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

JAN 20 1988

Report No.: 50-424/87-68

Licensee: Georgia Power Company
P. O. Box 4545
Atlanta, GA 30302

Docket No.: 50-424

Facility Name: Vogtle, Unit 1 License No.: NPF-61

Inspection conducted: December 7-11, 1987

Inspector: P G Stoddart 1/13/88
P. G. Stoddart Date Signed

Approved by: John B Kahle 1/13/88
J. B. Kahle, Section Chief Date Signed
Division of Radiation Safety and Safeguards

SUMMARY

Scope: This routine, announced inspection was conducted in the areas of Post Accident Sampling System evaluation, investigation of technical aspects of allegations, and followup on previously identified items.

Results: One violation was identified - failure to follow procedures. Three scheduled maintenance or calibration checks were not performed in the required time periods.

REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   *G. Bockhold, General Manager
   *R. Bellamy, Plant Manager
   *S. Ewald, Manager, Health Physics and Chemistry
   *S. Hallman, Chemistry Superintendent
   *W. E. Mundy, Quality Assurance Supervisor
   *P. Jackson, Engineer, PASS System
   *A. Stalker, Corporate Health Physics and Chemistry
   *A. Desrosiers, Superintendent, Health Physics and Chemistry Support

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

   Other Organization

   T. Harkins, Bartlett Corporation, PASS Engineer
   R. Cisio, Bartlett Corporation, Electronics Engineer

   *Attended exit interview

2. Exit Interview

   The inspection scope and findings were summarized on December 11, 1987, with those persons indicated in Paragraph 1, above. The inspector described the areas inspected and discussed in detail the inspection findings listed below. No dissenting comments were received from the licensee.

   One probable violation was discussed - Failure to follow procedures required under Technical Specification 6.7.1.b. Periodic surveillances were missed on three occasions. The licensee acknowledged the inspector's finding regarding this matter and stated that corrective measures had already been initiated to prevent a recurrence. Two inspector followup items were identified in areas of the Post Accident Sampling System evaluation where a full evaluation could not be made due to system component malfunctions. The licensee noted these items and indicated that action had been taken toward resolution of the system malfunctions. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspector during this inspection.

3. Licensee Action on Previous Enforcement Matters

   (Closed) Violation (IV) 50-424/87-34-01: Failure to follow procedure for waste gas releases, resulting in uncontrolled release of radioactive gases to the environment. The inspector reviewed revised procedures and

documentation of special training given to operators to prevent future recurrence. Licensee actions were considered adequate and the matter is closed.

4. Summary of Evaluation of the Post Accident Sampling System (PASS)

The Post Accident Sampling System (PASS) was evaluated for conformance to the criteria of Section II.B.3 of NUREG-0737, "Clarification of TMI Action Plan Requirements" and related generic letters to all power reactor licensee applicants and licensees dated March 20, 1980. The eleven criteria of NUREG-0737 contained some multiple requirements; for purposes of this evaluation, the criteria were re-stated as 17 separate items and evaluated and reported in that context. However, for purposes of conformance to NUREG-0737, the following Table I summarized the evaluation against the 11 NUREG-0737 criteria of Section II.B.3, Post Accident Sampling Capability.

TABLE I

INSPECTION SUMMARY

NUREG-0737 Criteria	Meets all of Criteria	Does Not Meet All of Criteria	Reasons
1	X		
2	X		
3	X		
4		X	Hydrogen analysis of reactor coolant or stripped gas was outside of accuracy guidelines
5	X		
6	x		
7	X		
8	X		
9	X		
10		X	Isotopic radioactivity analyses in reactor coolant or stripped

		gas were outside of accuracy guidelines
11	X	

Details of the evaluation and PASS areas which did not fully meet the evaluation criteria are provided in the subsequent sections of this inspection report. Attachment 1 of this inspection report provides the details of the evaluation against seventeen criteria derived from NUREG-0737 and implementing correspondence.

5. PASS Description

The Vogtle Unit 1 PASS was built by the Sentry Corporation, Oconomowoc, WI, and included components supplied by other vendors. The PASS was designed for full remote sampling and analysis for all of the measurements or analyses specified in Section II.B.3, Post Accident Sampling Capability, of NUREG-0737.

The PASS installed at Vogtle Unit 1, together with a second identical PASS installed at Vogtle Unit 2 but not yet placed in operation, was the first operational Sentry PASS system incorporating in-line gamma spectrometry for reactor coolant system (RCS) and containment sump samples (liquid) and for RCS stripped gas and containment atmosphere samples.

No violations or deviations were identified.

