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US Nuclear Regulatory Commission  
Washington, DC 20555  
Attn: Document Control Desk

Three Mile Island Nuclear Station, Unit 2 (TMI-2)  
Operating Licensing No. DPR-73  
Docket No. 50-320  
Quarterly Dose Assessment Report Fourth Quarter 1991  
Semi-Annual Radioactive Effluent Release Report

Dear Sir:

The attached submittal includes: 1) the quarterly report of radiological releases and estimated doses for the Fourth Quarter 1991 in accordance with the TMI-2 Technical Specifications Appendix B Section 5.6.1.c; and 2) the TMI-2 semi-annual radioactive effluent release report for the Third and Fourth Quarters 1991, in accordance with the requirements of 10 CFR 50.36a(a)(2).


The maximum hypothetical doses received by an individual from TMI-2 effluents for the latest reporting period is 0.0002 mrem whole body dose from liquid releases and 0.06 mrem whole body dose from gaseous releases. These doses are each less than 0.5% of the Technical Specification limits and are 1200 times lower than the dose the average individual in the TMI area receives from natural background radiation during the same time period. The reported maximum hypothetical doses are conservative overestimates of the actual offsite doses which are likely to occur.

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Dose summaries and effluent releases for the previous quarters of the 1991 calendar year were submitted via GPU Nuclear letter C312-91-2037 dated May 29, 1991, C312-91-2074 dated August 29, 1991, C312-91-2095 dated November 27, 1991, and C312-92-2009 dated February 14, 1992.

Sincerely,

  
R. L. Long  
Director, Corporate Services/  
TMI-2

EDS/dlb  
Attachments

cc: T. T. Martin - Regional Administrator, Region I  
M. T. Masnik - Project Manager, PDNP Directorate  
L. H. Thonus - Project Manager, TMI Site  
F. I. Young - Senior Resident Inspector, TMI

LIST OF ATTACHMENTS

TMI-2 Quarterly Dose Assessment Report Fourth Quarter 1991

Attachment 1	Executive Summary
Attachment 2	Effluent Summary
Attachment 3	Dose Report
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TMI-2 Semi-Annual Radioactive Effluent Release Report  
Third and Fourth Quarters 1991

Attachment 5	Effluent and Waste Disposal Semi-Annual Report
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Three Mile Island Nuclear Station Unit Two  
Effluent and Off Site Dose Report  
for the Period of October 1, 1991 through December 31, 1991

This report summarizes the radioactive liquid and gaseous releases (effluents) from Three Mile Island Unit Two and the calculated maximum hypothetical radiation exposure to the public resulting from these releases. This report covers the period of operation from October 1, 1991 through December 31, 1991.

Radiological releases from the plant are monitored by installed plant radiation monitors which survey the plant stack for gaseous releases and liquid discharges to the Susquehanna River. These monitors and associated sample analyses provide a means to accurately determine the type and quantities of radioactive materials being released to the environment.

Calculations of the maximum hypothetical dose to an individual and the total population around Three Mile Island due to radioactive releases from the plant are made utilizing environmental conditions existing at the time of the release. Susquehanna River flow data are used to calculate the maximum hypothetical doses to an individual and the population downstream of TMI due to liquid releases. Actual or "real-time" meteorological data from an onsite tower is used to determine the doses resulting from gaseous releases from the plant. The use of real-time meteorological information permits the determination of both the direction in which the release traveled and the dispersion of radioactive material in the environment.

Utilizing gaseous effluent data and real-time meteorology, the maximum hypothetical dose to any individual and to the total population within 50 miles of the plant is calculated. Similarly, Susquehanna River flow and liquid effluent data are used to calculate a maximum hypothetical dose to an individual and a population dose from liquid effluents for any shoreline exposure down to the Chesapeake Bay. Exposure to the public from consumption of water and fish withdrawn from the Susquehanna River downstream of the plant is also calculated.

Dose calculations for liquid and gaseous effluents are performed using a mathematical model which is based on the methods defined by the U.S. Nuclear Regulatory Commission.

The maximum hypothetical doses are conservative overestimates of the actual off site doses which are likely to occur. For example, the dose does not take into consideration the removal of radioactive material from the river water by precipitation of insoluble salts, absorption onto river sediment, biological removal, or removal during processing by water companies prior to distribution and consumption.

