



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

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Report Nos.: 50-327/92-05 and 50-328/92-05

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

Docket Nos.: 50-327 and 50-328 License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Conducted: February 24-28, 1992

Inspector: Thomas B. Gloersen for 3/18/92  
W. B. Gloersen Date Signed

Approved by: Thomas R. Decker 3/18/92  
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 radioactive waste treatment, and effluent and environmental monitoring.

Results:

The licensee's audits and activities in the areas of radioactive waste treatment, and effluent and environmental monitoring were technically sound, thorough, 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 amount of liquid waste processed in 1991 increased to 59 gallons per minute (gpm) from 34 gpm in 1990. The licensee installed a series of acoustic sensing devices to aid in the identification of the sources of in-leakage so that the amount of liquid waste processed could be decreased.

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

R. Alsup, Site QA Audit Manager  
D. Amos, Chemist  
\*D. Bodine, Chemistry Process Control Manager  
D. Buckley, Environmental Engineer  
\*M. Cooper, Site Licensing Manager  
D. Cross, Operations, Process Water Manager  
\*B. Eiford-Lee, Senior Chemistry Specialist (Corporate)  
G. Fiser, Chemistry and Environmental Superintendent  
\*S. Harvey, Corporate Chemistry  
J. Hereford, Instrument Engineer  
\*C. Kent, Radiological Controls Manager  
\*O. Kilgore, Site Quality  
\*J. Osborne, Radwaste Supervisor  
\*J. Proffitt, Compliance Licensing Engineer  
\*W. Pruett, QA Monitoring Manager  
W. Raines, Environmental Radiation Monitoring Manager (WARL)  
L. Riales, Radiological Control Program Manager (Corporate)  
\*R. Thompson, Compliance Licensing Manager  
\*K. Walker, QA Specialist  
R. Wallace, Health Physicist (WARL)  
\*C. Whittemore, Licensing Engineer  
J. Wilson, Vice President, Sequoyah Site

#### Nuclear Regulatory Commission

R. Bernhard, Project Engineer  
\*W. Holland, Senior Resident Inspector  
\*R. McWhorter, Resident Inspector  
\*S. Shaffer, Resident Inspector

\*Attended exit meeting on February 28, 1992

### 2. 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 radioactive wastes at least once per 24 months; and (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.

The inspector reviewed the following audit reports:

- ° Nuclear Quality Audit and Evaluation Audit Report SSA 90011, "Radioactive Material Management (14C) (T-S)," July 19, 1990
- ° Browns Ferry Nuclear Plant- Nuclear Quality Assurance- Radiological Environmental and Effluent Monitoring Audit- BFA91201, December 10, 1991 (with respect to the review of the Western Area Radiological Laboratory (WARL) which functions as the environmental sample analytical laboratory for both Sequoyah and Browns Ferry stations).
- ° Sequoyah Nuclear Plant- Nuclear Quality Assurance- Radiological Environmental and Effluent Monitoring Audit- SQA91204, January 14, 1992.

The above audits assessed the adequacy and effectiveness of the radiological effluent monitoring program, radiological environmental program, the Offsite Dose Calculation Manual (ODCM), and the Process Control Program (PCP). The audits covered the areas specified in TS 6.5.2.8. In general, the audits were technically sound, thorough, 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.

3. Changes in 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. Organizationally, it was noted that the licensee selected a new Radwaste Manager in January 1991. This individual had worked in the areas of radiological controls and engineering and field operations at the Sequoyah plant for several years. Other than reductions in force in the chemistry and environmental organization, there were no other significant organizational changes in the areas noted above during the last year. Although there were no major changes to the methodologies of the ODCM, it was noted that the Radiological Effluent Technical Specifications (RETS) had been deleted and incorporated in to the ODCM on November 16, 1990. The inspector did not note any other changes to the PCP or radwaste system design and operations since the last inspection that would require a 10 CFR 50.59 review. The inspector did observe, however, that the licensee installed

new wide range gaseous and particulate effluent monitors on the Shield Building exhaust for both units and declared them operational on January 31, 1991. This system represented a significant effluent monitoring equipment upgrade for both normal and accident conditions.

No violations or deviations were identified.

4. Process and Effluent Radiation Monitors (84750)

Sequoyah ODCM Revision 26, Sections 1/2.1.1 and 1/2.1.2 describe the controls and surveillance requirements for radioactive liquid effluent and gaseous effluent monitoring instrumentation, respectively.

