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

Report No.: 50-395/94-24

Licensee: South Carolina Electric & Gas Company
Columbia, SC 29218

Docket No.: 50-395 License No.: NPF-12

Facility Name: Virgil C. Summer Nuclear Station

Inspection Conducted: September 19 through October 31, 1994

Inspectors: _____ for 11/16/94
R. C. Haag, Senior Resident Inspector Date Signed

_____ for 11/16/94
T. R. Farnholtz, Resident Inspector Date Signed

_____ 11/16/94
W. P. Kleinsorge P.E., Regional Inspector Date Signed
(October 3-7 and 20-24, 1994)

_____ 11/16/94
for B. A. Parker, Regional Inspector Date Signed
(September 19-23 and September 29 - October 4, 1994)

Approved by: _____ for 11/18/94
Floyd S. Cantrell, Chief Date Signed
Reactor Projects Section 1B
Division of Reactor Projects

SUMMARY

Scope:

This inspection was conducted by the resident and regional inspectors onsite for the activities associated with steam generator replacement. Selected tours were conducted on backshift or weekends. These tours were conducted on October 2, 10, 16, 22, 23, 26, 27, and 29, 1994.

Results:

A violation was identified for the failure to provide adequate cleanliness control instructions related to the steam generator (S/G) secondary manway openings (paragraph 3.f.1). A non-cited violation was identified for issuing a respirator to a person whose qualifications had expired (paragraph 3.b.2). Minor problems were experienced during removal of the old S/Gs from containment; however, these problems were satisfactorily resolved as encountered. Installation of the new S/Gs was accomplished safely and within

program requirements. In the area of health physics, the original goals for personnel exposure were lowered for both the steam generator replacement project and the overall outage, and the licensee was still able to keep total exposure less than the new goals. Cutting, welding, and nondestructive examination activities were performed in accordance with approved procedures with some minor exceptions. Management oversight continued to be maintained at a consistently high level.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

J. Archie, Coordinator, SGRP
* +W. Baehr, Manager, Health Physics
# K. Beale, SGRP
* +R. Beck, Project Manager, Bechtel Corporation
# L. Bennett, Welding Manager, Bechtel Corporation
*#+M. Browne, Manager, Design Engineering
R. Burch, Supervisor, Chemistry
*#+R. Clary, Manager, Steam Generator Project
* +L. Faltus, Acting Manager, Chemistry
*# S. Fipps, Independent Safety Engineering Group (ISEG)
*#+M. Fowlkes, Manager, Nuclear Licensing & Operating Experience
#+T. Franchuk, SGRP/Quality Assurance
*#+S. Furstenberg, Manager, Maintenance Services
L. Hipp, Manager, Materials and Procurement
*#+S. Hunt, Manager, Quality Systems
* M. Jordan, Supervisor, Health Physics
+J. LaBorde, Design Engineer
+D. Lavigne, General Manager, Nuclear Safety
+M. Miltner, Start-up Coordinator, SGRP
G. Moffatt, Manager, Planning and Scheduling
* P. Mothena, Supervisor, SGRP Health Physics
#+J. Nesbitt, Manager, Technical Services
*#+K. Nettles, General Manager, Station Support
H. O'Quinn, Manager, Nuclear Protection Services
W. Poppell, Becon PCE
M. Quinton, General Manager, Engineering Services
A. Rice, Engineer, Nuclear Licensing
J. Senecal, Becon PQCE
J. Skolds, Senior Vice President, Nuclear Operations
*#+R. Slover, Site Manager, Bechtel
#+B. Steffy, Bechtel Outage Manager
D. Strohman, QA Manager, Bechtel
#+G. Taylor, General Manager, Nuclear Plant Operations
#+B. Waselus, Manager, System and Component Engineering
R. White, Nuclear Coordinator, SC Public Service Authority
*#+B. Williams, Manager, Operations
G. Williams, Acting Associate Manager, Operations

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

NRC Personnel

*#+T. Farnholtz, Resident Inspector
*#+R. Haag, Senior Resident Inspector
* B. Parker, Radiation Specialist, DRSS, Region II
# W. Kleinsorge, Reactor Inspector, DRP, Region II

* Attended October 4, 1994 Exit Meeting (B. A. Parker)
# Attended October 24, 1994 Exit Meeting (W. P. Kleinsorge)
+ Attended November 2, 1994 Exit Meeting (T. R. Farnholtz)

F. S. Cantrell, Section Chief, was on site October 6-7, 1994, to review resident inspector activities.

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

2. Plant Activities

Mr. Stewart Ebneter, Regional Administrator, Region II and Mr. Harold Christensen, Acting Branch Chief, DRP, were onsite October 12, 1994, to review resident inspector activities, tour the plant, and meet with licensee management.

3. Steam Generator Replacement Project (SGRP) (50001)

a. Procurement and Receipt Inspection

To determine whether the S/Gs were fabricated in accordance with applicable code requirements and the procurement specifications, the inspectors conducted a vertical slice examination of the "C" channel head and nozzles base material and welding archives records. These records included material analyses, heat treat certifications, mechanical test reports, weld status reports, PWHT reports, material disposition reports and deviation reports. The records support S/G fabrication in accordance with applicable code requirements and the procurement specifications.

b. Radiation Protection Controls, Planning, and Preparations

(1) Dose Rates and As Low As Reasonably Achievable (ALARA) Considerations

10 CFR 20.1101(b) requires that each licensee use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as reasonably achievable (ALARA).

The inspector reviewed the licensee's method for determining the SGRP portion of the RF-8 outage goals. First, the licensee developed effective dose rates for a number of specific areas in

the reactor building by extracting high, low and general dose rates from historical data. The effective dose rates were calculated by adding 10 percent of the high, 30 percent of the general, and 60 percent of the low dose rates, and then applying a rule-of-thumb that only 55 percent of RWP time is actually spent in a dose field. Second, the licensee multiplied the effective dose rates with the person-hours provided for each job by Bechtel, the SGRP contractor. The jobs were grouped into their respective RWPs and the dose estimates added together, providing estimates for each RWP and the SGRP as a whole. The initial estimation using this method was 507 person-rem.

The licensee used another method of estimation in order to "check" the estimate described above. Effective dose rates were calculated for the last three refueling outages conducted by the licensee, RF-5, -6, and -7, by dividing the person-rem by the person-hours in each outage. Effective dose rates were also calculated using data from SGRPs at North Anna, Palisades, and D.C. Cook. The results were effective dose rates ranging from 1.79 to 2.84 millirem per person-hour, and averaging roughly 2.3 millirem per person-hour. The licensee then negotiated an effective dose rate with the SGRP contractor of approximately 2.75 millirem per person-hour that, when multiplied with the estimated 129,000 person-hours needed for the SGRP, gave an estimate of 350 person-rem. The licensee then recalculated the dose estimate for each job and RWP by applying the 350 to 507 person-rem ratio.

An additional estimate of 26 person-rem was formulated to cover other miscellaneous work performed by utility personnel. Therefore, the total estimate for all contract and utility SGRP work was 376 person-rem. The licensee took 90 percent of that number, or 338 person-rem, as a more aggressive SGRP ALARA dose goal. The licensee's collective dose goal for the RF-8 outage was 490 person-rem. The inspector noted that the licensee tracked dose closely and discussed it during planning and turnover meetings. At the time of inspection, the collective dose was on target with projected goals, and the licensee was slightly ahead of schedule. No concerns were noted with the licensee's dose estimation methods or the tracking of dose in general.

