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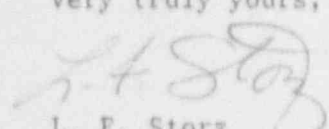
Subject: July 1 - December 31, 1991 Radioactive Effluent and
Waste Disposal Report

Gentlemen:

Enclosed are two copies of the July 1 - December 31, 1991 Radioactive Effluent and Waste Disposal Report for the Davis-Besse Nuclear Power Station. This report meets the requirements of Regulatory Guide 1.21 and Davis-Besse Technical Specifications, Section 6.9.1.11.

Gaseous and liquid radioactivity released remained well within the limits of the Operating License Appendix A Technical Specifications. No changes were made to the Offsite Dose Calculation Manual or Process Control Program during this reporting period. Should you have any questions please contact R. W. Schrauder, Manager - Nuclear Licensing, at (419) 249-2366.

Very truly yours,


L. F. Storz
Plant Manager

IMB/ekg

Enclosure

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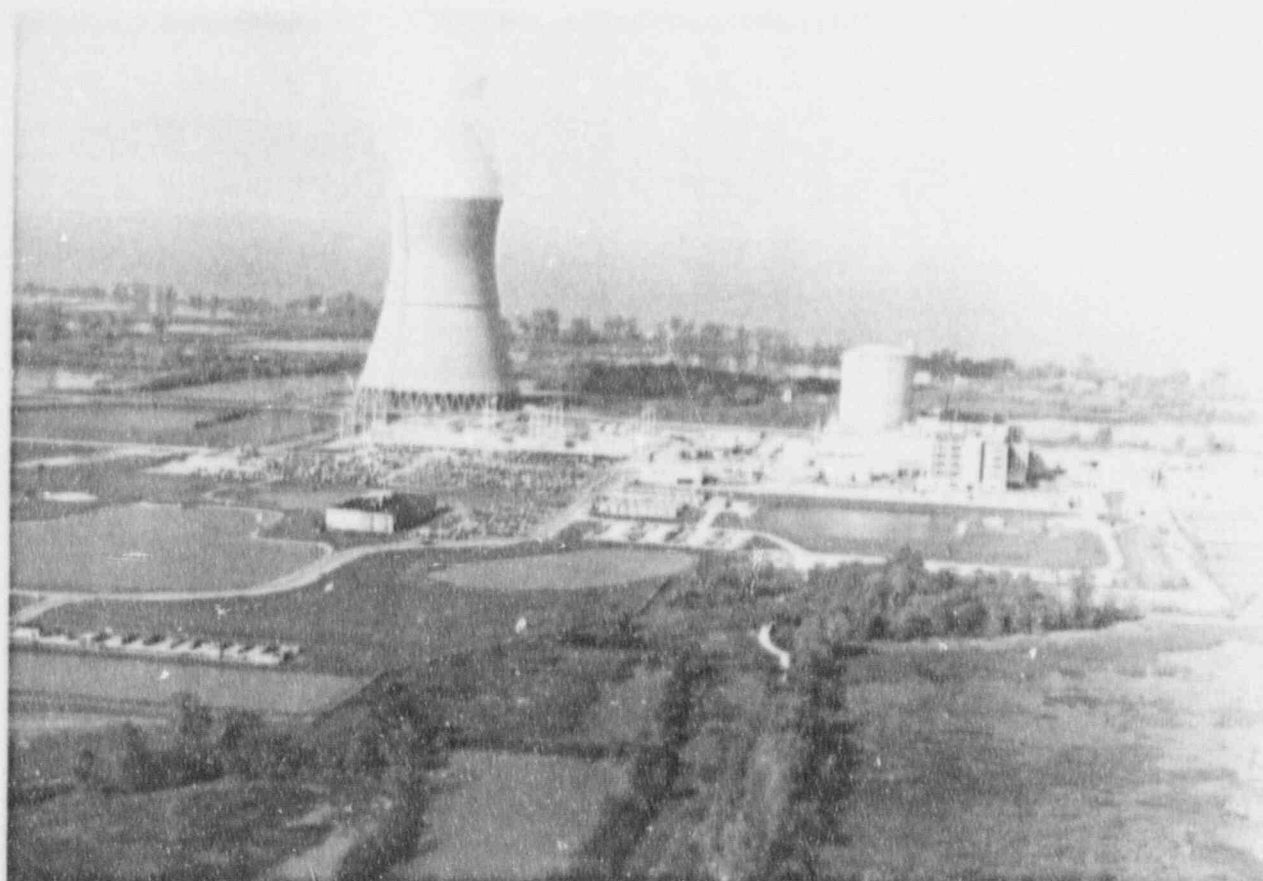
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The Davis-Besse Nuclear Power Station Semiannual Radioactive Effluent and Waste Disposal Report

July 1 - December 31, 1991



RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT

Davis-Besse Nuclear Power Station

Unit No. 1

July 1, 1991 through Dec. 31, 1991

Iocket Number 50-346
License Number NPF-3

Toledo Edison Company
300 Madison Avenue
Toledo, Ohio 43652

March 1992

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SUMMARY

The Radioactive Effluent and Waste Disposal Report is a detailed listing of radioactivity released from the Davis-Besse Nuclear Power Station during the period from July 1, 1991 through December 31, 1991.

This report provides the following information:

- Summation of the quantities of radioactivity released in gaseous and liquid effluents,
- Summation of the quantities of radioactivity contained in solid waste packaged and shipped for offsite disposal at federally approved sites, and
- A listing of radioactive effluent monitoring instrumentation required by Technical Specifications which was inoperable for 30 days or longer.

Environmental samples were available from the normal collection locations during this reporting period. The locations used for dose calculations and environmental monitoring were those identified by the 1991 Land Use Census. Some new sampling or dose assessment locations were identified in this Census, however, the critical receptor remained the same.

During the period of July 1 through December 31, 1991, the maximum individual offsite dose due to radioactivity released in effluents was approximately:

Liquid Effluents:

- 5.89E-02 mrem, whole body
- 9.91E-02 mrem, lower large intestine (GI-LLI)

Gaseous Effluents:

Noble Gas:

- 8.18E-03 mrem, whole body
- 2.56E-02 mrem, skin

Iodine-131, Tritium, and Particulates with Half-lives Greater Than 8 Days:

- 2.71E-02 mrem, whole body
- 4.22E-02 mrem, thyroid

These doses are only a small fraction of the limits set by the NRC in the Davis-Besse Technical Specifications.

There exist several additional normal release pathways from the secondary system as a result of prior primary-to-secondary leakage. For gaseous effluents, these pathways include the auxiliary feed pump turbine exhaust, the main steam safety valve system and the atmospheric vent valve system. For liquid effluents, the additional pathways include the Turbine Building drains via the settling basins. Releases which occurred via these pathways are included in the normal release tables in this report.

Several small gaseous releases associated with overpressurization of the Auxiliary Steam System occurred in the second half of 1991. These releases were quantified and included in the abnormal release sections of this report.

On October 15, 1991, 910 gallons of slightly contaminated water were discharged to the onsite Training Center Pond due to overfilling a steam generator. The discharge contained a total of 81 μCi of tritium, cesium-134 and cesium-137. The water discharged to the Training Center Pond has not yet been released from the site. Therefore, this does not constitute an offsite release and no resulting dose to the public will be reported for this semiannual period. Water samples are collected weekly from the Training Center Pond to track activity.

The third quarter composite samples from gaseous ground-level releases and liquid continuous releases were not analyzed due to loss of control of the samples. Therefore, Tables 2 and 6 use the term "unavailable" for the affected radionuclides. Based on past analyses, these radionuclides should not have been detectable in the third quarter samples.

No changes to the Offsite Dose Calculation Manual (ODCM) or the Process Control Program (PCP) occurred during this reporting period.

SUPPLEMENTAL INFORMATION

1. REGULATORY LIMITS

A. Gaseous Effluents

1. In accordance with 10CFR20, Appendix B, Table II, dose rates due to radioactivity released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:
 - a. Noble gases:- Less than or equal to 500 mrem/year to the total body.
- Less than or equal to 3000 mrem/year to the skin.
 - b. Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days:
- Less than or equal to 1500 mrem/year to any organ.
2. In accordance with 10CFR50, Appendix I, Sec. IB, air dose due to noble gases released in gaseous effluents to areas at and beyond the site boundary shall be limited to the following:
 - a. Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation during any calendar quarter.
 - b. Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation during any calendar year.
3. In accordance with 10CFR50, Appendix I, Sec. IIC, dose to a member of the public from Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:
 - a. Less than or equal to 7.5 mrem to any organ during any calendar quarter.
 - b. Less than or equal to 15 mrem to any organ during any calendar year.

B. Liquid Effluents

In accordance with 10CFR50, Appendix I, Sec IIA, the dose or dose commitment to a member of the public from radioactivity in liquid effluents released to unrestricted areas shall be limited to:

1. Less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ during any calendar quarter.
2. Less than or equal to 3 mrem to the total body and less than or equal to 10 mrem to any organ during any calendar year.

2. MAXIMUM PERMISSIBLE CONCENTRATION

The maximum permissible concentrations (MPC) for liquid and gaseous effluents at and beyond the site boundary are listed in 10 CFR 20, Appendix B, Table II, Column 2, with the most restrictive MPC being used in all cases. For dissolved and entrained gases the MPC of 2.0×10^{-4} $\mu\text{Ci/ml}$ is applied. This MPC is based on the Xe-135 MPC in air (submersion dose) converted to an equivalent concentration in water as discussed in the International Commission on Radiological Protection (ICRP), Publication 2.

3. AVERAGE ENERGY

The Davis-Besse Technical Specifications limit the dose equivalent rates due to the release of fission and activation products to less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin. Therefore, the average beta and gamma energies (E) for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," is not applicable.

4. MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

A. Fission and Activation Gases:

1. These gases, excluding tritium, are collected in a marinelli beaker specially modified for gas sampling, steel bombs, or glass vials and are counted on a germanium detector for principal gamma emitters. Detected radionuclides are quantified via gamma spectroscopy.

2. Tritium gas is collected using a bubbler apparatus and counted by liquid scintillation.

B. Iodines are collected on a charcoal cartridge filter, and counted on a germanium detector. Specific quantification of each iodine radionuclide is made by gamma spectroscopy.

C. Particulates are collected on filter paper and counted on a germanium detector. Specific quantification of each radionuclide present on the filter paper is made by gamma spectroscopy.

D. Liquid Effluents are collected in a marinelli beaker and counted on a germanium detector. Specific quantification of each radionuclide present in liquid samples is made by gamma spectroscopy.

