audit of the EP Program was conducted July 22 through August 30, 1991, and documented in report BNP/NAD/91-142. This audit fulfilled the 12-month frequency requirement for such audits. The audit, performed by the NAD, included a review of the following EP program areas: organization, administration, Plan and implementing procedures, training, facilities and equipment, public information, assessment and notifications, and personnel protection. Further, the inspector noted that the audit included an evaluation of the offsite interface which was conducted through the performance of interviews with selected offsite groups. The audit did not identify any items of non-compliance; however, several areas were noted for program improvement. Audit results were well documented and provided to both Corporate and site management. In general, the licensee's independent audit program appeared satisfactory. Additional discussion regarding the audit program effectiveness is provided in Paragraph 12 above.

Section 6.1 of the Emergency Plan and Plant Emergency Procedure 04.3 required the performance of critiques following exercises and drills. Licensee documentation for the 1991 annual exercise and drills conducted subsequent to October 1991, showed that critiques were conducted as required and included a discussion of both weaknesses and program strengths. The inspector noted that the critique of the 1991 exercise was fully documented and distributed to site management and supervisory personnel.

The licensee's program for followup on findings from audits, drills, and exercises was reviewed. Licensee representatives stated that the method used to track critique items was the Regulatory Compliance Tracking System, FACTS. Both significant findings, documented in Adverse Condition Reports, and other items requiring corrective actions were tracked using this system. A selective review of previous audit and inspection findings and exercise and drill critique items indicated that identified items were tracked and root cause analyses were

performed, as required. With the exception of the apparent repeat EP training violation, for the records reviewed corrective actions appeared appropriate and were implemented in a timely manner.

Section 6.2.1 of the Emergency Plan required an annual review of the Plan by the Plant Nuclear Safety Committee (PNSC). A review of pertinent documentation indicated that the PNSC review of the Emergency Plan was being conducted at the annual frequency, as required. The last two reviews were conducted on November 21, 1990, and November 27, 1991, and included appropriate discussion of EP program changes. Further, the inspector noted that the 1991 annual review of the implementing Procedures was performed by the EPC as required by the licensee's Administrative Procedure.

No violations or deviations were identified.

15. Procedure Compliance (84750)

T.S. 6.8.1 requires that procedures shall be established, implemented and maintained. Procedures compliance ensures that procedures pertinent to safety related equipment and activities are reviewed and performed in a manner conducive to maintaining operational safety.

Pursuant to these requirements the inspector reviewed applicable portions of the Administrative Procedure, Volume 1, Book 1, Revision 138, which covered the use of procedures, and the departure and deviation from established procedures. The portions reviewed were adequate for their intended purposes.

The inspector also interviewed several licensee personnel regarding their understanding of what qualified as "procedure compliance." In each case, the interviewee understood that procedure compliance meant that the procedures were performed as they were written, i.e., verbatim. The licensee personnel indicated that they understood that if a procedure step was unclear, incorrect, or missing that they were to stop and inform their supervisor. They interviewees also understood that in no case was "professional" procedure compliance allowed ("professional" knowledge allowing the procedure user to modify, eliminate, or add steps to a procedure without prior approval and review).

The interviewees indicated that a measure of reason was to be applied. For example, the interviewees indicated that if a procedure required them to write a value on a "line," but there was only a space without a line actually shown, that

they would write the value in the space and continue performing the procedure.

No violations or deviations were identified.

16. Chemistry (84750)

This area was inspected to determine whether the licensee was adequately controlling the quality of the reactor coolant to ensure long-term integrity of the reactor pressure boundaries and minimize out-of-core radiation field buildup. Pursuant to this effort, several areas were reviewed, as follows:

a. Boron Intrusion into the Reactor Coolant System

IR No. 50-324, 325/91-29 detailed the cause and results of an inadvertent boron intrusion in primary fluid systems at BSEP, including both reactor vessels, radioactive waste systems, and CSTs (for example, 580 parts per billion (ppb) in the Unit 2 reactor cooling water on August 9, 1991). The Chemistry Department's guideline for boron was 500 ppb. The licensee formed a task force to evaluate the situation, determine the source of boron and its effects on safe reactor operation, and find a method to correct the condition.

