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

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Report Nos.: 50-259/93-20, 50-260/93-20, and 50-296/93-20

Licensee: Tennessee Valley Authority
6N 38A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Docket Nos.: 50-259, 50-260, and 50-296

License Nos.: DPR-33, DPR-52, and DPR-68

Facility Name: Browns Ferry 1, 2, and 3

Inspection Conducted: May 24-28, 1993

Inspectors: W. B. Gloersen — 6/23/93 Date Signed

N. G. McNeill — 6/23/93 Date Signed

Approved by: T. R. Decker, Chief — 6/23/93 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 audits; radioactive waste treatment and effluent and environmental monitoring; semi-annual radiological effluent reports; annual environmental monitoring report; offsite dose commitments; and the status of previously identified inspection findings.

Results:

During the Semiannual Radiological Effluent Report periods for January 1 through December 31, 1992, there were no gaseous or liquid radiological effluent instrumentation inoperable for periods greater than 30 days. However, to keep the analog liquid effluent monitoring equipment in an operable condition, the licensee had expended a significant number of maintenance hours.

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The licensee's audits and activities in the areas of radioactive waste treatment, effluent, and environmental monitoring were detailed and well documented. The licensee effectively controlled, quantified, and monitored releases of radioactive materials in liquid, gaseous, and particulate forms to the environment; and maintained and operated radioactive waste treatment systems to keep offsite doses as low as reasonably achievable (ALARA). The 1992 Semiannual Radiological Effluent Release Reports were reviewed and effluent trends and cumulative doses from those effluents were found to be within the limits specified by the Offsite Dose Calculation Manual (ODCM).

The licensee's Unit 2 post accident sampling system (PASS) was maintained in an operable condition in that it was periodically tested to ensure operability and to ensure the staff remained qualified on its use. The Units 1 and 3 PASS equipment had not yet been installed since those plants are not operating.

The meteorological sensing equipment was maintained and calibrated according to the frequency required by the Technical Specifications (TSs) and met the operability performance requirements.

The Western Area Radiological Laboratory (WARL) was well maintained and was successfully participating in an interlaboratory Quality Assurance (QA) program. The environmental monitoring program was meeting all of the requirements of the ODCM in the areas of sample collection, analysis, and submittal of the Annual Radiological Environmental Operating Report.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

S. Armstrong, Chemistry Technical Support Supervisor
*M. Bajestani, Technical Support Manager
J. Bratcher, Waste Process Manager
S. Bugg, Radwaste Manager
*J. Cory, Radiation Protection Manager
B. Eiford-Lee, Senior Chemistry Specialist (Corporate)
E. Frederick, Radiochemical Laboratory Analyst
R. Givens, Systems Engineer
*R. Howard, Site Engineering
J. Johnson, Systems Engineer (Radiation Monitoring)
T. Knuettel, Compliance Engineer, Licensing
*J. Maddox, Engineering Manager
D. McDaniel, Nuclear Chemist
*R. Moll, Operations Superintendent
K. Nesmith, Nuclear Chemist (PASS)
D. Nix, Nuclear Chemist
*S. Rudge, Site Support Manager
*J. Rupert, Engineering and Modifications Manager
*J. Sabados, Chemistry and Environmental Manager
*P. Salas, Compliance Manager
*J. Scalice, Plant Manager
*K. Schaus, Monitoring Manager, Quality Assurance
*A. Sorrell, Program Manager
D. Vinson, Radiochemical Laboratory Analyst
J. Wallace, Compliance Engineer, Licensing
K. Wastrack, Meteorologist
*R. Wells, Compliance Licensing Manager
*O. Zeringue, Vice President

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

Nuclear Regulatory Commission

*P. Kellogg, Section Chief, DRP/RII
*C. Patterson, Senior Resident Inspector
*T. Ross, Project Manager, NRR
*G. Schnebli, Resident Inspector
*J. Stohr, Division Director, DRSS/RII

*Attended exit meeting on May 28, 1993

2. Licensee Action on Previous Inspection Findings (92701)

(Closed) Inspector Followup Item (IFI) 50-259, 50-260, 50-296/92-10-01: Review licensee's evaluation of not using the recently purchased isokinetic sampling equipment for more accurate air flow measurements in the reactor, refuel floor, and turbine building ventilation systems versus the continued use of the existing equipment using Pitot tubes.

