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

MAR 2 7 1991

Report No.: 50-400/91-03

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

Docket Nos.: 50-400 License No.: NPF-63

Facility Name: Shearon Harris Nuclear Power Plant

Inspection Conducted: February 25 - March 1, 1991

Inspector: D. A. Seymour 3/22/91
D. A. Seymour Date Signed

Accompanying Personnel: N. G. McNeill

Approved by: T R Decker 3/22/91
T. R. Decker, Chief Date Signed
Radiological Effluents and Chemistry Section
Radiological Protection and Emergency
Preparedness Branch
Division of Radiation Safety and Safeguards

SUMMARY

Scope:

This routine, unannounced inspection was conducted in the areas of the Post-Accident Sampling System (PASS), audits and appraisals, confirmatory measurements, the Energy and Environmental Center, chemistry procedures, and the Spent Fuel Pool.

Results:

The Crud Task Force recommended that the spent fuel be cleaned prior to shipment. Corporate management approved these recommendations on December 14, 1990. The cleanup of the spent fuel pools and transfer canals had progressed well.

One violation was determined in the Post Accident Sampling System due to the lack of a procedure for the removal of a post-accident undiluted liquid reactor coolant sample from the shielded container in which it is collected. One deviation was also determined for failure to meet a commitment to semiannual retraining of all technicians who could be required to obtain PASS samples. The status of procedure development, training procedures, as well as further examination of knowledgeability of NUREG-0737 criteria were areas needing improvement.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*N. Baker, Nuclear Assessment Department (NAD)
G. Boley, Technician, Environmental and Chemistry (E&C)
D. Elkins, Shipment Director, Spent Nuclear Fuel
*M. Hamby, Project Specialist, Regulatory Compliance
*C. Hinnant, Plant General Manager
S. Johnson, Chemistry Foreman
*B. Meyer, Manager, Environmental and Radiation Control (E&RC)
*R. Morgan, Manager, Nuclear Assessment
*G. Nathan, Senior Specialist, E&RC
*C. Olexik, Manager, Regulatory Compliance
M. Pate, Manager, Training, Harris Energy and Environmental Center (E&EC)
D. Redmond, Technician, E&C
*B. Sears, Foreman, E&C
*M. Station, Site Representative, Power Agency
*F. Strehle, Manager, Quality Assurance Engineering
D. Tysinger, Technician, E&C
*M. Wallace, Senior Specialist, Regulatory Compliance
T. Williams, Manager, Health Physics and Chemistry Training, E&EC
*W. Wilson, Manager, Spent Nuclear Fuel

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

NRC Inspectors

M. Shannon, Resident Inspector
W. Stansberry

*Attended exit interview

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

2. Post Accident Sampling System (PASS) (84750)

NUREG-0737, Criterion 2a provides specifications for the establishment of onsite radiological analysis capabilities to provide quantification of noble gases, iodines, and non-volatile radionuclides in the reactor coolant system (RCS) and containment atmosphere. Technical Specification (TS) 6.8.4.e requires that a program be established, implemented and maintained to ensure the capability to obtain and analyze, under accident conditions, reactor coolant, radioactive iodines and particulates in plant gaseous effluents, and containment atmosphere samples. The PASS should

provide these capabilities, and should enable the licensee to obtain information critical to the efforts to assess and control the course and effects of an accident.

Pursuant to these specifications, the inspector reviewed portions of selected procedures for the operation, maintenance, and testing of the PASS, and discussed system operation, performance testing, and analytical capabilities of the PASS with the licensee. The inspector also observed E&C technicians obtain PASS samples.

The inspector reviewed selected portions of two procedures dealing with the operation and maintenance of the PASS. These procedures were No. CRC-821, entitled "Postaccident RCS/RHR Sampling," dated May 9, 1989; and No. CRC-830, entitled "Periodic Maintenance and Operability Verification of the PASS," dated May 20, 1988. The portions reviewed were adequate for their intended purpose.

The inspector determined through discussions with the licensee, that as part of operation of the PASS, the capability existed for the collection of a post-accident, undiluted, ten milliliter, liquid reactor coolant sample in an shielded container or "pig." This sample could serve several functions. It could be sent to an off-site vendor, still in the pig, for isotopic or chloride analysis, or it could be analyzed on site for chlorides by the licensee, after a thirty day decay time. The inspectors determined, at the time of this inspection, that the licensee did not have a procedure for the removal of this sample from the pig.

