QUAD CITIES POWER STATION

RADIOACTIVE WASTE, ENVIRONMENTAL MONITORING AND

OCCUPATIONAL PERSONNEL RADIATION EXPOSURE

JANUARY THROUGH JUNE 1976

EXCERPTS

SUMMARY

Gaseous and liquid effluents for the period remained at a fraction of the Technical Specification limits. Calculations of environmental concentrations based on effluent, Mississippi River flow, and meteorological data for the period indicate that consumption by the public of radionuclides attributable to the plant will not exceed the quantity of those radionuclides that result from continuous exposure to the concentration values listed in Apprendix B, Table II, of 10CFR20. Gamma radiation exposure from noble gases released to the atmosphere represented the critical pathway for the period with a maximum individual dose estimated to be 0.03mrem for the six-month period, 1976, when a shielding and occupancy factor of two is assumed. Environmental monitoring results confirm that dose via other pathways was not significant.

1.0 EFFLUENTS

1.1 GASEOUS EFFLUENTS TO THE ATMOSPHERE

Measured concentrations and isotopic composition of noble gases, radioiodine, and particulate radioactivity released to the atmosphere during the period 1 January through 30 June 1976, are listed in Table 1.1-1. A six-month total of 2.2 E+04 curies of noble gases was released during the period with a maximum release rate during any one-hour period of 8.7 E+04 uCi/sec. Average release rates during either quarter of the period did not exceed 12% of the Technical Specification limit.

A total of 0.25 curies of I-131 and 0.64 curies of I-133 were released during the six-month period.

Six-month total of~0.1 curies of beta-gamma emitters and negligible curies of alpha emitters were released as airborne particulate matter. The highest monthly release of beta-gamma particulate activity did not exceed 10% of the Technical Specification limit.

1.2 LIQUIDS RELEASED TO MISSISSIPPI RIVER

A total of 1.9 curies of radioactive liquid wastes were discharged from the station. These wastes were released at an average concentration of 1.9 E-08 uCi/ml which is 9.7% of the Technical Specification releases limit for unidentified radioactivity. During the same period, 11 curies of tritium, excluding second quarter releases, and 2.1 E-03 curies of alpha radioactivity were released. Monthly release estimates and principal radionuclides in liquid effluents are given in Table 1.2-1.

The maximum concentration of radioactivity, above background, in the Quad Cities Unit 1/2 discharge canal during the period was computed to be 4.4 E-07 uCi/ml.

2.0 SOLID RADIOACTIVE WASTE

The total amount of solid waste packaged for disposal was 19361 cubic feet during the first six-month period. The total amount of radioactivity involved was calculated to be 1553 curies. Solid radioactive wastes were shipped to either Nuclear Engineering Company, Sheffield, Illinois or Chemical Nuclear Services, Bellevue, Washington. Date, volume and radioactivity of each shipment are shown in Table 2.0-1.

TABLE 1.1-1

QUAD CITIES NUCLEAR POWER STATION

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission & Activation Gases				
1. Total release	Ci	1.45 E+04	7.55 E+03	
2. Average release rate for period	uCi/sec	1.84 E+03	9.60 E+02	
3. a. Percent of Tech. Spec. limit Chimney	%	1.52 E-01	7.77 E-02	
b. Percent of Tech. Spec. limit Stack	%	1.22 E+01	5.61 E+00	
B. Iodines				
1. Total iodine-131	Ci	1.23 E-01	1.28 E-01	
2. Average release rate for period	uCi/sec	2.66 E-02	1.63 E-02	
3. a. Percent of Tech. Spec. limit Chimney	%	5.82 E-01	2.27 E-01	
b. Percent of Tech. Spec. limit Stack	%	4.25 E+01	2.57 E+01	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	1.15 E-01	1.36 E-01	
2. Average release rate for period	uCi/sec	1.47 E-02	1.72 E-02	
3. a. Percent of Tech. Spec. limit Chimney	%	8.94 E-02	8.21 E-02	
b. Percent of Tech. Spec. limit Stack	%	1.07 E+01	9.37 E+00	
4. Gross alpha radioactivity	Ci	4.63 E-05	3.94 E-05	

1625 250

TABLE 1.1-1 (Cont'd)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
D. Tritium				
1. Total release	Ci	1.98 E+02	7.95 E+01	
2. Average release rate for period	uCi/sec	2.55 E+01	1.01 E+01	

1625 251

TABLE 1.1-1 (Cont'd)