Following the issuance of Inspection Report (IR) No.: 50-259, 50-260, and 50-296/91-01, NRC/RII requested technical assistance from NRC/NRR in a letter dated March 14, 1991, to evaluate the adequacy of the continuous air monitor (CAM) sampling systems for the reactor, refuel floor, and turbine building ventilation systems. The evaluation was performed by the Radiation Protection Branch in the Division of Radiation Protection and Emergency Preparedness with the assistance of Battelle Pacific Northwest Laboratories. The concerns identified in the request were whether the configuration of the sampling lines were such that significant line losses would occur and whether the problem was plant specific or generic to the particular monitoring system. The NRR assessment was included in IR 50-259, 50-260, and 50-296/92-10.

The NRC also determined that the sample probe locations were not in accordance with the recommendations of ANSI N13.1, but were about as good as available with the existing ductwork. The licensee did not possess particle concentration mapping data in the sampled cross sections of the ducts to justify the use of a single nozzle probe instead of a multi-port sampling nozzle across the duct cross-section. In general, the probes were located too near a change in the direction of flow. Should the contaminant come from one of the feeder ducts of the particular ventilation system, it may not be well mixed with the bulk air flow by the time it reaches the sampling nozzle plane. The licensee had purchased isokinetic sampling probes so that the Pitot tubes presently in the ductwork could be replaced by air flow velocity probes. However, during the inspection documented in IR 92-10, the licensee indicated that the installation of the isokinetic process sampling probes was not planned for the Unit 2 Cycle 6 outage. The inspector indicated to the licensee that an evaluation should be performed demonstrating that offsite releases would not be underestimated by using the existing duct flow measuring equipment.

At Browns Ferry Nuclear Plant (BFNP), the licensee identified 11 actual release points from which gaseous radiological effluent were released to the environment. There were ten ground level release points and one elevated release point. The elevated release point (180 meter plant stack) used ideal isokinetic sampling. The ground level release points (Reactor and Turbine Building Effluent CAMs) utilized fixed-size sampling nozzle arrays to obtain a representative sample of the gaseous effluent stream. This method of sampling is referred to as sub-isokinetic sampling. If the fixed-sized sampling nozzles were designed for the worst case scenario, then this method of sampling would be conservative. Part of the U2 Cycle 5 upgrades included replacing the CAMs, Pitot tubes, and sample nozzles. The CAMs were replaced with

Eberline SPING 3As. Although sample nozzles and Pitot tubes were deferred to Unit 2 Cycle 6 outage, the licensee, based on current operational data, deferred this modification from the Cycle 6 schedule.

The licensee collected approximately 12 months of operating data (between cycle 5 and cycle 6) from the noble gas channel of the CAMs as well as the chemistry lab samples of the monitors' particulate and iodine filters. During that 12 month period, drywell leakage increased and small amounts of fuel leakage were observed. The CAM readings remained relatively constant at essentially "zero." Attempts to measure particle sizes in these ventilation areas had been unsuccessful due to low activity levels. In situations similar to this, monitor readings that are essentially zero were not considered abnormal.

The stack release path provided the largest contribution to the licensee's offsite dose. For the time period noted above, operational data for the stack monitor had shown increased activity due to small fuel leaks, thus providing useful data for fuel performance analysis.

A review of operational data has not shown that offsite releases were being underestimated due to the sub-isokinetic sampling probes in the vents of the ground level release pathways at the licensee's facility. The licensee documented justifications and evaluations for the isokinetic and sub-isokinetic sampling of the eleven gaseous release pathways in Technical Instruction (TI) 15, Radioactive Gaseous Effluent Engineering Calculations and Measurements, Revision (Rev.) 6, dated June 24, 1991. The inspector indicated to the licensee that in the event the fuel integrity changes such that the activity levels increase in the ground level release path, additional evaluations should be performed since at that time particle concentration mapping data could be obtained. This item is administratively closed.

3. Audits (84750)

Technical Specification (TS) 6.5.2.8 requires that audits of unit activities be performed under the cognizance of the Nuclear Safety Review Board (NSRB) in the following areas: (1) the radiological environmental monitoring program and the results thereof at least once per 12 months; (2) the OFFSITE DOSE CALCULATION MANUAL and implementing procedures at least once per 24 months; (3) the PROCESS CONTROL PROGRAM and implementing procedures for SOLIDIFICATION of wet radioactive wastes at least once per 24 months; (4) the performance of activities required by the Quality Assurance Program to meet the criteria of Regulatory Guide 4.15, December 1977 or Regulatory Guide 1.21, Rev. 1, 1974, at least once per 12 months; and (5) the Radiological Effluent Manual and implementing procedures at least once per 12 months.