The inspector considered the lack of this procedure to be a violation of TS 6.8.1 a, which requires that written procedures be established and implemented. Since this is an anticipated sampling point following an accident, the inspectors believe that a procedure covering the sampling, including the removal of the sample from the pig, should be developed and tested. Due to the nature and timing of this sample, it could be expected to have a very high activity level. Considering this, the use of "generic" site procedures for handling radioactive materials might not ensure the safety of the technician who would have to remove this sample, for the first time ever, with little prior training and with instructions that had not been verified as effective. The inspectors did not consider the possibility of developing this procedure during the thirty day decay time as appropriate. The reduction or elimination of any unnecessary uncertainties following an accident would obviously increase the overall effectiveness of the licensee's program for dealing with an accident. Another consideration was the possible importance of sample volume changes and/or dilution factors that may be associated with the removal of this sample from the pig. This knowledge, if needed, would help ensure that the licensee could accurately quantify chosen sample parameters upon analysis. Site management, during the exit interview, committed to the development of a procedure to remove this sample from the pig (Violation 50-400/91-03-01).

The inspector also reviewed the training that the E&C technicians received on the PASS. This included interviews with the licensee, and a document review. The inspectors determined that new, or previously untrained, technicians would initially receive eight hours of training on the PASS, with annual retraining of two hours a year thereafter. This training was not "hands-on" training. The hands-on training was accomplished during the required quarterly operability verification of the PASS.

The inspector determined that there were nineteen E&C technicians; twelve of these technicians were qualified to operate the PASS (i.e. had received the initial and annual retraining) and were also respirator qualified (which would be required to operate the PASS during an emergency). A review of records for 1988, 1989, 1990 and 1991 to date, indicated that only a small portion of these technicians were receiving opportunities to operate the PASS during the quarterly checks. Two of the technicians operated the PASS a majority of the time, five had operated the PASS once or twice, and five of the technicians had not received the opportunity to operate the PASS during the quarterly checks.

During discussions with the inspector, the licensee indicated that any one of the qualified technicians could be required to obtain a PASS sample following an accident. The inspectors also determined that the licensee was not tracking this type of training for the technicians, as this information was not readily available when requested, and had to be generated from several different documents. The licensee was also not aware that CP&L had committed, in a letter to headquarters dated May 18, 1988, to semiannual retraining of the technicians who could be required to operate the PASS. This retraining was to be performed in conjunction with the quarterly operability verification testing of the PASS. The inspectors considered the failure to meet this commitment a deviation (Deviation 50-400/91-03-02).

The inspector discussed this with the licensee, and the licensee verbally committed to tracking the training of their technicians to ensure that the semiannual retraining commitment on the PASS would be met. The licensee also indicated that they might specify which technicians would be considered qualified to operate the PASS system, thus reducing the number of technicians who would require semiannual retraining on the PASS. The effect of this proposed reduction in the number of technicians qualified to operate the PASS, if implemented, would be examined by regional inspectors in terms of the safety significance and effectiveness of the PASS program, during subsequent inspections.

As part of the review, the inspectors also examined PASS Quarterly Operability Verification Test Results for 1987, 1988, 1989, 1990, and 1991 to date. These records summarized the results of the quarterly tests in terms of passing or failing the comparisons between PASS analyses and

routine RCS sampling, as detailed in NUREG-0737 Criterion 10 and Attachment No. 1 to the Generic Letter. These analyses included: boron, isotopic activity, and chlorides for diluted RCS liquid; dissolved hydrogen and isotopic activity for stripped RCS gas; in-line pH, in-line dissolved oxygen, and in-line hydrogen; and gas activity and iodine activity for containment air. Inspection Report No. 50-400/90-12 had previously detailed a poor history of meeting the PASS acceptance criteria for several of these tests, and had indicated a continuing problem with the stripped gas results and with the in-line pH, dissolved oxygen and hydrogen. At the time of this inspection several of these problems had been eliminated; however, there were continuing problems with stripped gas isotopic results. The inspectors determined that the PASS was continuing to receive attention and support from the system engineer and Technical Support organization.

The inspectors questioned the usefulness of comparing the isotopic activity of a highly diluted PASS sample to a much less diluted, primary reactor coolant sample, as a means to determine PASS operability. The point of this comparison is to verify that the PASS system operates, and that the dilution ratios and sample volumes have been accurately determined. In cases where the fuel integrity was high, as at Harris, the highly diluted PASS samples may not contain enough activity to be detected. This results in comparisons being performed between samples with activity levels below the "lower limit of detection" with samples from the primary RCS, which have measurable activity. The licensee agreed to investigate the possibility of improving the comparisons, by either increasing the volume of the PASS sample, or by increasing the count time.

