

SEQUOYAH NUCLEAR PLANT

SPECIAL REPORT 81-3

UNIT 1

I. Summary

This report provides the details of exceeding Technical Specification 3.11.1.2 for the first quarter of 1981 and provides supplemental information to Special Report 80-8. The report discusses the cause of the first quarter 1981 violation and corrective actions taken.

II. Detailed Discussion

This section is divided into two major parts. The first part details the first quarter 1981 violation, and the second part provides the supplemental information for Special Report 80-8.

PART ONE

Special Report 80-8, Appendix C, alerted the Commission to the probability that Technical Specification 3.11.1.2 would be exceeded for the first quarter of 1981. It was pointed out that sufficient volumes of primary water were released without processing and that these volumes would cause the hypothetical quarterly doses to be exceeded. The releases were made in January and February 1981 prior to the realization that P-32 was a dose problem. A determination of whether the limit actually was exceeded could not be made until the end of the quarter when all subsequent releases became known and river dilution effects could be applied. Those effects were applied in April and the calculations determined that the hypothetical dose for the first quarter of 1981 was 28 mrem organ (bone) via the fish pathway. The calculations show that 99 percent of the dose was due to P-32. The allowable organ quarterly limit is 5 mrem and the yearly limit is 10 mrem.

Beginning in February, all radwaste releases at Sequoyah have been processed through portable demineralizers. The maximum organ bone dose for Sequoyah for the months for March and April, including that attributed to P-32, was calculated to be hypothetically 0.4 mrem and 0.78 mrem respectively. These monthly values are below that which would be necessary to exceed quarterly and yearly limits. Therefore, it is anticipated that no further violations will occur.

PART TWO

Special Report 80-8 informed the Commission of suspected violations to Technical Specification 3.11.1.2 for the third and fourth quarters of 1980. The report provided data which indicated that P-32 activity was present in the secondary cycle during the third and fourth quarters of 1980 and the first two months of 1981. The data, however, was suspect for a number of reasons as was pointed out in the report.

One of the corrective actions committed to in the report was a followup investigation of the existence of P-32 in the secondary cycle. That investigation has been concluded with a determination that for the months of March and April when the unit operated for 15 days and 24 days respectively at or near 100% power, no P-32 activity could be detected in the secondary cycle. Therefore, we feel confident that the values reported for the third and fourth quarters of 1980 and the first two months of 1981 were, in fact, analytical errors and that the Technical Specification limits were never exceeded.

Other corrective actions and their status listed in Special Report 80-8 are as follows:

- a. Laboratory practices will be improved to minimize the possibility of cross-contamination of samples during analyses and sample collection.

Separate locations have been established for storage of primary and secondary samples. Procedures have been revised to ensure that sample preparation and counting of primary and secondary samples are done separately.

- b. Increased sample volumes will be tried in an attempt to improve activity concentrations and therefore reduce counting errors.

This item has been determined to be unnecessary.

- c. Use of liquid scintillation detectors as a means for detecting low levels of P-32 will continue to be investigated.

This item is still active but preliminary results indicate that the overall method is acceptable. We are continuing to work with new procedures to find the best one for our applications.

- d. Programs will be established to determine dose levels due to P-32 on a monthly basis. An Offsite Dose Calculations Manual (ODCM) change will be made.

Completed.

PART TWO (Continued)

- e. Communications between the Division of Nuclear Power and the Division of Occupational Health and Safety will be strengthened.

Completed.

III. Supportive Data

Appendix A, attached, details radiological impact on drinking water supplies in accordance with 10 CFR 141 reporting requirements.

Appendix B, attached, details measured radiological impact on samples of surface water above and below Sequoyah in accordance with 10 CFR 141 reporting requirements.

Appendix C, attached, shows calculated doses for the past four quarters from releases from Sequoyah Nuclear Plant.

Table I, attached, summarizes P-32 release activity data for the first four months at Sequoyah as related to unit 1 operation.

IV. Conclusions and Recommendations

Sequoyah did exceed the allowable offsite dose limit for the first quarter of 1981 due to the isotope P-32. However, it has subsequently started processing radwaste to eliminate the problem. Sequoyah did not exceed the allowable limit for the third and fourth quarters of 1980 as previously reported.

Sequoyah is presently processing all radwaste through portable demineralizers, primarily to reduce the dose effect of P-32. If P-32 were not a consideration, releases could be made, in some instances, without processing at all. The Commission has data that indicates the effects of P-32 may not be as impacting as originally thought. NUREG/CR 1336 states that the bioaccumulation factor in freshwater fish for P-32 could be as low as 3000 uci/gm/uci/ml vice 100,000 uci/gm/uci/ml as per Regulatory Guide 1.109.