The inspector reviewed the following audit reports:

- Tennessee Valley Authority Nuclear Assurance - Audit Report No. SSA93306, Radiological Controls and Radioactive Material Management, February 22, 1993 - April 14, 1993

- Browns Ferry Nuclear Plant--Nuclear Quality Assurance-Radiological Environmental and Effluent Monitoring Audit-BFA92303, November 9 - December 9, 1992.

The above audits assessed the adequacy and effectiveness of the radiological effluent monitoring program, radiological environmental program, and the waste management program. The audits covered the areas specified in TS 6.5.2.8. In general, the audits were detailed and well documented. The audits identified some program weaknesses and licensee management made adequate commitments to correct the few deficiencies identified.

No violations or deviations were identified.

4. Changes to the ODCM, PCP, and Radwaste System Design and Operation (84750)

The inspector and the licensee discussed any changes in the radwaste and radiological environmental monitoring organizations; in the ODCM and PCP; and in the radwaste system design and operations since the last inspection.

There were no significant organizational changes in the areas noted above since the last inspection. There were no major changes to the methodologies of the ODCM or PCP during the period from January 1 - December 31, 1992. The inspector did not note any changes to the radwaste system design and operations that would require a 10 CFR 50.59 review since the last inspection.

The licensee applied for a TS amendment (which was received from the NRC on April 13, 1993) to revise the BFNP TSs to reflect a design change of the Refuel Zone and Reactor Building Ventilation Radiation Monitoring (RBVRM) system that replaced existing analog components with digital equipment manufactured by General Electric (GE). This digital equipment was part of the GE Nuclear Measurement Analysis and Control (NUMAC) product line. In addition, the licensee replaced the Control Room Emergency Ventilation System (CREVS) Radiation Monitors with GE NUMAC equipment. The GE NUMAC design change was implemented by the end Unit Cycle 6 Refueling Outage. The inspector and licensee representative performed a system walkdown. The RBVRM consisted of two chassis, each having one channel for monitoring the Reactor Zone radiation and another channel for monitoring the Refuel Zone radiation. Each chassis had the following modules:

- Geiger-Muller (GM) Detectors
- Digital Sensor and Converter (DSC)
- Essential Microcomputer
- Display Microprocessor
- Front Panel Display
- High Speed Parallel Data Bus
- Serial Data Link

- Instrument Power Supply
- Detector High Voltage Power Supply
- Trip and Analog Outputs

The licensee installed this new equipment with the expectation of reducing the number of failures experienced with the previous system. The failures experienced by the previous system during the last four years included 40 equipment failures, eight inadvertent Primary Containment Isolation System (PCIS) initiations, and 12 other events. Most of the failures were caused by human error during maintenance and calibration activities and equipment and component failures. The NUMAC RBVRM should have a lower electronic drift rate than the previous model due to the digital circuitry. The NRR/NRC's conclusions regarding the capability of the NUMAC RBVRM system to tolerate electromagnetic interference and radio frequency interference (EMI/RFI) were contingent upon the successful accomplishment of the following TVA commitments:

- Perform an on-site EMI/RFI survey and submit a report with acceptable test results.

- Perform additional EMI/RFI tests and submit a report with acceptable test results.

- Maintain administrative control on the use of walkie-talkies, portable telephones, and temporary equipment in the area that already prohibits the use of walkie-talkies.

The inspector noted that the resident inspector had performed a followup inspection of the special test for the EMI/RFI mapping for the Units 1, 2, and 3 RBVRM system (see IR 50-259, 50-260, and 50-296/93-18). In addition, it was noted in a letter from the NRC to BFNP dated April 13, 1993, that the licensee had until December 31, 1993 to complete the RBVRM system testing and formally submit a report with acceptable test results to NRR.

No violations or deviations were identified.