The inspector and a licensee representative toured the plant and examined several process and effluent radiation monitors, including the liquid effluent monitor (0-RM-90-122), Service Building Exhaust System (0-RM-90-132), Condenser Vacuum Exhaust System (1-,2-RM-90-99,-119), Auxiliary Building Ventilation System (0-RM-90-101), Shield Building Ventilation System (1-,2-RM-90-400), and the Containment Purge Exhaust System (1-,2-RM-90-130,-131). The inspector reviewed the calibration records and set point determinations for the liquid radwaste effluent monitor and the Shield Building wide range gaseous effluent monitor. The liquid radwaste effluent monitor (0-RM-90-122) was calibrated on August 13, 1990 using calibration procedure 0-SI-ICC-090-122.0, "Channel Calibration of Waste Disposal System Liquid Effluent Radiation Monitor 0-RM-90-122," Revision 0, April 4, 1990. The licensee utilized a Cs-137 standard to perform the calibration. Set-point determinations were verified before each release in accordance with the ODCM. The inspector also reviewed the calibration records for the Units 1 and 2 Shield Building wide range gas monitor. The initial in-place calibration was performed on January 31, 1991 using Work Plan Number 1435-06, "Calibration of Shield Building Ventilation Radiation Monitor," Revision 0, October 30, 1990. At the time of this inspection, the draft calibration procedure was waiting for review and approval. The inspector did not note any chronic operability problems with the radiation monitoring systems noted above.

No violations or deviations were identified.

## 5. Dose Commitments (84750)

Sequoyah ODCM, Revision 26, Section 8.1, 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 7.6 specify the quarterly dose calculations for liquid effluent and gaseous effluents, respectively.

The inspector reviewed with a licensee representative the quarterly and yearly dose commitments to a member of the public from radioactive materials in gaseous and liquid effluents released during 1991. The NRC PC-DOSE computer code was not available during this inspection to verify the licensee's calculation for the dose contribution to the maximum exposed individual from the radionuclides in liquid and gaseous effluents released to unrestricted areas. The inspector did review the licensee's methodologies for calculating the various individual doses and observed no apparent problems. For the monthly gaseous effluent dose calculations, the licensee uses the worst case, historical meteorological data for operational control purposes. The quarterly dose calculations due to gaseous effluents were based on actual meteorological conditions, real pathways, and receptor locations which were identified in the last land use survey. The following table compares the annual dose calculations due to gaseous and liquid effluents for 1990 and 1991:

<u>Liquid Effluents</u>	<u>Dose Calculation</u>	
<u>Annual ODCM Limit</u>	<u>1991</u>	<u>1990</u>
≤ 3 mrem total body	0.041 mrem	0.006 mrem
≤ 10 mrem any organ	0.052 mrem	0.011 mrem
 <u>Gaseous Effluents</u>		
<u>Annual Dose Limit</u>	<u>1991</u>	<u>1990</u>
≤ 10 mrad noble gas (gamma)	0.123 mrad	0.42 mrad
≤ 20 mrad noble gas (beta)	0.317 mrad	1.1 mrad
≤ 15 mrem iodines, tritium, and particulates	0.025 mrem	0.009 mrem

As can be seen from the data presented above, the annual dose contributions to the maximum exposed individual from the radionuclides in liquid and gaseous effluent 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 operating within the design criteria.

No violations or deviations were identified.

6. Solid Radwaste Management and Storage (84750, 86750)

The inspector and a licensee representative discussed the solid radioactive waste management program, including radioactive waste storage, minimization, and processing.

The inspector noted that the Radwaste Manager had been in his position since January 1991. Since that time, the licensee had established several programs directed at reducing the radwaste generated and personnel exposures to individuals handling the waste. The programs were as follows:

Radioactive Materials Reclamation for Free Release Program:

- ° Inventory of all onsite radioactive materials storage containers.
- ° Segregation of materials considered to be non-compactable.
- ° Survey and identification of loose and fixed contamination of non-compactables.
- ° Decontamination of non-compactables to the extent practicable.
- ° Survey and free release of materials in accordance with site release criteria.
- ° Disposal of radioactive non-compactable material failing to meet site release limits.

Radioactive Waste Minimization Action Plan:

- ° Implementation of SSP-5.51, "Radioactive Waste Volume Minimization," Revision 0, July 1, 1991.
- ° Modify the access to the Radiation Controlled Area (RCA) o enhance the control of material entry (Bulk Material Permit program).