5. BATCH RELEASES

A. Liquid from 7/1/91 to 12/31/91

1. Number of batch releases: 62
2. Total time period for the batch releases: 1.08E+02 hours
3. Maximum time period for a batch release: 2.44E+02 minutes
4. Average time period for a batch release: 1.05E+02 minutes
5. Minimum time period for batch releases: 6.30E+01 minutes

B. Gaseous from 7/1/91 to 12/31/91

1. Number of batch releases: 11
2. Total time period for the batch releases: 9.29E+01 hours
3. Maximum time period for a batch release: 1.34E+03 minutes
4. Minimum time period for a batch release: 1.80E+02 minutes
5. Average time period for batch releases: 5.07E+02 minutes

6. ABNORMAL RELEASES

Several unplanned gaseous releases occurred during this reporting period from lifts of safety valves on the 235-psig and 50-psig Auxiliary Steam System Headers due to system overpressurization. These releases occurred on 8/10/91, 10/08/91, 10/15/91, 10/21/91, 11/08/91, 11/17/91, 11/25/91, and 12/23/91 and produced very small offsite doses. Activity released and resultant doses are reported in Tables 4 and 9.

7. PERCENT OF TECHNICAL SPECIFICATIONS LIMITS

The following table presents the Technical Specifications dose limits and the associated offsite dose to the public, in percent of limits, for July through December 1991.

SPECIFICATION	LIMIT	PERCENT OF LIMITS
A. Third Quarter, 1991: Gaseous		
Noble gases (gamma)	5.0 mrad	3.02E-01
Noble gases (beta)	10.0 mrad	4.63E-01
I-131, tritium, and particulates with half-lives greater than 8 days	7.5 mrem	7.47E-01
B. Fourth Quarter, 1991: Gaseous		
Noble gases (gamma)	5.0 mrad	4.74E-03
Noble gases (beta)	10.0 mrad	9.96E-03
I-131, tritium, and particulates with half-lives greater than 8 days	7.5 mrem	4.82E-02
C. Calendar year, 1991: Gaseous		
Noble gases (gamma)	10.0 mrad	1.53E-01
Noble gases (beta)	20.0 mrad	2.36E-01
I-131, tritium, and particulates with half-lives greater than 8 days	15.0 mrem	3.98E-01
D. Third Quarter, 1991: Liquid		
Total body	1.5 mrem	1.30E+00
Any organ (liver)	5.0 mrem	5.02E-01
E. Fourth Quarter, 1991: Liquid		
Total body	1.5 mrem	1.26E+00
Any organ (GI-LLI)	5.0 mrem	2.50E+00
F. Calendar year, 1991: Liquid		
Total body:	3.0 mrem	1.28E+00
Any organ (GI-LLI)	10.0 mrem	1.30E+00

8. DOSE ASSESSMENT

Sources of input data include:

- A. Water Usage: Appendix I analysis, NRC Docket 50-346, "Evaluation of Compliance with Appendix I to 10 CFR 50, June 4, 1976, Davis-Besse Nuclear Power Station."
- B. 0-50 mile meat, milk, vegetable production, and population data: 1982 Annual Environmental Operating Report, report entitled, "Evaluation of Compliance with Appendix I to 10 CFR 50: Updated Population, Agricultural, Meat - Animal, and Milk Production Data Tables for 1982." This evaluation was based on the 1980 census; the Agricultural Ministry of Ontario 1980 report entitled, "Agricultural Statistics and Livestock Marketing Account, 1980"; the Agricultural Ministry of Ontario 1980 report entitled, "Agricultural Statistics for Ontario - 1980 Publication 21, 1980"; the Michigan Department of Agriculture, July, 1981 report entitled, "Michigan Agricultural Statistics, 1981"; the Ohio Crop Reporting Service, 1981 report entitled, "Ohio Agricultural Statistics, 1981."
- C. Gaseous and liquid source terms: Tables 1 through 7 of this report.
- D. Location of the nearest individuals and pathways by sector out to 5 miles: Report entitled, "1991 Land Use Census," included in the 1991 Annual Environmental Operating Report for Davis-Besse.

9. DOSE TO PUBLIC DUE TO ACTIVITIES INSIDE THE SITE BOUNDARY

In accordance with Technical Specification 6.9.1.11, the Semiannual Effluent and Waste Disposal Report shall include an assessment of radiation doses from radioactivity released in liquid and gaseous effluents to members of the public due to their activities inside the site boundary.

In special instances, members of the public are permitted access to the radiologically controlled area within the Davis-Besse station. Tours for the public are conducted with the assurance that no individual will receive an appreciable dose due to radioactivity released in gaseous or liquid effluents (i.e., not more than a small fraction of the 40 CFR 190 dose standards).

The Visitor Center located inside the Davis-Besse Administration Building (DBAB) is also accessible to members of the public. Considering the frequency and duration of the visits, the resultant dose would be a small fraction of the calculated maximum site boundary dose. The dose from gaseous effluents as modeled for the DBAB Visitor Center is considered the controlling factor when evaluating doses to members of the public from activities inside the site boundary. For purposes of assessing the dose to members of the public in accordance with Technical Specification 6.9.1.11, the following exposure assumptions may be used:

- Exposure time for maximum-exposed visitor of 20 hours (4 visits, 5 hours per visit is a maximum conservative estimate).
- Annual average meteorological dispersion (conservative, default use of maximum site boundary dispersion).

The equations in the Offsite Dose Calculation Manual (ODCM) may be used for calculating the potential dose to a member of the public for activities inside the site boundary. Based on these assumptions, this dose would be at least a factor of 400 less than the maximum site boundary air dose as calculated in the ODCM. There are no areas onsite accessible to the public where exposure to liquid effluents could occur. Therefore, the modeling of the ODCM conservatively estimates the maximum potential dose to members of the public.

10. INOPERABLE RADIOACTIVE EFFLUENT MONITORING EQUIPMENT

No radioactive effluent monitoring equipment required to be operable by Davis-Besse Technical Specifications Sections 3.3.3.9 and 3.3.3.10 was inoperable for 30 days or longer during this reporting period.

11. CHANGES TO THE LAND USE CENSUS

The following are the results of the 1991 Land Use Census. Changes from the 1990 Land Use Census are denoted with asterisks.

<u>Sector</u>	<u>Distance (meters)</u>	<u>Pathways</u>	<u>Age Group</u>	<u>X/Q (sec/m³)</u>	<u>D/Q (m⁻²)</u>
N	880	inhalation	child	9.15E-07	8.40E-09
NNE	870	inhalation	child	1.27E-06	1.47E-08
NE	900	inhalation	child	1.26E-06	1.58E-08
ENE through SE are located over marsh areas and Lake Erie, no inhalation or ingestion pathways are present.					
SSE	2900	vegetation	child	6.80E-08	7.90E-10
S	1450	vegetation	child	1.21E-07	2.46E-09
SSW	1560*	vegetation	child	1.03E-07*	2.28E-09*
SW	1050*	vegetation	child	2.92E-07*	5.33E-09*
WSW	4270	cow/milk	infant	5.71E-08	5.31E-10
W	1720*	vegetation	child	2.47E-07*	3.81E-09*
WNW	1750*	vegetation	child	1.46E-07*	1.72E-09*
NW	2630*	vegetation	child	5.96E-08*	4.50E-10*
NNW	1210	vegetation	child	2.70E-07	1.92E-09

TABLE 1. GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

		EST. TOTAL		
TYPE	UNIT	THIRD QUARTER	FOURTH QUARTER	PERCENT ERROR
A. <u>Fission and Activation Gases</u>				
1. Total Release	Ci	7.21E+02	1.22E+01	2.50E+01
2. Average Release Rate for Period	μCi/sec	9.08E+01	1.53E+00	
3. Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		
B. <u>Iodines</u>				
1. Total Iodine	Ci	2.87E-03	2.88E-04	2.50E+01
2. Average Release Rate for Period	μCi/sec	3.61E-04	3.63E-05	
3. Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		
C. <u>Particulates</u>				
1. Particulates with half-lives greater than 8 days	Ci	5.81E-06	7.57E-06	2.50E+01
2. Average Release Rate for Period	μCi/sec	7.31E-07	9.54E-07	
3. Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		
4. Gross Alpha Activity	Ci	3.47E-07	3.10E-07	2.50E+01
D. <u>Tritium</u>				
1. Total Release	Ci	4.72E+01	5.41E+00	2.50E+01
2. Average Release Rate for Period	μCi/sec	5.95E+00	6.83E-01	
3. Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		

TABLE 2. GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES*

NUCLIDES	UNIT	CONTINUOUS MODE		BATCH MODE	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. Fission Gases	Ci				
Ar-41		1.66E-07	LLD ^b	N/A	N/A
Kr-85		LLD	LLD	N/A	N/A
Kr-85m		3.02E-03	LLD	N/A	N/A
Kr-87		2.64E-03	LLD	N/A	N/A
Kr-88		3.39E-03	LLD	N/A	N/A
Xe-133		7.29E-02	LLD	N/A	N/A
Xe-133m		1.98E-03	LLD	N/A	N/A
Xe-135		7.86E-03	LLD	N/A	N/A
Xe-135m		3.71E-03	LLD	N/A	N/A
Xe-138		2.24E-03	LLD	N/A	N/A
Total for Period:		9.77E-02	N/A	N/A	N/A
2. Iodines	Ci				
I-131		5.31E-08	LLD	N/A	N/A
I-133		2.55E-07	LLD	N/A	N/A
I-135		LLD	LLD	N/A	N/A
Total for Period:		3.08E-07	N/A	N/A	N/A
3. Particulates	Ci				
H-3		2.55E-02	8.94E-04	N/A	N/A
Sr-89 ^c		unavailable	LLD(2)	N/A	N/A
Sr-90 ^c		unavailable	LLD(2)	N/A	N/A
Cs-134		LLD	4.11E-08	N/A	N/A
Cs-137		2.59E-07	1.15E-07	N/A	N/A
Total for Period:		2.55E-02	8.94E-04	N/A	N/A

* Includes Atmospheric Vent Valve weepage and Auxilliary Feed Pump Turbine tests, both are listed as continuous releases.