5. Process and Effluent Radiation Monitors (84750)

The Browns Ferry Nuclear Plant (BFNP) Radiological Effluent Technical Specification (RETS) Manual, Section III, Offsite Dose Calculation Manual (ODCM), Rev. 13, Sections 1/2.1.1 and 1/2.1.2 specify the controls and surveillance requirements for radioactive liquid effluent and gaseous effluent-monitoring instrumentation, respectively. The inspector reviewed selected calibration procedures and records for the following radiation monitoring systems: (1) liquid radwaste monitor (0-RM-90-130); (2) Raw Cooling Water Radiation Monitor (2-RM-90-132D); (3) RHR Service Water Radiation Monitor (2-RM-90-133D and 2-RM-90-134D); (4) the Wide Range Gaseous Effluent Radiation Monitoring System (WRGERMS) (0-RM-90-306); (5) the Reactor Building Vent Exhaust Radiation Monitor (2-RM-90-250); (6) the Radwaste Building Vent Exhaust Radiation Monitor (0-RM-90-252); (7) the Turbine Building Vent Exhaust Radiation

Monitor (2-RM-90-249 and 2-RM-90-251); and (8) the Off-Gas Post-Treatment Radiation Monitoring System (2-RM-90-265 and 2-RM-90-266). The following procedures were included in this review:

- 0-SI-4.2.D.1, "Liquid Radwaste Monitor Calibration and Functional Test," Rev. 10, February 26, 1993
- 0-SI-4.2.D.1B, "Liquid Radwaste Effluent Radiation Monitor (0-RM-90-130)- Source Check," Rev. 4, March 1, 1993
- 0-SI-4.2.F-25(A), "Wide Range Gaseous Effluent Radiation Monitoring System (WRGERMS) Normal Range Noble Gas Calibration," Rev. 4, March 30, 1993
- 0-SI-4.2.F-25(B), "Wide Range Gaseous Effluent Radiation Monitoring System (WRGERMS) Mid and High Range Noble Gas Calibration," Rev. 2, November 1, 1991
- 0-SI-4.2.F-27(A), "Wide Range Gaseous Effluent Radiation Monitoring System (WRGERMS) Normal Range Flow Loop Calibration," Rev. 3, November 9, 1992
- 0-SI-4.2.F-27(B), "Wide Range Gaseous Effluent Radiation Monitoring System (WRGERMS) Mid and High Range Flow Calibration and Functional Test," Rev. 2, November 8, 1991
- 2-SI-4.2.K.2.a, "Reactor Building Ventilation Exhaust Radiation Monitor Source Calibration and Functional Test, 2-RM-90-250," Rev. 4, July 29, 1991
- 2-SI-4.2.K.2.d, "Reactor Building Ventilation Exhaust Radiation Monitor Sample Flow Calibration and Functional Test, 2-RM-90-250," Rev. 3, August 2, 1991

The inspector did not note any significant problems with the calibration and functional test procedures noted above other than a minor incorrect reference to the National Bureau of Standards (NBS) throughout the calibration procedures. The inspector discussed this incorrect reference with the licensee and it was agreed that during the next procedure revision the NBS reference would be changed to the National Institute of Standards and Technology (NIST).

The inspector and a licensee representative toured the facility and visually inspected the radiation monitoring systems noted above. In addition, the inspector reviewed the calibration records of the monitoring systems noted above and determined that the monitoring systems had been calibrated in accordance with the applicable procedures and within the frequencies prescribed by the ODCM.

The inspector also reviewed the maintenance history during the last 12 months of the process and effluent radiation monitors. Although there were no chronic operability problems with the radiation monitoring systems noted above that rendered the monitors inoperable for 30 consecutive days or more, the following was noted:

- The licensee has experienced problems with radioactive material plateout in the detector chamber of the liquid radwaste monitor (0-RM-90-130) and with high drift rates associated with the analog electronic equipment. The licensee was developing a design change request (DCR) to redesign the detector chamber to minimize the plateout problem and to eventually replace the analog equipment with GE NUMAC digital equipment to reduce the electronic drift. The licensee indicated that continued drifting problems could result in either not isolating or excessive isolations of radwaste discharges. To keep the analog liquid effluent monitoring equipment in an operable condition, the licensee had expended a significant number of maintenance hours.

- The licensee experienced two Turbine Building Ventilation continuous air monitors (CAMs) sample pump failures in Unit 3 during the third quarter 1992 due to excessive dust loading on the sample filters. The source of the dust was due to the construction of block wall rooms in Unit 3 for storage of battery chargers and condenser tube work.

- An engineered safety feature (ESF) initiation of the CREV occurred during the third quarter 1992 due to spiking on the CREVS radiation monitor (0-RM-90-259A). As noted in Paragraph 4, this system was subsequently replaced with GE NUMAC equipment.