Liquid discharges made during the reporting period October 1, 1991 through December 31, 1991 consisted of 0.0002 curies of tritium, 0.00001 curies of cesium-137, and 0.000002 curies of strontium-90. The quantities of effluents are consistent with results of previous quarters. The quantities of each radionuclide released are actually up to 1 million times smaller than the normal existing environmental quantities that flowed past the plant during the same time period.

During the reporting period October 1, 1991 through December 31, 1991, the maximum hypothetical calculated whole body dose to an individual due to liquid effluents from Three Mile Island Unit Two was 0.0002 millirem. The maximum hypothetical calculated dose to any organ of an individual was 0.0003 millirem to the bone.

Airborne discharges made during this same time period consisted of 104 curies of tritium, 0.000005 curies of cesium-137, 0.00001 curies of strontium-90, and 0.00002 curies of carbon-14. These quantities are primarily due to releases from the evaporation of TMI-2 Accident Generated Water. The maximum hypothetical calculated organ dose to any individual due to gaseous effluents was about 0.06 millirem to the whole body. The maximum hypothetical calculated whole body dose to any individual due to gaseous effluents was 0.06 mrem.

The total maximum hypothetical whole body dose of 0.06 mrem received by any individual from effluents from the Three Mile Island Nuclear Station Unit 2 for the reporting period is 1200 times lower than the dose the average individual in the Three Mile Island area receives from natural background and radon during the same time period. Natural background averages about 25 millirem whole body per quarter in the Three Mile Island area. In addition, average equivalent dose to the whole body from natural radon is about 50 millirem per quarter.

The doses which could be received by the maximum hypothetical individual are each less than 0.5 percent of the annual guidelines established by the Nuclear Regulatory Commission.



EFFLUENT SUMMARY  
THREE MILE ISLAND UNIT 2 LIQUID AND GASEOUS EFFLUENTS  
(SUMMARY OF ALL RELEASES)

TYPE EFFLUENT	4TH QUARTER 1991			
	OCTOBER	NOVEMBER	DECEMBER	TOTAL 4TH QUARTER
I. LIQUID EFFLUENTS:				
A. FISSION AND ACTIVATION PRODUCTS (NOT INCLUDING H-3, GASES, & ALPHA)				
1. TOTAL RELEASE (Ci)	5.80E-06	2.37E-06	7.89E-06	1.61E-05
2. CONCENTRATION (uCi/cc)	1.19E-12	5.75E-13	2.36E-12	1.30E-12
B. TRITIUM				
1. TOTAL RELEASE (Ci)	9.79E-05	1.81E-05	5.73E-05	1.73E-04
2. CONCENTRATION (uCi/cc)	2.00E-11	4.38E-12	1.71E-11	1.40E-11
C. DISSOLVED AND ENTRAINED GASES				
1. TOTAL RELEASE (Ci)	<LLD	<LLD	<LLD	<LLD
2. CONCENTRATION uCi/cc)	N/A	N/A	N/A	N/A
D. GROSS ALPHA ACTIVITY				
1. TOTAL RELEASE (Ci)	<LLD	<LLD	<LLD	<LLD
E. VOLUME OF WASTE RELEASED PRIOR TO DILUTION (LITERS)	1.74E+04	1.62E+04	2.44E+04	5.80E+04
F. VOLUME OF DILUTION WATER (FLOW TO RIVER IN LITERS FROM NPDES REPORT)	4.89E+09	4.12E+09	3.34E+09	1.24E+10
G. NUMBER OF BATCH RELEASES	5	8	8	21

1991 UNIT 2 LIQUID RADIOISOTOPE RELEASES BY ISOTOPE (C1)

RADIOISOTOPE	OCTOBER	NOVEMBER	DECEMBER	4TH QUARTER 1991
FISSION AND ACTIVATION PRODUCTS				
(NOT INCLUDING ALPHA, H-3 & GASES)	<LLD	<LLD	<LLD	<LLD
AG-110M	<LLD	<LLD	<LLD	<LLD
CE-144	<LLD	<LLD	<LLD	<LLD
CO-58	<LLD	<LLD	<LLD	<LLD
CO-60	<LLD	<LLD	<LLD	<LLD
CS-134	<LLD	<LLD	<LLD	<LLD
CS-137	5.09E-06	1.71E-06	6.89E-06	1.37E-05
I-131	<LLD	<LLD	<LLD	<LLD
SR-90	7.15E-07	6.85E-07	9.99E-07	2.38E-06
TOTAL				
	5.80E-06	2.37E-06	7.89E-06	1.61E-05
H-3	9.79E-05	1.81E-05	5.73E-05	1.73E-04