There are no specific resins to remove boron. When boron is present, it changes to boric acid which is weakly held by ion exchange resins and is easily displaced by other ions, such as chlorides. In addition, boron is activated by neutrons to produce tritium.

The inspector was informed that the licensee determined that corrosion-inhibiting chemicals used in the Turbine Building (TB) Component Cooling Water Head Tank may have been introduced into a TB Floor Drain Sump, which in turn may have been emptied into the Waste Neutralizer Tank. An immediate suspension of the use of the boron-containing corrosion inhibitor was implemented. Sampling/testing activities shortly thereafter revealed significant improvement, i.e. lowering of the boron concentration.

Because there is no resin which is "boron specific" and boric acid is weakly held (i.e. ions with greater affinity easily displace the boron) by the Condensate Deep-bed Demineralizers, a "feed and bleed" operation was initiated to remove the boron from the reactor

coolant systems. This operation resulted in increased tritium concentrations in liquid releases.

Partially as a result of this boron intrusion, the licensee performed a tritium "mass-balance" across the site. Using the Final Safety Analysis Report (FSAR) value for the theoretical amount of tritium generated by a two unit site at full power, and assuming a linear relation of tritium generation to power, the licensee calculated a hypothetical amount of tritium generated at BSEP for a given time period. The licensee then determined that the tritium measured in effluents released from BSEP was less than this hypothetical, calculated amount of tritium (approximately 50 curies).

This prompted the licensee to analyze the plant for unmonitored releases of tritium. This included the sampling and analysis of several effluent release points. The licensee identified the Storm Drain Collection Pond (SDCP), or retention pond, as a previously unrecognized release point for tritium. The input of the SDCP was the Storm Drain Collection Basin (SDCB), which received effluents from the storm drains and from some sumps in the TB.

The inspector was informed that the licensee noted that the SDCP is a permitted release point. It was identified as an unmonitored release point much earlier (1980s) and specific analyses were implemented by TS requirements. A release from the SDCP required sampling and analysis prior to release, but tritium analysis was only required when a "trigger level" based on gamma isotopic concentration was exceeded. The trigger level requiring tritium analysis was never reached and, thusly, tritium analyses were not required by TS.

An investigation performed by the licensee revealed that the source of the tritium was steam leaks in the TB. The steam containing the tritium was condensed in the TB Ventilation System Swamp Cooler. The overflow from the TB Swamp Coolers fed a sump that fed the SDCB which fed the SDCP.

The licensee determined that during the last six months of 1991 approximately 3.7 E+07 gallons of water containing 1.88 E+01 curies of tritium were released. The large number of gallons of water released included rainwater from the site's storm drains, and rainwater on the pond itself. The licensee reported these releases in the Semiannual Radioactive Effluent Release Report (SRERR) for July 1, 1991 through December 31,

1991. The amount of tritium released was well below the regulatory limits.

During this inspection, the inspector discussed with the licensee the appropriate format for reporting these releases. The licensee committed to amending the July 1, 1991 through December 31, 1991, SRERR to reflect these changes. These changes included incorporating the curies released by this pathway in the quarterly activity summaries. The licensee anticipated that the amounts of tritium released from the SDCP will decrease as the effects of the boron intrusion are mitigated.

b. Unit 1 Fuel Leaks

The inspector reviewed the licensee's efforts to identify and track the effects of a leaking Unit 1 fuel element. The licensee used a vendor supplied program to compare measured values of radioisotopic concentrations of fission gases in the exhaust of the Steam Jet Air Ejectors, and iodines and fission products in reactor coolant, to an empirically derived computer model.