The inspector discussed the maintenance problems with the radiation monitoring equipment noted above and, in particular the liquid radwaste monitoring system, and it was determined that licensee management was aware of the number of hours expended to maintain the liquid effluent radiation monitoring system in an operable condition.

No violations or deviations were identified.

6. Low-Level Radioactive Waste Storage (84750)

The inspector reviewed the licensee's capability for temporary, long-term storage of low-level radioactive waste (LLW). In addition, the inspector toured the licensee's facility with emphasis on excessive, temporary radwaste storage in outside areas.

The inspector and a licensee representative toured the licensee's low-level radioactive waste storage facility (LLWSF) which was located outside of the protected area, but in a remote location in the owner controlled area. The access to the facility was restricted by a locked fence. The LLWSF consisted of four concrete modules. There were five cells per module. The facility's total storage capacity was approximately 29,000 cubic feet. Although there was no formal schedule on facility activation, it was noted that following a 10 CFR 50.59 evaluation, the modules would be used for interim storage of radioactive waste with a storage capacity of five to seven years (see IR 50-259, 50-260, and 50-296/92-16 for more information on the LLWSF).

Although the licensee was not using any of the four modules to store low-level radioactive waste at present, the fenced area within the LLWSF was being used to store contaminated equipment and as a staging area for the temporary storage of dry active waste (DAW). The DAW and contaminated equipment were either stored in strong tight containers (STCs) (ie., metal boxes) or "sea-land" trailers. Although DAW temporarily stored at the LLWSF was minimal, there was a large amount of contaminated equipment stored at this facility due to the limited storage capacity at the plant. The licensee maintained an inventory of the equipment stored at the LLWSF. The fence surrounding the LLWSF was also conspicuously posted as a radiation area and was maintained locked except during periods when access to the area was required. The Radwaste Organization controlled the key. The inspector noted the following items stored at the LLWSF:

Quantity	Container Type	Contents
28	SeaLand	Contaminated Equipment
4	SeaLand	Empty
4	Trailers	Contaminated Equipment
5	"C" Boxes	Flammable liquids
18	"B" Boxes	Empty
8	"B" Boxes	Contaminated Equipment, DAW
22	STCs	Contaminated Equipment, DAW
10	STCs	Empty

In addition, the inspector toured the onsite radwaste storage areas at BFNP. It was noted that the licensee designated the South Side Radioactive Materials Storage Area (SSRMSA) for the onsite, temporary storage of DAW. This area was merely an open storage area which was defined with rope barriers. Within the roped area was a small wooden building. The inspector did not identify any loose bags of DAW. All of the DAW and radioactive materials were stored in various types of STCs or "sea-land" trailers. The inspector noted the following items stored at the SSRMSA:

- Approximately 20 B-25 boxes of DAW
- Approximately eight B-25 boxes of lead shielding blankets in a wooden building
- One large sand blasting booth (which was tied down and secured)
- One mobile trailer with scaffolding equipment

- One SEG van with contaminated equipment (hoses, electrical cords, etc.)

During tours of the licensee's facility, the inspector noted several intact "contamination/radiation" labels in green, clean trash bags located in the staging area near the clean waste compactor awaiting disposal. The inspector and a licensee representative verified by a direct radiation survey that the labels and contents of the green trash bags were not contaminated. In addition, the inspector and licensee representatives discussed the need to destroy or deface these labels before they are placed in the clean trash bags. The licensee promptly revised radiological control instruction RCI-1.1, Step 1.10.4, to include the following guidance:

> Items (such as radioactive materials tags, signs, yellow bags, containers, labels, etc.) which display the radiation caution symbol or the word "radioactive" will be placed into the contaminated trash or shredded to the extent that it is no longer legible.

The inspector noted the licensee's prompt actions to resolve this concern.

No violations or deviations were identified.

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

The inspector reviewed the licensee's capability to obtain safely and analyze accurately highly radioactive reactor coolant and containment atmosphere samples under accident conditions. The licensee's PASS was designed and built by General Electric. The Unit 2 PASS was installed in 1991 and was reviewed by the NRC in IR 50-259, 50-260, and 50-296/91-28. The PASS equipment for Units 1 and 3 had been purchased, however the equipment had not been installed.