^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

Ar-41:	<1.4E-08	μCi/ml	Xe-135m:	<9.2E-09	μCi/ml
Kr-85:	<3.2E-06	μCi/ml	Xe-138:	<6.9E-08	μCi/ml
Kr-85m:	<2.6E-06	μCi/ml	I-131:	<1.2E-08	μCi/ml
Kr-87:	<1.1E-08	μCi/ml	I-133:	<1.8E-08	μCi/ml
Kr-88:	<2.8E-08	μCi/ml	I-135:	<8.0E-08	μCi/ml
Xe-133:	<3.4E-08	μCi/ml	Cs-134:	<1.6E-08	μCi/ml
Xe-133m:	<6.7E-08	μCi/ml	Sr-89(2):	<1.0E-08	μCi/ml
Xe-135:	<8.0E-09	μCi/ml	Sr-90(2):	<2.0E-09	μCi/ml

^c Quarterly composite sample

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES^a

NUCLIDES	UNIT	CONTINUOUS MODE		BATCH MODE	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. <u>Fission Gases</u>	Ci				
Ar-41		LLD ^b	LLD	LLD	1.73E-02
Kr-85		LLD	LLD	2.82E+01	3.88E+00
Kr-85m		LLD	LLD	LLD	2.99E-04
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-131m		LLD	LLD	4.68E+00	1.67E-01
Xe-133		1.54E+02	6.65E+00	5.24E+02	8.09E-01
Xe-133m		LLD	LLD	7.72E-01	1.07E-02
Xe-135		1.01E+01	6.15E-01	7.28E-02	7.38E-03
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		1.64E+02	7.26E+00	5.58E+02	4.89E+00
2. <u>Iodines</u>	Ci				
I-131		2.48E-03	1.44E-04	LLD	4.71E-06
I-132		LLD	LLD	LLD	6.36E-06
I-133		3.94E-04	4.90E-05	LLD	5.35E-05
I-135		LLD	LLD	LLD	3.07E-05
Total for Period:		2.87E-03	1.93E-04	LLD	9.52E-05
3. <u>Particulates</u>	Ci				
H-3		5.39E+00	5.40E+00	4.18E+01	2.32E-02
Co-58		LLD	LLD	LLD	1.81E-07
Sr-89		LLD(1)	LLD(2)	LLD(1)	LLD(2)
Sr-90		LLD(1)	LLD(2)	LLD(1)	LLD(2)
Cs-134		2.45E-06	LLD	LLD	2.85E-06
Cs-137		3.10E-06	LLD	LLD	4.54E-06
Total for Period:		5.39E+00	5.40E+00	4.18E+01	2.32E-02

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES^a (continued)

^a Abnormal releases not included

^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

Ar-41:	<9.1 E-09	μCi/ml
Kr-85:	<2.8 E-06	μCi/ml
Kr-85m:	<2.6 E-09	μCi/ml
Kr-87:	<1.1 E-08	μCi/ml
Kr-88:	<2.8 E-08	μCi/ml
Xe-131m:	<3.0 E-07	μCi/ml
Xe-133m:	<6.7 E-08	μCi/ml
Xe-138:	<6.9 E-08	μCi/ml
I-131:	<1.6 E-14	μCi/ml
I-132:	<1.4 E-14	μCi/ml
I-133:	<1.2 E-14	μCi/ml
I-135:	<8.2 E-14	μCi/ml
Co-58:	<2.0 E-14	μCi/ml
Sr-89(1):	<1.0 E-14	μCi/ml
Sr-89(2):	<1.5 E-15	μCi/ml
Sr-90(1):	<2.0 E-15	μCi/ml
Sr-90(2):	<3.0 E-16	μCi/ml
Cs-134:	<1.2 E-14	μCi/ml
Cs-137:	<1.6 E-14	μCi/ml

TABLE 4. GASEOUS EFFLUENTS - ABNORMAL RELEASES

	NUCLIDES	UNIT	THIRD QUARTER	FOURTH QUARTER
1.	<u>Fission Gases</u>	Ci	LLD ^a	LLD
	Total For Period:		N/A	N/A
2.	<u>Iodines</u>	Ci	LLD	LLD
	Total For Period:		N/A	N/A
3.	<u>Particulates</u>	Ci		
	H-3		6.91E+01	2.81E+01
	Cs-134		LLD	1.66E-01
	Cs-137		<u>2.14E-04</u>	<u>5.32E-01</u>
	Total For Period:		6.91E+01	2.88E+01

^aThese radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed in Table 3.

TABLE 5. LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

TYPE	UNIT	THIRD QUARTER	FOURTH QUARTER	EST. TOTAL PERCENT ERROR
A. <u>Fission And Activation Products</u>				
1. Total Release (without Tritium, Gases, Alpha)	Ci	4.18E-02	1.13E-01	1.00E+01
2. Average Diluted Concentration During Period *	μCi/ml	4.29E-09	1.05E-08	
3. Percent of Technical Specifications Limit	%	See Supplemental Information, Section 7		
4. Percent of 10CFR20 Limit	%	1.20E-01	2.86E-02	
B. <u>Tritium</u>				
1. Total Release	Ci	8.01E+01	9.90E+01	1.00E+01
2. Average Diluted Concentration During Period *	μCi/ml	7.18E-06	9.18E-06	
3. Percent of 10CFR20 Limit	%	2.39E-01	3.06E-01	
C. <u>Dissolved and Entrained Gases</u>				
1. Total Release	Ci	1.29E+00	8.56E-02	1.00E+01
2. Average Diluted Concentration During Period *	μCi/ml	1.16E-07	7.68E-09	
3. Percent of Limit	%	4.83E-02	3.20E-03	
D. <u>Gross Alpha</u>				
1. Total Release	Ci	LLD ^b	2.17E-05	1.00E+01
E. Volume of Waste Released (prior to dilution)				
	liters	1.55E+08	1.28E+08	1.00E+01
F. Volume of Dilution Water (used during releases)				
	liters	1.11E+10	1.08E+10	1.00E+01
g. Total Volume of Water Released (Outfall 001)				
	liters	1.13E+10	1.09E+10	1.00E+01

* Based on volume of dilution water used during releases (Item F)

^b Alpha activity was not detected above the lower limit of detection, 2.8E-07 μCi/cc

TABLE 6. LIQUID EFFLUENTS - NUCLIDES RELEASED^a

NUCLIDES	CONTINUOUS MODE (Ci)		BATCH MODE (Ci)	
	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. <u>Fission and Activation Products</u>				
Cr-51	LLD ^b	LLD	3.19E-04	8.08E-03
Mn-54	LLD	LLD	7.26E-06	3.32E-04
Fe-55 ^c	unavailable	LLD(C2)	LLD(B1)	1.61E-02
Fe-59	LLD	LLD	2.01E-05	2.25E-04
Co-57	LLD	LLD	2.23E-06	2.55E-06
Co-58	1.09E-03	LLD	3.74E-02	1.70E-02
Co-60	LLD	LLD	1.21E-03	2.83E-02
Cu-64	LLD	LLD	LLD	4.49E-03
Zn-65	LLD	LLD	LLD	LLD
Sr-89 ^c	unavailable	LLD(C2)	LLD(B1)	6.21E-05
Sr-90 ^c	unavailable	LLD(C2)	LLD(B1)	LLD(B2)
Zr-95	LLD	LLD	LLD	2.64E-03
Zr-97	LLD	LLD	2.79E-05	5.53E-05
Nb-95	LLD	LLD	LLD	4.38E-03
Nb-97	LLD	LLD	4.49E-06	2.09E-06
Mo-99	LLD	LLD	LLD	LLD
Tc-99m	LLD	LLD	8.65E-06	LLD
Ru-103	LLD	LLD	3.38E-06	1.37E-03
Ru-106	LLD	LLD	LLD	1.82E-04
Ag-110m	LLD	LLD	6.11E-04	3.36E-02
Sb-125	LLD	LLD	5.86E-05	9.51E-04
Sn-113	LLD	LLD	1.03E-05	8.69E-04
Te-132	LLD	LLD	1.09E-04	LLD
I-131	3.61E-03	LLD	2.57E-04	1.36E-05
I-132	LLD	LLD	9.69E-05	LLD
I-133	LLD	LLD	LLD	5.04E-06
Cs-134	LLD	LLD	7.54E-04	5.98E-04
Cs-136	LLD	LLD	3.55E-05	LLD
Cs-137	1.31E-03	7.61E-03	8.92E-04	8.31E-04
Ba-140	LLD	LLD	3.59E-06	LLD
La-140	LLD	LLD	1.41E-06	LLD
Ce-141	LLD	LLD	LLD	1.37E-04
Ce-144	LLD	LLD	LLD	1.53E-04
Total for period:	6.01E-03	7.61E-03	4.18E-02	1.06E-01
2. <u>Tritium</u>				
	1.23E+00	5.72E-01	7.88E+01	9.84E+01
3. <u>Dissolved and Entrained Gases</u>				
Kr-85	LLD	LLD	3.46E-02	5.05E-02
Kr-85m	LLD	LLD	1.26E-06	LLD
Xe-131m	LLD	LLD	3.63E-02	9.97E-03
Xe-133	LLD	LLD	1.20E+00	2.52E-02
Xe-133m	LLD	LLD	1.44E-02	LLD
Xe-135	LLD	LLD	1.62E-03	LLD
Total for Period:	N/A	N/A	1.29E+00	8.56E-02

TABLE 6. LIQUID EFFLUENTS - NUCLIDES RELEASED* (continued)

* Abnormal releases not included.

b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

Cr-51:	<1.3 E-07 μ Ci/ml	Mn-54:	<2.1 E-08 μ Ci/ml
Fe-55(B1):	<2.0 E-06 μ Ci/ml	Fe-55(C2):	<1.0 E-06 μ Ci/ml
Fe-59:	<2.4 E-08 μ Ci/ml	Co-57:	<1.3 E-08 μ Ci/ml
Co-58:	<1.9 E-08 μ Ci/ml	Co-60:	<2.0 E-08 μ Ci/ml
Cu-64:	<3.5 E-06 μ Ci/ml	Zn-65:	<4.2 E-08 μ Ci/ml
Kr-85:	<4.8 E-06 μ Ci/ml	Kr-85m:	<1.1 E-08 μ Ci/ml
Sr-89(B1):	<3.0 E-08 μ Ci/ml	Sr-89(B2):	<3.0 E-08 μ Ci/ml
Sr-89(C2):	<3.0 E-08 μ Ci/ml	Sr-90(B1):	<7.0 E-09 μ Ci/ml
Sr-90(B2):	<9.0 E-09 μ Ci/ml	Sr-90(C2):	<6.0 E-09 μ Ci/ml
Zr-95:	<3.1 E-08 μ Ci/ml	Zr-97:	<1.5 E-08 μ Ci/ml
Nb-95:	<1.4 E-08 μ Ci/ml	Nb-97:	<1.7 E-08 μ Ci/ml
Mo-99:	<1.2 E-07 μ Ci/ml	Tc-99m:	<1.2 E-08 μ Ci/ml
Ru-103:	<1.6 E-08 μ Ci/ml	Ru-106:	<1.2 E-07 μ Ci/ml
Ag-110m:	<1.3 E-08 μ Ci/ml	Sn-113:	<1.5 E-08 μ Ci/ml
Sb-125:	<4.2 E-08 μ Ci/ml	Te-132:	<1.2 E-08 μ Ci/ml
I-131:	<1.2 E-08 μ Ci/ml	I-132:	<1.6 E-08 μ Ci/ml
I-133:	<1.8 E-08 μ Ci/ml	Xe-131m:	<5.1 E-07 μ Ci/ml
Xe-133:	<3.0 E-08 μ Ci/ml	Xe-133m:	<1.1 E-07 μ Ci/ml
Xe-135:	<1.4 E-08 μ Ci/ml	Ba-140:	<6.1 E-08 μ Ci/ml
La-140:	<2.1 E-08 μ Ci/ml	Ce-141:	<1.0 E-08 μ Ci/ml
Ce-144:	<9.0 E-08 μ Ci/ml	Cs-134:	<1.6 E-08 μ Ci/ml
Cs-136:	<1.4 E-08 μ Ci/ml		

c Quarterly composite sample

TABLE 7. LIQUID EFFLUENTS - ABNORMAL RELEASES^a

NUCLIDES	UNIT	THIRD QUARTER	FOURTH QUARTER
1. <u>Fission and Activation Products</u>		N/A	N/A
2. <u>Tritium</u>	Ci	N/A	N/A
3. <u>Dissolved and Entrained Gases</u>		N/A	N/A

^a There were no abnormal liquid releases during the third or fourth quarters of 1991.