Based on the offgas measurements, the comparison indicated one leaking fuel element; however, four fuel elements were estimated to be leaking based on the iodine measurements. Since there was a large amount of uncertainty associated with the correlation of the iodine measurements, the licensee concluded that the indication for one leaking fuel element was more accurate. The licensee was tracking and trending these measurements. The information on the number of leaking fuel elements can be used to determine plant operations (for example, operators may decide to adjust flux patterns to minimize the impact of leaking fuel).

c. Hydrogen Water Chemistry (HWC)

The inspector reviewed the status of the HWC Program at BSEP. Based on interviews with the licensee and a document review, the inspector determined that the licensee was planning to operate Unit 2 under HWC during Cycle 10. The plans indicated that Cycle 10 would start under normal water chemistry (NWC) for approximately six weeks, to allow preconditioning of the decontaminated pipe. HWC would then be implemented using a hydrogen injection rate which would achieve a electrochemical potential of $\leq$ -230 millivolts (standard hydrogen electrode). The licensee planned to return to NWC at the end of Cycle 10. The licensee's

past experience with reinstituting NWC prior to an outage was that it significantly mitigated the high dose rates previously seen in the drywell when completing a fuel cycle with HWC. The theorized mechanism for this drop in dose rates was that the NWC caused the redistribution of the crud back to the reactor core.

Prior to the resumption of HWC, the licensee planned to repair the hydrogen injection system, including the replacement and/or cleaning of reference electrodes. The licensee did not have a schedule for the completion of these tasks.

The licensee was waiting for additional operating experience on Unit 2 prior to definitively scheduling the implementation of HWC on Unit 1.

d. Process Water Reduction

The inspector also discussed with the licensee the efforts of the E&C Organization to reduce the amount of process water released from the site. Primarily this effort was focused on identifying areas for improvement and making recommendations to plant operations staff with regard to this goal. These recommendations included: (1) improving water movement and usage during outages by increased coordination and planning; (2) the balancing of discharges and water usage with make-up and radwaste processing to quantify leakage, which then could be identified; (3) increasing efforts to identify and correct system leaks by the aggressive monitoring of sump inleakage rates; and (4) restoring the floor drain process path to allow more efficient processing of these liquids.

e. Conclusions

Based on this selective review, the inspector concluded that the licensee was adequately controlling the quality of the reactor coolant to ensure long-term integrity of the reactor pressure boudaries and minimize out-of-core radiation field buildup.

The inspector also concluded that the licensee's prompt, professional action in the handling of the boron intrusion, the resulting tritium in the SDCP releases, and the proactive nature of the E&C recommendations to reduce water usage, clearly illustrated the strengths of this organization.

No violations or deviations were identified.

17. Radiation Monitoring

TS 3.3.5.8 and 3.3.5.9 require, in part, that radioactive liquid and gaseous effluent monitoring instrumentation channels be operable. The operability of these instruments ensures that the licensee will have the capability to measure the amount of radioactivity released from the site in effluents, and be able to calculate the resulting doses to the public from these effluents.

Pursuant to these requirements, the inspector reviewed the overall operability of process and effluent liquid and gaseous radiation monitors. This review included a review of documents and interviews with cognizant licensee personnel. The documentation reviewed included a computer generated routine work request list for work requests initiated between December 13, 1991, and February 10, 1992. The inspector selected several different items in the radiation monitoring area from this list and discussed the status of these items with an representative from Instrumentation and Control (I&C). The inspector concluded from this review that most of these items were being repaired within a reasonable time frame. Many items were completed, while others had been scheduled for repair, or were considered work "in progress."

In addition, the inspector requested that the licensee generate a list of effluent and process radiation monitors that had been inoperable during 1991, the causes of the inoperability, and the disposition of the monitors. The licensee is required to report, to the NRC, monitors which were inoperable for 30 or more days. The list requested by the inspector would include these monitors, but also monitors which were inoperable for less than 30 days.

The licensee generated this list by reviewing their historical records for Limiting Conditions of Operation (LCO) involving applicable monitors, and backtracking from the LCOs to the individual work requests for the monitors or associated components. The inspector reviewed this list with the licensee, and concluded, based on this review, that radiation monitors at BSEP did not typically experience undue or lengthy periods of inoperability, and were receiving adequate attention and support from Maintenance and I&C. The inspector noted that monitors which were inoperable for 30 or more days were reported to the NRC as required.