6. PASS Procedure Review

The inspector reviewed licensee procedures for the testing, calibration, maintenance, and operation of the PASS during this inspection and prior inspections 50-424/87-09, 86-119 and 86-137. The procedures appeared to be adequate and had been reviewed and approved by appropriate plant supervisors in accordance with Technical Specification requirements. Since the Vogtle Unit 1 PASS was the first vendor system (of this model) to be placed in operation, it was necessary for the licensee to develop test, calibration, maintenance and operating procedures based on the vendor's design description and recommended operating procedures and to modify or revise those procedures according to plant-specific circumstances or conditions encountered during installation, inspection and preliminary acceptance tests. In doing so, the licensee was not able to consult with other licensees as to suggested courses of action to resolve problems or questions which arose. However, licensee personnel, with technical assistance from the vendor, were able to prepare the necessary procedures and to validate those procedures through operation of the PASS.

No violations or deviations were identified.

7. PASS Training

The inspector reviewed the licensee's training program for operation of the PASS during Inspections 50-424/87-34 and 87-09. In those inspections, the licensee's training program appeared to be adequate. Training consisted of classroom and "hands on" sessions and included vendor participation.

No violation or deviations were identified.

8. PASS Acceptance Testing

The inspector reviewed appropriate portions of acceptance and preoperation tests of the PASS during prior inspection 50-424/87-09. The requisite tests appeared to have been completed satisfactorily and had been reviewed and approved in accordance with licensee's established procedures.

No violations or deviations were identified.

9. PASS Surveillance Checks and Periodic Calibration Checks

The inspector observed while licensee personnel performed daily surveillance checks as specified in Procedure 35640-C. All steps in the procedure were accomplished as described and minor adjustments were made as necessary. The engineer performing tne surveillance checks explained each step to the inspector, who was furnished with a copy of tne surveillance procedure, and in doing so demonstrated an adequate level of familiarity with the system and the surveillance procedure. The inspector also reviewed records of monthly periodic surveillances and system calibration. Several PASS procedures concerned with PASS component or subsystem calibration required surveillance tests or checks at monthly (not to exceed 45 days) intervals. Three instances were identified in which recalibration or system testing was not performed within the required time frame. These were:

a. Procedure 35611-C, Remote Analysis With the Post Accident Sampling System. System testing was performed on June 15, 1987, and next on August 17, 1987 -- an interval of two months plus two days. This was in violation of the procedural requirement for system testing at intervals not to exceed 45 days.

b. Procedure 35625-C, Calibration of the Post Accident Sampling System Dissolved Oxygen Monitor. Calibration was performed on March 10, 1987, and next on July 14, 1987 -- an interval of four months plus four days. This was in violation of the procedural requirement for calibration at intervals not to exceed 45 days.

c. Procedure 35629-C, Recalibration of the Post Accident Sampling System Ion Chromatograph. Calibration was performed on June 10, 1987 and next on August 16, 1987 -- an interval of two months plus six days.

This was in violation of the procedural requirement for recalibration at intervals not to exceed 45 days.

Technical Specification 6.7.1.b requires the licensee to implement established procedures, including these established for the PASS referenced in NUREG-0737. The instances detailed above represented multiple examples of failure to implement p cedures by failure to perform procedural requirements for periodic system tests within the specified time limits.

(Opened) Violation, 50-424/87-68-01 - Failure to perform procedural requirements in accordance with specified periodic tests of the post accident sampling system (PASS).

10. PASS Facility Shielding and Dose Calculations

NUREG-0737 Criterion 6 of Section II.B.3, Post Accident Sampling Capability, specifies that the design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assure that it is possible to obtain and analyze a sample without radiation exposures to any individual exceeding 5 rem to the whole body or 75 rem to the extremities (General Design Criterion 19, Appendix A, 10 CFR Part 50).

The inspector reviewed the licensee's shielding and dose calculation study. The study was conducted by Bechtel in December 1986, and included an extensive time-motion study. Dose calculations were based on Bechtel calculation package X6CDJ.08 and on Plant Vogtle operating procedure 35620-C, Rev. 1. The licensee at the time of the inspection was using operating procedure 35611-C, Rev. 3, dated December 6, 1987. The inspector reviewed portions of the above-referenced documents and verified selected calculations. The documentation appeared to be adequate and satisfactorily addressed the principal points of concern in the matters of shielding and dose calculation.

No violations or deviations were identified.

11. PASS Design Requirements

NUREG-0737 Criterion 3 (II.B.3: PASS) specifies that reactor coolant and containment atmosphere sampling during accident conditions shall not require an isolated auxiliary system to be placed in operation in order to use the sampling system. The inspector reviewed the PASS design and PASS operating procedures and determined that no isolated auxiliary system would have to be placed in operation in order to use the sampling system. As a point of clarification, it is noted that "isolated auxiliary system" includes such systems as the Residual Heat Removal System or the Primary Coolant Letdown System; reference to sampling isolation valves or sampling piping or control valves as "isolated auxiliary systems" was not intended or inferred.

No violations or deviations were identified.

12. PASS Design Requirements for Time to Collect and Analyze Samples

NUREG-0737 Criterion 1 specifies that the licensee shall have the capability to promptly obtain reactor coolant samples and containment atmosphere samples. The combined time allotted for sampling and analysis should be three hours or less from the time a decision is made to take a sample.