TABLE 8. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite for Burial or Disposal (not irradiated fuel)

1. Type of Waste	UNIT	QUANTITY	EST. TOTAL PERCENT ERROR
a. Spent resins, filter sludges, evaporator bottoms, etc.	m ³ Ci	6.20E+01 5.42E+02	2.5E+01
b. Dry compressible waste, contaminated equipment, etc.	m ³ Ci	9.60E+01 1.26E+00	2.5E+01
c. Irradiated components, control rods, etc.	m ³ Ci	0.00E+ 0 0.00E+ 00	N/A
d. Other:			
1. Contaminated Oil	m ³ Ci	4.47E+00 2.86E-04	2.5E+01

2. Estimate of Major Nuclide Composition (by type of waste)

	PERCENT COMPOSITION
a. Fe-55	5.3
Ni-63	12.7
Cs-134	18.6
Cs-137	56.1
b. Fe-55	20.5
Co-59	12.6
Co-60	25.9
Cs-134	6.0
Cs-137	16.2
Mn-54	7.7
Cr-51	5.5
Ni-63	5.3
d. Fe-55	8.3
Co-60	18.0
Ni-63	31.0
Cs-137	41.0

TABLE 8. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (continued)

A. Solid Waste Shipped Offsite for Burial or Disposal (not irradiated fuel) (continued)

3. Solid Waste Disposition

Number of Shipments: 6

Mode of Transportation: Truck

Destination: Barnwell, SC

Type of Container (Container Volume): 30 B25 Boxes (2.7 m^3), 1 Resin Liner (5.80 m^3), 3 Resin Liners (3.36 m^3), 1 Resin Liner (5.1 m^3)

Solidification Agents: None

Number of Shipments: 4

Mode of Transportation: Truck

Destination: Oak Ridge, TN

Type of Container: 6 B25 Boxes (2.7 m^3) containing 20 55-gallon drums, 6 B25 Boxes (2.7 m^3), 7 Resin Liners (5.84 m^3)

Solidification Agents: None

B. Irradiated Fuel Shipments

There were no shipments of irradiated fuel.

TABLE 9. SEMIANNUAL DOSES DUE TO GASEOUS RELEASES

A. Maximum Individual Doses Due to I-131, H-3, and Particulates with Half-lives Greater Than 8 Days*

1. Whole Body Dose

	SECTOR	DISTANCE(m)	AGE	DOSE(mrem)
Quarter 1	SSE	2900	Child	2.13E-03
Quarter 2	W	1050	Child	1.37E-03
Semiannual	W	1050	Child	2.77E-03
Quarter 3	WSW	2640	Child	2.71E-02
Quarter 4	SSE	2900	Child	1.34E-03
Semiannual	WSW	2640	Child	2.71E-02
1991 Annual	WSW	2640	Child	2.76E-02

2. Significant Organ Dose

	SECTOR	DISTANCE(m)	AGE	ORGAN	DOSE(mrem)
Quarter 1	SSE	2900	Child	Thyroid	4.07E-03
Quarter 2	W	1050	Child	Thyroid	1.40E-01
Semiannual	W	1050	Child	Thyroid	1.44E-01
Quarter 3	WSW	2640	Child	Thyroid	4.20E-02
Quarter 4	SSE	2900	Child	Thyroid	2.91E-03
Semiannual	WSW	2640	Child	Thyroid	4.22E-02
1991 Annual	W	1050	Child	Thyroid	1.44E-01

B. Maximum Individual Doses Due to Noble Gas*

1. Whole Body Dose

	SECTOR	DISTANCE(m)	AGE	DOSE(mrem)
Quarter 1	NE	900	NA	1.46E-03
Quarter 2	NE	900	NA	9.78E-03
Semiannual	NE	900	NA	1.12E-02
Quarter 3	S	1070	NA	8.17E-03
Quarter 4	N	800	NA	1.00E-04
Semiannual	S	1070	NA	8.18E-03
1991 Annual	NE	900	NA	1.48E-02

* Does not include abnormal releases

Table 9. SEMIANNUAL DOSES DUE TO GASEOUS RELEASES (continued)

2. Skin Dose

	SECTOR	DISTANCE(m)	AGE	DOSE(mrem)
Quarter 1	NE	900	NA	4.02E-03
Quarter 2	NE	900	NA	3.67E-02
Semiannual	NE	900	NA	4.08E-02
Quarter 3	S	1070	NA	2.56E-02
Quarter 4	N	880	NA	1.75E-03
Semiannual	S	1070	NA	2.56E-02
1991 Annual	NE	900	NA	5.10E-02

C. Population Doses due to I-131, H-3, and Particulates with Half-lives Greater than 8 Days

	ORGAN	TOTAL INTEGRATED POPULATION DOSE (person rem)	AVERAGE DOSE TO INDIVIDUALS IN POPULATION (mrem)
Quarter 1	W/body	1.74E-03	7.80E-07
Quarter 2	W/body	1.39E-03	6.24E-07
Semiannual	W/body	3.12E-03	1.40E-06
Quarter 3	W/body	7.48E-03	3.36E-06
Quarter 4	W/body	1.49E-03	6.69E-07
Semiannual	W/body	8.97E-03	4.03E-06
1991 Annual	W/body	1.21E-02	5.43E-06

D. Population Doses due to Noble Gas

	ORGAN	TOTAL INTEGRATED POPULATION DOSE (person rem)	AVERAGE DOSE TO INDIVIDUALS IN POPULATION (mrem)
Quarter 1	W/body	1.29E-03	5.82E-07
Quarter 2	W/body	1.33E-02	5.97E-06
Semiannual	W/body	1.46E-02	6.55E-06
Quarter 3	W/body	1.84E-03	8.26E-06
Quarter 4	W/body	8.96E-05	4.03E-08
Semiannual	W/body	1.85E-02	8.30E-06
1991 Annual	W/body	3.31E-02	1.49E-05

TABLE 9. SEMIANNUAL DOSES DUE TO GASEOUS RELEASES (continued)

E. Abnormal Releases due to Overpressurization of the Auxiliary Steam System

1. Maximum Individual Dose due to I-131, H-3, and Particulates with Half-lives Greater than 8 Days

SECTOR	DISTANCE(m)	AGE	ORGAN	DOSE(mrem)
SSE	2900	Adult	W/body	9.83E-06
SSE	2900	Child	Liver	1.65E-05

2. Maximum Individual Dose due to Noble Gas*

SECTOR	DISTANCE(m)	AGE	ORGAN	DOSE(mrem)
NA	NA	NA	W/body	0.00E+00
NA	NA	NA	Skin	0.00E+00

* Noble gases were not detected above the lower level of detectability in samples from the Auxilliary Steam System. Refer to Table 6 for LLD values.

TABLE 10. SEMIANNUAL DOSES DUE TO LIQUID RELEASES

A. Maximum Individual Whole Body Dose

	SECTOR	DISTANCE(mi)	AGE	DOSE(mrem)
Quarter 1	NW	0.6	Adult	7.88E-03
Quarter 2	NW	0.6	Child	2.73E-03
Semiannual	NW	0.6	Adult	1.06E-02
Quarter 3	NW	0.6	Adult	3.10E-02
Quarter 4	NW	0.6	Adult	2.71E-02
Semiannual	NW	0.6	Adult	5.89E-02
1991 Annual	NW	0.6	Adult	6.95E-02

B. Maximum Individual Significant Organ Dose

	SECTOR	DISTANCE(mi)	AGE	ORGAN	DOSE(mrem)
Quarter 1	NW	0.6	Child	Liver	9.84E-03
Quarter 2	NW	0.6	Child	Liver	3.35E-03
Semiannual	NW	0.6	Child	Liver	1.32E-02
Quarter 3	NW	0.6	Teen	Liver	4.44E-02
Quarter 4	NW	0.6	Teen	GI-LLI	9.50E-02
Semiannual	NW	0.6	Teen	GI-LLI	9.91E-02
1991 Annual	NW	0.6	Teen	GI-LLI	1.12E-01

C. Population Dose

	ORGAN	TOTAL INTEGRATED POPULATION DOSE (person rem)	AVERAGE DOSE TO INDIVIDUALS IN POPULATION (mrem)
Quarter 1	W/body	2.57E-01	1.15E-04
Quarter 2	W/body	2.72E-01	1.22E-04
Semiannual	W/body	5.28E-01	2.37E-04
Quarter 3	W/body	3.31E-01	1.49E-04
Quarter 4	W/body	1.36E+00	6.10E-04
Semiannual	W/body	1.69E+00	7.59E-04
1991 Annual	W/body	2.22E+00	9.96E-04

