UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30303

JUN 27 1984

Report Nos.: 50-327/84-14 and 50-328/84-14

Licensee: Tennessee Valley Authority
500A Chestnut Street
Chattanooga, TN 37401

Docket Nos.: 50-327 and 50-328

License Nos.: DPR-77 and DPR-79

Facility Name: Sequoyah 1 and 2

Inspection Date: May 21-25, 1984

Inspection at Sequoyah site near Chattanooga, Tennessee

Inspector: W. W. Peery — Date Signed: 6/19/84

Accompanying Personnel: A. C. Stalker, EG&G, Idaho

Approved by: G. R. Jenkins, Section Chief, Division of Radiation Safety and Safeguards — Date Signed: 6/21/84

SUMMARY

Scope: This routine, announced inspection involved 32 inspector-hours on site in the areas of ALARA, external exposures, and the post accident sampling system.

Results: No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

   Licensee Employees

   *C. C. Mason, Plant Superintendent
   *L. M. Nobles, Assistant Plant Superintendent
   *M. R. Harding, Compliance Supervisor
   D. E. Crawley, Health Physics Supervisor
   S. P. Holderfer, Assistant Health Physicist
   *J. S. Steigleman, Health Physics Supervisor
   J. Osborne, Health Physics Supervisor
   *W. Williams, Chemical Engineer

   NRC Resident Inspectors

   E. J. Ford, Senior Resident Inspector
   *S. D. Butler, Resident Inspector

   * Attended exit interview

2. Exit Interview

   The inspection scope and findings were summarized on May 25, 1984, with those persons indicated in paragraph 1 above. The Inspector Followup Items identified with the Post Accident Sampling System were discussed in detail. The licensee acknowledged the findings and took no exceptions.

3. Licensee Action on Previous Enforcement Matters

   Not inspected.

4. ALARA Program - External Exposures

   Several improvements have been made in the ALARA program as follows:

   a. Assignment of personnel to the ALARA program full time.

   b. Computer program for tracking exposures.

   c. Improved Radiation Work Permit program for ALARA purposes.

   d. Improved pre-planning program.

   e. Procedural changes and additions.

   f. The inclusion of more ALARA aspects in training.

The inspector informed licensee representatives that although the above improvements have been implemented in the ALARA program, it should be emphasized that of the 1000 man-rem ALARA goal set for the year 1984, about 600 man-rem had been expended in the first six months of 1984. The inspector recognized that there have been numerous jobs during outages but he stated that for the future in the ALARA program, it should be possible to lower actual exposures permitting adjustment downward of projected man-rem. During a recent event involving the ejection of a highly activated thimble tube into the incore instrument room (Report Nos. 50-327, 50-328/84-12), the inspector observed that thorough consideration was given to maintaining exposures ALARA during retrieval and storage of the thimble tube. This was a joint effort including operations. It was also noted that management support for ALARA during this project was excellent. The inspector made the observation that the ALARA supervisor apparently has adequate opportunity for ALARA input for major jobs but perhaps he should have more input concerning other casual entries into areas having exposure potential.

5. Post Accident Sampling System

The Inspector reviewed conformance with the following criteria of NUREG-0737: DPR-77, License condition 2C (23).F; and DPR-79, License Condition 2C (16).g:

a. 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. (NUREG 0737 Criterion (1)).

   The licensee demonstrated the ability to take a reactor coolant sample and a containment air sample and analyze them within the three hour time limit. The licensee meets this criterion.

b. Reactor coolant and containment atmosphere sampling systems are completely independent from all other auxiliary system. (NUREG 0737 Criterion (3)). The licensee meets this criterion.

c. The design basis for plant equipment for reactor coolant and containment atmosphere sampling and analysis must assume that it is possible to obtain and analyze a sample without radiation to any individual exceeding 5 rem whole body and 75 rem extremities. (NUREG 0737 Criterion (6)) The system is installed as per the design and the system installation has not resulted in an unreviewed safety question.