EFFLUENT SUMMARY  
THREE MILE ISLAND UNIT 2 LIQUID AND GASEOUS EFFLUENTS  
(SUMMARY OF ALL RELEASES)

TYPE EFFLUENT

4TH QUARTER 1991

	OCTOBER	NOVEMBER	DECEMBER	TOTAL 4TH QUARTER
II. GASEOUS EFFLUENTS:				
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE (Ci)	<LLD	<LLD	<LLD	<LLD
2. RELEASE RATE (uCi/sec)	N/A	N/A	N/A	N/A
B. IODINE 131 RELEASED (Ci)	<LLD	<LLD	<LLD	<LLD
C. PARTICULATES WITH HALF-LIVES >8 DAYS				
1. TOTAL RELEASES (NOT INCLUDING ALPHA) (Ci)	1.82E-05	9.79E-06	1.27E-05	4.07E-05
2. RELEASE RATE (uCi/sec)	6.78E-06	3.78E-06	4.75E-06	5.12E-06
3. GROSS ALPHA RADIO- ACTIVITY (Ci)	<LLD	<LLD	<LLD	<LLD
D. TRITIUM				
1. TOTAL RELEASE (Ci)	3.06E+01	2.06E+01	5.30E+01	1.04E+02
2. RELEASE RATE (uCi/sec)	1.14E+01	7.95E+00	1.98E+01	1.31E+01
E. SECONDS IN PERIOD REPORTED	2.68E+06	2.59E+06	2.68E+06	7.95E+06
F. NUMBER OF BATCH RELEASES	0	0	0	0



UNIT 2 GASEOUS RADIONUCLIDE RELEASES BY ISOTOPE (Ci)

RADIOISOTOPE	OCTOBER	NOVEMBER	DECEMBER	4TH QUARTER	1991
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FISSION AND ACTIVATION GASES

KR-85	<LLD	<LLD	<LLD	<LLD	<LLD
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TOTAL

PARTICULATES (HALF-LIVES >8 DAYS)

CS-137	3.04E-06	<LLD	1.85E-06	4.89E-06
CS-134	<LLD	<LLD	<LLD	<LLD
SR/Y-90	1.15E-05	1.58E-06	<LLD	1.31E-05
C-14	3.65E-06	8.21E-06	1.09E-05	2.27E-05
SB-125	<LLD	<LLD	<LLD	<LLD
CO-60	<LLD	<LLD	<LLD	<LLD
GROSS ALPHA	<LLD	<LLD	<LLD	<LLD

TOTAL (INCLUDING ALPHA)	1.62E-05	9.79E-06	1.27E-05	4.07E-05
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TOTAL (MINUS ALPHA)	1.62E-05	9.79E-06	1.27E-05	4.07E-05
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TRITIUM (T-3)	3.05E+01	2.06E+01	5.30E+01	1.04E+02
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TABLE 1

UNIT 2  
Fourth Quarter Dose Report

SUMMARY OF MAXIMUM INDIVIDUAL DOSES FOR UNIT 2 FROM  
October 1, 1991 through December 31, 1991

Effluent	Applicable Organ	Estimated Dose (mrem)	Age Group	Location		% of Applicable Limit		Limits (mrem) 10 CFR 50 Appendix I	
				Dist (m)	Dir (toward)	Quarterly	Annual	Quarterly	Annual
(1) Liquid	Total Body	1.87E-4	Adult	Receptor 1		---	6.23E-3	---	3.0
(2) Liquid	Bone	3.02E-4	Child	Receptor 1		---	3.02E-3	---	10.0
(3) Noble Gas	Air Dose (gamma-mrad)	0	---	---	---	---	0	---	10.0
(4) Noble Gas	Air Dose (beta-mrad)	0	---	---	---	---	0	---	20.0
(5) Noble Gas	Total Body	0	---	---	---	---	0	---	5.0
(6) Noble Gas	Skin	0	---	---	---	---	0	---	15.0
(7) Iodine & Particulates	Lung, Total Body	6.18E-2	Teen	700	E	---	4.12E-1	---	15.0