The inspector observed reactor coolant liquid and containment atmosphere sampling and analysis operations on several occasions during the inspection. In each instance, the licensee was able to obtain a sample and analyze the sample within the required three hours. In one case, the licensee was demonstrating an alternative or backup method for obtaining a "grab" sample of undiluted reactor coolant when the mechanism for coupling the liquid sample injection system to the shielded shipping cask containing the sample collection bottle could not be lowered into position. After several attempts to make the coupling were unsuccessful, the licensee utilized a second backup system and obtained a diluted reactor coolant sample and was able to perform an analysis of that sample within the specified time. In determining the cause of the malfunction, it was found that a microswitch safety device had shifted position slightly, preventing the movement of the coupling device. The microswitch was repositioned and the system was operated several times to assure correct operation. On the following day, the inspector observed another sampling operation, at which time the system functioned properly and a sample was taken and analyzed within the prescribed time.

On the basis of the demonstrated sampling and analysis operations, the inspector concluded that the licensee had the capability to promptly obtain reactor coolant samples and containment atmosphere samples and to analyze the collected samples within a time frame of three hours.

No violations or deviations were identified.

13. PASS Onsite Nonradiological Analysis Capability

NUREG-0737, Item II.B.3, Criteria 2(b), 2(c), 4, 5, and 7 specify requirements or recommendations for determination of hydrogen in containment atmosphere and of boron, chloride, dissolved oxygen, hydrogen (or total dissolved gas), and pH in reactor coolant. With the exception of hydrogen in reactor coolant, the licensee adequately demonstrated the capability for nonradiological sampling and analysis.

The measurement of hydrogen in primary coolant using the in-line gas chromatograph produced results which were significantly below those produced in the concurrent normal sample analyses of primary coolant. The licensee was not able to demonstrate the required accuracy. Investigation by licensee staff into the underlying cause appeared to indicate the presence of a vacuum leak in the gas evacuation chamber of the gas

chromatograph. The licensee was not able to resolve this problem as of the end date of this inspection.

This matter was identified as an Inspector Followup Item and will be reviewed during a later inspection.

(Open) Inspector Followup Item (IFI) 50-424/87-68-02, Review resolution of low hydrogen/dissolved-gas analysis results in primary coolant PASS samples.

14. PASS Onsite Radiological Analysis Capability

NUREG-0737 Criteria 9 and 10 and Attachment No. 1 to the generic letters to all power reactor applicants and licensees dated March 20, 1980, require that the licensee's radiological and chemical sample analysis capability include the following provisions:

a. Establish an onsite capability for quantification of noble gases, iodines, and nonvolatile radionuclides in the reactor coolant which may provide an indication of the degree of core damage.

b. The range of activity that the equipment must be capable of measuring for a reactor coolant sample is from 1 µCi/g to 10 Ci/g (total activity).

c. The results of gamma spectral measurements should be accurate within a factor of 2 across the entire range.

The Sentry PASS for Vogtle Unit 1 had an in-line capability for analysis and measurement of reactor coolant and containment sump liquid samples and of containment atmosphere and RCS stripped gas samples. Vendor and licensee tests of the range of activity that the various components of the PASS were capable of measuring, in diluted or undiluted modes of operation, appeared to confirm that the PASS was capable of measuring reactor coolant samples from 1 µCi/g to 10 Ci/g and containment atmosphere samples ranging from normal operating levels to approximately 1 E+05 µCi/cc (total activity).

The inspector observed several sampling runs of the PASS. The first sample analyzed by the in-line gamma spectrometer indicated activity concentrations in reactor coolant which were higher than those obtained concurrently with the normal sampling system and the in-plant laboratory gamma spectrometer. Licensee personnel attempted to resolve the discrepancy by flushing out all system sample lines to reduce suspected radiation background. When the operator tried to run the spectrometer following the attempt to reduce background, there was an apparent electronics failure in the transmittal of data from the spectrometer to the computer used for interpretation of the spectra. As a result, the licensee was unable to successfully analyze the RCS liquid sample, or the RCS str pped gas sample containment atmosphere sample using the in-line spectrometer for the remainder of the inspection. However, the licensee

was able to utilize the backup sampling and analysis systems which had been incorporated to fulfill the requirements of NUREG-0737 Criteria 9 and 10 and of Attachment 1 (referenced in the lead paragraph of this section of this inspection report). The systems problem in the communication link between the spectrometer and the computer was listed as an inspector followup item and will be reviewed during a subsequent inspection.