   The system as originally designed has been evaluated and a sample could be taken within the exposure limits of 5 rem whole body. However, a modification to the vent from the drain tank has been made such that the drain tank now vents to the emergency ventilation system and the vent comes very close to the system operator. This design has not been reviewed with respect to the dose that the operator may receive from this modification. In addition, there are a number of manual valves in the system that would cause possible exposure problems in the event that one of them was inadvertently left closed. These valves should have special administrative controls to assure that they are kept open

at all times. A licensee representative stated that corrective action will be taken concerning the drain tank vent and administrative contract for the valve (IFI 84-14-01).

d. The licensee shall establish an onsite radiological analysis capability to provide quantification of noble gases, iodines and nonvolatile radionuclides in the reactor coolant and containment atmosphere, which may provide an indication of the degree of core damage. (NUREG 0737 Criterion (2)(a)) The range of activity that the equipment must be capable of measuring for a reactor coolant sample is from 1.0 uCi/g to 10 Ci/g total activity. (NUREG 0737 Criterion (9)). The results of the gamma spectral measurements should be accurate within a factor of two across the e...'e range. (NUREG 0737 Criterion (10))

The licensee demonstrated the capability to provide the quantification of radionuclides in the reactor coolant with the following results:

	PASS (uCi/g)		
Nuclide	1:1000 dilution	undiluted	RCS
^{131}I	7.47×10^{-3}	1.85×10^{-3}	2.53×10^{-3}
^{132}I	$<3.9 \times 10^{-2}$	2.12×10^{-3}	2.48×10^{-3}
^{133}I	$<1.4 \times 10^{-2}$	1.11×10^{-3}	2.08×10^{-3}
^{134}Cs		4.32×10^{-4}	8.79×10^{-4}
^{137}Cs	$<9.0 \times 10^{-3}$	4.49×10^{-4}	7.86×10^{-4}
^{133}Xe	1.46×10^{-2}	1.82×10^{-2}	1.44×10^{-2}

The inspector stated that the results of the diluted ^{134}Cs analysis will be examined during a future inspection. (IFI 84-14-02)

Stripped Gas Nuclide	PASS	RCS Normal
^{133}Xe	2.6×10^{-4}	1.48×10^{-2}
^{135}Xe	$<4.1 \times 10^{-1}$	
^{135}Xe	$<6.2 \times 10^{-4}$	1.75×10^{-4}

The inspector stated that the analysis of the normal reactor coolant sample for ^{135}Xe will be examined during a future inspection. (IFI 84-14-03)

The licensee demonstrated the capability to provide the quantification of radionuclides in the containment atmosphere with the following results:

Radionuclide	PASS	Containment
^{133}Xe	5.48×10^{-4}	1.53×10^{-4}
^{131}I	$<1.0 \times 10^{-4}$	
^{133}I	$<2.0 \times 10^{-4}$	

The containment atmosphere sample analysis for ^{131}I and ^{133}I will be examined during future inspections (IFI 84-14-04).

A long term iodine sample was installed in the grab sample port of the containment air sampler with the following results:

Radionuclide	PASS	Containment

16 hour at 250 cc/min resulted in no-detectable iodine.

e. The licensee shall establish an onsite chemical analysis capability to provide quantification of hydrogen levels in the containment atmosphere (NUREG 0737 Criterion (2)(b)). Accuracy, range, and sensitivity shall be adequate to provide pertinent data to describe the chemical status of the reactor coolant system (NUREG 0737 Criterion (10)).

Range 0-10 volume %
0-30 volume % for inerted or ice condenser containments.
(Reg. Guide 1.97, Rev. 3)

The licensee has installed redundant independent hydrogen monitors for the monitoring of the containment atmosphere. The licensee meets this criterion.

f. The licensee shall establish an onsite chemical analysis capability to provide quantification of dissolved gases (e.g., H_2) in reactor coolant. Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized samples. Measuring total dissolved gases or hydrogen is adequate. (NUREG 0737 Criterion (2)(c) and (4)) The recommended range for the analysis is 0-2000 cc (STP)/kg (Reg. Guide 1.97, Rev. 3). The accuracy within this range is ±10% between 50 and 2000 cc/kg is desirable but ±20% between 50 and 2000 cc/kg can be acceptable below 55 cc/kg the tolerance is ±5.0 cc/kg.

The licensee demonstrated the capability to monitor dissolved hydrogen in the reactor coolant with the following results:

	PASS	RCS Normal
H_2 (cc/kg)	41 cc/kg	29.2 before
		25.1 after

g. The licensee shall establish chemical analysis capability to provide quantification of chloride in reactor coolant. BWRs on sea or brackish water sites, and plants which use sea or brackish water in essential heat exchangers that have only single barrier protection between the reactor coolant are required to analyze chloride within 24 hours. All other plants have 96 hours to perform the chloride analysis. The chloride analysis does not have to be done onsite. (NUREG 0737 Criterion (2) and (5)). The range of the analysis is 0-20 ppm (Reg. Guide 1.97, Rev. 3).