SUMMARY OF MAXIMUM POPULATION DOSES FOR UNIT 2 FROM  
October 1, 1991 through December 31, 1991

Effluent	Applicable Organ	Estimated Population Dose (person-rem)
(8) Liquid	Total Body	1.20E-3
(9) Liquid	Bone	4.39E-3
(10) Gaseous	Total Body	2.80E-1
(11) Gaseous	Liver, Thyroid, Lung, GI-LLI, Kidney	2.80E-1

## INTERPRETATION OF DOSE SUMMARY TABLE

The Dose Summary Table presents the maximum hypothetical doses to an individual and the general population resulting from the release of gaseous and liquid effluents from TMI-2 during the fourth quarter reporting period of 1991.

### A. Liquid (Individual)

The first two lines present the maximum hypothetical dose to an individual. Presented are the whole body and critical organ doses. Calculations are performed on the four age groups and eight organs recommended in Regulatory Guide 1.109. The pathways considered for TMI-2 are consumption of drinking water and fish and standing on the shoreline influenced by TMI effluents. The latter two pathways are considered to be the primary recreational activities associated with the Susquehanna River in the vicinity of TMI. The "receptor" would be that individual who consumes water from the Susquehanna River and fish residing in the plant discharge, while occupying an area of shoreline influenced by the plant discharge.

For the fourth quarter of 1991 the calculated maximum whole body dose received by anyone would have been  $1.87\text{E-}4$  mrem to an adult. Similarly, the maximum organ dose would have been  $3.02\text{E-}4$  mrem to the bone of a child.

### B. Gaseous (Individual)

There are seven major pathways considered in the dose calculations for gaseous effluents. These are: (1) plume, (2) inhalation, consumption of (3) cow milk, (4) goat milk, (5) vegetables, (6) meat, and (7) standing on contaminated ground.

Lines 3 and 4 present the maximum gamma and beta plume exposure, respectively, from noble gases at or beyond the site boundary. Direct noble gas plume dose to the total body and skin of an individual is shown on lines 5 and 6, respectively. Because there were no noble gases released during the third quarter, the plume exposures (lines 3 and 4) and plume doses (lines 5 and 6) are zero.

The Iodines and Particulates section described in line 7 represents the maximum exposed organ due to iodine, particulates, and tritium. The dose presented in this section again reflects the maximum exposed organ for the appropriate age group.

The fourth quarter 1991 iodines and particulates would have resulted in a maximum dose of  $6.18\text{E-}2$  mrem to the lung of a teen residing 700 meters from the site in the E sector. The maximum total body dose as a result of iodines and particulates was  $6.18\text{E-}2$  mrem to a teen residing 700 meters from the site in the E sector. No other organ of any age group would have received a greater dose.

C. Liquid and Gaseous (Population)

Lines 8 - 11 present the person-rem doses resulting from the liquid and gaseous effluents. These doses are summed over all pathways and the affected populations. The person-rem doses from liquid effluents are based upon the population encompassed within the region from the TMI outfall extending down to the Chesapeake Bay. The person-rem for doses from gaseous effluents are based upon the 1980 population and consider the population out to a distance of 50 miles around TMI. Population doses are summed over all distances and sectors to give an aggregate dose.

Based upon the calculations performed for the fourth quarter of 1991, liquid effluents resulted in a whole body population dose of  $1.20\text{E-}3$  person-rem. The maximum critical organ population dose was  $4.39\text{E-}3$  person rem to the bone. Gaseous effluents resulted in a whole body population dose of  $2.80\text{E-}1$  person-rem. The maximum organ population dose was  $2.80\text{E-}1$  person-rem to the liver, lung, thyroid, kidney, and GI tract.

EFFLUENT AND WASTE DISPOSAL SEMI ANNUAL REPORT

July 1, 1991 to December 31, 1991

SUPPLEMENTAL INFORMATION

FACILITY: TMI Unit 2 (All Release Points) LICENSEE: DPR-73-320

1. Regulatory Limits:

- a. Fission and activation gases:
- b. Iodines:
- c. Particulates, half-lives > 6 days: Environmental Tech Spec.,
- d. Liquid Effluents: Article 2.3

2. Maximum Permissible Concentrations:

Provide the MPC's used in determining allowable release rates or concentrations.