The licensee demonstrated the PASS built-in backup sampling systems by collecting undiluted and diluted (1:1000) samples and analyzing them onsite. Comparison of these analyses to the analysis of a concurrent reactor coolant sample procured at the normal sampling sink yielded the following results:

Nuclide	PASS: Reactor Coolant Sample - Undiluted µCi/ml	PASS: Reactor Coolant Sample - Diluted 1000:1 µCi/ml*	SAMPLE SINK: Normal Reactor Coolant Sample µCi/ml
Na-24	5.36E-02 ± 0.04E-02	8.98E-02 ± 0.28E-02	5.69E-02 ± 0.09E-02
Co-58	9.90E-04 ± 1.22E-04	6.92E-03 ± 0.92E-03	6.49E-04 ± 2.21E-04
I-131	1.15E-04 ± 0.56E-04	-----	-----
I-1[illegible]	3.30E-03 ± 0.20E-03	5.10E-03 ± 1.29E-03	3.28E-03 ± 0.31E-03
I-133	1.88E-03 ± 0.07E-03	2.86E-03 ± 0.52E-03	2.02E-03 ± 0.19E-32
I-134	8.37E-03 ± 0.82E-03	1.03E-02 ± 0.42E-02	5.46E-03 ± 0.70E-03

*Concentration corrected for 1000:1 Dilution

With the exception of the diluted RCS PASS sample value for Co-58, all of the undiluted and diluted RCS PASS Sample analysis values were within a factor of two (2) of the analysis of the normal RCS sample for the same time period. Since 9 out of 10 values were within the specified factor of two, the analysis values were considered acceptable.

(Opened) Inspector Followup Item (IFI), 50-424/87-68-03, Review licensee resolution of data transmission problem between the PASS gamma spectrometer and the system computer used in spectrum analysis.

No violations or deviations were identified.

15. Allegation Followup (99014)

The inspector conducted a review of circumstances surrounding Allegation RII-87-A-0122 on December 8-10, 1987. The allegation stated that the Plant Vogtle FSAR, in Section 9.1.2.1.2, committed to sample liquid wastes, analyze before release and maintain records (of analyses and release documentation) but (the licensee) was not sampling or analyzing wastes being dumped into the turbine drains. The inspector reviewed the FSAR files and observed that Section 9.1.2 was concerned with spent fuel storage and was unrelated to radioactive liquid waste processing, analysis, and release. Further, there was no indication in either

licensee or NRC files that a Section 9.1.2.1.2 has ever been present in the Vogtle FSAR.

The inspector observed that the alleger may have intended to reference Plant Vogtle FSAR Section 11.2, Liquid Radwaste Processing Systems, Subsection 11.2.1.2, Controlled Release of Radioactivity, which represents the licensee's commitments for the sampling and analysis of radioactive liquid effluent streams. It is noted that Subsection 11.2.1.2, does not specifically commit the licensee to sampling and analysis of all potential radioactive liquid waste streams prior to release. Liquid effluents from the turbine building and from the plant cooling water discharge are continuously monitored to detect inadvertent releases of radioactive materials by these pathways.

In the absence of more information specific to the alleger's concerns, it is recommended that this matter be closed.

No violations or deviations were identified.

16. Followup on Inspector Identified Problems (92701)

a. (Closed) Inspector Followup Item (IFI) 87-09-01, Evaluate Post Accident Sampling System operation after plant has operated at least 30 days at full power and correlate analytical measurements against normal sample results. See Paragraphs 4 through 12 and Attachment 1 of this inspection report. This item is closed.

b. (Closed) Inspector Followup Item (IFI) 87-34-02, Review allegation of procedural violation involving order for contractor mechanics to torque radwaste filter lid holddown bolts to 20 foot pounds above specified value. This allegation was investigated in part in Inspection 50-424/87-34. In that inspection report, it was noted that a procedure revision had been made to permit torquing of the holddown bolts to 15 foot pounds above the previous procedure value; during that inspection, however, press of other activities involving a large volume liquid radwaste spill did not permit the inspector to attempt to contact unidentified contract workers employed by Chicago Bridge and Iron (CB&I). During this inspection, the inspector was informed that the CB&I contract had been terminated and that no CB&I personnel were currently onsite. In the absence of specific information concerning the identity of the CB&I workers who may have been involved in mechanical work in the Interim Radwaste Facility in March 1987 -- the period concerned in the allegation -- further investigation into this allegation was not considered within the scope of the inspector's assignment. This matter was referred to the original investigating organization to determine the need for further investigation. This item is closed.

c. (Closed) Inspector Followup Item (IFI), 50-424/86-137-03, Review preoperational procedures for boron recycle system and associated waste evaporator. The inspector was informed that the licensee does

not plan to use the boron recycle system or the associated waste evaporator. The USNRC was informed of this position in letter from R. E. Conway, Georgia Power, to Dr. J. N. Grace, Region II, USNRC, dated January 2, 1987. This item is closed.

d. (Closed) Inspector Followup Item (IFI) 86-119-01, Review environmental laboratory procedures for air cartridge placement, gamma system efficiency checks, audit frequency, and sample presentation. The inspector reviewed the licensee's IFI closure package, which contained copies of environmental laboratory procedures which had been revised to address the concerns of this IFI. The inspector reviewed selected sections of procedures PSL-12450.613, PSL-12450.703, and PSL-12450.625. The procedures appeared to satisfactorily address the principal concerns, including audit frequency, filter placement relative to the front side of charcoal cartridges, gamma spectrometer calibration frequency, and preservation of composited samples to prevent plateout or deterioration. This item is closed.