TABLE 11. 1991 ANNUAL DOSE TO THE MOST-EXPOSED MEMBER OF THE PUBLIC

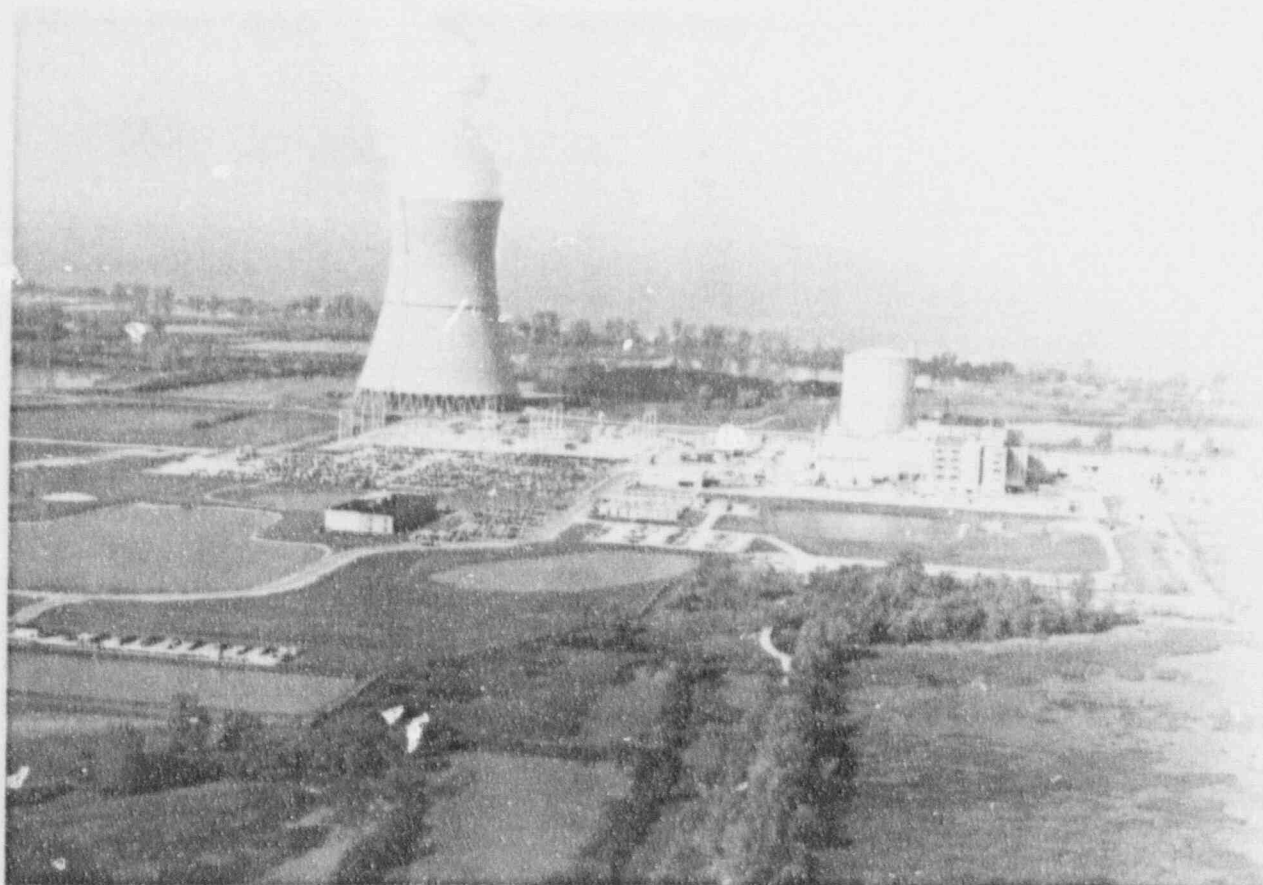
	ANNUAL DOSE (mrem)	40 CFR 190 LIMITS (mrem)	PERCENT OF LIMITS
<u>Whole Body Dose</u>			
- Noble Gas	1.48E-02		
- Iodine, Tritium, Particulates	2.76E-02		
- Liquid	6.95E-02		
Total Whole Body Dose	1.12E-01	25	2.44E-01
<u>Thyroid Dose</u>			
-Iodine,Tritium, Particulates	1.44E-01	75	1.92E-01
<u>Skin Dose</u>			
- Noble Gas	5.10E-02	25	2.04E-01
<u>GI-LLI Dose</u>			
- Liquid	1.12E-01	25	4.48E-01

METEOROLOGICAL DATA

Meteorological data on magnetic tape for July through December 1991 has been submitted with this document to the U.S. Nuclear Regulatory Commission Document Control Desk, Washington, D.C. 20555.

The Davis-Besse Nuclear Power Station Semiannual Radioactive Effluent and Waste Disposal Report

July 1 - December 31, 1991



RADIOACTIVE EFFLUENT AND WASTE DISPOSAL REPORT

Davis-Besse Nuclear Power Station

Unit No. 1

July 1, 1991 through Dec. 31, 1991

Docket Number 50-346

License Number NPF-3

Toledo Edison Company
300 Madison Avenue
Toledo, Ohio 43652

March 1992

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SUMMARY

The Radioactive Effluent and Waste Disposal Report is a detailed listing of radioactivity released from the Davis-Besse Nuclear Power Station during the period from July 1, 1991 through December 31, 1991.

This report provides the following information:

- Summation of the quantities of radioactivity released in gaseous and liquid effluents.
- Summation of the quantities of radioactivity contained in solid waste packaged and shipped for offsite disposal at federally approved sites, and
- A listing of radioactive effluent monitoring instrumentation required by Technical Specifications which was inoperable for 30 days or longer.

Environmental samples were available from the normal collection locations during this reporting period. The locations used for dose calculations and environmental monitoring were those identified by the 1991 Land Use Census. Some new sampling or dose assessment locations were identified in this Census, however, the critical receptor remained the same.

During the period of July 1 through December 31, 1991, the maximum individual offsite dose due to radioactivity released in effluents was approximately:

Liquid Effluents:

- 5.89E-02 mrem, whole body
- 9.91E-02 mrem, lower large intestine (GI-LLI)

Gaseous Effluents:

Noble Gas:

- 8.18E-03 mrem, whole body
- 2.56E-02 mrem, skin

Iodine-131, Tritium, and Particulates with Half-lives Greater Than 8 Days:

- 2.71E-02 mrem, whole body
- 4.22E-02 mrem, thyroid

These doses are only a small fraction of the limits set by the NRC in the Davis-Besse Technical Specifications.

There exist several additional normal release pathways from the secondary system as a result of prior primary-to-secondary leakage. For gaseous effluents, these pathways include the auxiliary feed pump turbine exhaust, the main steam safety valve system and the atmospheric vent valve system. For liquid effluents, the additional pathways include the Turbine Building drains via the settling basins. Releases which occurred via these pathways are included in the normal release tables in this report.

Several small gaseous releases associated with overpressurization of the Auxiliary Steam System occurred in the second half of 1991. These releases were quantified and included in the abnormal release sections of this report.

On October 15, 1991, 910 gallons of slightly contaminated water were discharged to the onsite Training Center Pond due to overfilling a steam generator. The discharge contained a total of 81 μCi of tritium, cesium-134 and cesium-137. The water discharged to the Training Center Pond has not yet been released from the site. Therefore, this does not constitute an offsite release and no resulting dose to the public will be reported for this semiannual period. Water samples are collected weekly from the Training Center Pond to track activity.

The third quarter composite samples from gaseous ground-level releases and liquid continuous releases were not analyzed due to loss of control of the samples. Therefore, Tables 2 and 6 use the term "unavailable" for the affected radionuclides. Based on past analyses, these radionuclides should not have been detectable in the third quarter samples.

No changes to the Offsite Dose Calculation Manual (ODCM) or the Process Control Program (PCP) occurred during this reporting period.

SUPPLEMENTAL INFORMATION

1. REGULATORY LIMITS

A. Gaseous Effluents

1. In accordance with 10CFR20, Appendix B, Table II, dose rates due to radioactivity released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:
 - a. Noble gases:- Less than or equal to 500 mrem/year to the total body.
 - Less than or equal to 3000 mrem/year to the skin.
 - b. Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days:
 - Less than or equal to 1500 mrem/year to any organ.
2. In accordance with 10CFR50, Appendix I, Sec. IB, air dose due to noble gases released in gaseous effluents to areas at and beyond the site boundary shall be limited to the following:
 - a. Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation during any calendar quarter.
 - b. Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation during any calendar year.
3. In accordance with 10CFR50, Appendix I, Sec. IIC, dose to a member of the public from Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:
 - a. Less than or equal to 7.5 mrem to any organ during any calendar quarter.
 - b. Less than or equal to 15 mrem to any organ during any calendar year.

B. Liquid Effluents

In accordance with 10CFR50, Appendix I, Sec IIA, the dose or dose commitment to a member of the public from radioactivity in liquid effluents released to unrestricted areas shall be limited to:

1. Less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ during any calendar quarter.
2. Less than or equal to 3 mrem to the total body and less than or equal to 10 mrem to any organ during any calendar year.

2. MAXIMUM PERMISSIBLE CONCENTRATION

The maximum permissible concentrations (MPC) for liquid and gaseous effluents at and beyond the site boundary are listed in 10 CFR 20, Appendix B, Table II, Column 2, with the most restrictive MPC being used in all cases. For dissolved and entrained gases the MPC of $2.0E-04$ $\mu\text{Ci/ml}$ is applied. This MPC is based on the Xe-135 MPC in air (submersion dose) converted to an equivalent concentration in water as discussed in the International Commission on Radiological Protection (ICRP), Publication 2.

3. AVERAGE ENERGY

The Davis-Besse Technical Specifications limit the dose equivalent rates due to the release of fission and activation products to less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin. Therefore, the average beta and gamma energies (E) for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," is not applicable.

4. MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

A. Fission and Activation Gases:

1. These gases, excluding tritium, are collected in a marinelli beaker specially modified for gas sampling, steel bombs, or glass vials and are counted on a germanium detector for principal gamma emitters. Detected radionuclides are quantified via gamma spectroscopy.

2. Tritium gas is collected using a bubbler apparatus and counted by liquid scintillation.

B. Iodines are collected on a charcoal cartridge filter, and counted on a germanium detector. Specific quantification of each iodine radionuclide is made by gamma spectroscopy.

C. Particulates are collected on filter paper and counted on a germanium detector. Specific quantification of each radionuclide present on the filter paper is made by gamma spectroscopy.

D. Liquid Effluents are collected in a marinelli beaker and counted on a germanium detector. Specific quantification of each radionuclide present in liquid samples is made by gamma spectroscopy.