- a. Fission and activation gases:
- b. Iodines: 10CFR, Part 20, Appendix B
- c. Particulates, half-lives 8 days:
- d. Liquid effluents:

3. Average Energy:

Provide the average energy (E) of the radionuclide mixture in releases of fission and activation gases, if applicable - N/A

4. Measurements and Approximations of Total Radioactivity:

Provide the methods used to measure or approximate the total radioactivity in effluents and the methods used to determine radionuclide composition.

- a. Fission and activation gases: HpGe(Li) Spectrometry, Liquid Scintillation
- b. Iodines: HpGe(Li) Spectrometry,
- c. Particulates: HpGe(Li) Spectrometry, Gas Flow Proportional, Beta Spectrometry
- d. Liquid Effluents: HpGe(Li) Spectrometry, Liquid Scintillation

5. Batch Releases:

Provide the following information relating batch releases of radioactive materials in liquid and gaseous effluents.

A. Liquid	1991	1991
	3rd Quarter	4th Quarter
1. Number of batch releases:	38	21
2. Total time period for batch releases:	N/A	N/A
3. Maximum time period for a batch release:	N/A	N/A
4. Average time period for batch releases:	N/A	N/A
5. Minimum time period for a batch release:	N/A	N/A
6. Average stream flow during periods of release of effluent into flowing stream:	N/A	N/A
B. Gaseous:	1991	1991
	3rd Quarter	4th Quarter
1. Number of batch releases:	0	0
2. Total time period for batch releases:	N/A	N/A
3. Maximum time period for a batch release:	N/A	N/A
4. Average time period for a batch releases:	N/A	N/A
5. Minimum time period for a batch release:	N/A	N/A
6. Abnormal Releases:		
A. Liquid:		
1. Number of releases:	None	None
2. Total activity released:	N/A	N/A
B. Gaseous:		
1. Number of releases:	None	None
2. Total activity released:	N/A	N/A

N/A = not applicable



TABLE 1A  
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	UNITS	1991 3RD QUARTER	1991 4TH QUARTER	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	CI	<LLD	<LLD	+/- 60%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	N/A	N/A	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	TECH SPEC LIMIT = 7.2 E+3 uCi/sec FOR KR-85
B. IODINES				
1. TOTAL IODINE-131	CI	<LLD	<LLD	+/- 60%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	N/A	N/A	
3. PERCENT OF TECH SPEC LIMIT	%	N/A	N/A	TECH SPEC LIMIT = 2.4 E-2 uCi/sec
C. PARTICULATES				
1. PARTICULATES WITH HALF-LIVES >8 DAYS	CI	3.56E-05	4.07E-05	+/- 60%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	4.47E-06	5.12E-06	
3. PERCENT OF TECH SPEC LIMIT	%	0.02%	0.02%	TECH SPEC LIMIT =
4. GROSS ALPHA RADIOACTIVITY	CI	1.03E-08	<LLD	2.4 E-2 uCi/sec
D. TRITIUM				
1. TOTAL RELEASE	CI	7.47E+01	1.04E+02	+/- 60%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	9.40E+00	1.31E+01	
3. PERCENT OF TECH SPEC LIMIT	%	0.20%	0.27%	TECH SPEC LIMIT = 4.8 E+3 uCi/sec FOR H-3