The inspector and a licensee representative visually inspected the Unit 2 PASS (2-LPNL-25-366). The inspector verified that the PASS supply box, which was secured to the Unit 2 PASS panel, was properly stocked with extra sample vials and bottles, syringes, special handling tools, and other equipment listed on the inventory list. The Unit 2 PASS had the capability to obtain samples from the following locations:

Sample Type	Location
Liquid	Jet Pump #1 RHR Heat Exchanger "C"
Gaseous	Drywell Atmosphere Suppression Pool Atmosphere Secondary Containment

The inspector verified that the licensee had a program in place to test periodically the PASS and to train periodically personnel on its use. Technical Instruction 0-TI-222, PASS Testing, Rev. 2, September 10, 1992, provided the necessary guidance to perform PASS tests once per quarter. The test required the analyst to collect, analyze, and compare PASS samples to samples taken from the normal sample locations. The following schedule was established in 0-TI-222:

- First Quarter — Small Volume Liquid (Jet Pump #1 or RHR Heat Exchanger "C")
- Second Quarter — Drywell Atmosphere
- Third Quarter — Large Volume Liquid (Jet Pump #1 or RHR Heat Exchanger "C")
- Fourth Quarter — Suppression Pool Atmosphere

It should be noted that due to the low concentrations of radioactive gaseous and particulate material in the drywell atmosphere (due to good fuel integrity), the licensee was typically unable to compare the PASS and normal drywell atmosphere sampling results. During the quarters that specify a containment atmosphere sample, the licensee would normally substitute either a large or small volume liquid sample. The acceptance range specified in 0-TI-222 was 0.5 to 2.0 times the normal sample. The inspector reviewed the PASS test results for 1992 and noted that liquid sample comparisons were all in agreement. During the fourth quarter 1992 the licensee attempted to compare normal and PASS oxygen (O_2) concentrations. The PASS sampling path yielded an O_2 sample from containment at 3.18 times the actual (normal) O_2 concentration as determined from the H_2O_2 analyzers. The licensee documented this test deficiency in Plant Event Report (PER) 93-0012. Work Request (WR) C165584 was initiated to trouble shoot and, if necessary, correct the problem. The licensee was in the process of determining whether or not a comparison of O_2 concentrations was an appropriate parameter to use.

The inspector reviewed the licensee's training and annual requalification program for the PASS. This program was specified in training procedures CHM120.003, Post Accident Sampling, Rev. 0 and CHM120.002, Post Accident Analyses, Rev. 0. The inspector verified that 21 Chemistry Technicians were qualified between August and September 1992, on CHM120.002 and CHM120.003.

In addition, the inspector reviewed the licensee's capability to analyze post accident samples in the event that the onsite gamma spectroscopy laboratory facility would be unavailable following a design base accident (DBA). Although the licensee had made arrangements to use the Oak Ridge National Laboratory as a backup laboratory, the inspector noted that the licensee's procedures did not specify any backup laboratory capability. The inspector discussed this concern with the

licensee, and the licensee promptly revised Chemistry Instruction CI-304 to specify alternate laboratory facilities in case the BFNP laboratory was unavailable. The following facilities were specified:

- Oak Ridge National Laboratory
- TVA - Sequoyah Nuclear Plant
- Babcock and Wilcox - Lynchburg Research Center

The inspector acknowledged the licensee's prompt response in correcting this concern.

No violations or deviations were identified.

8. Liquid Radioactive Waste Processing and Disposal (84750)

The BFNP RETS Manual, Section III, ODCM, Revision 13, Section 1.2.1.3, specifies that the liquid radwaste system will be used to reduce the radioactive materials in liquid discharge from the site when the projected monthly dose would exceed 0.06 mrem to the total body or 0.21 mrem to any other organ per unit.

The inspector toured the liquid radwaste processing facility and observed the preparation for the discharge of the Floor Drain Sample Tank (FDST) including tank recirculation, sample collection and analysis, and the authorization for discharge. The licensee used procedure 0-SI-4.8.A.1-1, Release Procedure- Liquid Effluents, Revision 27, April 14, 1993. It was noted that the procedure specified an adequate recirculation time of 25 minutes so that a representative sample could be collected from the 32,000 gallon FDST. The inspector observed no apparent problems with either the procedure or the liquid radwaste release.

No violations or deviations were identified.