- ° Evaluate the replacement of disposable items with reusable items.
- ° Reduce quantity of reusable material being discarded as disposable.
- ° Track the volume of waste generated by type of waste.
- ° Evaluate the use of a scaffold release program.
- ° Evaluate the use of positive closure protective clothing.
- ° Evaluate the incineration of compactable items.

The success of the Radioactive Materials Reclamation program was noted in that the program resulted in a burial volume savings of 118.29 cubic meters. The licensee had requested funds for reimplementaion of the program in January 1992. The Radwaste Minimization Action Plan was also successful in reducing the volume of radwaste generated, as demonstrated when comparing the waste generated during the Unit 1 cycle 4 (U1C4) and cycle 5 (U1C5) outages. Although U1C5 outage involved a larger workscope than U1C4 outage, roughly half of the amount of solid radwaste was generated during the U1C5 outage (1397 cubic meters vs. 757 cubic meters). During calendar year 1991, the volume of solid radwaste buried was 72.6 cubic meters per unit. When compared to an industry performance indicator, the licensee compared favorably. The 1990 industry best quartile (three year average) was 94 cubic meters per unit. The licensee's 1992 goal for radwaste buried was 95 cubic meters per unit. As of January 31, 1992 the licensee had buried 24 cubic meters per unit. The U2C5 outage was scheduled for March 1992. The licensee has also realized a volume reduction in radwaste shipped to a waste processor. In 1990, approximately 2207 cubic meters were shipped to a processor while in 1991, approximately 1386 cubic meters were shipped.

The licensee also has stored onsite three types of mixed waste.

- ° Waste scintillation fluid and glass (400 kilograms (kg))
- ° Spent halogenated degreasing solvent (356 kg)
- ° Waste isopropanol (40 kg)

The licensee has eliminated the organic scintillation fluid from the waste stream. The licensee was planning to eliminate the degreasing solvent from the RCA and minimize the use of the isopropanol.

No violations or deviations were identified.

7. Liquid Waste Processing (84750)

Sequoyah ODCM, Revision 26, Section 6.0 describes the liquid radwaste system.

The inspector toured the liquid radwaste processing area and discussed the operation with a cognizant licensee representative. The liquid radwaste system was vendor supplied and operated and consisted of a series of demineralizers and a carbon bed. At one time the licensee had used the Condensate Demineralizer Waste Evaporator (CDWE) to process liquid radwaste, although the original intent of the CDWE was to process secondary water in the event of a primary to secondary leak. In Inspection Report Nos. 50-327/91-15 and 50-328/91-15, the inspector described an operational problem involving the CDWE which resulted in transporting contaminated sludge into the 270,000 gallon passive sump located in the Auxiliary Building. As a result, the entrance to the sump was controlled as a locked high radiation area (LHRA). Although the sump had been cleaned, this area was still controlled as a LHRA. In addition, the licensee had since discontinued using the CDWE and placed the facility in wet lay-up.

The inspector also discussed the amount of water processed as liquid radwaste with licensee representatives. From 1989 to 1991, the licensee processed an average of 459 gallons per minute (gpm), 34 gpm, and 59 gpm, respectively. The amount of water processed per month due to in-leakage ranges from 400,000-450,000 gallons. In 1992, the licensee installed an array of acoustic sensors to help identify the sources of in-leakage. At this point in time, the reduction in the amount of water processed annually would represent an economic incentive as opposed to an ALARA incentive, as can be seen from the liquid effluent dose data in Paragraph 5.

No violations or deviations were identified.

8. Radiological Environmental Monitoring Program (84750)

Sequoyah ODCM, Revision 26, Sections 9.1, 9.2, 9.3, and 9.4 specify the requirements for the environmental radiological monitoring program, including the detection capabilities of analytical techniques, land use census, and the interlaboratory comparison program.



The inspector discussed with licensee representatives from the licensee's Western Area Radiological Laboratory (WARL) the radiological environmental program, including changes to the program and program implementation. There were no significant changes to the program, monitoring locations, equipment, or organization, other than a reduction in force. With the reduced work force, the licensee indicated that the program objectives could still be met. The inspector also examined one offsite air sampling station (LM-2) and noted that the air sampling equipment and flow measuring device was operational and calibrated.