In mid-October 1994, the licensee determined that due to being ahead of schedule and below projected doses, the set goals should be reevaluated. The goals were lowered from 315 person-rem to approximately 200 person-rem for the SGRP, and from 490 person-rem to approximately 360 person-rem for the total outage. Although contractual arrangements were not significantly affected, the new goals were more aggressive and gave the licensee a higher standard of performance to strive for.

The inspector noted a number of ALARA initiatives taken by the licensee to lessen dose rates and individual exposures. The

controlled shutdown with early boration and peroxide injection significantly reduced plant dose rates in certain areas by removing approximately 250 curies of radioactive cobalt. The Chemistry department appeared to have good working relations with HP and Operations which enhanced the overall success of the controlled shutdown process.

Other ALARA initiatives included: spreading dose among work crews so no particular individual received substantially more dose than another; limiting excess traffic and eliminating unnecessary "onlookers" in the reactor building; development of a special jig to assist welders in holding RCS nozzle covers in place for welding onto the old steam generators; continually seeking to find more and better ways to utilize the extensive camera and teledosimetry systems; a total risk assessment performed during the first pipe end decon in "C" loop that showed that the work could be completed without respiratory protection, which, at that point, had been a contributing factor to heat stress and dose overruns; and an overall excellent effort to keep workers aware of their dose and dose limits.

The inspector concluded that implementation of the ALARA concept was a high priority with licensee management, as well as the plant workers in general.

No violations or deviations were identified.

(2) Exposure and Contamination Controls - Implementation of Radiation Protection Controls

- Exposure/Contamination Control

  10 CFR 20.1201(a) requires each licensee to control the occupational dose to individual adults, except for planned special exposures under 20.1206, to the following dose limits:

  (a) An annual limit, which is the more limiting of:

  (i) The total effective dose equivalent being equal to 5 rems; or
  (ii) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems;

  (b) The annual limits to the lens of the eye, to the skin, and to the extremities, which are:

  (i) An eye dose equivalent of 15 rems; and
  (ii) A shallow-dose equivalent of 50 rems to the skin or to any extremity.

10 CFR 20.1204 states that for purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee, when required to monitor internal exposure, shall take suitable and timely measurements of concentrations of radioactive materials in air, quantities of radionuclides in the body, quantities of radionuclides excreted from the body, or combinations of these measurements. When specific information on the behavior of the material in an individual is known, that information may be used to calculate the Committed Effective Dose Equivalent (CEDE).

10 CFR 20.1601, 10 CFR 20.1602 and 10 CFR 20.1902 specify the control and posting requirements for high radiation areas and very high radiation areas.

The inspector reviewed worker doses and noted that the licensee did an excellent job of tracking dose and keeping individuals informed of their dose and dose limits. The initial administrative dose limit was an "ALARA Awareness Limit" of 500 millirem, which was used "to stress each individual's personal awareness of ALARA, radiation exposure accumulation, and their responsibility for maintaining their exposure ALARA." By procedure, each individual could extend their own limit to 1,000 millirem by contacting the HP Dosimetry office and requesting it. Further extensions required increasing management review and approval.

At the time of the inspection, a few workers per day were approaching 500 millirem and being prompted to extend themselves to 1,000 millirem, if necessary. By mid-October 1994, the licensee reported that 17 workers to date had been extended to 1,500 millirem, and indicated that, based on the scope of work left in the outage, there were no plans to allow any individual to exceed that limit.

The inspector reviewed the licensee's control of high radiation areas, contaminated areas, and other radiologically controlled areas. All areas, including those required to be locked, were appropriately controlled and posted. Catch containments observed during the outage for collection of effluent leakage primarily from pipes and valves were relatively few in number, and were tracked monthly and eliminated as possible. Contaminated square footage was very low, averaging 600-700 square feet, or approximately 0.5 percent, during 1994, excluding the reactor building and "unrecoverable" areas such as skids, tanks, and inaccessible slabs. A large portion of the reactor building was accessible in street clothes and shoe covers, with only the loop rooms and overhead areas requiring protective clothing for entry.

The inspector reviewed a number of RWPs and attended some RWP pre-job briefings. The RWPs were general in nature, covering large jobs such as pipe end decon or rigging. The pre-job briefings were thorough and informative, and gave workers an opportunity to ask questions or provide input. Stay times were addressed from a heat stress standpoint, especially if respirators, plastics, or wetsuits were being used, and were not a radiological issue in most cases. Exposure was tracked by RWP and, during the inspection, RWP doses were generally well within their allowances. No problems or concerns were noted with the licensee's RWP methods or procedures.

The inspector inquired of the licensee as to what precautions would be taken if it rained after the steam generator was removed from containment awaiting transport to the Old Steam Generator Recycle Facility (OSGRF). Before lifting the "C" steam generator from the loop cube, a paint sealant was applied to the entire steam generator to "fix" any loose contamination to the surface. The licensee indicated that HP would ensure that the steam generator was smearably clean (less than 1,000 dpm per 100 square centimeters) prior to removing it from containment; therefore, rain was not a concern. The inspector verified that the steam generator was smearably clean prior to removal from containment. However, it rained after the steam generator was loaded onto the transport cart awaiting removal to the OSGRF. Due to safety concerns about the stability of the gantry crane/ramp foundations in the standing water, the licensee sampled the water that collected under the cart and gantry crane prior to releasing it to the sewer. Slight contamination on the order of 10E-8 microcuries per milliliter of cesium was identified. Smears from the wet generator were also found to be slightly above smearably clean levels. The licensee evaluated the situation and appropriately released the water to the sewer. The licensee covered the steam generator with tarps and wiped it down to below smearably clean levels. The recontamination appeared to be due to some seepage through the paint coating and the large amount of surface area "washed down" by the rain. No further problems or concerns were noted by the inspector. The inspector and the licensee agreed that the event was a good "lessons learned" item.

- Pipe End Decontamination

  In order to reduce the dose rates on the steam generator platforms, the licensee decontaminated the RCS pipe ends after the old steam generators were removed. This was expected to save scores of person-rem since thousands of person-hours were required to be spent on or near the platforms when the new steam generators were set in place and welded up. The inspector observed the "C" loop evolution of the pipe end decon, which was the first one done after

removal of the old steam generators. The licensee experienced problems with installation of the decon equipment in "C" loop mainly due to mismarking of the inflatable debris dams that were installed prior to the installation of the decon heads. The dams looked alike, differing only in diameter by 9/16 of an inch. The smaller dam was placed into the larger cold leg pipe end, although it was marked "COLD" and it did not fit well. When workers attempted to install the dam marked "HOT" into the hot leg, it would not go into the pipe end. The licensee realized that the dams were mismarked, corrected the problem in "C" loop, and took actions to prevent the same problem during the "A" and "B" loop pipe end decons.

Other problems further complicated matters during the "C" loop evolution. For example, two workers were affected by heat stress. In both cases, the heat stress appeared to be due to overexertion. The workers were well within the allowable stay times based on heat stress potential; however, from the inspector's observations, it appeared that the workers may have worked too quickly and overexerted themselves. The fast pace of the work may have been due to the workers' relative inexperience working within significant dose fields (1,000 - 5,000 millirem per hour), although all training and respiratory requirements were verified by the inspector to be satisfactorily met. The licensee noted the problem associated with inexperience and assigned more experienced workers to the pipe end decon work.

The pipe end decons were completed with somewhat disappointing results. The "C" loop evolution cost 5-6 person-rem to complete; however, after lessons learned on "C" loop, "A" and "B" loop pipe end decons were completed for 1-3 person-rem each. The licensee was anticipating a dose reduction factor at the pipe ends of roughly 100. However, after decon, radiation levels at the pipe ends were only down by a factor of 2-5, and after shielding, they were reduced by another factor of 0-20. To compensate, the licensee reconfigured the pipe shielding that was put into place after the pipe end decon. Removable contamination levels were also not as low as hoped. A decision was made to paint the pipe ends with an approved strippable coating which, after removal, lowered the pipe end contamination from millirad smearable levels to levels of 20-30,000 dpm per 100 square centimeters. Overall, the pipe end decon work was very successful, lowering the general area dose rates on the steam generator platforms to 20-30 millirem per hour.