e. (Closed) Inspector's Followup Item (IFI) 50-424/86-119-07, Modify 90° bend on the intake line of the environmental air samplers. The inspector reviewed the licensee's IFI closure package, which included a drawing showing revision of the 90° bend to a straight line intake. A memorandum in the closure package stated that all of the 90° elbows on the Vogtle area environmental air monitors had been replaced on January 13, 1987. Based on the licensee's written statements, the item is closed.

f. (Open) Inspector Followup Item (IFI) 50-424/86-37-04, Review final resolution between NRC and applicant regarding filter system clarification for the four ESF systems. This matter was not reviewed during this inspection.

g. (Open) Inspector Followup Item (IFI) 50-424/86-92-01, Review of chemistry staff training. This matter was not reviewed during this inspection.

h. (Open) Inspector's Followup Item (IFI) 50-424/86-137-04, Review preoperational tests of waste gas system which were to be completed by December 15, 1986. This matter was not reviewed during this inspection.

i. (Open) Inspector Followup Item (IFI) 50-424/86-137-05, Review installation of HEPA filters and charcoal adsorbers in ESF and non-ESF ventilation and exhaust treatment systems. This matter was not reviewed during this inspection.

j. (Open) Inspector Followup Item (IFI) 50-424/86-137-06, Review applicant evaluation of mechanism of sample transport for (gaseous) iodine in long sampling lines. The licensee informed the inspector

that this matter was scheduled for in-plant tests and evaluation during the first refueling outage. This matter remains open.

k. (Open) Inspector Followup Item (IFI) 50-424/87-09-02, Review results of DOP and freon leak tests of TSC filters and charcoal adsorbers. This matter was not reviewed during this inspection.

ATTACHMENT 1

EVALUATION CRITERIA FOR
POST ACCIDENT SAMPLING SYSTEMS AND
ANALYSIS OF SAMPLES: PWR

Criterion (1): Criterion 1, NUREG-0737, Regulatory Guide 1.97, Rev. 3

The licensee shall have the capability to promptly obtain reactor coolant samples and containment atmosphere samples. The combined time allotted for sampling and analysis should be 3 hours or less from the time a decision is made to take a sample.

Evaluation Results: The licensee demonstrated the capability to obtain reactor coolant samples and containment atmosphere samples and the capability to sample and analyze those samples within three hours.

The licensee meets this criterion.

Criterion (2): Criterion 2a, NUREG-0737, Regulatory Guide 1.97 Rev. 3

The licensee shall establish an onsite radiological analysis capability to provide within a three hour time frame, quantification of certain radionuclides in the reactor coolant and containment atmosphere that may be indicators of the degree of core damage (e.g., noble gases, iodines and cesiums, and non-volatile radionuclides).

Evaluation Results: The licensee provided an in-line sampling and analysis facility which was demonstrated to be capable of providing, within a three hour time frame, quantitative analysis of radionuclides in reactor coolant samples and in containment atmosphere samples. The licensee employed the PWR Owners Group recommended procedure for determining the degree of core damage in the event of a reactor accident.

The licensee meets this criterion.

Criterion (3): Criterion 2b, NUREG-0737

The licensee shall establish an onsite analysis capability to provide, within a 3 hour time frame, quantification of hydrogen levels in the containment atmosphere.

Evaluation Results: The licensee has provided an onsite analysis capability to provide, within a 3 hour time frame, an in-line quantitative analysis facility for the determination of hydrogen levels in the containment atmosphere. Calibration records indicated that the system was capable of accurately quantifying concentrations of hydrogen gas in gas samples containing predetermined concentrations of hydrogen gas. The inspector observed the sampling and analysis of containment atmosphere but

since the containment atmosphere did not contain measurable hydrogen, the analysis showed zero percent hydrogen. Based on calibration data, the inspector concluded that the system was adequate.

The licensee meets this criterion.

Criterion (4): Criterion 2(c)(1) NUREG-0737

The licensee shall establish an onsite analysis capability to provide, within a 3 hour time frame, quantification of dissolved gases (e.g., hydrogen) in the reactor coolant.

Evaluation Results: The licensee has provided in-line sampling and analysis capability for determination of dissolved hydrogen gas in reactor coolant. The licensee's hydrogen analysis system is based on gas chromatography. The licensee demonstrated that the analytical results for dissolved hydrogen in reactor coolant was available in less than three hours.

The licensee meets this criterion.

Criterion (5): Criterion 2(c)(2) and Criterion (7), NUREG-0737

The licensee shall establish an onsite analysis capability to provide within a 3 hour time frame, quantification of boron concentration in reactor coolant.