In addition, the inspector also discussed monitor inoperability with several BSEP personnel, including technicians, supervisors, and maintenance personnel. The

interviews indicated that radiation monitors were receiving adequate support from I&C and maintenance.

However, discussions with the licensee did indicate that monitors associated with plant modifications might experience lengthy periods of "inoperability" due to the complex nature of getting a plant modification approved, designed, budgeted and implemented. In addition, operable monitors may not be considered as such, because of administrative concerns connected with the official completion of a plant modification and classification of a monitor as operable. Previous inspection reports provided details of two of these instances (50-324, 325/91-29, 91-04, 90-28, 90-10, etc.). Additional details on the affected monitors follow.

a. Radioactive Liquid Effluent Flow Integrator

This flow integrator had been inoperable since 1984. This placed the licensee in a continuous Action Statement of TS 3.3.5.8, and required the licensee to estimate flow during liquid releases by the use of pump performance curves or tank level indicators. The major delay with the replacement of this item was the low priority it received by the licensee, as well as the lengthy amount of time it took to initiate and complete the associated plant modification (Plant M ?ication 91-040).

During this inspection, the inspector determined that the plant modification for the replacement of the flow integrator device had been completed and the flow integrator was in-place and operable. The inspector reviewed the results of a study comparing the flow integrator values to known changes in tank levels.

The percent differences between the calculated volumes released based on tank dimensions and level indicator values versus the flow integrator values were typically in the range of ± 2 percent. One tank, the Salt Water Release Tank (SWRT), showed a larger difference due to its design (110 feet long, 10.2 feet wide; i.e., a small error in the level reading on this tank would translate into a significant difference in the calculated volume released). The differences for this tank ranged from -5.3 percent to +13 percent. At the time of this inspection, E&RC planned to use a tank release from a tank with a calibrated level indicator to fulfill the quarterly functional test requirements of the radwaste flow integrator. Based on a telephone conversation held on April 6, 1992, the licensee was planning to input a simulated signal to the monitor to

fulfill the required quarterly functional check. The monitor may require some physical modification to allow the input of the simulated signal. This may cause the monitor to be inoperable to greater than 30 days.

b. Unit 1 & 2 Main Condenser Off-Gas Treatment System Monitors

As discussed in IR Nos. 5-324, 325/90-10, 89-17, 88-44, 88-28, 87-33, 87-07, 86-26, etc., these four hydrogen analyzers have been inoperable for several years (approximately 1985 timeframe). For the last two years (approximately) this delay was caused by the hydrogen monitoring equipment in the Augmented Offgas Systems being associated with the Hydrogen Injection Systems tied to the implementation of HWC in both units. The licensee implemented HWC for Unit 2 on December 28, 1988 and for Unit 1 on February 23, 1990.

Although hydrogen has been injected into the feedwater of both units, the complete Hydrogen Injection System, of which the Hydrogen Gas Monitoring System was part, was still in the testing phase. Due to this, the complete system had not been accepted from the construction group as "operable." Part of the delay was incurred while waiting for a TS change and part was due to other system problems. Although the hydrogen analyzers have, in fact, been operable for a significant length of this time, because they were part of an incomplete plant modification, they remained "administratively" inoperable and the licensee continued in an Action Statement of the TS. As of March 26, 1992, the licensee indicated to the inspector, by telephone, that the monitors for Unit 2 had been declared operable.

The inspector also reviewed other monitors for operability concerns. Details of these monitors and/or situations follow.

a. Unit 2 RB Roof Ventilation Monitor

This monitor was listed on the SRERR dated February 21, 1992, as being inoperable for greater than 30 days during the last six-month reporting period. The cause of the inoperability was a modification of the monitor which would allow for continuous collection of particulate and iodine samples; even during periods of sample filter and cartridge change-outs. Basically, this involved the installation of a parallel sample train. During acceptance testing of the modified system it was determined that the older components of

the system suffered from considerable, heretofore undiscovered, air inleakage.