The inspectors also observed two E&C technicians obtain PASS samples, and one E&C technician obtain a primary RCS sample. In each case, the appropriate procedures were followed, proper sampling techniques and health physics practices were observed, and the technicians seemed knowledgeable and competent. The sampling and analysis of the PASS samples were accomplished in under three hours, meeting the criteria in NUREG 0737 for the time limit on sampling and analysis. The analysis for boron was not performed because the level of boron in the RCS was 72 parts per billion (ppb). The tremendous dilution of the liquid PASS sample (1000:1) prevents boron analysis if the RCS boron level is below 500 ppb. The stripped gas isotopic activity results did not meet NUREG 0737 acceptance criteria. All other parameters passed. The inspectors determined that there was an ongoing effort by the system engineer to determine the cause of this disagreement. The inspectors did not observe containment air sampling.

The inspectors also discussed, with the system engineer, the ability to provide an alternate source of power to the PASS, in the event of the loss of site power during an accident. The system engineer indicated, on at least two occasions, that this capability did not exist. The inspectors discussed this with site management, and pointed out that an alternate

power source was required by the criteria of NUREG 0737. The licensee then determined, and discussed with the inspectors, that an alternate power source did exist, in that the PASS could be powered by the site diesels. The inspectors discussed the procedure by which this would be accomplished with the licensee by telephone on March 6, 1991.

The inspectors considered the PASS program to be adequately implemented and maintained; with areas in procedure development, technician training, and knowledgeability of NUREG-0737 criteria needing improvement.

One violation and one deviation were identified.

3. Audits and Appraisals (84750)

TS 6.5.4.1 requires the licensee's Corporate Quality Assurance Department (CQAD) to perform periodic audits of Facility activities, including: training and qualification of the facility staff; the Radiological Environmental Monitoring Program (REMP); the Offsite Dose Calculation Manual (ODCM); and the Process Control Program (PCP). These audits provide assurance that these programs are properly and effectively implemented.

Pursuant to these requirements, the inspector discussed the status of the CQAD with cognizant licensee personnel. The inspector determined that the licensee's CQAD department had been recently reorganized in December, 1990, with an approximately 50 percent reduction in personnel, and was renamed the Nuclear Assurance Department (NAD). As with the CQAD, the NAD has branches at each CP&L site and in Raleigh; and the organization continued to be responsible to corporate management in Raleigh. The licensee explained that the focus of the new organization was different from the old. The focus of the NAD will be to identify problems and anticipate and implement changes, not just react to findings. Additional details of the new organization can be found in Inspection Report 50-324,325/91-04.

The inspectors briefly reviewed the Quality Assurance Audits conducted in 1989 and 1990. These audits were conducted over an approximate two week time frame with five to seven auditors, and covered a very broad scope. The inspectors determined that there were no significant audit findings in the areas of the REMP, ODCM, or the PCP.

Although the concept of the NAD appeared to be an improvement over the CQAD, the inspectors considered it premature to make any conclusions concerning its effectiveness, since this organization was still in its infancy and required further development, planning and implementation. This area will be reviewed during subsequent regional inspections.

No violations or deviations were identified.

4. Confirmatory Measurements (84750)

As part of the NRC Confirmatory Measurements Program, spiked liquid samples were sent to SHNPP for selected radiochemical analyses. The samples were received by Harris in October 1990. The NRC received the analytical results from CP&L in a letter dated December 10, 1990. The comparison of licensee results to known values are presented in Attachment 1. The acceptance criteria for the comparisons are presented in Attachment 2. The results were all in agreement.

No violations or deviations were identified.

5. Energy and Environmental Center (E&EC) and Chemistry Procedures

Technical Specification (TS) 6.8.1 requires written procedures to be established, implemented and maintained for the Quality Assurance Program for effluent and environmental monitoring.

Inspection Report No. 50-400 (90-21 detailed a violation (failure to properly implement a radiochemistry procedure) for failure to add nitric acid to liquid samples prior to counting as required by TSs. This report detailed the licensee's study to qualify the effects of not treating liquid samples with nitric acid prior to compositing and analyzing. At that time the licensee decided to perform a more thorough study to quantify the effects of not acidifying liquid samples.