In the past, the licensee had used on pipe shielding extensively, but due to engineering concerns, very little on-pipe shielding was used. In 1993, an inspector followup item (IFI) 50-395/93-12-01 was identified in NRC Inspection Report

93-12 after the inspector discussed with the licensee the shielding policy, and reviewed an occurrence in which lack of on-pipe shielding significantly increased worker dose. During this inspection, the inspector reviewed the licensee's progress in this area and noted that the licensee had recently implemented a new temporary shielding program. Engineering and HP were coordinating shielding efforts and communicating well. Engineering prepared procedures to allow for on-pipe shielding, and developed an easy-to-use computer program for HP to calculate the amount of allowable shielding per linear foot of pipe. This is based on certain criteria such as pipe run length, type of pipe, pipe size, safety significance, and operating status. The software was used extensively during the planning phase of the outage and, during tours, the inspector noted a wide use of on-pipe shielding on a number of plant systems. At the time of inspection, Engineering was handling most of the calculation work; however, according to licensee representatives, the shielding program would be turned over to HP after the outage, and Engineering would act as a "consultant" for future uses of shielding. Based on the review of the temporary shielding program and the related procedures and software, the inspector informed the licensee that the IFI would be closed.

The inspector noted that the licensee continued to use shadow shielding in many areas as an extra measure or where on-pipe shielding was not possible. Permanent shielding was being added in a few areas as well, constructed in such a way that lead plates were removable and the system fully accessible when maintenance was required.

- Personnel Contamination Events

On January 1, 1994, the licensee implemented a new method for documenting and tracking personnel contamination events (PCEs). A PCE remained defined as any clothing or skin contamination above 100 counts per minute (cpm). However, only those PCEs greater than 1,000 cpm were documented as a PCE. Those events between 100 and 1,000 cpm were simply logged in a logbook maintained by HP at the RCA access point. The inspector discussed this change with licensee representatives and noted that it was an effort to minimize the administrative burden associated with processing PCEs while still maintaining contamination data for future reference. The inspector agreed with the rationale and noted no concerns. At the time of inspection, approximately 30 PCEs had been documented in 1994. Approximately 70 other minor shoe, clothing, and skin contaminations were logged in the aforementioned log. The maximum skindose to date, due to a fuel fragment "hot particle," was calculated to be three microcurie-hours, well below the hot particle dose limiting

guidance of 75 microcurie-hours. The dose was equivalent to 12-15 rem, and the licensee took appropriate actions by surveying the area that the particle was supposedly picked up for additional particles.

No concerns were noted with the licensee's methods, procedures, or evaluations; however, some inconsistencies concerning where and how a few of the events were logged/documented were identified. The licensee acknowledged this and corrected the inconsistencies. In addition, the licensee generated a Radiological Deficiency Report (RDR) about the matter to review the PCE procedure and revise it if necessary.

- Internal Exposure Controls

10 CFR 20.1502(b) requires each licensee to monitor the occupational intake of radioactive material by and assess the committed effective dose equivalent (CEDE) to:

(a) Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable Annual Limit of Intake (ALI) in Table 1, Columns 1 and 2 of Appendix B to 10 CFR 20.1001-20.2401; and

(b) Minors and declared pregnant women likely to receive, in one year, a CEDE in excess of 0.05 rem.

The inspector noted the licensee had one individual who had received a measurable intake of radioactive material thus far in the outage. The intake occurred when a decontamination technician was cleaning up one of the steam generator platforms after the pipe end decon work was completed. Initial whole body counts indicated a CEDE dose of approximately nine millirem. According to the licensee, the intake appeared to be an ingestion and was eliminated by the individual within a few days. No problems or concerns were identified with regard to the intake.

During the inspection, the licensee identified at least one and the inspector identified two instances in which candy/gum wrappers were found in the radiologically-controlled area (RCA) of the plant. The inspector reemphasized to the licensee the potential hazards of eating/chewing in the RCA as evidenced by the wrappers. The licensee acknowledged the inspector's concern and repeatedly stressed to the supervisors and plant personnel that eating, drinking, and smoking in the RCA was not permitted and would not be tolerated. Towards the end of the inspection, no more evidence was found to indicate such practices were occurring

and no individual was observed eating, drinking or smoking in the RCA. The licensee indicated that they would continue to stress the matter and watch for violators.

- Respiratory Protection

  10 CFR 20.1701 requires the licensee to use, to the extent practicable, process or other engineering controls to control the concentrations of radioactive material in air.

  10 CFR 20.1703(a)(3) requires that if the licensee uses respiratory protection equipment to limit intakes pursuant to 10 CFR 20.1702, the licensee will implement and maintain a respiratory protective program that includes: air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures; surveys and bioassays to evaluate the actual exposures; written procedures to select, fit, maintain, and test respirators; written procedures regarding supervision and training of personnel and issuance of records; monitoring; record keeping; and determination by a physician prior to initial fitting of respirators, and at least every 12 months thereafter, that the individual user is physically able to use respiratory protective equipment.

  The inspector noted a number examples during plant tours of engineering controls in place to control the concentrations of radioactive material in air. These mainly consisted of local and general area HEPA filtration units, as well as remote alarming continuous air monitors. The licensee was prompt in obtaining confirmatory air samples when alarms occurred. No significant problems occurred and the inspector noted that the licensee's respiratory protection efforts were a key in reducing total dose and the amount of respirator usage, as well as improving overall working conditions.

  The inspector reviewed and discussed with licensee representatives the respiratory protection program in general. The inspector observed the issuance and proper use of respirators by workers, and verified that selected workers were properly trained to use respiratory protection equipment.

  During an inspection conducted June 6-10, 1994, and documented in NRC Inspection Report No. 50-395/94-15, the inspector identified an item of concern regarding the failure of fire drill responders to don appropriate sized face pieces with their self-contained breathing apparatus. During this inspection, the inspector noted that two additional examples had occurred and had been identified by the licensee. This brought the total number of identified occurrences to seven during the 1993-94 timeframe. Again, the inspector stressed

to the licensee the importance of ensuring that the drill responders use appropriate equipment so as to minimize the risks to themselves as well as the safety of the plant, the workers and the public. The licensee acknowledged the inspector's concern. The inspector was informed that action would be taken to clarify in the pertinent fire protection procedure that the donning of the proper face piece would be one of the criterion for each responder to satisfactorily complete the drill.

The inspector noted from a review of RDRs that early in the outage, an individual was issued a respirator who was not qualified for issuance. Specifically, the individual's fit test had expired some months earlier. The licensee indicated that the mistake was made when the HP issuing the respirator consulted an out-of-date printout for the fit-test date and other pertinent information. The inspector informed the licensee that this was a violation of procedure HPP-154, "Issuance and Control of Respiratory Protection Equipment," Rev. 8, dated May 4, 1994. However, based on the licensee's self-identification and adequate corrective actions, the criteria specified in Section VII.B of the enforcement policy were met and the violation was not cited (NCV 94-24-01).

One non-cited violation was identified.