This inleakage was discovered because the modification relocated a photohelic sensing orifice (PSO) upstream of the detector, sample holder chambers, and pump seals. After the modification, the licensee noted differences between the PSO and a calibrated rotometer, indicating system leaks. The impact of these leaks was that the licensee was sampling and analyzing samples which were comprised, at least partially, of the ambient atmosphere surrounding the monitor, as opposed to samples consisting solely of effluents from the RB roof ventilation system as intended.

The licensee eliminated the sources of inleakage from the system, but then determined that the system was unable to obtain the previously used system flow of three standard cubic feet per minute (scfm). The licensee's short term solution was to use the reconfigured monitor and an auxiliary pump. The licensee's long term solution was to plan to install sealed shaft sample pumps capable of maintaining the desired sample flow, and which would give indications of seal failure. The Unit 2 RB roof ventilation monitor was being replumbed at the time of the inspection.

The licensee planned on evaluating the differences in the data collected over the next six-month reporting period compared to data reported prior to the discovery of the inleakage. Although significant differences were not expected, if they occur, the licensee will amend any applicable reports.

c. Unit 1 and 2 TB Ventilation

During this inspection, the inspector noted that there were several instances where personnel, who had been in the Unit 1 TB, encountered a delay when leaving the RCA, due to rubidium gas adhering to their clothes, hard hats, hair, etc. While it is not uncommon to encounter this situation, the inspector performed a selective review of the TB ventilation system and the cause of the rubidium gas, in order to evaluate the extent of the problem. This review included discussions with the licensee and a review of pertinent documentation.

This review indicated that the TBs' Heating, Ventilation and Air Conditioning System was designed to maintain the TBs at a negative pressure to minimize

unmonitored radioactive releases from the buildings. The ventilation system design did not include a fan or specific air "intake" to draw air into the buildings. Air into the TBs was supplied by "leaks" only. The licensee indicated that in the past they performed smoke tests with "smoke sticks" to verify that the buildings were maintained at a negative pressure. The ventilation systems for the TBs were designed to have one point of exhaust for each TB, which was filtered and monitored for radioactivity. The system was designed to recirculate a large portion of the air (approximately 90 percent) and was designed to cascade air from clean areas of the buildings to areas of greater potential contamination.

The current ventilation system was a modification of the original system. The original system consisted of several large fans in the roof of the shared 70 foot elevation. The modification included the addition of filtering and radioactivity monitoring capabilities. The original roof fans were left in place with their dampers closed to prevent unmonitored releases to the environment. The licensee indicated that it was not desirable to permanently cap these fans because they might be needed in the event of a TB fire.

The licensee indicated that the source of the rubidium gas in the Unit 1 TB was steam leaks in the Unit 1 TB. Because of the leaking fuel element in the Unit 1 reactor core discussed above (Paragraph 16 b.), these steam leaks have a radioactive component. Rubidium gas is a progeny of a fission product.

The inspector requested, and received from the licensee, the following: (1) a list of the locations of the steam leaks in the Unit 1 TB; (2) the approximate magnitude of the leaks; (3) the length of time these leaks had existed; and (4) scheduled dates for repair. The inspector noted that 11 leaks were identified for the Unit 1 TB, with magnitudes ranging from "drips" to five gallons per minute (gpm). Most of the leaks were measured in drips per minute, with two leaks shown as 0.5 gpm. Five of the leaks were identified in February or March of 1992; three were identified since October, 1991; three were identified in April, July and August, 1991, respectively. Seven of these leaks were scheduled for repair during the next refueling outage or next Periodic Test outage. One leak was scheduled for repair in April, 1992. Two recently identified leaks had not been scheduled for repair as of this inspection, and one leak was scheduled to be worked by I&C.

The inspector reviewed the Radwaste Daily Status Sheet for March 3, 1992, and noted that the inleakage listed for the Unit 1 TB floor drain averaged 5.78 gpm. The inleakage listed for the Unit 2 TB floor drain averaged 0.20 gpm. The licensee assumed that the inleakage was due to the partial condensing of the steam leaks. The report listed seven leaks for the Unit 2 TB.