TABLE 1B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES RELEASED	UNIT	1991 3RD QUARTER	1991 4TH QUARTER	1991 3RD QUARTER	1991 4TH QUARTER
1. FISSION GASES					
KRYPTON-85	C1	<LLD	<LLD	<LLD	<LLD
KRYPTON-85M	C1	<LLD	<LLD	<LLD	<LLD
KRYPTON-87	C1	<LLD	<LLD	<LLD	<LLD
KRYPTON-88	C1	<LLD	<LLD	<LLD	<LLD
XENON-133	C1	<LLD	<LLD	<LLD	<LLD
XENON-135	C1	<LLD	<LLD	<LLD	<LLD
XENON-135M	C1	<LLD	<LLD	<LLD	<LLD
XENON-138	C1	<LLD	<LLD	<LLD	<LLD
OTHERS (SPECIFY)	C1	<LLD	<LLD	<LLD	<LLD
	C1				
	C1				
	C1				
UNIDENTIFIED	C1	<LLD	<LLD	<LLD	<LLD
TOTAL FOR PERIOD	C1	N/A	N/A	N/A	N/A
2. IODINES					
IODINE-131	C1	<LLD	<LLD	N/A	N/A
IODINE-133	C1	<LLD	<LLD	N/A	N/A
IODINE-135	C1	<LLD	<LLD	N/A	N/A
TOTAL FOR PERIOD	C1	N/A	N/A	N/A	N/A
3. PARTICULATES					
STRONTIUM-89	C1	<LLD	<LLD	<LLD	<LLD
STRONTIUM-90	C1	1.61E-05	1.31E-05	<LLD	<LLD
CESIUM-134	C1	<LLD	<LLD	<LLD	<LLD
CESIUM-137	C1	6.73E-06	4.69E-06	<LLD	<LLD
BARIUM-LANTHANUM-140	C1	<LLD	<LLD	<LLD	<LLD
CARBON-14	C1	1.28E-05	2.27E-05	<LLD	<LLD
ANTIMONY-125	C1	<LLD	<LLD	<LLD	<LLD
COBALT-60	C1	<LLD	<LLD	<LLD	<LLD
PU-239/240	C1	4.97E-10	<LLD	<LLD	<LLD
CM-242	C1	6.38E-09	<LLD	<LLD	<LLD
CM-243	C1	1.40E-09	<LLD	<LLD	<LLD

TABLE 2A  
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	UNITS	1991 3RD QUARTER	1991 4TH QUARTER	EST. TOTAL ERROR %
	PLUM RELEASES (GROSS RELEASE)	1991 RELEASES (GROSS RELEASE)	1991 RELEASES (GROSS RELEASE)	1991 RELEASES (GROSS RELEASE)
A. FISSION AND ACTIVATION PRODUCTS				
1. TOTAL RELEASES (NOT INCLUDING TRITIUM, GASES, ALPHA)	Ci	1.52E-05	1.61E-05	+/- 60% BASED ON 2E-5 uCi/ml (Cn-137)
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	1.43E-12	1.30E-12	
3. PERCENT OF APPLICABLE LIMIT	%	0%	0%	
B. TRITIUM				
1. TOTAL RELEASE	Ci	1.76E-03	1.73E-04	+/- 60% BASED ON 3E-3 uCi/ml (H-3)
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	1.67E-10	1.60E-11	
3. PERCENT OF APPLICABLE LIMIT	%	0%	0%	
C. DISSOLVED AND EMPTAINED GASES				
1. TOTAL RELEASE	Ci	<LLD	<LLD	+/- 60%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	<LLD	<LLD	
3. PERCENT OF APPLICABLE LIMIT	%	<LLD	<LLD	
D. GROSS ALPHA ACTIVITY				
1. TOTAL RELEASE	Ci	<LLD	<LLD	+/- 25%
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	liters	1.07E+05	5.80E+04	+/- 25%
F. VOLUME OF DILUTION WATER USED	liters	1.06E+10	1.24E+10	+/- 10%

TABLE 2B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

LIQUID EFFLUENTS

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE	
		1991 3RD QUARTER	1991 4TH QUARTER	1991 3RD QUARTER	1991 4TH QUARTER
STRAONTIUM-89	C1			<LLD	<LLD
STRAONTIUM-90	C1			1.17E-06	2.38E-06
CESIUM-134	C1			<LLD	<LLD
CESIUM-137	C1			1.40E-05	1.37E-05
IODINE-131	C1			<LLD	<LLD
COBALT-58	C1			<LLD	<LLD
COBALT-60	C1			<LLD	<LLD
IRON-59	C1			<LLD	<LLD
ZINC-65	C1			<LLD	<LLD
MANGANESE-54	C1			<LLD	<LLD
CHROMIUM-51	C1			<LLD	<LLD
ZIRCONIUM-NIOBIUM-95	C1			<LLD	<LLD
MOLYBDENUM-99	C1			<LLD	<LLD
TECHNETIUM-99M	C1			<LLD	<LLD
BARIUM-LANTHANUM-140	C1			<LLD	<LLD
CERIUM-141	C1			<LLD	<LLD
OTHER (SPECIFY)	C1				
UNIDENTIFIED	C1			<LLD	<LLD
TOTAL FOR PERIOD	C1			1.52E-05	1.61E-05
XENON-133	C1			<LLD	<LLD
XENON-135	C1			<LLD	<LLD