(3) Emergency Contingencies

The inspector reviewed the licensee's analysis of potential offsite consequences resulting from an old steam generator drop accident during the SGRP outage. The inspector reviewed and discussed with the licensee Calculation No. 21927-C-06, dated November 16, 1993, which outlined the assumptions and methodology for analysis of the steam generator drops. Two drop scenarios were postulated: (1) Drop from a horizontal position outside containment with the axis of the steam generator initially horizontal at an elevation of 45 feet above grade, and (2) Drop from a horizontal position from the transporter with the axis of the steam generator initially horizontal at an elevation of 14 feet 7 inches above grade. The drops were evaluated to occur on soil, concrete surfaces, and an arbitrary reinforced concrete hard spot. The inspector noted that the analysis found that although a steam generator could be significantly damaged if dropped, breaching was not anticipated; therefore, offsite consequences did not need to be evaluated. The conclusion of the analysis stated:

This calculation indicates that with the nozzle modifications and the installation of nozzle cover plates and plugs (prescribed), the old steam generators (shells,

nozzles, trunnions, and manways) can withstand the impact conditions associated with the postulated load drops without compromising leak tight integrity of the old steam generator vessels.

The inspector noted that the drop analysis was similar to that performed for other SGRPs, and no concerns were noted.

No violations or deviations were identified.

(4) Project Staffing and Training Plans

10 CFR 19.12 requires the licensee to instruct all individuals working in or frequenting any portion of a restricted area in the health protection problems associated with exposure to radioactive material or radiation, in precautions or procedures to minimize exposure, in the purposes and functions of protection devices employed, the applicable provisions of Commission regulations and licenses, the individuals' responsibilities, and the availability of radiation exposure data.

The licensee had established a separate HP organization for the SGRP. This group was distinct from the routine organization and was responsible for coordinating and supporting only activities related to the project. Activities related to non-SGRP work were managed through the routine HP organization. Although much of the core SGRP organization was in place during the previous inspection, most of the technicians for the SGRP and routine outage had not yet arrived onsite. During this inspection, the inspector noted that the licensee had implemented the overall staffing plan consistent with that previously reviewed. The licensee had 228 contracted HP personnel onsite to support the utility staff, 107 of which were budgeted for the SGRP. This staffing included junior and senior HP technicians, ALARA personnel, trainers, decontamination personnel, and dosimetry personnel.

The inspector reviewed portions of the ongoing mock-up training conducted by the licensee. Specific mock-up activities for the project included mechanical cutting of the RCS piping, decontamination of RCS pipe ends, installation and removal of shielding, installation and removal of the tripod debris dams, and various welding and machine activities. The inspector reviewed the mock-up training conducted for portions of the RCS pipe cuts, RCS pipe end decon, and RCS weldup of new steam generators and noted no concerns. The inspector toured the SGRP mock-up facility, and noted that the licensee had made a good effort to make the mock-ups as realistic as possible, including the placement simulated shielding, support structures, and interferences to simulate actual working conditions. Respiratory protection was used if required for the particular job and environmental temperatures were often close to those found in the

reactor building. The inspector did note, however, that "full dress mock-up" sometimes only meant simulating the task in protective gloves and not in full protective clothing. The inspector discussed this with the licensee and they indicated that the main goal was to ensure that those particular tasks could be completed with gloves on and that the ability to work in full protective clothing was known for those workers and not of concern.

Based on discussions with licensee representatives and observations of activities in progress, no concerns were identified regarding the licensee's organization and staffing. The staffing levels appeared adequate to support ongoing outage activities.

The inspector reviewed the licensee's training conducted as part of the SGRP. The inspector noted that general employee training was given to all incoming workers which consisted of site specifics, radiological protection, respiratory protection, industrial safety, and other related topics. All training required passing grades of 70 percent. The inspector noted that the licensee offered accelerated training that was conducted in one day as opposed to two to three days, but required a passing grade of 80 percent on the examination. Contract HP training consisted of the above as well as an additional 40 hours of HP-related training and examination. The inspector reviewed selected portions of the lesson plans and a number of examinations and noted no problems. Failure rates were minimal. Discussions with plant workers regarding the training they had received were very positive and many felt that it was excellent training.

In addition to the above training, the inspector noted that the licensee also provided SGRP overview training to all workers, which consisted of a video presentation about the SGRP in general. Also, Supervisor ALARA Awareness seminars were given to promote the ALARA concept within the supervisory ranks and make them aware of the radiological controls and conditions that support ALARA. As previously mentioned, extensive mock-up training was also conducted for many of the crafts involved in the SGRP with good results.

No violations or deviations were identified.

c. Cutting, Welding, and Nondestructive Examination (NDE)

(1) Special Procedures for Cutting, Machining, Welding, and Nondestructive Examination, Training and Qualification, Setup and Testing

To evaluate the set-up and testing of cutting and welding equipment, the inspectors reviewed procedures and viewed a video

tape of mock-up training activities conducted at the PCI's home facilities at Lake Bluff IL. These activities included setup, testing, and preparation of the cutting and welding equipment. The inspectors observed practice automated production and repair welding at the Summer station. Observations were compared with the applicable licensee procedures.

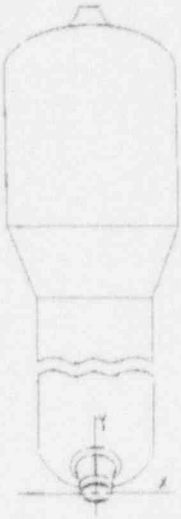
The licensee's activities associated with the set-up and testing of cutting and welding equipment were appropriate for the circumstances.

(2) Measurement of Pipe Deflection After Cutting

The licensee indicated that the Westinghouse three Loop PWR is designed such that all piping and components thermally expand (grow) outwardly from the Reactor Vessel. This movement is essentially unrestrained due to the support gaps and snubbers. The Main Steam piping at the top of the S/Gs and the Feedwater pipe do provide some minor opposition. There is no cold spring and there are no components which are supported by springs, therefore, residual stresses, which could cause the Reactor Coolant hot and cold leg piping to move upon severing, are expected to be minimal. To prevent pipe deflection that might occur after cutting the Reactor Coolant hot and cold leg piping attached to the S/Gs, the piping was restrained prior to cutting. To determine what movement, if any, occurred the licensee took measurements before and after cutting. Both mechanical measurements and lazer templating measurements, using the CMS-3000 laser coordinate measurement system, were taken.

The Chesapeake Laser System Coordinate Measurement System CMS-3000 is a servo controlled tracking laser interferometer measuring tool. The tracker follows a retro target while giving real time coordinate information to the retro center location. The retro center is measured in spherical coordinates where distance from the tracker axis to the retro center is determined by laser interferometer, the azimuth angle is determined by the laser rotary encoder in the azimuth axis and the elevation angle in the elevation rotary encoder.

The movement determined by lazer templating is indicated below.



Pipe Movement Measurements

	Y-Axis	X-Axis	Z-Axis
S/G "A" HL	0.050"	-0.058"	-0.007"
S/G "A" CL	0.105"	0.008"	0.122"
S/G "B" HL	0.185"	-0.016"	0.016"
S/G "B" CL	0.079"	0.034"	0.195"
S/G "C" HL	-0.029"	-0.086"	-0.028"
S/G "C" CL	0.038"	0.004"	0.033"

Z-Axis is Perpendicular to the X-Y Plane.

The after-cutting pipe movement measurements demonstrate that the licensee's actions relative to potential pipe deflection were effective.

(3) Cutting of Piping

To evaluate pipe cutting operations, the inspectors monitored RCS pipe cutting operations via video monitors and viewed a video tape made during the cutting of the S/G "A" hot leg. Observations were compared with WP&IR No. WR-07.01-M-14, 'S/G "A" Cut/Prep RCS 2-Cut Method'.

Cutting operations were consistent with the licensee's program.