Evaluation Results: The licensee has provided in-line sampling and analytical capability for the determination of boron in reactor coolant within a three hour time frame. Analysis was provided by an automatic mannitol titration system. Operation of the automatic boron analysis system observed by the inspector produced results which correlated to the normal reactor coolant boron analysis for the same time period to within 2.2 percent (PASS: 681 ppm; Normal Analysis: 696 ppm).

The licensee meets this criterion.

Criterion (6): Criterion 2(c)(3) and Criterion (5), NUREG-0737

The licensee shall establish the capability to provide chloride analysis for primary coolant. If the plant's cooling water is seawater or brackish water and if there is only a single barrier between the primary coolant and the cooling water, the chloride analysis shall be provided within 24 hours of the time the sample was taken. For all other cases, the licensee shall provide for the analysis to be completed within 4 days (96 hours). The chloride analysis, in either case above, does not have to be done onsite.

Evaluation Results: The licensee provided in-line chloride analysis for primary coolant within a three hour time frame. The analysis was provided by means of an in-line ion chromatograph (IC). The inspector noted that

the chloride analysis value was available in less than three hours. Provisions was also made for grab sampling, with analysis available onsite and for collecting a sample for shipment offsite for analysis, if needed.

The licensee meets this criterion.

Criterion (7): Criterion (3), NUREG-0737

Reactor coolant and containment atmosphere sampling shall not require an isolated auxiliary system, such as the letdown system of a PWR, to be placed in operation in order to use the sampling system.

Evaluation Results: The design of the PASS for both reactor coolant and containment atmosphere sampling did not require an isolated auxiliary system, such as the letdown system or residual heat removal system, to be placed in operation in order to use the sampling system. Certain sampling line isolation valves were required to be activated from the main control room in order to obtain samples; however, such valves were not systems of the nature of the letdown system or the residual heat removal (RHR) system. It was not the intent of the PASS criteria to prohibit actuation of sampling line isolation valves during sampling under accident conditions.

The licensee meets this criterion.

Criterion (8): Criterion (4), NUREG-0737

The measurement of dissolved oxygen in primary coolant is recommended but not mandatory. For measurement of dissolved gases in primary coolant, the measurement of either total dissolved gases or of hydrogen gas is considered adequate.

Evaluation Results: The licensee provided a system for the measurement of dissolved oxygen in primary coolant. The system was an Orbisphere detector for analysis of dissolved oxygen. The inspector observed operation of the dissolved oxygen system. The Orbisphere results indicated 11 ppb of dissolved oxygen in the PASS sample, while the chemistry laboratory recorded a result of less than 5 ppb. NUREG-0737 requires an accuracy of $\pm$ 50 ppb at dissolved oxygen levels less than 500 ppb.

The licensee's system for measurement of dissolved gases in primary coolant utilized an in-line gas chromatograph for determination of hydrogen. See Criterion (4) and Criterion (13)a for further discussion.

The licensee meets this criterion.

Criterion (9): Criterion (6), NUREG-0737

The design basis for reactor coolant and containment atmosphere sampling and analysis systems must assure that it is possible to obtain and analyze

a sample without radiation exposures to any individual exceeding 5 rem to the whole body or 75 rem to the extremities.

Evaluation Results: The design basis for the PASS for both reactor coolant and containment atmosphere sampling and analysis was limitation of radiation dose to operations under worst conditions to less than 5 rem to the whole body and less than 75 rem to the extremities. The inspector reviewed Bechtel calculation package X6CDJ.08 and Vogtle Operating Procedures 35620-C, Rev. 1, and 35611-C, Rev. 3. The review of selected portions of the Bechtel evaluations and of procedures 35620-C and 35611-C verified that calculated doses during system operation under worst design basis conditions would be less than 5 rem to the whole body and 75 rem to the extremities. The inspector reviewed the system installation and found it to be consistent with the design.

The licensee meets this criterion.

Criterion (10): Criterion (8), NUREG-0737

If in-line monitoring is used, the licensee shall provide backup sampling through grab samples, and shall demonstrate the capability of analyzing the grab samples. Established planning for analysis at offsite facilities is acceptable.

Evaluation Results: The licensee provided for grab sample capability for all required sample analyses. An undiluted depressurized reactor coolant sample can be collected in a transportable lead shield for processing and analysis in an onsite laboratory. The sample can also be transferred to a shipping container for transport to the Babcock and Wilcox facility at Lynchburg, Virginia, under pre-arranged agreement. The shipping container for such a shipment would be procured under a owner's group agreement from a pre-established facility and transported under a pre-established shipping contract. A diluted reactor coolant grab sample can also be obtained using a shielded syringe assembly which obtains a sample from the sampling system through a septum and hypodermic needle arrangement.

Containment atmosphere and stripped gas samples can also be obtained at septum connections on the sampling panel. Samples can be analyzed at an onsite laboratory or can be shipped offsite for analysis.