The accuracy ± 10% for 0.5 - 20 ppm Cl-
± 0.05 ppm for Cl- <0.5 ppm.

(Attachment No. 1 to Clarification Letter - see footnote 1)

The licensee demonstrated the capability to monitor the chloride level in the reactor coolant with the following results:

	PASS	RCS Normal
Cl- (ppm)	<20 ppb	<10 ppb

h. The licensee shall establish an onsite chemical analysis capability to provide quantification of boron in reactor coolant. BWRs are to have the capability to perform boron analysis but they do not have to do so unless boron was injected. (NUREG 0737 Criterion (2)(c) and (7))

Range: BWRs 0-1000 ppm
PWRs 0-6000 ppm (Reg. Guide 1.97, Rev. 3)
Accuracy: ±5% for B >1000 ppm
±50 ppm for B <1000 ppm

(Attachment No. 1 to Clarification Letter - see footnote 1)

The licensee demonstrated the capability to measure boron in the reactor coolant with the following results:

	PASS	RCS Normal
B (ppm)	1590 ppm	1370 ppm

i. The following analysis are recommended but not required:

Dissolved Oxygen in reactor coolant (NUREG 0737 Criterion (4)) pH of the reactor coolant. (Reg. Guide 1.97, Rev. 3).
Range: oxygen 0-20 ppm
pH 1-13 (Reg. Guide 1.97, Rev. 3)
Accuracy: dissolved oxygen ±10% for 0.5 to 20 ppm
±0.05 ppm for <0.5 ppm
pH ±0.3 pH units for 5 to 9
±0.5 pH units for 1-5 and 9-13

(Attachment No. 1 to Clarification Letter - see footnote 1)

The licensee demonstrated the capability to measure oxygen in and the pH of reactor coolant with the following results:

	PASS	RCS Normal
pH	N/M	6.31
O^2 (ppm)	1.8 ppb	<5 ppb

j. If inline monitoring is used for any sampling and analytical capability specified in (4) above, the licensee shall provide backup sampling through grab samples and shall demonstrate the capability of analyzing the samples. Established planning for analysis at offsite facilities is acceptable. (NUREG 0737 Criterion (8))

The licensee has the capability to take undiluted reactor coolant samples in a shielded cask. Oak Ridge National Laboratory is under contract to provide analytical services for the analysis of these samples as required. During the demonstration of this system, the samples leaked a significant amount of the undiluted reactor coolant into the cask cavity. The inspector stated that the licensee's corrective actions to prevent future leaks of undiluted sample contents into the transfer cask will be examined during future inspections. (IFI 84-14-05)

k. Provisions 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 should be made. The ventilation exhaust from the sample station should be filtered at some point through charcoal absorbers and high efficiency particulate air (HEPA) filters. (NUREG 0737 Criterion (11))

The system is well designed for flushing of sample lines. The containment atmosphere lines are heat traced to reduce iodine plate out. The ventilation exhaust is filtered through HEPA and charcoal filters prior to being released to the auxiliary building ventilation system. The licensee meets this criterion.

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

The licensee has a formalized training program with written lesson plans, documented hands-on training and formal tests. The Sentry Equipment Corporation is currently providing training on the system. Eighteen technicians have received initial training. The licensee meets this criterion.

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

The licensee has operating procedures that have been prepared, reviewed, and approved in accordance with station procedures. The operating procedures are being upgraded and changed as required during the initial testing of the equipment. The licensee meets this criterion.

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

The licensee has documented acceptance tests for the equipment, calibration and recalibration requirements. Periodic performance tests for the equipment are being planned. However, the procedures are not yet in place. The inspector stated that the procedures for periodic testing will be examined during future inspections. (IFI 84-14-05)

Footnote 1: The clarification letter dated July 13, 1982, furnished criteria for accuracy to TVA, Browns Ferry, but no such letter was provided to Sequoyah. The criterion are guides and not regulatory requirements. They are used in this post implementation review of the PASS to aid in the assessment of its acceptability.