During this inspection the results of the effects of acidification of liquid samples were reviewed. CP&L Memorandum, Serial #91LF5013 was discussed at length with the Senior Specialist-Environmental. The memorandum described two sets of samples which were counted for gamma spectroscopic analysis and aliquots which were analyzed for Iron-55, Strontium-89, and Strontium-90.

Several flaws were noted in the samples of BNP reactor coolant which were analyzed for gamma activity. The samples were "aged", or left standing for an unspecified amount of time; composited, and then diluted. The samples were then counted over an eight hour period without acidification. An examination of the activities reported yielded very little in the way of direct information which can be of use as there is no comparison between acidified and non-acidified samples. Any plating out of isotopes may have already occurred and the time of eight hours is not comparable to that which might be encountered in monthly composite samples. The Senior Specialist-Env. stated that this portion of the analyses may be repeated to correct the aforementioned limitations.

The second section of the memorandum dealt with three analyses; Iron-55, Strontium-89, and Strontium-90. One liter aliquots of deionized water were spiked with known activities of these isotopes and the samples were stored for thirty days.

The Iron-55 samples showed a significant (up to twenty percent) difference in the amounts recorded as gamma activity. Those samples which were not acidified yielded a consistently lower activity than those which were acidified. Based on these analyses the July 1-December 31, 1990 SemiAnnual Radioactive Effluent Release Report was changed to reflect this twenty percent increase in activity. This amount of change had no significant impact on the overall effluent releases from SHNPP for the time frame noted.

The Strontium-90 samples were subjected to the same analysis parameters as above. Larger (750 ml as opposed to 50 ml) aliquots were analyzed for this portion of the study. The analyses yielded very little (less than five percent) difference in the acidified and non-acidified samples. Due to a spiking error in the Strontium-89 samples these analyses were not performed. Strontium analysis requires many steps leading to preparation of the isolated strontium precipitate which is analyzed for beta activity. Among these steps are several additions of acid to the aliquot which may or may not account for the relatively minor difference in the reported activities.

RESL (et al)have demonstrated significant "plating" of gamma nuclides (such as Iron-55 and Cobalt-60) onto collection container surfaces. The analyses provided by CP&L in Memorandum #91LFS013 in part, at least, substantiates those conclusions.

The inspectors also toured the Energy and Environmental Center Laboratories (E&EC) and discussed analysis parameters and laboratory equipment to gain familiarity with operations.

Based on this selective review, the actions taken concerning revision of the 1990 Radioactive Effluent Release Report appeared to be appropriate. Further revisions may be necessary dependent upon further examination by the E&EC personnel. Appropriate procedures were in place to prevent recurrence of the failure to add nitric acid to liquid samples.

No violations or deviations were identified.

6. Spent Fuel Pool (SFP) Facility (84750)

The inspectors met with licensee representatives to discuss the status of the continued cleanup of the Spent Fuel Pools. Items discussed with the licensee included those described in NRC Inspection Report No. 50-400/90-22. Particular emphasis was placed on the progress made in the filtration process, status of the fuel pools at present, and the disposition of Corporate Task Force recommendations concerning the treatment of spent fuel received from other sites.

The licensee representative outlined the current cleanup under way on 2-3 canal. The filters had been effective in reducing crud deposited on fuel pool surfaces, and on removal of fine particles in suspension in the pool water. Eight spent filters were stored in D pool. These filters were replaced upon reaching a maximum differential pressure of 20 psi (planned maximum was 60 psi) and have a worst case contact reading of 200 R/hour (planned maximum was 300-400 R/hour). Cleanup had been completed on the 1-4 canal and the main pool. The licensee representative stated that they planned to reclean the 1-4 transfer canal as well as the transfer tube prior to refueling. The licensee planned on suspending cleaning of the fuel pools during the outage, and resume when refueling was completed.

The licensee described an anomaly observed in the water condition of the 2-3 canal. While work was ongoing in the canal the water clarity was fairly clear. Overnight, over a time period of approximately eight to ten hours, while no work was ongoing, the pool suddenly turned opaque and green in color. The licensee continued to operate the filters passively with the suction head not in contact with any surface. The pool returned to clarity after 48 to 72 hours. The licensee representative stated that the cause of this transformation was not known and that Corporate Chemistry representatives were currently examining this phenomenon.