The inspector observed grab samples being taken from the liquid and gaseous septum connections on the sampling panel and grab samples taken by a remotely operated device which injected a liquid reactor coolant sample into a sample vial located in a shielded transport container. Liquid and gaseous grab samples from all of the above locations were analyzed onsite with acceptable results in accordance with accuracy requirements of Criterion (13)

The licensee meets this criterion.

Criterion (11): Criterion (9)(a), NUREG-0737 and Regulatory Guide 1.97, Rev. 3

Sampling and analysis capability for samples of primary coolant and of containment atmosphere shall be provided for radioactivity concentrations as follows:

Containment Atmosphere: 1 E-06 µCi/cc to 1 E+05 µCi/cc

Primary Coolant: 10 µCi/ml to 10 Ci/ml (pressurized sample)

Evaluation Results: The licensee provided for in-line sampling and analysis of both diluted and undiluted reactor coolant and containment atmosphere over the ranges prescribed by the above criteria. Using a 1000:1 dilution and a small volume geometry for the detector of the gamma spectrometry system, the vendor and licensee have calculated, on the basis of calibration with undiluted standards, that the system would be capable of evaluating reactor coolant samples with activity levels to 10 Ci/ml (prior to dilution); however, it was noted that since the degassing which takes place upstream of the detector is expected to remove more than 90% of the total activity by removal of short-lived highly radioactive noble gases, the licensee's design may actually be conservative by a factor of ten or more. The in-line analysis system for gamma spectrometry of containment atmosphere was considered to be adequately designed and fabricated. Calibration data on both the liquid gaseous channels of the gamma spectrometer showed good correlation between expected or calculated results and actual test data.

The licensee meets this criterion.

Criterion (12): Criterion (9)(b), NUREG-0737

The design of the licensee's radiological and chemical sample analysis facility should be such as to restrict radiation background levels, attributable to post accident samples, to values such that the analyses will provide results with small error factors. Acceptable errors should not exceed a factor of two. Radiation reduction methods may include shielding of samples and sample lines and controlled ventilation systems exhausting to filtered release paths.

Evaluation Results: The licensee provided for the minimizing of radiation levels at the in-line sampling and analytical facility through provisions for shielding, use of small diameter sampling lines, and provision for flushing sampling lines after sample procurement to minimize radiation levels to both equipment and operators. The local sampling panel area is ventilated by local exhaust intakes which exhaust to the plant vent by way of charcoal adsorber beds and high efficiency particulate air (HEPA) filtered systems. The PASS can be remotely operated, following initial setup, from the remote control panel in a room adjacent to the Technical Support Center (TSC). If necessary, grab samples of reactor coolant and containment atmosphere can be extracted at the local control panel and

taken to alternative analytical facilities located in low radiation background areas.

The licensee meets this criterion.

Criterion (13): Criterion (10), NUREG-0737, Regulatory Guide 1.97, Rev. 3

Accuracy and range of analysis shall be adequate to provide pertinent data to the operator in order to describe radiological and chemical status of the reactor coolant systems.

Established criteria are as follows:

(a) Hydrogen or dissolved gases in primary coolant

Range: 0 to 2,000 cc/kg
Accuracy: 50 to 2,000 cc/kg: ± 10% desirable
± 20% acceptable
below 50 cc/kg: ± 5 cc/kg desirable
± 10 cc/kg acceptable

(b) Chloride in primary coolant

Range: 0 to 20 ppm
Accuracy: ± 10% 0.5 to 20 ppm Cl
± 50 ppb for Cl - less than 50 ppb

(c) Boron in primary coolant

Range: 0 - 6,000 ppm
Accuracy: ± 5% @ 1,000 to 6,000 ppm
± 50 ppm @ 0 to 1,000 ppm

(d) Dissolved oxygen in primary coolant (not a requirement)

Range: 0 - 20 ppm
Accuracy: ± 10% @ 0.5 to 20 ppm
± 50 ppb @ 0 to 500 ppb

(e) pH in Primary Coolant

Range: 1 - 13 pH units
Accuracy: ± 0.3 pH unit @ 5 to 9
± 0.5 pH unit @ 1-5 and 9-13

Evaluation Results: The licensee had provided analytical equipment for in-line identification and measurement of all of the above items in the ranges and accuracies specified.

The inspector observed as measurements were taken with the in-line instrumentation and, in some cases, by analysis of grab samples.

(a) The measurement of hydrogen in primary coolant using the in-line gas chromatograph produced results which were significantly below those produced in the normal sample analyses of primary coolant. The licensee was not able to demonstrate the required accuracy. Investigation by licensee staff into the underlying cause appeared to indicate the presence of a vacuum leak in the gas evacuation chamber of the gas chromatograph. The licensee was not able to resolve the problem as of the end date of this inspection.

(b) Chloride in primary coolant was analyzed on the in-line liquid ion chromatograph of the PASS. No chloride was detected in either the PASS analysis or in the normal reactor coolant sample analysis. Calibration data for chlorides showed satisfactory correlation between known value and IC readout.