(4) Fit Up and Welding Preparations

To evaluate the licensee's fit up and welding preparations for the new S/Gs, the inspectors: observed machining operations by remote video, interviewed the machine operators at the remote control center during the machining of the end preparations on S/G "C" hot and cold legs, and observed portions of the fit up activities for S/G "C" Main Steam spool piece.

During the installation of S/G "C" Main Steam spool piece, the licensee's contractors were unable to achieve an acceptable fit up. By WCN 206, and MRF 90001, Minor Change 8, "Steam Generator "C" Main Steam piping has a horizontal misalignment with the Steam Generator Nozzle", the licensee amended WP&IR WR-07.02-M-06 to correct the misalignment condition.

Relative to the inspections above, the inspectors noted the following:

- During the final cleanup of the S/G "C" nozzle in preparation for the pre-fit up QC inspection, one craft person was working under the 36 inch Main Steam spool piece suspended by a sling from the polar crane. The inspectors noted that the Main Steam spool piece was not involved with the work activities in progress at that time. Several other craft persons were sitting under or immediately adjacent to the suspended load. The PCI supervisor was unconcerned about working/waiting under the suspended load (the Main Steam spool piece) as it was supported by the polar crane and not one of the small cranes. The personnel safety concern here is not only the capacity of the crane, but the capacity and condition of all the rigging. Working under suspended loads is contrary to both the SCE&G and BPC safety policies. The inspectors notified the applicable licensee and contractor safety personnel.

- Item No. 760 in WP&IR No. WR-07.01-M-16 "Perform NDE on the finished weld end prep per requirements of the SPM", was indicated as an Inspection Point when it should have been a Review Point. The inspectors informed the licensee's contractor, who subsequently made corrections to WP&IR No. WR-07.01-M-16, as well as WR-07.01-M-15, and WR-07.01-M-17, which also needed correction. The inspectors noted that although the contractor made appropriate changes to all three WP&IRs, the changes were not made in accordance with the requirements of WP/P-1, "Establishment, Control, and Implementation of the Work Plan/Procedure Program", paragraph 8.3, which requires the signature of the engineer and QC. In this case only the QC signature appeared. The contractor corrected the program to permit QC to change their inspection points without the engineers concurrence. The inspectors consider their change appropriate.

  Except as noted above, preparations for welding were conducted in accordance with regulatory commitments and procedural requirements.

(5) Welding of Piping

To evaluate the licensee's welding activities associated with the RCS, Main Steam, and Feedwater lines joining the new S/Gs, the inspectors observed in-process welding activities, inspected welding filler material issue stations, and examined selected records as listed below.

Welding Activities Observed

Weld No.	Systems	Activities Observed
BW-58	Main Steam	ID Weld Buildup
BW-53	Main Steam	Root and fill welding
FW-13-BC1	Main Steam	Tack and fill welding
FW-24-BC1	Reactor Coolant	Final surface
FW-9-BC1	Reactor Coolant	Final surface
FW-16-BC1	Reactor Coolant	Fill welding
FW-17-BC1	Reactor Coolant	Fill welding
FW-8-BC1	Reactor Coolant	Final surface
FW-1-BC1	Reactor Coolant	Final surface

Records of
Welding Filler Materials Examined

Type	Size	Heat/Lot/Batch No.
E-7018	3/32"	2D407A03
E-7018	5/32"	3D329A01
E-7018	1/8"	2E416A
E-8018-B2L	5/32"	3A122D01
E-8018-B2L	1/8"	3B126G02
E-9018-B3L	3/32"	2E205H02
E-9018-B3L	1/8"	3C231J06
E-9018-B3L	5/32"	3J328H02
ENiCrFe-3	1/8"	3K5E-5A
ER-308L	1/16"	AT6641
ER-308L	3/32"	CT6641
ER-309	3/32"	CM6603
ER-70S2	3/32"	06515
ER-9SB3	1/8"	211030
E-8N12	3/32"	4E4C-4A Lot Mark MA
E-9018-D1	1/8"	401B6101
E-9019-D1	5/32"	416520

Records of
Welding Filler Materials Examined

Type	Size	Heat/Lot/Batch No.
E-9019-D1	3/32"	N85670
ENiCrFe-3	3/32"	4E4C-4A

Welder/Welding Operator Qualification Records

Welder/Welding Operator Symbol	Process
P-33	GTAW/SMAW
P-37	GTAW Machine Direct and Remote
P-40	GTAW
P-55	GTAW/SMAW
P-57	GTAW/SMAW

The inspectors reviewed radiographs of welder qualification test assemblies Nos. WQ 248-53-3845, WQ B43, and WQ P4. Observations were compared to applicable licensee procedures and ASME Code Sections V and IX. The radiographs were consistent with regulatory and procedural requirements.

Relative to the inspection of the welds indicated above, the inspectors noted the following:

- On S/G "C" Main Steam nozzle to pipe weld Joint FW-13BC1, after pre-fit up inspection, tack welding and tack weld preparation were complete and prior to final fit up inspection, and the deposition of the root weld layer, the inspectors noted that one of the tack welds, which was intended to be incorporated into the final weld, was cracked. This was contrary to BPC General Welding Standard GWS-1, Revision 2, "Bechtel General Welding Standard", paragraph 6.2.2, which states: "Tack welds that will become part of the finished weld, shall be visually checked and defective tack welds repaired or removed. This condition adverse to quality was ignored by the welder and his supervisor. The inspectors have no doubt that this condition, had it not been identified by the inspectors, would have been identified by the QC final fit up inspection.

- While observing welding activities associated with S/G "B" Reactor Coolant hot and cold leg nozzles to pipe welds FW16BC1 and FW17BC1 on October 20, 1994, the inspectors asked a certified welding operator at the weld location "How do you

measure preheat and interpass temperatures?". The welding operator's answer was "I didn't know there was any such-a-thing". No temperature indicating devices could be found on the platform where the welding was in progress. The inspectors discussed this matter with PCI and was informed that experience gained by PCI on many SGRPs indicated that the 350 F° code required interpass temperature had never been approached.

On October 22, 1994, after welding had been in process for many hours, the inspectors measured the temperature of the base metal in the heat affected zone, with a calibrated surface pyrometer 90° behind the welding head, while welding was in progress. A reading of less than 120 °F validated the PCI experience. A 350 °F temperature indicating crayon was available at the weld location. The inspectors have no concerns that the weld intrepass temperature requirements had been violated, but they are concerned that a welding operator was not familiar with a variable of a Welding Procedure Specification to which he was certified.

- During the preparation of Weld No. FW7-BC1, the weld joining the S/G "A" Main Steam nozzle to the first pipe section downstream, it was necessary to deposit a weld build-up on the ID of the pipe to facilitate acceptable weld joint fit-up dimensions. After welding, machining, and grinding of the ID weld buildup was completed, BPC conducted the Cod required final surface examination (Liquid Penetrant). After the final surface examination, the inspectors discovered that BPC had performed additional surface grinding with an abrasive cloth "flapper" wheel, thus forming a new "final surface". There was no indication that without the inspectors intervention, the new "final surface" would be examined as required by the Code.

The above observations indicate a weakness in the BPC program for welder/welding operator training.

Except as noted above, welding was conducted in accordance with regulatory commitments and procedural requirements.

(6) Nondestructive Examinations

The inspectors observed setup and exposure activities associated with the radiographic examination of welds FW-24-BC1 and FW-9-BC1, and S/G "A" reactor coolant safe end to pipe welds. The setup activities were consistent with regulatory and procedural requirements.