9. Nuclear Air Cleaning and Control Room Habitability Systems (84750)

TS 3.7.B/4.7.B specifies the operability and surveillance requirements for the Standby Gas Treatment System (SGTS). TS 3.7.E/4.7.E specifies the operability and surveillance requirements for the CREVS. TS 3.7.F/4.7.F specifies the operability and surveillance requirements for the Primary Containment Purge System (PCPS).

The inspector reviewed the TS surveillance tests of the nuclear air cleaning systems and the CREVS noted above and verified that the tests had been performed in accordance with the requirements and frequencies specified in the TS. Each system was tested for the following: (1) pressure drop across the combined high efficiency particulate and air (HEPA) filters and charcoal adsorber banks; (2) in-place cold DOP and halogenated hydrocarbon tests on the HEPA filters and charcoal adsorber banks, respectively, tested in accordance with ANSI N510-1975;

(3) laboratory carbon sample analysis for demonstrating minimum efficiency to remove radioactive methyl iodide at a specified velocity when tested in accordance with ASTM D3803 (130 degrees C, 95 percent relative humidity); and (4) system flow rate measurements tested in accordance with ANSI N510-1975. The inspector reviewed selected portions of the procedures implementing the surveillance requirements on the air filtration systems noted above and observed no apparent problem areas. In addition, the inspector discussed with the licensee the need to test the CREVS charcoal adsorber samples in accordance with the newer ASTM D3803 (1989) test conditions (30 degrees C, 70 percent relative humidity). It was noted that TS 3.7.E/4.7.E would need to be revised to incorporate the newer testing conditions. The licensee acknowledged the inspector's comments.

No violations or deviations were identified.

10. Meteorological Tower Instrumentation (84750)

TS 3/4.2.I states operability and surveillance requirements for meteorological monitoring instrumentation.

The inspector examined the meteorological tower, sensors, instrumentation, and associated documentation. In addition, the inspector discussed the operation and surveillance requirements with a Senior Instrumentation Mechanical Foreman to determine compliance and assess quality and capabilities.

The tower was 91 meters tall, with wind direction, wind speed, and temperature sensors at 10 meters, 46 meters, and 91 meters. A dewpoint sensor was mounted at 10 meters. A solar radiation unit and a rain gauge were mounted on the ground near the tower. The inspector observed that there were no obstructions, such as trees, which would interfere with the free flow of air in the vicinity of the tower. There was no backup meteorological tower. The licensee used instead TVA's NOWCAST aids to predict weather parameters whenever there was a problem with one of the monitors. The tower and the associated instrument system had a 30 kW generator for a backup power supply and an uninterruptable power supply (UPS) could supply power for up to 30 minutes in the event of an emergency.

The inspector reviewed maintenance and calibration records for the equipment. The records were maintained in the instrument building. The 1992 and 1993 calibration records indicated that the equipment had been calibrated at the required six month frequency. The inspector noted that the system consistently had a data retrieval rate greater than the required 90 percent. A review of the calibration and maintenance records indicated that the system had met the TS operability requirements. The inspector concluded that the meteorological tower and the support system had been properly maintained and calibrated.

No violations or deviations were identified.

11. Environmental Laboratory (84750)

The BFNP RETS Manual, Section II, Radiological Effluent Manual (REM), Revision 13, Section E, states the requirements for the radiological environmental monitoring program.

The inspector visited the Western Area Radiological Laboratory (WARL) in Muscle Shoals, AL. The WARL performed environmental sampling and analyses for the Browns Ferry site as well as for the Sequoyah and Watts Bar sites. The WARL also split samples and performed comparisons with the States of Alabama and Tennessee. The Laboratory also participated in the Environmental Protection Agency's (EPA) Intercomparison Cross-check Program.

The inspector toured the laboratory and reviewed analytical equipment records for calibration and maintenance. The equipment and records were maintained in an exemplary manner and laboratory personnel revealed a high degree of expertise in the operation of the laboratory.

Records for the results of splits with the State of Alabama for sampling locations around the Browns Ferry plant were examined for comparison. There were no anomalous data reports and the samples revealed a high degree of agreement on the samples reviewed.

The WARL had also performed very well in the EPA Cross-Check Program. As an additional Quality Assurance program the laboratory performed blind samples analyses and participated in other interlaboratory as well as intralaboratory checks of the accuracy of the samples analyzed in the WARL.

The inspector concluded that environmental sampling and analyses were being conducted in a competent and thorough manner as required in the REM.

No violations or deviations were identified.