QUAD CITIES NUCLEAR POWER STATION

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

GASEOUS EFFLUENTS- ELEVATED RELEASE

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter	Quarter
1. Fission gases					
Kr-85	Ci	< LDL	< LDL		
Kr-85m	Ci	1.22 E+03	5.92 E+02		
Kr-87	Ci	2.70 E+00	4.63 E+01		
Kr-88	Ci	5.18 E+02	3.50 E+02		
Xe-133	Ci	1.20 E+04	6.04 E+03		
Xe-135	Ci	6.16 E+02	4.57 E+02		
Xe-135m	Ci	< LDL	< LDL		
Xe-138	Ci	< LDL	< LDL		
	Ci				
	Ci				
Max. Release Rate	uCi/sec	1.90 E+04	6.28 E+03		
Unidentified	Ci	< LDL	< LDL		
Total for Period	Ci	1.43 E+04	7.49 E+03		
2. Iodines					
I-131	Ci	2.01 E-01	9.79 E-02		
I-133	Ci	1.93 E-01	2.66 E-01		
I-135	Ci	2.63 E-01	5.50 E-02		
Total for Period	Ci	6.57 E-01	4.19 E-01		

1625 252

TABLE 1.1-1 (Cont'd)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

GASEOUS EFFLUENTS- ELEVATED RELEASE

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter	Quarter
3. Particulates					
Sr-89	Ci	1.98 E-02			
Sr-90	Ci	4.02 E-05			
Cs-134	Ci	2.19 E-04	8.14 E-04		
Cs-137	Ci	6.32 E-04	2.08 E-03		
Ba-140	Ci	4.10 E-03	5.85 E-03		
La-140	Ci	5.64 E-03	7.93 E-03		
Mn-54	Ci	4.16 E-05	3.66 E-05		
Co-58	Ci	4.15 E-05	< LDL		
Co-60	Ci	1.23 E-03	8.85 E-04		
Zn-65	Ci	8.11 E-05	< LDL		
I-131	Ci	8.92 E-03	5.71 E-03		
Ce-141	Ci	6.38 E-05	< LDL		
	Ci				
	Ci				
	Ci				
	Ci				
	Ci				
Unidentified	Ci	3.46 E-02	*		

*Strontium results not available at time of publication.

1625 253

TABLE 1.1-1 (Cont'd)

QUAD CITIES NUCLEAR POWER STATION

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

GASEOUS EFFLUENTS - GROUND LEVEL RELEASE

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter	Quarter
1. Fission gases					
Kr-85	Ci	<LDL	< LDL		
Kr-85m	Ci	1.59 E+01	3.58 E+00		
Kr-87	Ci	3.20 E-02	4.45 E-01		
Kr-88	Ci	5.96 E+00	1.96 E+00		
Xe-133	Ci	1.41 E+02	3.88 E+01		
Xe-135	Ci	9.29 E+00	2.68 E+00		
Xe-135m	Ci	1.05 E+00	< LDL		
Xe-138	Ci	<LDL	< LDL		
	Ci				
	Ci				
Max. Release Rate	uCi/sec	8.70 E+04	3.62 E+04		
Unidentified	Ci	< LDL	< LDL		
Total for Period	Ci	1.73 E+02	4.75 E+01		
2. Iodines					
I-131	Ci	4.98 E-02	3.02 E-02		
I-133	Ci	8.69 E-02	9.40 E-02		
I-135	Ci	3.37 E-02	1.83 E-01		
Total for Period	Ci	1.70 E-01	3.07 E-01		

1625 254

TABLE 1.1-1 (Cont'd)

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

GASEOUS EFFLUENTS - GROUND LEVEL RELEASE

Nuclides Released	Unit	Continuous Mode Quarter 1	Continuous Mode Quarter 2	Batch Mode Quarter	Batch Mode Quarter
3. Particulates					
Sr-89	Ci	4.98 E-04			
Sr-90	Ci	9.90 E-06			
Cs-134	Ci	6.86 E-04	3.27 E-04		
Cs-137	Ci	1.10 E-03	5.20 E-04		
Ba-140	Ci	1.41 E-03	4.74 E-03		
La-140	Ci	1.84 E-03	6.42 E-03		
Cr-51	Ci	6.17 E-03	3.39 E-03		
Mn-54	Ci	4.60 E-04	5.69 E-05		
Co-58	Ci	5.76 E-04	7.79 E-05		
Co-60	Ci	8.40 E-03	7.00 E-04		
Zn-65	Ci	3.53 E-04	1.49 E-04		
I-131	Ci	2.54 E-03	2.45 E-03		
Cs-136	Ci	9.23 E-05	1.95 E-04		
Ag-110m	Ci	4.52 E-05	< LDL		
Ce-141	Ci	< LDL	7.42 E-05		
	Ci				
	Ci				
Unidentified	Ci	1.38 E-02	*		

*Strontium results not available at time of publication.