The inspectors reviewed the radiographs of feedwater system 18 X 0.938 inch weld Nos. FW-BW-5B and FW-BW-2B. The radiographs were examined for both film quality and acceptance. The documentation

supporting the qualification and visual acuity of radiographic examiners GWS RT-III(BPC) and MRD RT-II(Conam) were examined. Observations were compared to applicable licensee procedures and ASME Code Section V. The radiographs were consistent with regulatory and procedural requirements.

As discussed in NRC Inspection Report 50-395/94-22, the Visual Acuity Record for GSK, the PT examiner who conducted the PT examination of the "B" S/G cold leg nozzle end preparation area, reported near vision uncorrected as **20/20 @ 14"**. At the time of that inspection, it could not be determined whether GSK could read the J-1 letters on a Standard Jager test chart at a distance of not less than 12 inches. The licensee subsequently has provided the inspectors with a revised Near Visual Acuity Record for GSK attesting to the ability of GSK to read the J-1 letters at 14".

(7) Weld Heat Treatment

To evaluate the licensee's PWHT activities associated with the Main Steam and Feedwater lines joining the new S/Gs, the inspectors observed in-process PWHT of Feedwater system weld Nos. BW-14 R2 and BW-15 activities, and examined selected records. Observations were compared to applicable licensee procedures and ASME Code Section III. The PWHT was consistent with regulatory and procedural requirements.

d. Lifting and Rigging Activities

(1) Lifting and Rigging of Steam Generators from Containment

To evaluate lifting and rigging of S/G components from the containment building, the inspectors reviewed procedures, selected records and observed work activities to ascertain whether lifting and rigging activities were conducted in accordance with regulatory commitments and procedural requirements.

The first S/G to be removed did not clear the equipment hatch on the first attempt. The problem was that the secondary manway bosses, which are welded to opposite sides of the steam dome, would have interfered with the hatch had movement of the generator continued. To allow removal of the generator, the bosses were partially cut and ground away to provide sufficient clearance. Following this, the "C" S/G was removed with no further problems. To avoid this situation on the remaining two S/Gs, the secondary manway bosses were cut and ground after the generators were downended and before they were moved toward the equipment hatch. This expedited the removal of the generators from containment with no further delays. The S/Gs were moved through the equipment hatch and onto the gantry platform outside the reactor building.

As discussed in NRC Inspection Report 50-395/94-22, Whiting provided recommended inspections to assure the polar crane's reliability. These included inspections made prior to the first Planned Engineered Lift (PEL), before and after each PEL, and after all PELs. The inspectors reviewed the records supporting the accomplishment of the Whiting recommended inspections after several PELs were complete and at the completion of all PELs.

Relative to the inspections above, the inspectors noted the following:

- During observations of closure welding operations on S/G "A", it was noted that Item number 160(1) and 160(2) of WP&IR No WR-12.02-C-01, "POSITION, FIT-UP AND WELD OUT THE PRIMARY NOZZLE COVER PLATES...", a superintendent verification point was signed off prior to the completion of the welding operations. Discussions with the licensee indicated that these superintendent verification points were intended to be signed off after the satisfactory completion of the welding operation. The superintendent prematurely signed off the verification point. The licensee informed the inspectors that the superintendent indicated above, was counseled as to the importance of records reflecting actual work accomplishment.

- A review of completed Punch List 3 (a check list to assure that previously identified maintenance items were corrected), at Attribute 17, revealed that something was obliterated. This is not consistent with BPCs program (WP/P-1, Revision 3, "Establishment, Control, and Implementation of Work Plan Procedure Program", Paragraph 8.3) which requires corrections to be initialled and dated.

Except as noted above, lifting and rigging activities associated with the removal of the old S/Gs were conducted in accordance with regulatory commitments and procedural requirements.

(2) Movement and Lifting of New Steam Generators Into Place

Following removal of the three old S/Gs, the three new S/Gs were moved from their storage location in the protected area into the reactor building. Prior to moving the first S/G into the reactor building, the alignment of the ramp which passes through the equipment hatch was checked and adjusted. The purpose of this was to avoid the clearance problems experienced when moving the old S/Gs through the equipment hatch. Each of the S/Gs was brought into the reactor building and upended using the polar crane. Following this, the upending trunnions near the bottom of the S/Gs were removed and the helicoils in the support pads were inspected. Also, the protective covering in the hot and cold side channel head and tubesheet area was repositioned and

supported as required after upending. Following final preparations and inspections of the RCS hot and cold leg piping and S/G supports in the generator cubicle, the generators were raised to a height high enough to clear the wall of the cubicle and then lowered into position. These activities were performed in accordance with approved procedures and no violations or deviations were noted.

The inspectors noted that in case of the "C" and "A" S/Gs, the time the generator remained suspended from the polar crane between the completion of final preparations of the S/Gs and the beginning of movement into the cubicle was relatively short. However, according to records, the "B" S/G was suspended for approximately six hours before movement toward the cubicle began. The RCS pipe end preparation in the cubicle and the S/G upending operation was intended to be completed at about the same time. Preparation and inspection of the RCS pipe ends took longer than expected which resulted in the "B" S/G remaining suspended for an extended period of time. The inspector was concerned about the safety of having a load of this magnitude suspended for longer than necessary. The accomplishment of these two activities, generator upending and cubicle preparation, was done concurrently in the interest of reducing the time required to place the "B" S/G in position in its cubicle. The inspector concluded that, in this case, the scheduling of concurrent activities resulted in a condition which may have increased the risk of injury to personnel or damage to the plant.

(3) Transportation of Old Steam Generators to Storage

The inspector observed portions of transporting the old "B" S/G to the recycle/storage facility per the instructions of WP&IR No. WR-05.05-C-01. Security and health physics (HP) support for the S/G transport was effective in controlling personnel and vehicle access for the transfer route. A "moving" radiation area was established around the old S/G by HP personnel equipped with radiation meters. Adequate precautions were taken to ensure the S/G was not damaged while being moved on the transporter.

e. Interference Removal and Restoration

(1) Restoration of Steam Generator Component and Piping Restraints, Snubbers, and Supports

- A total of 15 S/G support snubbers were removed during preparations to remove the old S/Gs (5 snubbers per generator). A total of six snubbers will be installed as part of the supports for the new S/Gs (2 snubbers per generator). The licensee sampled the hydraulic fluid in the snubbers removed and found them to be contaminated with small amounts of water and particulates which could indicate internal degradation of the snubbers. A boroscope inspection

was performed on some of the snubbers after which the licensee brought in a vendor representative to advise as to a course of action. Each of the 17 snubbers (15 removed snubbers and 2 spares) were boroscope inspected and ranked on the basis of visual indications. Only a very small area of the interior of each snubber can be seen using a boroscope. The six snubbers that appeared to be in the best condition were set aside and the next one was subjected to further tests and inspection.

A seal integrity test was performed on the selected snubber which consisted of pressurizing one side of the piston while venting the other side and monitoring for a pressure decrease over time. This test was done for each side of the piston. After the seal integrity test, the snubber piston was fully stroked ten times and the seal test was repeated. The purpose for this was to check for seal degradation due to foreign material or corrosion. All the seal tests, before and after stroking the snubber, were satisfactory and did not indicate significant seal degradation. Following the seal testing, the snubber was disassembled to allow inspection of the entire interior. This inspection revealed small areas of corrosion consistent with the presence of small quantities of water in the hydraulic oil. The extent of this corrosion was extremely minor and posed no problems to the proper functioning of the snubber.

Based on these tests and inspections, the licensee flushed, cleaned, and installed new hydraulic oil in the six snubbers selected for use and all were subjected to seal tests and functional tests which were acceptable. In addition, the hydraulic oil in the reservoirs was replaced. The inspector concluded, based on the above information and personal observation, that the actions taken by the licensee was appropriate.