TABLE 3A  
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid waste shipped off-site for burial or disposal (not irradiated fuel)

1. Type of waste	UNIT	6 month period	EST. TOTAL ERROR %
a. spent resins, filter sludges, evaporator bottoms, etc.	m <sup>3</sup> C1	22.4 m <sup>3</sup> 52.7 C1	5%
b. Dry compressible waste, contaminated equipment, etc.	m <sup>3</sup> C1	294.6 m <sup>3</sup> 8.76 C1	5%
c. Irradiated components, control rods, etc.	m <sup>3</sup> C1	N/A	N/A
d. Other (describe)	m <sup>3</sup> C1	N/A	N/A

2. Estimate of major nuclide composition (by type of waste)	
a. Sr90	75.2 %
Cs137	19.1 "
Sb125	3.81 "
Tel25m	.873 "
b. Sr90	44.8 "
H3	25.25 "
Cs137	15.52 "
Pm147	5.85 "
Pu241	3.46 "
c.	
d.	

3. Solid Waste Disposition		
Number of Shipments	Mode of Transportation	Destination
See Attached		

### B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
N/A		



TMI-2 EFFLUENT & WASTE DISPOSAL SEMI-ANNUAL REPORT

July 1, 1991 through December 31, 1991

A.1.a - Material Shipped as Follows:

Three (3) Steel Liners at 170 Ft.<sup>3</sup> Each  
Two (2) Medium Poly Hics at 38.3 Ft.<sup>3</sup> Each  
Two (2) EA-50 High Integrity Containers - 49.0 Ft.<sup>3</sup> Each  
\*One (1) Steel Liner at 105 Ft.<sup>3</sup> Each

A.1.b

Hundred and Forty Three (243) Steel Drums at 7.5 Ft.<sup>3</sup> Each  
Eighty Nine (89) Steel Boxes at 92 Ft.<sup>3</sup> Each  
\*Ten (10) Steel Drums at 7.5 Ft.<sup>3</sup> Each  
\*Seven (7) Medium Poly Hics at 38.3 Ft.<sup>3</sup> Each  
One (1) Steel Liner at 50 Ft.<sup>3</sup>

Table A.3.a

<u>No. of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
Two (2) Shipment	Tractor - Cask (NuPac 14/190w)	U. S. Ecology - Hanford
Two (2) Shipment	Tractor - Cask (3-82B)	Chem-Nuclear - Barnwell
One (1) Shipment	Tractor - Cask (CNL 21-300)	Chem-Nuclear - Barnwell

Table A.3.b

<u>No. of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
*Five (5) Shipments	Tractor - Flatbed	Scientific Ecology Group Oak Ridge, TN
Three (3) Shipments	Tractor - Closed Van	U. S. Ecology, Hanford
Two (2) Shipments*	Tractor - Cask (CNS 21-300)	Chem-Nuclear - Barnwell
One (1) Shipment	Tractor - Flatbed	U.S. Ecology - Hanford

\*Material Sent to a Waste Processor for Volume Reduction

TABLE 1

TYPICAL LIQUID EFFLUENT LLD (Lower Limit of Detection) VALUES

ASSUMPTIONS:

Sample volume = 1 liter = 1000 cc  
Sample counting time = 1000 sec  
Sample counted with a 25% Ge(Li) for Gamma Emitters