The licensee representative also discussed with the inspectors the status of Task Force Recommendations concerning future processing of offsite spent fuel shipments and the handling of spent fuel shipments upon receipt at SHNPP. The Task Force has recommended that the fuel be cleaned at Brunswick Steam Electric Plant (BSEP) prior to shipment. The Task Force also recommended the vendor for implementation of these processes. The recommendations were approved by Corporate on December 14, 1990. No formal announcements have as yet been announced nor have the necessary contracts been formalized.

Based on this review, the actions taken to cleanup the fuel pools appear to be effective. This area will be reviewed during subsequent regional inspections.

No violations or deviations were identified.

7. Exit Interview

The inspection scope and results were summarized on March 1, 1991 with those persons indicated in Paragraph 1. The inspectors described the areas inspected and discussed in detail the inspection results as listed in the summary. Proprietary information is not contained in this report. Dissenting comments were not received from the licensee.

Item No.	Description and Reference
50-400/91-03-01	Violation - Lack of a procedure for the removal of a PASS sample from a shielded container (Paragraph 2).
50-400/91-03-02	Deviation - Failure to train technicians qualified to operate the PASS on a semiannual basis (Paragraph 2).

8. Acronyms and Initialisms

BNP - Brunswick Nuclear Plant
BSEP - Brunswick Steam Electric Plant
BWR - Boiling Water Reactor
CFR - Code of Federal Regulation
CP&L - Carolina Power and Light Company
CQAD - Corporate Quality Assurance Department
E&EC - Energy and Environmental Center
E&RC - Environmental and Radiation Control
E&C - Environmental and Chemistry
mR/h - milliRoentgen per hour
NAD - Nuclear Assurance Department
NRC - Nuclear Regulatory Commission
NRR - Nuclear Reactor Regulation
ODCM - Offsite Dose Calculation Manual
PASS - Post Accident Sampling System
PCP - Process Control Program
ppb - parts per billion
PWR - Pressurized Water Reactor
RCS - Reactor Coolant System
REMP - Radiological Environmental Monitoring Program
RESL - Radiological and Environmental Sciences Laboratory
SFP - Spent Fuel Pool
SHNPP - Shearon Harris Nuclear Power Plant
TS - Technical Specification

ATTACHMENT 1

CONFIRMATORY MEASUREMENT COMPARISONS OF H-3, Fe-55, Sr-89, AND Sr-90 ANALYSES FOR HARRIS NUCLEAR PLANT REPORTED ON DECEMBER 10, 1990

Isotope	NRC (uCi/ml)	Licensee (uCi/ml)	Resolution	Ratio (Licensee/NRC)	Compariso
H-3	5.59 ±0.22 E-5	5.59 E-05	25	1.00	Agreement
Fe-55	4.06 ±0.16 E-5	3.90 E-05	25	0.96	Agreement
Sr-89	7.29 ±0.29 E-5	6.57 E-05	25	0.90	Agreement
Sr-90	2.17 ±0.09 E-6	1.92 E-06	24	0.88	Agreement

ATTACHMENT 2

CRITERIA FOR COMPARISONS OF ANALYTICAL MEASUREMENTS

This attachment provides criteria for the comparison of results of analytical radioactivity measurements. These criteria are based on empirical relationships which combine prior experience in comparing radioactivity analyses, the measurement of the statistically random process of radioactive emission, and the accuracy needs of this program.

In these criteria, the "Comparison Ratio Limits"[1] denoting agreement or disagreement between licensee and NRC results are variable. This variability is a function of the ratio of the NRC's analytical value relative to its associated statistical and analytical uncertainty, referred to in this program as "Resolution"[2].

For comparison purposes, a ratio between the licensee's analytical value and the NRC's analytical value is computed for each radionuclide present in a given sample. The computed ratios are then evaluated for agreement or disagreement based on "Resolution." The corresponding values for "Resolution" and the "Comparison Ratio Limits" are listed in the Table below. Ratio values which are either above or below the "Comparison Ratio Limits" are considered to be in disagreement, while ratio values within or encompassed by the "Comparison Ratio Limits" are considered to be in agreement.

TABLE

NRC Confirmatory Measurements Acceptance Criteria
Resolution vs. Comparison Ratio Limits

Resolution	Comparison Ratio Limits for Agreement
<4	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

[1]Comparison Ratio = $\frac{\text{Licensee Value}}{\text{NRC Reference Value}}$

[2]Resolution = $\frac{\text{NRC Reference Value}}{\text{Associated Uncertainty}}$