The inspector concluded, based on the documentation review, and based on discussions with the licensee, that the steam leaks in the Unit 1 TB were being tracked and were scheduled for repair.

On April 2, and 6, 1992, the inspector discussed with the licensee by telephone some recent developments concerning the TB ventilation system. On March 22, 1992, an auxiliary operator performing rounds discovered a TB ventilation louver from one of the original fans on the 70 foot elevation in an open position. The licensee closed the louver, but a positive pressure existed at this elevation and measureable flow out of the TB still existed. The licensee took flow rate readings and proceeded to perform continuous radioactive particulate and iodine sampling of the flow. Initial values for the activity of this flow was 2.31 E-12 microcuries per milliliter (μCi/ml) for particulates and 6.70 E-11 μCi/ml for iodine-131 and iodine-133. Noble gases for the Unit 2 TB were below the limit of detection, and 5.70 E-08 μCi/ml for the Unit 1 TB. The licensee estimated the flow to be 7000 scfm. Routine total flow out of the TBs stacks was 30,000 scfm. The licensee was investigating the cause and length of time this condition may have existed. The licensee indicated that the cause may have been an inoperable louver on the original fan and an unbalanced ventilation system.

The licensee performed smoke tests and determined that the TB had several areas of localized positive pressure, probably due to the ventilation system imbalance. The licensee was evaluating the extent of the system imbalance, making adjustments, and repairing the ventilation system when feasible. The licensee was considering the appropriateness of implementing a PT to monitor the status of the air pressure in the TBs.

At the time of these conversations, the licensee was still investigating the situation. The licensee reported this situation in Adverse Condition Report 92-270.

No violations or deviations were identified.

18. Licensee Action of Previous Inspection Findings (92701)

a. (Closed) Unresolved Item (URI) 50-325, 324/89-34-44: Radwaste Cleanup Phase Separator Tank Room Reportability

The licensee has determined that the Radwaste Cleanup Phase Separator Tank Room is not reportable and has an active evaluation underway to determine the course of action.

b. (Closed) Inspector Followup Item (IFI) 50-325, 324/91-23-01: Review the resin dewatering area for the potential of an unmonitored release and review temporary resin transfer for adequacy of procedural requirements.

The licensee used a mobile unit located at the loading dock for the processing of wet, solid radioactive waste. A concern had been previously raised regarding the overall safety of performing this operation outside, in the proximity of a storm drain(s).

The inspector reviewed portions of two separate 10 CFR 50.59 Program Manual Safety Review Packages for two procedures associated with this operation (Procedure Number PT-45.1.11, Revision 9, titled "Solidification Process Control Program Verification," and Procedure Number SP-88-027, Revision 7, titled "Transferring of Spent Resins or Filter Sludges to the Mobile Process Unit"). It was noted in these packages that the mobile unit used for processing waste was not related to any safety systems as evaluated in Chapter 15 of the FSAR. The packages also addressed several potential safety concerns (tube rupture, airborne releases, liner overfill, bottom weld rupture of the liner, miscommunications between technicians, etc). It was concluded that the potential of these accidents was minimized by pretesting of affected equipment, as well as built in safety controls (for example, storm drains in the immediate vicinity were sealed during the transfer process).

In addition, calculations showed that a release from the mobile processing unit would result in a site

boundary airborne radioactivity release at concentrations at a small fraction of the 10 CFR 20 limits. Based on this analysis, the operation of the mobile process unit waste solidification facility did not constitute an unreviewed safety question.

The inspector also asked the licensee for any reports of accidents or incidents involved with this operation. The inspector reviewed four of these reports, the latest of which was dated January 15, 1982. Three of these incidents involved hose ruptures. The licensee indicated that there have not been any recent radiological incidents associated with this operation.

In addition, the inspector toured the area were this operation was performed. No problems or concerns were noted.