1625 255

TABLE 1.2-1

QUAD CITIES NUCLEAR POWER STATION

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission and Activation Products				
1. Total release (not including tritium, gases, alpha)	Ci	1.61 E+00	3.34 E-01	
2. Average diluted concentration during period	uCi/ml	1.75 E-08	1.81 E-09	
3. Percent of applicable limit	%	1.75 E+01	1.81 E+00	
4. Maximum diluted concentration during period	uCi/ml	4.35 E-07	9.67 E-08	
B. Tritium				
1. Total release	Ci	1.11 E+01		
2. Average diluted concentration during period	uCi/ml	1.20 E-07		
3. Percent of applicable limit	%	4.00 E-03		
C. Dissolved and Entrained Gases				
1. Total release	Ci	< LDL	< LDL	
2. Average diluted concentration during period	uCi/ml	< LDL	< LDL	
3. Percent of applicable limit	%	< LDL	< LDL	
D. Gross Alpha Radioactivity				
1. Total release	Ci	4.59 E-04	1.63 E-03	
2. Average concentration released	uCi/ml	4.98 E-12	8.82 E-12	
E. Volume of waste released (prior to dilution)	Liters	9.58 E+06	3.13 E+06	
F. Volume of dilution water used during period	Liters	9.21 E+10	1.85 E+11	

1625 256

TABLE 1.2-1 (Cont'd)

QUAD CITIES NUCLEAR POWER STATION

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1976

LIQUID EFFLUENTS

		Continuous Mode		Batch Mode	
	Unit	Quarter	Quarter	Quarter 1	Quarter 2
Sr-89	Ci			2.59 E-03	
Sr-90	Ci			6.86 E-04	
Cs-134	Ci			8.44 E-02	3.70 E-02
Cs-137	Ci			8.90 E-02	7.29 E-02
I-131	Ci			4.76 E-02	3.61 E-02
Co-58	Ci			2.80 E-02	1.68 E-04
Co-60	Ci			9.06 E-02	4.01 E-02
Fe-59	Ci			2.65 E-03	<LDL
Zn-65	Ci			2.81 E-03	1.11 E-04
Mn-54	Ci			5.25 E-03	2.03 E-03
Cr-51	Ci			< LDL	< LDL
Zr-95	Ci			< LDL	3.01 E-04
Ag-110m	Ci			4.88 E-04	< LDL
Cs-136	Ci			4.13 E-02	2.51 E-04
Tc-99m	Ci			7.34 E-01	2.28 E-03
Ba-140	Ci			1.45 E-01	8.88 E-04
Ce-141	Ci			8.74 E-04	< LDL
La-140	Ci			8.50 E-02	2.06 E-03
Sr-91	Ci			3.60 E-03	< LDL
Unidentified	Ci			2.5 E-01	
Total for Period (above)	Ci			1.61 E+00	3.34 E-01
Xe-133	Ci			< LDL	< LDL
Xe-135	Ci			< LDL	< LDL

TABLE 2.0-1 (Cont'd)