ISOTOPE		$\mu\text{Ci/cc LLD}$	NOTES
Gross Alpha	$\alpha$	4 E-9	Counted with proportional counter
Gross Beta	$\beta$	7 E-8	Counted with proportional counter
Tritium	H-3	4 E-6	Counted with liquid scintillation counter
Krypton-85	Kr-85	1 E-4	
Xenon-131m	Xe-131m	2 E-5	
Xenon-133	Xe-133	1 E-6	
Xenon-135	Xe-135	3 E-7	
Chromium-51	Cr-51	3 E-6	
Manganese-54	Mn-54	4 E-7	
Cobalt-58	Co-58	4 E-7	
Iron-59	Fe-59	9 E-7	
Cobalt-60	Co-60	6 E-7	
Zinc-65	Zn-65	1 E-6	
Zirconium-95	Zr-95	7 E-7	
Niobium-95	Nb-95	4 E-7	
Molybdenum-99	Mo-99	3 E-7	
Technetium-99m	Tc-99m	3 E-7	
Silver-110m	Ag-110m	6 E-7	
Antimony-125	Sb-125	9 E-7	
Cesium-134	Cs-134	5 E-7	
Cesium-136	Cs-136	4 E-7	
Cesium-137	Cs-137	5 E-7	
Barium-140	Ba-140	1 E-6	
Lanthanum-140	La-140	7 E-7	
Cerium-141	Ce-141	5 E-7	
Cerium-144	Ce-144	3 E-6	
Iodine-131	I-131	3 E-7	
Iodine-133	I-133	4 E-7	
Phosphorus-32	P-32	1 E-6	These LLD values for liquid sample analyses of gross alpha, P-32, Fe-55, Sr-89, and Sr-90 are the same as Unit 1 which are offsite vendor LLD values.
Iron-55	Fe-55	5 E-8	
Strontium-89	Sr-89	5 E-8	
Strontium-90	Sr-90	5 E-8	
Gross Alpha	$\alpha$	1 E-7	

TABLE 2

TYPICAL GASEOUS EFFLUENT LLD (Lower Limit of Detection) VALUES

ASSUMPTIONS:	Sample volume (Marinelli)	1640cc
	Sample volume (Particulate & Charcoal Filters)	5.7E8cc
	Sample flow rate	2 cfm or 5.66E4cc/min
	Sample time	1 week or 1E4 min
	Sample volume (tritium bubbled thru water)	7.56E5cc
	Sample Rate	75cc/min
	Sample Time	1E4 min
	Sample Counting Time: $\alpha$ & H-3=20 min; $\beta$ =10 min; $\gamma$ =1000 sec	
	Sample Counters: $\gamma$ emitters	25% Ge(Li)
	$\alpha$ or $\beta$	Proportional Counter
	H-3	Liquid Scintillation Counter

ISOTOPE		$\mu\text{Ci/cc LLD}$	NOTES
Gross Alpha	$\alpha$	1 E-15	Particulate Filter Paper
Gross Beta	$\beta$	1 E-14	"
Tritium	H-3	1 E-10	Air bubbled thru water by a fritted disc or Fisher Milligan gas washer
Krypton-85	Kr-85	5 E-6	Marinelli
Krypton-85m	Kr-85m	2 E-8	"
Krypton-87	Kr-87	6 E-8	"
Krypton-88	Kr-88	5 E-8	"
Xenon-133	Xe-133	4 E-8	"
Xenon-133m	Xe-133m	1 E-7	"
Xenon-135	Xe-135	2 E-8	"
Xenon-135m	Xe-135m	3 E-7	"
Xenon-138	Xe-138	3 E-7	"
Iodine-131	I-131	2 E-8	"
Iodine-133	I-133	3 E-8	"
Iodine-135	I-135	2 E-7	"
Iodine-131	I-131	3 E-14	Charcoal Filter
Iodine-133	I-133	4 E-14	"
Iodine-135	I-135	3 E-13	"
Manganese-54	Mn-54	3 E-14	Particulate filter paper
Iron-59	Fe-59	8 E-14	"
Cobalt-58	Co-58	3 E-14	"
Cobalt-60	Co-60	5 E-14	"
Zinc-65	Zn-65	9 E-14	"
Strontium-89	Sr-89	2 E-14	"
Strontium-90	Sr-90	2 E-14	"
Molybdenum-99	Mo-99	2 E-14	"
Ruthenium-103	Ru-103	2 E-14	"
Silver-110m	Ag-110m	3 E-14	"
Cesium-134	Cs-134	4 E-14	"
Cesium-137	Cs-137	3 E-14	"
Cerium-141	Ce-141	3 E-14	"
Cerium-144	Ce-144	9 E-14	"