- During installation of the "C" replacement S/G, one of the 32 column adapter bolts could not be installed. There are four column adapter brackets which are secured to the S/G by eight bolts each. A minor design change to MRF 90001 (No. 21) was submitted to allow leaving the one bolt out. The inspector reviewed this change and agreed with the conclusion.

  To avoid similar problems when installing S/Gs "A" and "B", a minor design change to MRF 90001 (No. 17) was submitted to allow drilling the adapter bolt holes 1/8 inch oversize. This would provide the required clearance to install all the column adapter bolts. Based on the design of the column support and the loads that the column support bracket is subjected to, the inspector had no concerns about the acceptability of drilling the bolt holes slightly larger to facilitate bolt installation. However, the inspector did

note that the justification provided on the field change request (FCR #198) was inadequate. The disposition on the FCR simply states that enlargement of the holes is acceptable with no amplifying information. The FCR was prepared and approved by Bechtel Engineering. The inspector discussed this issue with the Manager of Design Engineering, who stated that he considered the justification to be adequate based on his experiences with the people involved. The inspector considers this to be a weakness in the licensee's engineering program.

(2) Restoration of Interferences, Piping, and Instrumentation

The inspector observed portions of the effort to restore interferences, piping, and instrumentation following the installation of the new S/Gs. Additional work in this area is scheduled and will be reviewed as required. Components that were to be installed in the reactor building were moved in and staged until ready for final installation. These included main steam pipe whip restraints, piping sections, new S/G insulation pieces, etc. The inspector noted good coordination of activities in this area in the reactor building.

f. Other Activities Associated with Steam Generator Replacement

(1) Cleanliness and Foreign Materials Exclusion Controls

During a tour of the reactor building on October 26, 1994, the inspector noticed that the temporary cleanliness cover for one of the "A" S/G secondary manway openings was missing. Each S/G has two, sixteen inch diameter openings that lead into the upper portions of the S/G. To support installation of the new S/Gs, the permanent manway covers were removed and cleanliness was being maintained with plastic barriers/covers taped over the opening. The inspector verified that the cleanliness cover was installed on the other opening for "A" S/G. There were no signs of the missing cover in the general area of the opening.

After being notified of this condition, the licensee initiated NCN 5114. The NCN disposition required that a cleanliness cover be installed and that a cleanliness inspection be reperformed inside the S/G prior to installation of the permanent manway. The final cleanliness inspections on the secondary side of the S/Gs had been accomplished three days earlier. The licensee stated that they were not aware of why the cleanliness cover was not installed. The NCN did not address the possible causes for the missing cover. During the inspector's subsequent review of this item, it appeared that the licensee's efforts to determine the cause of the missing cover were minimal.

The inspector was initially informed by the licensee that Construction Work Plan/Procedure, WP/P-10, Housekeeping, was the

document that provided the programmatic control for maintaining cleanliness of SGRP related components. Paragraph 6.3, of WP/P-10, describes the cleanliness controls for Zone III areas which applied to the internals of the S/Gs. The requirements for cleanliness covers which are provided in paragraph 6.3.a states, "If suitable protective devices (such as pipe plugs) have been installed to isolate a particular work area, access control for that area is not required provided the integrity of the installation has been verified by QC".

Two documents that provided instructions for work activities where the S/G secondary manway cleanliness covers had to be removed were reviewed to determine if adequate cleanliness controls were implemented. In WP&IR No. WR-05.05-C.09, the instructions state to "install temporary manway covers" after the lifting equipment which covered the secondary manway openings had been removed. However, QC is not mentioned in the step for installing the temporary covers. Also, a General Note of the WP&IR states to maintain a Zone IV housekeeping work area. A Zone IV area has less stringent cleanliness requirements than a Zone III. A final cleanliness inspection of "A" S/G, secondary side, was accomplished by MWR 900010157. Detailed instructions on performing the cleanliness inspection were provided in the MWR. A precaution in the MWR stated to install temporary covers over handholes/inspection holes when no work is in progress to prevent foreign objects from entering the system. Yet there were no specific work steps for installing cleanliness covers at the completion of the inspection activity. Also, QC was again not mentioned for witnessing the temporary cover installation.

During later conversations with the licensee, the inspector was informed that WP/P-10 was not in effect when the final cleanliness inspection activities were performed. The licensee stated that the MWR provided all the applicable instructions for maintaining cleanliness inside the S/G. As noted above the only reference in the MWR for installing cleanliness covers was contain in the precaution. When reviewing the procedure and work instructions it was not apparent why the requirements of WP/P-10 would not have been in effect while the cleanliness inspections were performed since SGRP work activities (welding secondary piping) were still underway.

In conversation with an individual who performed the final S/G secondary cleanliness inspections, the inspector was informed that one of the S/G's secondary manway cleanliness covers was also discovered missing when those inspections were initially started. This individual stated that when the cleanliness inspections inside the S/Gs were completed, the plastic covers were reinstalled and black tape (in lieu of a plastic cover) was placed over the opening that had the missing cover. QC was not at the jobsite to observe installation of the cleanliness covers. The inspector was not aware of the earlier occurrence of a

missing cleanliness cover until this conversation took place. It was also appearance that this was not well known among involved licensee personnel. The inspector was not aware of any changes to cleanliness controls in response to this initial missing cleanliness cover.

Based on two separate occurrences of missing S/G secondary manway cleanliness covers and a lack of consistency between a cleanliness procedure and work instructions involving cleanliness areas the inspector concluded that adequate instructions for cleanliness control were not provided. The existing requirement for QC involvement when installing cleanliness covers was not specified in one work document and according to the licensee not applicable for another work document. The inspector recognizes that the actual cause(s) of the cleanliness covers not being installed were not determined. However, on two separate occasions (in a four day time period) the cleanliness controls that were implemented failed to ensure that the required cleanliness covers were in place. For the last missing cover occurrence the final cleanliness inspection had already been performed. This item is identified as a Violation 395/94-24-02, Failure to have adequate work instructions to ensure cleanliness controls were properly implemented.

(2) Security Considerations

The inspectors observed security related activities associated with the SGRP. Both routine security outage activities and the additional security measures that are directly related to the SGRP were reviewed by the inspectors. Specific areas reviewed included vehicle access into the protected area (PA), personnel access into the RB, and safeguards event log entries.

With the opening of PA exit gate in the Northwest corner of the PA, vehicular traffic has been well controlled and excessive backlogs of vehicles entering the PA have been avoided. Vehicle traffic into the PA has increased by approximately 300 percent during the outage. The new exit gate is continuously manned by a security officer when the gate is in use (generally during dayshift hours). Security officers at the exit gate were alert and knowledgeable of vehicle exiting controls. Vehicle searches performed by security officers at the entrance gate were thorough and well controlled. To control access to the RB, while the equipment hatch was removed, two security officers were posted at the entrance points leading up to the equipment hatch. The inspectors noted effective access control by security personnel during the outage.

A review of the safeguards event log indicated that the increase of events was not excessive when compared to the increase of outage activities. The inspector noted that events with repeated occurrences, i.e., unsecured doors and vehicles, were not initiated by the same group, but were distributed between various groups performing outage work.

(3) Installation, Use, and Removal of Temporary Services

Following placement of the last new S/G in its cubicle, many of the temporary lifting and supporting structures used to move the generators were removed. These included the outside lift system, the column support structure which was placed in a multilevel access opening to support part of the in-containment runway system, and portions of the runway system itself. The removal of these large components from the reactor building expedited the removal of other equipment and provided more room for personnel. Activities in this area were completed within program requirements.