Solid Radioactive Waste Summary
Units 1/2
Quad Cities Station

JANUARY - JUNE 1976

Date	Disposition of Material	Volume (ft^3) Per Shipment	Volume (ft^3) Per Month	Millicuries Per Shipment	Curies Per Month
2-2	H.N. - Sheffield	102.9		5678.0	
2-2	H.N. - Sheffield	102.9		6346.0	
2-4	H.N. - Sheffield	102.9		2874.4	
2-5	C.N. - Sheffield	44.1		21,298	
2-6	C.N. - Sheffield	44.1		24,436	
2-6	C.N. - Sheffield	44.1		22597.4	
2-6	H.N. - Sheffield	102.9		3590.5	
2-9	H.N. - Sheffield	102.9		3287.5	
2-9	H.N. - Sheffield	102.9		3722.0	
2-9	H.N. - Sheffield	132.3		3269.7	
2-10	H.N. - Sheffield	102.9		3991.2	
2-12	H.N. - Sheffield	641.85		193.85	
2-12	C.N. - Sheffield	44.1		28901.0	
2-13	C.N. - Sheffield	44.1		9185.0	
2-13	H.N. - Sheffield	102.9		1113.4	
2-13	H.N. - Sheffield	102.9		1121.0	
2-17	H.N. - Sheffield	102.9		1320.0	
2-18	C.N. - Sheffield	44.1		22879.0	
2-19	H.N. - Sheffield	102.9		25773.0	
2-20	C.N. - Sheffield	44.1		31224.0	
2-20	H.N. - Sheffield	867.0		72.6	
2-23	C.N. - Sheffield	44.1		34798.0	
2-23	C.N. - Sheffield	44.1		19754.1	
2-24	H.N. - Sheffield	102.9		12692.4	
2-24	C.N. - Sheffield	44.1		23999.0	
2-25	C.N. - Sheffield	44.1		27621.8	
2-25	H.N. - Sheffield	102.9		5761.5	
2-27	C.N. - Sheffield	44.1		22049.0	
2-26	H.N. - Sheffield	102.9		13113.7	
			3610.95		3.83 E2 Ci

TABLE 2.0-1 (Cont'd)

Solid Radioactive Waste Summary
Units 1/2
Quad Cities Station

JANUARY - JUNE 1976

Date	Disposition of Material	Volume (ft^3) Per Shipment	Volume (ft^3) Per Month	Millicuries Per Shipment	Curies Per Month
3-3	H.N. - Sheffield	102.9		1123.5	
3-4	H.N. - Sheffield	102.9		16226.0	
3-8	H.N. - Sheffield	132.3		4507.3	
3-8	C.N. - Sheffield	44.1		5511.0	
3-9	H.N. - Sheffield	80.85		3706.5	
3-9	C.N. - Sheffield	44.1		6012.0	
3-10	C.N. - Sheffield	44.1		9268.5	
3-10	H.N. - Sheffield	102.9		13434.6	
3-11	H.N. - Sheffield	102.9		3353.33	
3-12	H.N. - Sheffield	88.35		2669.5	
3-15	C.N. - Morehead, KY.	44.1		37976.1	
3-15	H.N. - Sheffield	565.96		125.58	
3-16	H.N. - Sheffield	66.15		9602.9	
3-17	H.N. - Sheffield	668.7		149.96	
3-17	H.N. - Sheffield	88.2		15206.78	
3-18	H.N. - Sheffield	132.3		1697.2	
3-18	C.N. - Morehead, KY.	44.1		48425.0	
3-19	H.N. - Sheffield	102.9		2429.7	
3-22	C.N. - Sheffield	44.1		26455.0	
3-23	H.N. - Sheffield	102.9		4737.1	
3-24	C.N. - Morehead, KY.	44.1		60,210	
3-25	H.N. - Sheffield	404.25		304.59	
3-25	H.N. - Sheffield	102.9		4980.59	
3-29	H.N. - Sheffield	44.1		14,702	
3-30	H.N. - Sheffield	102.9		4114.1	
3-31	C.N. - Sheffield	29.4		17869.0	
3-31	H.N. - Sheffield	102.9		3740.8	
			3535.36		318.54

TABLE 2.0-1 (Cont'd)

Solid Radioactive Waste Summary
Units 1/2
Quad Cities Station
JANUARY - JUNE 1976

Date	Disposition of Material	Volume (ft^3) Per Shipment	Volume (ft^3) Per Month	Millicuries Per Shipment	Curies Per Month
4-1	H.N. - Sheffield	80.85		14847.3	
4-2	H.N. - Sheffield	102.9		6555.5	
4-5	C.N. - Sheffield	44.1		3707.3	
4-5	C.N. - Sheffield	44.1		3223.3	
4-6	H.N. - Sheffield	102.9		7748.9	
4-8	H.N. - Sheffield	102.9		2354.7	
4-8	H.N. - Sheffield	338.1		98.29	
4-9	H.N. - Sheffield	102.9		2121.2	
4-9	C.N. - Sheffield	44.1		2271.5	
4-12	C.N. - Sheffield	44.1		29,392	
4-12	H.N. - Sheffield	102.9		4293.6	
4-13	C.N. - Sheffield	44.1		4593.1	
4-13	C.N. - Sheffield	44.1		2605.2	
4-14	H.N. - Sheffield	102.9		6680.0	
4-15	C.N. - Sheffield	44.1		29555.0	
4-15	H.N. - Sheffield	80.85		9914.0	
4-19	C.N. - Sheffield	44.1		2487.9	
4-19	H.N. - Sheffield	102.9		2309.6	
4-20	C.N. - Shefrield	44.1		2939.2	
4-21	H.N. - Sheffield	102.9		7184.4	
4-21	C.N. - Morehead, KY.	44.1		43131.6	
4-22	H.N. - Sheffield	102.9		7046.1	
4-23	H.N. - Sheffield	102.9		7228.4	
4-26	C.N. - Morehead, KY.	44.1		40414.0	
4-26	H.N. - Sheffield	58.8		3590.5	
4-27	H.N. - Sheffield	133.5		267.4	
4-28	H.N. - Sheffield	102.9		6630.5	
4-29	H.N. - Sheffield	102.9		2747.8	
4-29	H.N. - Sheffield	644.25		103.67	
4-30	H.N. - Sheffield	102.9		6573.33	
			3159.15		321.62