The inspector also reviewed the results of the licensee's participation in the interlaboratory comparison program with the Environmental Protection Agency (EPA), quarterly independent laboratory crosschecks, and quarterly "blind spikes" for 1991 and January 1992. In 1991, the licensee was in agreement with the EPA approximately 98% of the time. In January 1992, the licensee was in agreement to the known values of the independent laboratory and "blind spike" programs 100% of the time.

Technical Specification 6.9.1.6 and Section 5.1 of the ODCM specifies the requirements for the content and submittal of the Annual Radiological Environmental Operating Report.

The inspector reviewed the 1990 Annual Radiological Environmental Operating Report, dated April 29, 1991. The report was reviewed for omissions, obvious mistakes, anomalous measurements, observed biases, and trends in the data. There were no anomalous measurements identified in the report, nor changes to the ODCM with respect to environmental monitoring. The land use survey indicated that there were no changes in 1990. There were no recurring problems with missed samples with regard to analytical or sample collection difficulties. The inspector did not observe any trends in the dose data. In the report, the licensee concluded that exposure to members of the public which may have been attributable to the Sequoyah station was negligible. The radioactivity reported was primarily the result of fallout or natural background. Any activity which may have been present as a result of plant operations did not represent a significant contribution to the exposure of members of the public.

No violations or deviations were identified.

9. Meteorological Monitoring Program (84750)

The inspector verified by direct observation and record review that the licensee's meteorological instrumentation was operable and maintained as delineated in Regulatory

Guide 1.23, "Onsite Meteorological Programs," and that the onsite meteorological measurement program was effectively implemented. The licensee's meteorological monitoring equipment consisted of a 91 meter (m) primary tower with three sensing stations located at 10 m, 46 m, and 91 m. Each sensing station had instruments for measuring horizontal wind speed, dew point, wind direction, and temperature. 1991 data indicated that the meteorological monitoring instrumentation had a reliability factor ranging from 95-99%. The inspector verified that the sensing equipment had been calibrated at least once per six months in 1991. In 1991, the licensee upgraded the data recording devices and purchased two Yokogawa HR 2300 hybrid chart recorders.

No violations or deviations were identified.

10. Effluent Release Reports (84750)

Technical Specification 6.9.1.8 and ODCM Section 5.2 requires that a Semi-Annual Radioactive Effluent Release Report covering the operation of the unit during the previous six months of operation shall be submitted within 60 days after January 1 and July 1 of each year. The ODCM and TS also specify the requirements for the content and format of the report.

The inspector reviewed the 1991 Semi-Annual Effluent Release Reports dated August 29, 1991 and March 2, 1992. In addition, the inspector reviewed effluent release data from previous years to evaluate trends in liquid and gaseous releases. The effluent data presented in the following table was obtained from previous and current effluent reports:

**EFFLUENT RELEASE SUMMARY FOR SEQUOYAH UNITS 1 & 2**

<u>Activity Released (curies)</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
<u>Gaseous Effluents:</u>			
Fission and Activation Products	3.90E+03	5.62E+03	1.42E+03
Iodines and Particulates	4.27E-04	2.65E-04	3.32E-04
Tritium	5.62E+01	1.17E+01	2.90E+01
<u>Liquid Effluents:</u>			
Fission and Activation Products	3.54E-01	1.22E+00	1.52E+00
Tritium	1.15E+03	8.53E+02	1.65E+03

<u>Volume of Liquid Waste Released (liters/year):</u>	9.13E+08	6.85E+07	1.18E+08
<u>Abnormal Releases:</u>			
Gaseous	0	0	0
Liquid	0	0	0

In general, the trends of the effluents released from the Sequoyah site showed a gradual increase of fission and activation products in the liquid effluent stream. This would be expected from a plant becoming operational after an extended outage for several years. The total quantity of radioactive material released in 1991 was approximately equal to that released in 1985, the year before the extended outage began. The licensee attributed the increase in liquid fission and activation products to an extensive refueling outage on Unit 1 in 1991 and to cessation of the use of the CDWE by the end of 1989. Presently, the licensee uses a vendor installed and operated demineralizer radwaste cleanup system to process water. The capacity of this system had been recently increased to handle the volume of liquid radwaste to process. The reports did not identify any abnormal releases. Since the last inspection, there were no effluent monitoring instruments that were inoperable for more than 30 days due to equipment failure or lack of maintenance.

No violations or deviations were identified.

#### 11. Exit Meeting

The inspector met with licensee representatives indicated in Paragraph 1 at the conclusion of the inspection on February 28, 1992. 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.