5. BATCH RELEASES

A. Liquid from 7/1/91 to 12/31/91

1. Number of batch releases: 62
2. Total time period for the batch releases: 1.08E+02 hours
3. Maximum time period for a batch release: 2.44E+02 minutes
4. Average time period for a batch release: 1.05E+02 minutes
5. Minimum time period for batch releases: 6.30E+01 minutes

B. Gaseous from 7/1/91 to 12/31/91

1. Number of batch releases: 11
2. Total time period for the batch releases: 9.29E+01 hours
3. Maximum time period for a batch release: 1.34E+03 minutes
4. Minimum time period for a batch release: 1.80E+02 minutes
5. Average time period for batch releases: 5.07E+02 minutes

6. ABNORMAL RELEASES

Several unplanned gaseous releases occurred during this reporting period from lifts of safety valves on the 235-psig and 50-psig Auxiliary Steam System Headers due to system overpressurization. These releases occurred on 8/10/91, 10/08/91, 10/15/91, 10/21/91, 11/08/91, 11/17/91, 11/25/91, and 12/23/91 and produced very small offsite doses. Activity released and resultant doses are reported in Tables 4 and 9.

7. PERCENT OF TECHNICAL SPECIFICATIONS LIMITS

The following table presents the Technical Specifications dose limits and the associated offsite dose to the public, in percent of limits, for July through December 1991.

SPECIFICATION	LIMIT	PERCENT OF LIMITS
A. Third Quarter, 1991: Gaseous		
Noble gases (gamma)	5.0 mrad	3.02E-01
Noble gases (beta)	10.0 mrad	4.63E-01
I-131, tritium, and particulates with half-lives greater than 8 days	7.5 mrem	7.47E-01
B. Fourth Quarter, 1991: Gaseous		
Noble gases (gamma)	5.0 mrad	4.74E-03
Noble gases (beta)	10.0 mrad	9.96E-03
I-131, tritium, and particulates with half-lives greater than 8 days	7.5 mrem	4.82E-02
C. Calendar year, 1991: Gaseous		
Noble gases (gamma)	10.0 mrad	1.53E-01
Noble gases (beta)	20.0 mrad	2.36E-01
I-131, tritium, and particulates with half-lives greater than 8 days	15.0 mrem	3.98E-01
D. Third Quarter, 1991: Liquid		
Total body	1.5 mrem	1.30E+00
Any organ (liver)	5.0 mrem	5.02E-01
E. Fourth Quarter, 1991: Liquid		
Total body	1.5 mrem	1.26E+00
Any organ (GI-LLI)	5.0 mrem	2.50E+00
F. Calendar year, 1991: Liquid		
Total body:	3.0 mrem	1.28E+00
Any organ (GI-LLI)	10.0 mrem	1.30E+00

8. DOSE ASSESSMENT

Sources of input data include:

- A. Water Usage: Appendix I analysis, NRC Docket 50-346, "Evaluation of Compliance with Appendix I to 10 CFR 50, June 4, 1976, Davis-Besse Nuclear Power Station."
- B. 0-50 mile meat, milk, vegetable production, and population data: 1982 Annual Environmental Operating Report, report entitled, "Evaluation of Compliance with Appendix I to 10 CFR 50: Updated Population, Agricultural, Meat - Animal, and Milk Production Data Tables for 1982." This evaluation was based on the 1980 census; the Agricultural Ministry of Ontario 1980 report entitled, "Agricultural Statistics and Livestock Marketing Account, 1980"; the Agricultural Ministry of Ontario 1980 report entitled, "Agricultural Statistics for Ontario - 1980 Publication 21, 1980"; the Michigan Department of Agriculture, July, 1981 report entitled, "Michigan Agricultural Statistics, 1981"; the Ohio Crop Reporting Service, 1981 report entitled, "Ohio Agricultural Statistics, 1981."
- C. Gaseous and liquid source terms: Tables 1 through 7 of this report.
- D. Location of the nearest individuals and pathways by sector out to 5 miles: Report entitled, "1991 Land Use Census," included in the 1991 Annual Environmental Operating Report for Davis-Besse.

9. DOSE TO PUBLIC DUE TO ACTIVITIES INSIDE THE SITE BOUNDARY

In accordance with Technical Specification 6.9.1.11, the Semiannual Effluent and Waste Disposal Report shall include an assessment of radiation doses from radioactivity released in liquid and gaseous effluents to members of the public due to their activities inside the site boundary.

In special instances, members of the public are permitted access to the radiologically controlled area within the Davis-Besse station. Tours for the public are conducted with the assurance that no individual will receive an appreciable dose due to radioactivity released in gaseous or liquid effluents (i.e., not more than a small fraction of the 40 CFR 190 dose standards).

The Visitor Center located inside the Davis-Besse Administration Building (DBAB) is also accessible to members of the public. Considering the frequency and duration of the visits, the resultant dose would be a small fraction of the calculated maximum site boundary dose. The dose from gaseous effluents as modeled for the DBAB Visitor Center is considered the controlling factor when evaluating doses to members of the public from activities inside the site boundary. For purposes of assessing the dose to members of the public in accordance with Technical Specification 6.9.1.11, the following exposure assumptions may be used:

- Exposure time for maximum-exposed visitor of 20 hours (4 visits, 5 hours per visit is a maximum conservative estimate).
- Annual average meteorological dispersion (conservative, default use of maximum site boundary dispersion).

The equations in the Offsite Dose Calculation Manual (ODCM) may be used for calculating the potential dose to a member of the public for activities inside the site boundary. Based on these assumptions, this dose would be at least a factor of 400 less than the maximum site boundary air dose as calculated in the ODCM. There are no areas onsite accessible to the public where exposure to liquid effluents could occur. Therefore, the modeling of the ODCM conservatively estimates the maximum potential dose to members of the public.

10. INOPERABLE RADIOACTIVE EFFLUENT MONITORING EQUIPMENT

No radioactive effluent monitoring equipment required to be operable by Davis-Besse Technical Specifications Sections 3.3.3.9 and 3.3.3.10 was inoperable for 30 days or longer during this reporting period.

11. CHANGES TO THE LAND USE CENSUS

The following are the results of the 1991 Land Use Census. Changes from the 1990 Land Use Census are denoted with asterisks.

<u>Sector</u>	<u>Distance (meters)</u>	<u>Pathways</u>	<u>Age Group</u>	<u>X/Q (sec/m³)</u>	<u>D/O (m⁻²)</u>
N	880	inhalation	child	9.15E-07	8.40E-09
NNE	870	inhalation	child	1.27E-06	1.47E-08
NE	900	inhalation	child	1.26E-06	1.58E-08
ENE through SE are located over marsh areas and Lake Erie, no inhalation or ingestion pathways are present.					
SSE	2900	vegetation	child	6.80E-08	7.90E-10
S	1450	vegetation	child	1.21E-07	2.46E-09
SSW	1560*	vegetation	child	1.03E-07*	2.28E-09*
SW	1050*	vegetation	child	2.92E-07*	5.33E-09*
WSW	4270	cow/milk	infant	5.71E-08	5.31E-10
W	1720*	vegetation	child	2.47E-07*	3.81E-09*
WNW	1750*	vegetation	child	1.46E-07*	1.72E-09*
NW	2630*	vegetation	child	5.96E-08*	4.50E-10*
NNW	1210	vegetation	child	2.70E-07	1.92E-09

TABLE 1. GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	TYPE	UNIT	THIRD QUARTER	FOURTH QUARTER	EST. TOTAL PERCENT ERROR
A.	<u>Fission and Activation Gases</u>				
1.	Total Release	Ci	7.21E+02	1.22E+01	2.50E+01
2.	Average Release Rate for Period	μCi/sec	9.08E+01	1.53E+00	
3.	Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		
B.	<u>Iodines</u>				
1.	Total Iodine	Ci	2.87E-03	2.88E-04	2.50E+01
2.	Average Release Rate for Period	μCi/sec	3.61E-04	3.63E-05	
3.	Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		
C.	<u>Particulates</u>				
1.	Particulates with half-lives greater than 8 days	Ci	5.81E-06	7.57E-06	2.50E+01
2.	Average Release Rate for Period	μCi/sec	7.31E-07	9.54E-07	
3.	Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		
4.	Gross Alpha Activity	Ci	3.47E-07	3.10E-07	2.50E+01
D.	<u>Tritium</u>				
1.	Total Release	Ci	4.72E+01	5.41E+00	2.50E+01
2.	Average Release Rate for Period	μCi/sec	5.95E+00	6.83E-01	
3.	Percent of Technical Specifications Limits	%	See Supplemental Information, Section 7		

TABLE 2. GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES*

NUCLIDES	UNIT	CONTINUOUS MODE		BATCH MODE	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. Fission Gases	Ci				
Ar-41		1.66E-07	LLD ^b	N/A	N/A
Kr-85		LLD	LLD	N/A	N/A
Kr-85m		3.02E-03	LLD	N/A	N/A
Kr-87		2.64E-03	LLD	N/A	N/A
Kr-88		3.39E-03	LLD	N/A	N/A
Xe-133		7.29E-02	LLD	N/A	N/A
Xe-133m		1.98E-03	LLD	N/A	N/A
Xe-135		7.86E-03	LLD	N/A	N/A
Xe-135m		3.71E-03	LLD	N/A	N/A
Xe-138		2.24E-03	LLD	N/A	N/A
Total for Period:		9.77E-02	N/A	N/A	N/A
2. Iodines	Ci				
I-131		5.31E-08	LLD	N/A	N/A
I-133		2.55E-07	LLD	N/A	N/A
I-135		LLD	LLD	N/A	N/A
Total for Period:		3.08E-07	N/A	N/A	N/A
3. Particulates	Ci				
H-3		2.55E-02	8.94E-04	N/A	N/A
Sr-89 ^c		unavailable	LLD(2)	N/A	N/A
Sr-90 ^c		unavailable	LLD(2)	N/A	N/A
Cs-134		LLD	4.11E-08	N/A	N/A
Cs-137		2.59E-07	1.15E-07	N/A	N/A
Total for Period:		2.55E-02	8.94E-04	N/A	N/A

* Includes Atmospheric Vent Valve weepage and Auxilliary Feed Pump Turbine tests, both are listed as continuous releases.