TABLE 2.0-1 (Cont'd)

Solid Radioactive Waste Summary
Units 1/2
Quad Cities Station

JANUARY - JUNE 1976

Date	Disposition of Material	Volume (ft^3) Per Shipment	Volume (ft^3) Per Month	Millicuries Per Shipment	Curies Per Month
5-3	C.N. - Morehead, KY.	44.1		10829.7	
5-3	H.N. - Sheffield	102.9		5628.4	
5-4	H.N. - Sheffield	132.3		870.2	
5-4	H.N. - Sheffield	133.0		4966.5	
5-6	C.N. - Sheffield	44.1		1269.2	
5-6	H.N. - Sheffield	854.85		39.11	
5-7	H.N. - Sheffield	102.9		3356.7	
5-10	H.N. - Sheffield	102.9		2655.0	
5-10	H.N. - Sheffield	132.3		522.1	
5-11	H.N. - Sheffield	102.9		4059.1	
5-12	C.N. - Sheffield	44.1		1666.6	
5-12	H.N. - Sheffield	102.9		4925.1	
5-13	H.N. - Sheffield	102.9		5611.2	
5-14	H.N. - Sheffield	102.9		5076.8	
5-18	C.N. - Sheffield	44.1		2037.4	
5-17	H.N. - Sheffield	102.9		4509.0	
5-18	C.N. - Sheffield	44.1		1686.7	
5-18	H.N. - Sheffield	102.9		4074.8	
5-19	C.N. - Sheffield	44.1		2422.2	
5-19	H.N. - Sheffield	102.9		4442.2	
5-20	C.N. - Sheffield	44.1		1720.1	
5-20	H.N. - Sheffield	51.45		1569.8	
5-21	H.N. - Sheffield	102.9		2702.0	
5-24	N.E. - Sheffield	44.1		31,229	
5-24	H.N. - Sheffield	132.3		2744.65	
5-27	H.N. - Sheffield	51.45		16366.0	
5-27	N.E. - Sheffield	44.1		70,885	
5-28	H.N. - Sheffield	132.3		1837.7	
5-28	H.N. - Sheffield	80.85		9403.1	
			3229.6		209.1 Ci

TABLE 2.0-1 (Cont'd)

Solid Radioactive Waste Summary
Units 1/2
Quad Cities Station

JANUARY - JUNE 1976

Date	Disposition of Material	Volume (ft^3) Per Shipment	Volume (ft^3) Per Month	Millicuries Per Shipment	Curies Per Month
6-1	H.N. - Sheffield	561.0		56.14	
6-2	C.N. - Sheffield	44.1		1252.9	
6-2	H.N. - Sheffield	58.8		4493.2	
6-3	C.N. - Sheffield	44.1		1586.5	
6-3	H.N. - Sheffield	102.9		4174.5	
6-4	C.N. - Sheffield	44.1		827.7	
6-7	H.N. - Sheffield	102.9		2003.9	
6-7	C.N. - Sheffield	44.1		864.4	
6-9	C.N. - Sheffield	44.1		594.4	
6-11	H.N. - Sheffield	133.3		3348.3	
6-14	C.N. - Sheffield	44.1		668.0	
6-15	H.N. - Sheffield	58.8		844.8	
6-16	H.N. - Sheffield	573.3		213.31	
6-18	H.N. - Sheffield	124.95		2053.8	
6-21	H.N. - Sheffield	133.8		29.4	
6-28	H.N. - Sheffield	66.15		624.7	
6-29	H.N. - Sheffield	102.9		1339.5	
			2283.4		2.50 E+01