(c) Boron in primary coolant was analyzed using the in-line automatic titration system using the mannitol titration procedure. The value of 681.1 ppm attained on the PASS in-line analysis system compared within ± 3% of the value reported for the concurrent normal reactor coolant sample analysis for boron.

(d) Dissolved oxygen in primary coolant was analyzed using the in-line Orbisphere detector. The PASS analysis indicated 11 ppb while the normal reactor coolant sample analysis indicated less than 5 ppb. The PASS value was well within the prescribed accuracy of ± 50 ppb at 0 to 500 ppb concentration.

(e) pH in primary coolant was measured on the PASS in-line pH meter at a pH of 6.3. The normal reactor coolant sample analysis for the same time period indicated a pH of 6.4. This was within the prescribed accuracy of ± 0.3 pH unit in the range of 5 to 9 pH units.

With the exception of the in-line analysis of dissolved hydrogen in primary coolant, the licensee met all of the sub-criteria of this criterion. Licensee records indicated that the dissolved hydrogen analysis system had functioned properly prior to this inspection.

The licensee meets this criterion, with the exceptions noted.

Criterion (14): Criterion (11), NUREG-0737

Provisions should be made for purging sample lines, for reducing plateout in sample lines, for minimizing sample loss or distortion, for preventing blockage of sample lines by loose material in the reactor coolant system or containment, for appropriate disposal of samples, and for flow restriction to limit the coolant loss from a rupture of the sample line. The ventilation exhaust from the sample station should be filtered at some point through charcoal absorbers and high efficiency particulate air (HEPA) filters.

The residues of liquid sample collection should be returned to containment or to a closed system. Purges of liquid or gaseous sample lines for the purpose of assuring a fresh representative sample should be returned to containment, preferably to the system of origin. Purges of sample lines after sample collection should be returned to containment (to original system, to the containment sump in the case of liquids, or to the containment atmosphere in the case of containment atmosphere samples).

Evaluation Results: The licensee made provisions for the purging of liquid and gaseous sampling lines to assure that representative samples were delivered to to the points of sampling and analyses. Further, the licensee made provisions for the purging of liquid and gaseous sampling lines, after sampling, with distilled water and gaseous nitrogen to reduce the potential for excessive radiation levels and to reduce background at the in-line gamma spectrometer. The licensee also provided for diverting purge materials back to containment in the event of an accident, with liquids going to the containment sump and gases to containment atmosphere. Under normal operating conditions, for example, during tests and calibration of PASS components, liquid wastes would go to the normal liquid radwaste system and gaseous wastes would go to a filtered and monitored gaseous discharge stack. The inspector verified that these provisions had been installed.

The licensee meets this criteria.

Criterion (15):

The licensee shall have a formalized training program, written lesson plans, and documented hands-on training. An adequate number of licensee staff members should be qualified to provide operation of the equipment under protracted accident conditions.

Evaluation Results: The inspector reviewed the formal PASS training program during previous inspections (50-424/87-34 and 50-424/87-09). The training program was established as a formal program, written lesson plans had been prepared and approved, and all training, including "hands-on" operation of the system, had been documented. The number of personnel trained on the PASS appeared to be adequate. Provision was made for annual re-training and qualification.

The licensee meets this criterion.

Criterion (16):

The licensee shall have operating procedures that have been prepared, reviewed, and approved in accordance with station requirements.

Evaluation Results: The inspector reviewed PASS operating, tracking, surveillance, and calibration procedures during prior inspections, 50-424/87-09, 50-424/86-119, and 50-424/87-137. The procedures appeared

to be adequate and had been reviewed and approved by appropriate management in accordance with Technical Specification requirements.

The licensee meets this criterion.

Criterion (17):

The licensee shall have a formal acceptance test program for the equipment, appropriate calibration and recalibration requirements, and a periodic performance test for each analytical test required for the equipment.

Evaluation Results: The inspector reviewed the licensee's program for formal acceptance and preoperational tests of the PASS during prior inspection 50-424/87-09. The formal programs for calibration and surveillance, including periodic performance tests for each analytical test required for the equipment, were reviewed by the inspector.

The acceptance and preoperational tests of the PASS appeared to have been completed satisfactorily; however, during review of the periodic calibration, recalibration, and periodic performance tests for each analytical test required for the PASS, it was observed that certain items had not been completed in accordance with established schedules.

Technical Specification 6.7.1.b requires the licensee to implement established procedures, which include those established for the PASS. A number of PASS procedures for PASS components or sub-system calibration and recalibration required performance at monthly intervals or not to exceed 45 days. Several instances were identified in which the required tests or calibrations had not been performed within the specified time limitations of the procedure. In three of those instances, the specified time limitations had been exceeded by from 17 to 49 days. This was identified in Section 9 in this report as a Technical Specification violation for failure to follow procedures. Prior to the end of the inspection, the licensee had initiated steps to prevent a recurrence.

Subject to the resolution of the above-noted violation, the licensee meets this criterion.