^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

Ar-41:	<1.4E-08	μCi/ml	Xe-135m:	<9.2E-09	μCi/ml
Kr-85:	<3.2E-06	μCi/ml	Xe-138:	<6.9E-08	μCi/ml
Kr-85m:	<2.6E-06	μCi/ml	I-131:	<1.2E-08	μCi/ml
Kr-87:	<1.1E-08	μCi/ml	I-133:	<1.8E-08	μCi/ml
Kr-88:	<2.8E-08	μCi/ml	I-135:	<8.0E-08	μCi/ml
Xe-133:	<3.4E-08	μCi/ml	Cs-134:	<1.6E-08	μCi/ml
Xe-133m:	<6.7E-08	μCi/ml	Sr-89(2):	<1.0E-08	μCi/ml
Xe-135:	<8.0E-09	μCi/ml	Sr-90(2):	<2.0E-09	μCi/ml

^c Quarterly composite sample

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES^a

NUCLIDES	UNIT	CONTINUOUS MODE		BATCH MODE	
		THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. <u>Fission Gases</u>	Ci				
Ar-41		LLD ^b	LLD	LLD	1.73E-02
Kr-85		LLD	LLD	2.82E+01	3.88E+00
Kr-85m		LLD	LLD	LLD	2.99E-04
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-131m		LLD	LLD	4.68E+00	1.67E-01
Xe-133		1.54E+02	6.65E+00	5.24E+02	8.09E-01
Xe-133m		LLD	LLD	7.72E-01	1.07E-02
Xe-135		1.01E+01	6.15E-01	7.28E-02	7.38E-03
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		1.64E+02	7.26E+00	5.58E+02	4.89E+00
2. <u>Iodines</u>	Ci				
I-131		2.48E-03	1.44E-04	LLD	4.71E-06
I-132		LLD	LLD	LLD	6.36E-06
I-133		3.94E-04	4.90E-05	LLD	5.35E-05
I-135		LLD	LLD	LLD	3.07E-05
Total for Period:		2.87E-03	1.93E-04	LLD	9.52E-05
3. <u>Particulates</u>	Ci				
H-3		5.39E+00	5.40E+00	4.18E+01	2.32E-02
Co-58		LLD	LLD	LLD	1.81E-07
Sr-89		LLD(1)	LLD(2)	LLD(1)	LLD(2)
Sr-90		LLD(1)	LLD(2)	LLD(1)	LLD(2)
Cs-134		2.45E-06	LLD	LLD	2.85E-06
Cs-137		3.10E-06	LLD	LLD	4.54E-06
Total for Period:		5.39E+00	5.40E+00	4.18E+01	2.32E-02

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES^a (continued)

^a Abnormal releases not included

^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

Ar-41:	<9.1 E-09	μCi/ml
Kr-85:	<2.8 E-06	μCi/ml
Kr-85m:	<2.6 E-09	μCi/ml
Kr-87:	<1.1 E-08	μCi/ml
Kr-88:	<2.8 E-08	μCi/ml
Xe-131m:	<3.0 E-07	μCi/ml
Xe-133m:	<6.7 E-08	μCi/ml
Xe-138:	<6.9 E-08	μCi/ml
I-131:	<1.6 E-14	μCi/ml
I-132:	<1.4 E-14	μCi/ml
I-133:	<1.2 E-14	μCi/ml
I-135:	<8.2 E-14	μCi/ml
Co-58:	<2.0 E-14	μCi/ml
Sr-89(1):	<1.0 E-14	μCi/ml
Sr-89(2):	<1.5 E-15	μCi/ml
Sr-90(1):	<2.0 E-15	μCi/ml
Sr-90(2):	<3.0 E-16	μCi/ml
Cs-134:	<1.2 E-14	μCi/ml
Cs-137:	<1.6 E-14	μCi/ml

TABLE 4. GASEOUS EFFLUENTS - ABNORMAL RELEASES

	NUCLIDES	UNIT	THIRD QUARTER	FOURTH QUARTER
1.	<u>Fission Gases</u>	Ci	LLD ^a	LLD
	Total For Period:		N/A	N/A
2.	<u>Iodines</u>	Ci	LLD	LLD
	Total For Period:		N/A	N/A
3.	<u>Particulates</u>	Ci		
	H-3		6.91E+01	2.81E+01
	Cs-134		LLD	1.66E-01
	Cs-137		<u>2.14E-04</u>	<u>5.32E-01</u>
	Total For Period:		6.91E+01	2.88E+01

^aThese radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed in Table 3.

TABLE 5. LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

TYPE	UNIT	THIRD QUARTER	FOURTH QUARTER	EST. TOTAL PERCENT ERROR
<u>A. Fission And Activation Products</u>				
1. Total Release (without Tritium, Gases, Alpha)	Ci	4.78E-02	1.13E-01	1.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	4.29E-09	1.05E-08	
3. Percent of Technical Specifications Limit	%	See Supplemental Information, Section 7		
4. Percent of 10CFR20 Limit	%	1.20E-01	2.86E-02	
<u>B. Tritium</u>				
1. Total Release	Ci	8.01E+01	9.90E+01	1.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	7.18E-06	9.18E-06	
3. Percent of 10CFR20 Limit	%	2.39E-01	3.06E-01	
<u>C. Dissolved and Entrained Gases</u>				
1. Total Release	Ci	1.29E+00	8.56E-02	1.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	1.16E-07	7.68E-09	
3. Percent of Limit	%	4.83E-02	3.20E-03	
<u>D. Gross Alpha</u>				
1. Total Release	Ci	LLD ^b	2.17E-05	1.00E+01
<u>E. Volume of Waste Released (prior to dilution)</u>				
	liters	1.55E+08	1.28E+08	1.00E+01
<u>F. Volume of Dilution Water (used during releases)</u>				
	liters	1.11E+10	1.08E+10	1.00E+01
<u>g. Total Volume of Water Released (Outfall 001)</u>				
	liters	1.13E+10	1.09E+10	1.00E+01

- ^a Based on volume of dilution water used during releases (Item F)
- ^b Alpha activity was not detected above the lower limit of detection, 2.8E-07 μCi/cc

TABLE 6. LIQUID EFFLUENTS - NUCLIDES RELEASED*

NUCLIDES	CONTINUOUS MODE (Ci)		BATCH MODE (Ci)	
	THIRD QUARTER	FOURTH QUARTER	THIRD QUARTER	FOURTH QUARTER
1. Fission and Activation Products				
Cr-51	LLD ^b	LLD	3.19E-04	8.08E-03
Mn-54	LLD	LLD	7.20E-06	3.32E-04
Fe-55 ^c	unavailable	LLD(C2)	LLD(B1)	1.61E-02
Fe-59	LLD	LLD	2.01E-05	2.25E-04
Co-57	LLD	LLD	2.23E-06	2.55E-06
Co-58	1.09E-03	LLD	3.74E-02	1.70E-02
Co-60	LLD	LLD	1.21E-03	2.83E-02
Cu-64	LLD	LLD	LLD	4.49E-03
Zn-65	LLD	LLD	LLD	LLD
Sr-89 ^c	unavailable	LLD(C2)	LLD(B1)	6.21E-05
Sr-90 ^c	unavailable	LLD(C2)	LLD(B1)	LLD(B2)
Zr-95	LLD	LLD	LLD	2.64E-03
Zr-97	LLD	LLD	2.79E-05	5.53E-05
Nb-95	LLD	LLD	LLD	4.38E-03
Nb-97	LLD	LLD	4.49E-06	2.09E-06
Mo-99	LLD	LLD	LLD	LLD
Tc-99m	LLD	LLD	8.65E-06	LLD
Ru-103	LLD	LLD	3.38E-06	1.37E-03
Ru-106	LLD	LLD	LLD	1.82E-04
Ag-110m	LLD	LLD	6.11E-04	3.36E-02
Sb-125	LLD	LLD	5.86E-05	2.51E-04
Sn-113	LLD	LLD	1.03E-05	8.69E-04
Te-132	LLD	LLD	1.09E-04	LLD
I-131	3.61E-03	LLD	2.57E-04	1.35E-05
I-132	LLD	LLD	9.69E-05	LLD
I-133	LLD	LLD	LLD	5.04E-06
Cs-134	LLD	LLD	7.54E-04	5.98E-04
Cs-136	LLD	LLD	3.55E-05	LLD
Cs-137	1.31E-03	7.61E-03	8.92E-04	8.31E-04
Ba-140	LLD	LLD	3.59E-06	LLD
La-140	LLD	LLD	1.41E-06	LLD
Ce-141	LLD	LLD	LLD	1.37E-04
Ce-144	LLD	LLD	LLD	1.53E-04
Total for period:	6.01E-03	7.61E-03	4.18E-01	1.06E-01
2. Tritium				
	1.23E+00	5.72E-01	7.88E+01	9.84E+01
3. Dissolved and Entrained Gases				
Kr-85	LLD	LLD	3.46E-02	5.05E-02
Kr-85m	LLD	LLD	1.26E-06	LLD
Xe-131m	LLD	LLD	3.63E-02	9.97E-03
Xe-133	LLD	LLD	1.20E+00	2.52E-02
Xe-133m	LLD	LLD	1.44E-02	LLD
Xe-135	LLD	LLD	1.62E-03	LLD
Total for Period:	N/A	N/A	1.29E+00	8.56E-02

TABLE 6. LIQUID EFFLUENTS - NUCLIDES RELEASED* (continued)

* Abnormal releases not included.

^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

Cr-51:	<1.3 E-07 μ Ci/ml	Mn-54:	<2.1 E-08 μ Ci/ml
Fe-55(B1):	<2.0 E-06 μ Ci/ml	Fe-55(C2):	<1.0 E-06 μ Ci/ml
Fe-59:	<2.4 E-08 μ Ci/ml	Co-57:	<1.0 E-08 μ Ci/ml
Co-58:	<1.9 E-08 μ Ci/ml	Co-60:	<2.0 E-08 μ Ci/ml
Cu-64:	<3.5 E-06 μ Ci/ml	Zn-65:	<4.2 E-08 μ Ci/ml
Kr-85:	<4.8 E-08 μ Ci/ml	Kr-85m:	<1.1 E-09 μ Ci/ml
Sr-89(B1):	<3.0 E-08 μ Ci/ml	Sr-89(B2):	<3.0 E-08 μ Ci/ml
Sr-89(C2):	<3.0 E-08 μ Ci/ml	Sr-90(B1):	<7.0 E-09 μ Ci/ml
Sr-90(B2):	<9.0 E-09 μ Ci/ml	Sr-90(C2):	<6.0 E-09 μ Ci/ml
Zr-95:	<1.0 E-08 μ Ci/ml	Zr-97:	<1.5 E-08 μ Ci/ml
Nb-95:	<1.0 E-08 μ Ci/ml	Nb-97:	<1.7 E-08 μ Ci/ml
Mo-99:	<1.2 E-07 μ Ci/ml	Tc-99m:	<1.2 E-08 μ Ci/ml
Ru-103:	<1.6 E-08 μ Ci/ml	Ru-106:	<1.2 E-07 μ Ci/ml
Ag-110m:	<1.3 E-08 μ Ci/ml	Sn-113:	<1.5 E-08 μ Ci/ml
Sb-125:	<4.2 E-08 μ Ci/ml	Te-132:	<1.2 E-08 μ Ci/ml
I-131:	<1.2 E-08 μ Ci/ml	I-132:	<1.6 E-08 μ Ci/ml
I-133:	<1.8 E-08 μ Ci/ml	Xe-131m:	<5.1 E-07 μ Ci/ml
Xe-133:	<3.0 E-08 μ Ci/ml	Xe-133m:	<1.1 E-07 μ Ci/ml
Xe-135:	<1.4 E-08 μ Ci/ml	Ba-140:	<6.1 E-08 μ Ci/ml
La-140:	<2.1 E-08 μ Ci/ml	Ce-141:	<1.9 E-08 μ Ci/ml
Ce-144:	<9.0 E-08 μ Ci/ml	Cs-134:	<1.6 E-08 μ Ci/ml
Cs-136:	<1.4 E-08 μ Ci/ml		

^c Quarterly composite sample

TABLE 7. LIQUID EFFLUENTS - ABNORMAL RELEASES^a

NUCLIDES	UNIT	THIRD QUARTER	FOURTH QUARTER
1. <u>Fission and Activation Products</u>		N/A	N/A
2. <u>Tritium</u>	Ci	N/A	N/A
3. <u>Dissolved and Entrained Gases</u>		N/A	N/A

^a There were no abnormal liquid releases during the third or fourth quarters of 1991.