12. Radiological Environmental Monitoring Program (84750)

The BFNP RETS Manual, Section II, REM, Rev. 13, Section F.1 states the requirements for timeliness, format, and content of the Annual Radiological Environmental Operating Report.

The inspector reviewed the Annual Radiological Environmental Operating Report for 1992. For 1992, air samples and gross beta activities were consistent with level reported in previous years. As in previous years only natural radioactivity was detected by gamma spectroscopy of air particulate samples. Low levels of radionuclides associated with radioactive fallout from previous atmospheric nuclear weapons testing were detected in selected milk, vegetation, and soil samples. No radioisotopes identified in these terrestrial monitoring samples were attributed to the Browns Ferry Plant.

From the review of the environmental report, the inspector concluded that the plant had negligible impact upon the surrounding environment and that the report fulfilled the RETS requirements.

No violations or deviations were identified.

13. Semiannual Radiological Effluent Release Report (84750)

The BFNP RETS Manual, Section II, REM, Rev. 13, Section F.2., states the requirements for the Semiannual Radiological Effluent Report including timeliness, content, and format. The BFNP RETS Manual, Section III, ODCM, Revision 13, Section 8.0, specifies the method to calculate the annual maximum individual total dose from radioactive effluents and all other nearby uranium fuel cycle sources. Sections 6.6 and 7.7 specify the quarterly dose calculations for liquid effluent and gaseous effluents, respectively.

The inspector reviewed the 1992 Semiannual Radiological Effluent Release Reports to assess the yearly totals for liquid and gaseous effluents as well as cumulative doses from those effluents.

Table 1 summarizes the cumulative doses from effluents for calendar year 1992:

Table 1

Cumulative Doses from Effluents - Calendar Year 1992
Browns Ferry Nuclear Plant

Dose Pathway	Dose	Annual Limit	% of Annual Limit
Airborne-Gamma Air Dose	2.41E-2 mrad	10 mrad	< 1%
Airborne-Beta Air Dose	1.44E-2 mrad	20 mrad	< 1%
Airborne-Max Organ Dose	1.31E-1 mrem	15 mrem	< 1%
Liquid-Total Body Dose	1.30E-1 mrem	3 mrem	4%
Liquid-Max Organ Dose	1.92E-1 mrem	10 mrem	< 1%
Total Dose-Thyroid	1.07E-1 mrem	75 mrem	< 1%
Total Dose-Total Body Organ other than Thyroid	7.80E-1 mrem	25 mrem	< 1%

As can be seen from the data presented above, the annual dose contributions to the maximum exposed individual from the radionuclides in gaseous and liquid effluents released to unrestricted areas were well below the limits specified in the ODCM. These data support the conclusion that the licensee's effluent releases were as low as reasonably achievable (ALARA) and that the radwaste systems were both fully utilized and/or operating within the design criteria.

The inspector also reviewed the Report to examine liquid and gaseous effluents specified in this and previous reports to determine trends. The review of the report showed that the content and format were as specified in the RETS. Table 2 compares the effluents for the past three years:

Table 2

Effluent Release Summary for Browns Ferry Units 1, 2 and 3

Activity Released (Curies)	1990	1991	1992
Gaseous Effluents:			
Fission and Activation Products	0.0	2.10E+03	1.62E+04
Iodines and Particulates	1.88E-04	8.62E-02	1.64E-01
Tritium	5.94E-01	2.79E+00	1.86E+01
Liquid Effluents:			
Fission and Activation Products	3.02E-01	9.90E-01	2.41E+00
Tritium	2.07E-01	5.96E+00	2.85E+01
Volume of Liquid Waste Released (liters)	1.49E+07	3.31E+07	3.33E+07
Inoperable Effluent Monitoring Instruments for greater than 30 days	30	3	0
Unplanned Releases	0	0	0

As can be ascertained from Table 2 there has been some increasing trends noted for effluents. This is however to be expected as Unit 2 continued to operate after all Units were shut down. Unit 2 became operable in May 1991, and has continued to operate to the date of this inspection with the exception of two refueling outages. Trends will be monitored to determine the effect of operations in the future. Improvements were noted in effluent monitor operability.

No violations or deviations were identified.

14. Exit Meeting

The inspector met with licensee representatives indicated in Paragraph 1 at the conclusion of the inspection on May 28, 1993. The inspector summarized the scope and findings of the inspection. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any proprietary documents or processes during this inspection. Dissenting comments were not received from the licensee.