TVA strongly recommends that the Commission consider a change to Regulatory Guide 1.109 based on the latest available information. Such a change would be in the best interest of the utilities, who are trying to run as efficiently as possible, and would incur undue costs by having to unnecessarily process radwaste. It would also benefit the public who would be unduly alarmed by fictitious reports of activity releases and have to eventually pay for the excess processing costs.

APPENDIX A

RADIOLOGICAL IMPACTS ON FINISHED DRINKING WATER SUPPLIES

Postulated radiological impacts on finished drinking water supplies have been evaluated as required in Radiological Effluent Technical Specification 3.11.1.2. Calculations based on reported effluent releases from Sequoyah Nuclear Plant for 12 months ending in March 1981 indicate compliance with the requirements of 40 CFR 141. The average concentrations of beta-particle and photon radioactivity from manmade radionuclides in drinking water were well below an annual dose equivalent to the total body or any internal organ of 4 millirem/year. The attached table lists the annual dose contributed by each isotope released.

APPENDIX A

ANNUAL WATER INGESTION DOSE (mrem) THROUGH MARCH 1981 AT FIRST PUBLIC WATER SUPPLY DOWNSTREAM^a FROM SEQUOYAH NUCLEAR PLANT

	<u>Bone</u>	<u>Percent</u>	<u>Total Body</u>	<u>Percent</u>
H-3	9.33 E-5 ^b	0.6	1.00 E-4	6.0
Na-24	2.25 E-6		2.25 E-6	0.1
P-32	1.10 E-2	73.3	4.23 E-4	25.3
Cr-51	3.91 E-7		3.23 E-7	
Mn-54	5.57 E-5	0.4	5.46 E-5	3.3
Fe-55	4.47 E-6		7.21 E-7	
Fe-59	3.26 E-5	0.2	2.92 E-5	1.8
Co-58	2.66 E-4	1.8	2.64 E-4	15.8
Co-60	3.68 E-5	0.2	3.67 E-5	2.2
Zn-65	2.68 E-7		3.88 E-7	
Kr-85	0.00		0.00	
Sr-89	4.97 E-4	3.3	1.43 E-5	0.9
Sr-90	2.98 E-3	19.9	7.30 E-4	43.7
Y-90	1.07 E-9		2.86 E-11	
Zr-95	2.47 E-7		5.36 E-8	
Nb-95	5.16 E-8		1.54 E-8	
Tc-99m	2.43 E-11		8.76 E-10	
Sb-124	5.55 E-8		2.19 E-8	
I-131	9.38 E-6		7.69 E-6	0.5
I-133	1.77 E-7		9.32 E-8	
Xe-131m	0.00		0.00	
Xe-133	0.00		0.00	
Xe-135	0.00		0.00	
Cs-137	6.17 E-7		5.15 E-7	
Ba-140	5.05 E-5	0.3	3.33 E-6	0.2
La-140	6.68 E-9		8.90 E-10	
Ce-144	1.88 E-6		1.01 E-7	
Pr-144	1.16 E-10		5.89 E-12	
W-187	3.28 E-8		9.54 E-9	
Total	1.50 E-2 ^c	100.0	1.67 E-3	99.8

a. C. F. Industries, Inc. at Tennessee River Mile 473.

b. $9.33 \text{ E-5} = 9.33 \times 10^{-5}$.

c. 60% of this dose is attributable to releases during the first quarter of 1981.

APPENDIX B

RADIOLOGICAL ANALYSES OF ENVIRONMENTAL MEDIA

Results of radiological analyses of drinking water sources above and below Sequoyah Nuclear Plant are presented for the first quarter of 1981 as required in Radiological Effluent Technical Specification 3.11.1.2. Evaluations of results of analyses of samples of drinking water indicate that there were no significant differences between concentrations in the upstream sources when compared to the downstream sources.

A table is attached which provides available results of analyses of samples of surface water for 1981 in the Sequoyah environs. There appear to be no radionuclide concentrations indicative of significant influence from Sequoyah Nuclear Plant operations.

Environmental data for 1980 have been provided to the NRC via the attached annual monitoring report for the Sequoyah Nuclear Plant.