TABLE 8. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite for Burial or Disposal (not irradiated fuel)

1.	Type of Waste	UNIT	QUANTITY	EST. TOTAL PERCENT ERROR
a.	Spent resins, filter sludges, evaporator bottoms, etc.	m ³ Ci	6.20E+01 5.42E+02	2.5E+01
b.	Dry compressible waste, contaminated equipment, etc.	m ³ Ci	9.60E+01 1.26E+00	2.5E+01
c.	Irradiated components, control rods, etc.	m ³ Ci	0.00E+00 0.00E+00	N/A
d.	Other:			
	1. Contaminated Oil	m ³ Ci	4.47E+00 2.86E-04	2.5E+01

2. Estimate of Major Nuclide Composition (by type of waste)

	PERCENT COMPOSITION
a. Fe-55	5.3
Ni-63	12.7
Cs-134	18.6
Cs-137	56.1
b. Fe-55	20.5
Co-58	12.6
Co-60	25.9
Cs-134	6.0
Cs-137	16.2
Mn-54	7.7
Cr-51	5.5
Ni-63	5.3
d. Fe-55	8.3
Co-60	18.0
Ni-63	31.0
Cs-137	41.0

TABLE B. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (continued)

A. Solid Waste Shipped Offsite for Burial or Disposal (not irradiated fuel) (continued)

3. Solid Waste Disposition

Number of Shipments: 6

Mode of Transportation: Truck

Destination: Barnwell, SC

Type of Container (Container Volume): 30 B25 Boxes (2.7 m³), 1 Resin Liner (5.80 m³), 3 Resin Liners (3.36 m³), 1 Resin Liner (5.1 m³)

Solidification Agents: None

Number of Shipments: 4

Mode of Transportation: Truck

Destination: Oak Ridge, TN

Type of Container: 6 B25 Boxes (2.7 m³) containing 20 55-gallon drums, 6 B25 Boxes (2.7 m³), 7 Resin Liners (5.84 m³)

Solidification Agents: None

B. Irradiated Fuel Shipments

There were no shipments of irradiated fuel.

TABLE 9. SEMIANNUAL DOSES DUE TO GASEOUS RELEASES

A. Maximum Individual Doses Due to I-131, H-3, and Particulates with Half-lives Greater Than 8 Days^a

1. Whole Body Dose

	SECTOR	DISTANCE(m)	AGE	DOSE(mrem)
Quarter 1	SSE	2900	Child	2.13E-03
Quarter 2	W	1050	Child	1.37E-03
Semiannual	W	1050	Child	2.77E-03
Quarter 3	WSW	2640	Child	2.71E-02
Quarter 4	SSE	2900	Child	1.34E-03
Semiannual	WSW	2640	Child	2.71E-02
1991 Annual	WSW	2640	Child	2.76E-02

2. Significant Organ Dose

	SECTOR	DISTANCE(m)	AGE	ORGAN	DOSE(mrem)
Quarter 1	SSE	2900	Child	Thyroid	4.07E-03
Quarter 2	W	1050	Child	Thyroid	1.40E-01
Semiannual	W	1050	Child	Thyroid	1.44E-01
Quarter 3	WSW	2640	Child	Thyroid	4.20E-02
Quarter 4	SSE	2900	Child	Thyroid	2.91E-03
Semiannual	WSW	2640	Child	Thyroid	4.22E-02
1991 Annual	W	1050	Child	Thyroid	1.44E-01

B. Maximum Individual Doses Due to Noble Gas^a

1. Whole Body Dose

	SECTOR	DISTANCE(m)	AGE	DOSE(mrem)
Quarter 1	NE	900	NA	1.46E-03
Quarter 2	NE	900	NA	9.78E-03
Semiannual	NE	900	NA	1.12E-02
Quarter 3	S	1070	NA	8.17E-03
Quarter 4	N	800	NA	1.00E-04
Semiannual	S	1070	NA	8.18E-03
1991 Annual	NE	900	NA	1.48E-02

^a Does not include abnormal releases

Table 9. SEMIANNUAL DOSES DUE TO GASEOUS RELEASES (continued)

2. Skin Dose

	SECTOR	DISTANCE(m)	AGE	DOSE(mrem)
Quarter 1	NE	900	NA	4.02E-03
Quarter 2	NE	900	NA	3.67E-02
Semiannual	NE	900	NA	4.08E-02
Quarter 3	S	1070	NA	2.56E-02
Quarter 4	N	880	NA	1.75E-03
Semiannual	S	1070	NA	2.56E-02
1991 Annual	NE	900	NA	5.10E-02

C. Population Doses due to I-131, H-3, and Particulates with Half-lives Greater than 8 Days

	ORGAN	TOTAL INTEGRATED POPULATION DOSE (person rem)	AVERAGE DOSE TO INDIVIDUALS IN POPULATION (mrem)
Quarter 1	W/body	1.74E-03	7.80E-07
Quarter 2	W/body	1.39E-03	6.24E-07
Semiannual	W/body	3.12E-03	1.40E-06
Quarter 3	W/body	7.48E-03	3.36E-06
Quarter 4	W/body	1.49E-03	6.69E-07
Semiannual	W/body	8.97E-03	4.03E-06
1991 Annual	W/body	1.21E-02	5.43E-06

D. Population Doses due to Noble Gas

	ORGAN	TOTAL INTEGRATED POPULATION DOSE (person rem)	AVERAGE DOSE TO INDIVIDUALS IN POPULATION (mrem)
Quarter 1	W/body	1.29E-03	5.82E-07
Quarter 2	W/body	1.33E-02	5.97E-06
Semiannual	W/body	1.46E-02	6.55E-06
Quarter 3	W/body	1.84E-03	8.26E-06
Quarter 4	W/body	8.96E-05	4.03E-08
Semiannual	W/body	1.85E-02	8.30E-06
1991 Annual	W/body	3.31E-02	1.49E-05

TABLE 9. SEMIANNUAL DOSFS DUE TO GASEOUS RELEASES (continued)

E. Abnormal Releases due to Overpressurization of the Auxiliary Steam System

1. Maximum Individual Dose due to I-131, H-3, and Particulates with Half-lives Greater than 8 Days

SECTOR	DISTANCE(m)	AGE	ORGAN	DOSE(mrem)
SSE	2900	Adult	W/body	9.83E-06
SSE	2900	Child	Liver	1.65E-05

2. Maximum Individual Dose due to Noble Gas*

SECTOR	DISTANCE(m)	AGE	ORGAN	DOSE(mrem)
NA	NA	NA	W/body	0.00E+00
NA	NA	NA	Skin	0.00E+00

* Noble gases were not detected above the lower level of detectability in samples from the Auxilliary Steam System. Refer to Table 6 for LLD values.

TABLE 1C. SEMIANNUAL DOSES DUE TO LIQUID RELEASES

A. Maximum Individual Whole Body Dose

	SECTOR	DISTANCE(mi)	AGE	DOSE(mrem)
Quarter 1	NW	0.6	Adult	7.82E-03
Quarter 2	NW	0.6	Child	2.73E-03
Semiannual	NW	0.6	Adult	1.06E-02
Quarter 3	NW	0.6	Adult	3.18E-02
Quarter 4	NW	0.6	Adult	2.71E-02
Semiannual	NW	0.6	Adult	5.89E-02
1991 Annual	NW	0.6	Adult	6.95E-02

B. Maximum Individual Significant Organ Dose

	SECTOR	DISTANCE(mi)	AGE	ORGAN	DOSE(mrem)
Quarter 1	NW	0.6	Child	Liver	9.84E-03
Quarter 2	NW	0.6	Child	Liver	3.35E-03
Semiannual	NW	0.6	Child	Liver	1.32E-02
Quarter 3	NW	0.6	Teen	Liver	4.44E-02
Quarter 4	NW	0.6	Teen	GI-LLI	9.50E-02
Semiannual	NW	0.6	Teen	GI-LLI	9.91E-02
1991 Annual	NW	0.6	Teen	GI-LLI	1.12E-01

C. Population Dose

	ORGAN	TOTAL INTEGRATED POPULATION DOSE (person rem)	AVERAGE DOSE TO INDIVIDUALS IN POPULATION (mrem)
Quarter 1	W/body	2.57E-01	1.15E-04
Quarter 2	W/body	2.72E-01	1.22E-04
Semiannual	W/body	5.28E-01	2.37E-04
Quarter 3	W/body	3.31E-01	1.49E-04
Quarter 4	W/body	1.36E+00	6.10E-04
Semiannual	W/body	1.69E+00	7.59E-04
1991 Annual	W/body	2.22E+00	9.96E-04

TABLE 11. 1991 ANNUAL DOSE TO THE MOST-EXPOSED MEMBER OF THE PUBLIC

	ANNUAL DOSE (mrem)	40 CFR 190 LIMITS (mrem)	PERCENT OF LIMITS
<u>Whole Body Dose</u>			
- Noble Gas	1.48E-02		
- Iodine, Tritium, Particulates	2.76E-02		
- Liquid	6.95E-02		
Total Whole Body Dose	1.12E-01	25	2.44E-01
<u>Thyroid Dose</u>			
-Iodine, Tritium, Particulates	1.44E-01	75	1.92E-01
<u>Skin Dose</u>			
- Noble Gas	5.10E-02	25	2.04E-01
<u>GI-LLI Dose</u>			
- Liquid	1.12E-01	25	4.48E-01

METEOROLOGICAL DATA

Meteorological data on magnetic tape for July through December 1991 has been submitted with this document to the U.S. Nuclear Regulatory Commission Document Control Desk, Washington, D.C. 20555.