(4) Management Controls and Oversight

During the inspection, the inspector attended various outage planning meetings including plan-of-the-day meetings and shift turnover meetings. Work activities occurring during the inspection period included the reactor head lift, upper internals lift, defueling, steam generator insulation removal, main steam, feedwater and RCS pipe cuts, rigging of the steam generators, lifting and removal from containment of steam generators, and pipe end decontamination. The inspector observed good participation in the meetings by HP personnel and appropriate emphasis was placed on HP-related concerns by outage management. In addition, excellent coordination and communications were observed between HP personnel during shift turnovers.

The inspector discussed with licensee representatives pre-outage planning activities including evaluation of lessons learned from previous steam generator replacement projects. In particular, the inspector reviewed a listing of Lessons Learned compiled by the licensee that addressed radiation protection lessons learned and their potential applicability to the V. C. Summer SGRP from past SGRPs at Plants North Anna, D.C. Cook, Surry, Palisades, Point Beach, Indian Point and H.B. Robinson. Review of several of the lessons learned items revealed that the licensee had appropriately evaluated the items for applicability and/or initiated actions to address the potential concern.

Based on the above, the inspector concluded that the licensee's preplanning and research for the SGRP was thorough, and appropriate consideration had been given to previous lessons learned.

(5) Facility Improvements to Support the SGRP

For the SGRP, the licensee made various facility and equipment upgrades including the new Decontamination Facility, the CAB, CCTV, upgraded communications equipment, a remote monitoring system, and the Old Steam Generator Recycle Facility. Following is a brief discussion of each:

Decontamination Facility: This temporary facility, located in the protected area, was constructed solely for the decontamination of tools, equipment, and various other materials generated from the SGRP. As of mid-October 1994, all metal removed from the plant had been decontaminated to less that detectable levels. The facility was designed for carbon dioxide (CO_2) blast cleaning. The contaminated equipment was blasted with supercooled CO_2 pellets, and the pellets sublimed into the atmosphere while the removed contaminants were sucked into a high volume HEPA ventilation unit. The HEPA filters were routinely monitored during operations and changed out as needed. The inspector noted that radioactive waste generation was reduced substantially, partly due to the success of the Decon Facility during the outage.

Containment Access Building (CAB): The CAB is a permanent metal building located within the protected area used during the outage for access control of SGRP activities and, after the outage, it is planned to be used as office space. Non-SGRP workers continued to use the normal HP Control Point for access to the RCA. Change rooms were provided and dosimetry, respirators, and instruments were obtainable. The inspector noted that all active RWPs and heat stress stay times were posted in the CAB, as were all NRC-required postings. HP maintained 24-hour coverage at the control point, and RWP briefings were given in an adjacent trailer. Workers also exited the RCA through the CAB, which was equipped with appropriate numbers of personnel contamination monitors and electronic dose readers.

Closed Circuit Television (CCTV): The licensee installed a 16 camera CCTV system that significantly enhanced HP's ability to lower their dose as well as the dose of much of the plant populous, while providing excellent job coverage. The camera system was set up in the CAB and HP monitored it 24 hours a day. Portions of the system were also provided in many areas of the plant for viewing by all plant personnel. Four cameras were installed in each of the three loops in the reactor building, two were installed in the top of reactor building, and two were installed outside the reactor building. The licensee made outstanding use of the camera system and no significant problems were noted with the system during the inspection.

Remote Monitoring System (RMS): The licensee utilized a RMS which provided personnel teledosimetry capability for real-time dose and dose rate data monitoring and recording. A number of personnel wearing multiple dosimeters each could be individually monitored from a remote location. In addition, the licensee implemented the continuous air monitoring capability of the system; however, the overall value of this portion of the system was questioned by the inspector during the inspection due to the inordinate amount of spurious alarms that occurred, requiring HP to take air samples for verification purposes.

Communications: The licensee used radio communication extensively during the outage, enhancing the system previously used. The licensee used higher powered radios with more repeater capability and more channels, and indicated that communications had significantly improved over previous usage. The inspector observed the use of radios during the inspection and noted that they were very beneficial in most cases.

The licensee also installed an intercom system in each of the loop rooms that enabled two-way communication between workers who were not equipped with radios.

Overall, the licensee's investment in improved facilities and equipment for the outage was considered a program strength. The combination of the CCTV, RMS, and communication systems were considered a significant enhancement to maintaining outage dose ALARA.

g. Steam Generator Post-Installation Verification and Testing

Temporary Storage and Disposal of Retired Steam Generators

The old S/G recycle facility is a large reinforced concrete structure located near the plant within the owner-controlled area built to store the old S/Gs until such time as the site is decommissioned. One end of the structure was left open during construction and was closed and sealed once the old S/Gs were situated inside. The facility was licensed by the State of South Carolina for storage of S/Gs containing no more than 2274.3 curies of mixed fission and activation products. The inspector toured the facility prior to S/Gs being placed and noted no problems. Background levels around the facility were measured with TLDs prior to installation of the S/Gs, and surveys after the S/Gs were installed indicated no increase in radiation levels above background. The licensee indicated during the inspection that surveys in and around the facility would be accomplished periodically in accordance with the State materials storage license.

4. Exit Interview

The inspectors met with licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on October 4, October 24, and November 2, 1994. During these meetings, the inspectors summarized the scope and findings of the inspection as they are detailed in this report. The licensee representatives disagreed with the inspector's finding that inadequate instructions were provided for cleanliness controls. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection.

Item Number	Status	Description and Reference
94-24-01	Open	NCV - Failure to properly issue a respirator (Paragraph 2.b.2).
94-24-02	Open	NOV - Failure to provide adequate instructions for cleanliness control of S/G secondary openings. (Paragraph 2.f.1).
93-12-01	Closed	IFI - Regarding the licensee's completion and implementation of a generic temporary shielding program, prior to the SGRP during RF-8.

5. Acronyms and Initialisms

ALARA	-	As Low As Reasonably Achievable
ASME	-	American Society of Mechanical Engineers
BOP	-	Balance of Plant
BPC	-	Bechtel Power Corporation
CAB	-	Containment Access Building
CCTV	-	Closed Circuit Television
CEDE	-	Committed Effective Dose Equivalent
CFR	-	Code of Federal Regulations
CL	-	Cold Leg
CPM	-	Counts Per Minute
FCR	-	Field Change Request
GTAW	-	Gas Tungsten Arc Welding
GWS	-	General Welding Standard
HL	-	Hot Leg
HP	-	Health Physics
HPP	-	Health Physics Procedure
ID	-	Identification
ID	-	Inside Diameter
IFI	-	Inspector Followup Item
MRF	-	Modification Request Form
MWR	-	Maintenance Work Request
NCN	-	Nonconformance Notice
NCV	-	Non-Cited Violation
NDE	-	Nondestructive Examination

NOV	-	Notice of Violation
NRR	-	Nuclear Reactor Regulation
OSGRF	-	Old Steam Generator Recycle Facility
PA	-	Protected Area
PCE	-	Personnel Contamination Event
PCI	-	Power Cutting Incorporated
PEL	-	Planned Engineered Lift
PT	-	Liquid Penetrant
PWHT	-	Post Weld Heat Treatment
PWR	-	Pressurized Water Reactor
QC	-	Quality Control
RB	-	Reactor Building
RCA	-	Radiation Control Area
RCS	-	Reactor Coolant System
RDR	-	Radiological Deficiency Report
RMS	-	Remote Monitoring System
RT	-	Radiography
RWP	-	Radiation Work Permit
S/G	-	Steam Generator
SGRP	-	Steam Generator Replacement Project
SMAW	-	Shielded Metal Arc Welding
SPM	-	Special Process Manual
WCN	-	Work Plan and Inspection Report Change Notice
WP&IR	-	Work Plan and Inspection Report