In conclusion, based on a review of the safety evaluations, historical data, and licensee interviews, the inspector concluded that the operation of the mobile unit for processing wet, solid, radioactive waste was adequate. Review of safety evaluations and historical data documented the adequacy of the operation.

c. (Closed) IFI 50-325, 324/91-26-02: Review offsite training course descriptions and documentation.

As discussed in detail in Paragraph 11 above, the inspector reviewed and discussed with licensee representative the recent training conducted for offsite support organizations as well as the newly formulated training checklist. Based on the inspector's evaluation, the licensee's actions to improve this area were considered satisfactory; therefore, this item is considered closed.

19. Action on Previous Enforcement Findings (92702)

a. (Closed) Violation (VIO) 50-325,324/91-03-02: Failure to adequately maintain the Emergency Ventilation System for the TSC and the EOC.

As discussed in detail in Paragraph 13 above, the inspector reviewed the current configuration of the TSC/EOF Emergency Ventilation System, applicable performance testing procedures for the system, and revised system drawings. Observation of a qualitative positive pressure test in the TSC also verified that the system could achieve a slight positive pressure as

required. Based on these reviews, this item is considered closed.

b. (Closed) VIO 50-325, 324/91-28-01: Failure to maintain training requirements for emergency response organization personnel.

The inspector reviewed corrective actions associated with this issue as documented in the licensee's response dated December 23, 1991. This item is being closed; however, an additional violation regarding Emergency Plan training was identified and is described in Paragraph 13 above.

20. Exit Interview

The inspection scope and results were summarized on March 13, 1992, with those persons indicated in Paragraph 1. The general program areas were reviewed and the apparent repeat Emergency Preparedness violation identified during this inspection and listed below was discussed in detail. No dissenting comments were received from the licensee.

The inspector informed licensee representatives that, although proprietary information was reviewed during this inspection, such material would not be included in the report. The licensee was informed that URI 89-34-44, IFI 91-26-02, and IFI-91-23-01 would be closed. Subsequently, on March 20, 1990, the licensee was informed that VIO 91- 03-02 and VIO 91-28-01 would also be closed.

Item Number	Description and Reference
50-325,324/92-06-01	NRC-identified repeat violation (VIO): Failure to conduct training of Emergency Response personnel in accordance with the applicable implementing procedures.

21. Acronyms and Initialisms

ALARA	As Low As Reasonably Achievable
ANS	Alert and Notification System
BSEP	Brunswick Steam Electric Plant
CST	Condensate Storage Tank
EAL	Emergency Action Levels
E&C	Environmental and Chemistry
E&RC	Environmental & Radiation Control
EOC	Emergency Operations Center
EOF	Emergency Offsite Facilities
EP	Emergency Preparedness

EPC	Emergency Preparedness Coordinator
EPZ	Emergency Planning Zones
ERO	Emergency Response Organization
FSAR	Final Safety Analysis Report
gpm	gallons per minute
HP	Health Physics
HWC	Hydrogen Water Chemistry
I&C	Instrumentation and Control
IFI	Inspector Followup Item
IR	Incident Report
IR	Inspection Report
LCO	Limiting Condition of Operation
NAD	Nuclear Assessment Department
NED	Nuclear Engineering Department
NWC	Normal Water Chemistry
OSC	Operations Support Center
PCE	Personnel Contamination Event
PEP	Plant Emergency Procedure
PNSC	Plant Nuclear Safety Committee
ppb	parts per billion
PSO	Photohelic Sensing Device
PT	Periodic Test
RB	Reactor Building
RC	Radiation Control
RCA	Radiologically Controlled Area
REP	Radiological Emergency Plan
RWP	Radiation Work Permit
scfm	standard cubic feet per minute
SDCB	Storm Drain Collection Basin
SDCP	Storm Drain Collection Pond
SRERR	Semiannual Radiological Effluent Release Report
SWCG	Site Workforce Control Group
SWRT	Salt Water Release Tank
TB	Turbine Building
TI	Training Instruction
TIP	Traversing Incore Probe
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications
TSC	Technical Support Center
URI	Unresolved Item
µCi/ml	microcuries per milliliter