RADIOACTIVITY IN DRINKING WATER SUPPLIES

SQN
1ST QUARTER 1981

Sampling Location	Sampling Date	Activity, pCi/l				
		Gross β	Gamma Emitting Radionuclides	^3I	^{89}Sr	^{90}Sr
Soddy-Daisy, TN	1/20/81	ND	ND	ND	ND	ND
Soddy Creek mile 0.5	2/17/81	2.1 ± 0.6^a				
8.6 miles upstream	3/17/81	ND	ND			
	Quarterly Composite				ND	ND
Dayton, TN	1/20/81	2.9 ± 0.7	ND			
TRM-503.8	2/17/81	4.9 ± 0.8	ND			
20.2 miles upstream	3/17/81	2.6 ± 0.7	ND			
	Quarterly Composite			301 ± 54	ND	ND
Cleveland, TN	1/20/81	ND	ND			
Hiwassee River 22.9 miles	2/17/81	2.1 ± 0.6	ND			
19.2 miles upstream	3/17/81	ND	ND			
	Quarterly Composite			ND	ND	ND
C. F. Industries	1/29/81	2.5 ± 0.7	ND			
TRM-473.0	2/13/81	4.1 ± 0.9	ND			
10.6 miles downstream	3/16/81	5.7 ± 0.9	ND			
	Quarterly Composite			273 ± 54	ND	ND
E. I. Dupont	1/20/81	2.6 ± 0.6	ND			
TRM-470.5	2/17/81	1.6 ± 0.6	ND			
13.1 miles downstream	3/17/81	3.1 ± 0.6	ND			
	Quarterly Composite			ND	ND	ND
Chattanooga, TN	1/20/81	2.5 ± 0.6	ND			
TRM-465.3	2/17/81	2.6 ± 0.6	ND			
18.3 miles downstream	3/17/81	3.3 ± 0.6	ND			
	Quarterly Composite			ND	ND	ND

a. The uncertainty reported is the 1-sigma counting error.

ND- No activity detected above the lower limit of detection (LLD).

Note: All drinking water samples collected on 2/17/81 & 2/18/81 were analysed for ^{32}P . No ^{32}P activity was detected in the samples.

RADIOACTIVITY IN SURFACE WATER

SQN
1ST QUARTER 1981

<u>Sampling Location</u>	<u>Sampling Date</u>	<u>Activity, pCi/l</u>					
		<u>Gross α</u>	<u>Gross β</u>	<u>Gamma Emitting Radionuclides</u>	<u>^3H</u>	<u>^{89}Sr</u>	<u>^{90}Sr</u>
TRM 497.0 (upstream)	1/19/81	ND	2.4 \pm 0.7 ^a	ND			
	2/13/81	ND	7.5 \pm 1.1	ND			
	3/16/81	ND	5.1 \pm 0.8	ND			
	Quarterly Composite				402 \pm 58	ND	ND
TRM 483.4 (downstream)	1/19/81	ND	3.7 \pm 1.1	ND			
	2/13/81	ND	6.3 \pm 0.9	ND			
	3/16/81	ND	4.6 \pm 0.9	ND			
	Quarterly Composite				307 \pm 54	ND	ND
TRM 473.2 (downstream)	1/19/81	2.0 \pm 0.9	2.6 \pm 0.7	ND			
	2/13/81	3.9 \pm 1.6	8.2 \pm 1.0	ND			
	3/16/81	ND	5.9 \pm 0.8	ND			
	Quarterly Composite				330 \pm 55	ND	ND

a. The uncertainty reported is the 1-sigma counting error.

ND- No activity detected above the lower limit of detection (LLD).

Note: All surface water samples collected on 2/13/81 were analyzed for ^{32}P . No ^{32}P activity was detected in these samples.

APPENDIX C

CALCULATED DOSES (mrem) FOR 12 CONSECUTIVE MONTHS FROM

RELEASES FROM SEQUOYAH NUCLEAR PLANT

	<u>TOTAL BODY</u>		<u>ORGAN (BONE)</u>	
	<u>Liquid Releases</u>	<u>Releases to Atmosphere</u>	<u>Liquid Releases</u>	<u>Releases to Atmosphere</u>
	-2		-1	-2
Second Quarter 1980	2.2x10	0.0	5.2x10	1.9x10
	-1	-2	0	
Third Quarter 1980	3.5x10	1.1x10	9.1x10	0.0
	-1	-1	1	-1
Fourth Quarter 1980	5.3x10	1.2x10	1.4x10	1.7x10
	0	-1	1	-1
First Quarter 1981	1.1x10	2.6x10	2.8x10	2.7x10

	<u>TOTAL BODY</u>	<u>ORGAN (BONE)</u>
12 month total for all releases	2.4	52

Note: There was no identified direct radiation exposure to individuals offsite resultant from plant operations.

Approximately 98% of the Organ dose is due to P-32.

TABLE I
SEQUOYAH NUCLEAR PLANT
PHOSPHORUS 32 RELEASED RELATIVE TO THE
OPERATION OF UNIT 1

Month	1981 January	1981 February	1981 March	1981 April
Turbine Bld. Sump Act. Ci	1.9×10^{-2}	0	0	0
Condensate Polisher Act. Ci	5.08×10^{-3}	1.98×10^{-3}	0	0
Radwaste Act. Ci	1.4×10^{-1}	4.55×10^{-2}	2.08×10^{-3}	3.15×10^{-3}
Steam Generator Blwdwn Act Ci	8.85×10^{-4}	0	0	0
Hrs. Rx Critical	496	94.2	336	576
% Max PWR	100	98	100	100
Max - MW Gen	1156	1088	1088	1132