

EFFLUENT AND WASTE DISPOSAL SEMI ANNUAL REPORT
January 1, 1986 to June 30, 1986
SUPPLEMENTAL INFORMATION

FACILITY TMI Unit 2 (including EPICOR II) LICENSEE DPR-73-320

1. Regulatory Limits

- a. Fission and activation gases:
- b. Iodines:
- c. Particulates, half-lives >8 days: Environmental Tech Specs,
- d. Liquid effluents: Article 2.3

2. Maximum Permissible Concentrations

Provide the MPCs used in determining allowable release rates or concentrations.

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

3. Average Energy

Provide the average energy (\bar{E}) of the radionuclide mixture in releases of fission and activation gases, if applicable. 0.253 MeV(Kr-85)

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: Ge(Li) Spectrometry, Liquid Scintillation
- b. Iodines: Ge(Li) Spectrometry
- c. Particulates: Ge(Li) Spectrometry, Gas Flow Proportional Counting
- d. Liquid effluents: Ge(Li) Spectrometry, Liquid Scintillation

5. Batch Releases

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

A. Liquid

	1986 1st Quarter	1986 2nd Quarter
1. Number of batch releases:	35	31
2. Total time period for batch release:	N/A	N/A
3. Maximum time period for a batch release:	N/A	N/A
4. Average time period for batch release:	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

See Note (1) on Page 5 of this report
N/A = Not Applicable

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5. Batch Releases (cont'd)

B. Gaseous

	1986 1st Quarter	1986 2nd Quarter
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1. Number of batch releases:
2. Total time period for batch releases:
3. Maximum time period for a batch release:
4. Average time period for batch release:
5. Minimum time period for a batch release:

0	0
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

6. Abnormal Releases

A. Liquid

1. Number of releases:
2. Total activity released:

None	None
N/A	N/A

B. Gaseous

1. Number of releases:
2. Total activity released:

None	None
N/A	N/A

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

	UNIT	1986 1st QUARTER	1986 2nd QUARTER	EST. TOTAL ERROR, %
A. Fission & activation gases				
1. Total release	Ci	<u><LLD</u>	<u><LLD</u>	± 60%
2. Average release rate for period	μCi/sec.	<u>N/A</u>	<u>N/A</u>	Tech Spec Limit = 7.20E3 μCi/sec
3. Percent of Tech Spec limit	%	<u>N/A</u>	<u>N/A</u>	for Kr-85
B. Iodines				
1. Total Iodine-131 (Note 1)	Ci	<u>1.11E-6</u>	<u>3.94E-6</u>	± 60%
2. Average release rate for period	μCi/sec.	<u>1.43E-7</u>	<u>5.01E-7</u>	Tech Spec Limit = 2.40E-2 μCi/sec
3. Percent of Tech Spec limit	%	<u>5.96E-4</u>	<u>2.09E-3</u>	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	<u>8.54E-6</u>	<u>3.02E-6</u>	± 60%
2. Average release rate for period	μCi/sec.	<u>1.10E-6</u>	<u>3.84E-7</u>	Tech Spec Limit = 2.40E-2 μCi/sec
3. Percent of Tech Spec limit	%	<u>4.58E-3</u>	<u>1.60E-3</u>	
4. Gross alpha radioactivity	Ci	<u>5.77E-8</u>	<u>2.85E-8</u>	
D. Tritium				
1. Total release	Ci	<u>6.00E0</u>	<u>5.70E0</u>	± 60%
2. Average release rate for period	μCi/sec.	<u>7.72E-1</u>	<u>7.25E-1</u>	Tech Spec Limit = 4.80E3 μCi/sec
3. Percent of Tech Spec limit	%	<u>1.61E-2</u>	<u>1.51E-2</u>	for H-3

Note (1) TMI Unit 1 origin

TABLE 1B
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
GASEOUS EFFLUENTS-GROUND LEVEL RELEASE

Nuclides Released	UNIT II	Continuous	Mode	Batch Mode	
		1986 1st QUARTER	1986 2nd QUARTER	1986 1st QUARTER	1986 2nd QUARTER
1. Fission gases					
krypton-85	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
krypton-85m	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
krypton-87	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
krypton-88	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
xenon-133	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
xenon-135	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
xenon-135m	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
xenon-138	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
others (specify)	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
	Ci	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Unidentified	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
Total for period	Ci	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
2. Iodines					
iodine-131 (Note 1)	Ci	<u>1.11E-6</u>	<u>3.94E-6</u>	<u>N/A</u>	<u>N/A</u>
iodine-133	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
iodine-135	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
Total for period	Ci	<u>1.11E-6</u>	<u>3.94E-6</u>	<u>N/A</u>	<u>N/A</u>
3. Particulates					
strontium-89	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
strontium-90	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
cesium-134	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
cesium-137	Ci	<u>2.46E-6</u>	<u>7.24E-7</u>	<u>N/A</u>	<u>N/A</u>
barium-lanthanum-140	Ci	<u><LLD</u>	<u><LLD</u>	<u>N/A</u>	<u>N/A</u>
others (specify)	Ci	<u> </u>	<u> </u>	<u> </u>	<u> </u>
	Ci	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Unidentified	Ci	<u>4.97E-6</u>	<u>2.29E-6</u>	<u>N/A</u>	<u>N/A</u>

Note (1) TMI Unit-1 origin

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

Tech Spec Limit = 10CFR20, Appendix B, Table II, Column 2

	UNIT II	1986 1st QUARTER	1986 2nd QUARTER	EST. TOTAL ERROR, %
A. Fission & activation products				
1. Total releases (not including tritium, gases, alpha)	Ci	<u>3.53E-5</u>	<u>3.37E-5</u>	± 60%
2. Average release rate for period	µCi/ml	<u>2.92E-12</u>	<u>3.18E-12</u>	Based on 2E-5 Ci/ml (Cs-137)
3. Percent of applicable limit	%	<u>1.46E-5</u>	<u>1.59E-5</u>	
B. Tritium				
1. Total release	Ci	<u>5.71E-4</u>	<u>3.17E-4</u>	± 60%
2. Average diluted concentration during period	µCi/ml	<u>4.72E-11</u>	<u>2.99E-11</u>	Based on 3E-3 Ci/ml (H-3)
3. Percent of applicable limit	%	<u>1.57E-6</u>	<u>9.97E-7</u>	
C. Dissolved and entrained gases				
1. Total release	Ci	<u><LLD</u>	<u><LLD</u>	± 60%
2. Average diluted concentration during period	µCi/ml	<u>N/A</u>	<u>N/A</u>	
3. Percent of applicable limit	%	<u>N/A</u>	<u>N/A</u>	
D. Gross alpha radioactivity				
1. Total release	Ci	<u>Note 1</u>	<u>Note 1</u>	± 60%
E. Volume of waste released (prior to dilution)				
	liters	<u>1.26E5</u>	<u>8.99E4</u>	± 25%
F. Volume of dilution water used during period				
	liters	<u>1.21E10</u>	<u>1.06E10</u>	± 10%

Includes only those releases mentioned in Note (1) which were found to contain radioisotope concentration > LLD.

Note (1) There were no liquid releases from the radwaste system during the first half of 1987 since this system is flanged off from the discharge lines. However, low concentrations of radionuclides have been occasionally found in the industrial waste stream and are appropriately included in Item A2.

Note (2) Refer to Table 5 for Typical LLD values.

Note (3) The values reported include Sr-90 activity and any activity not specifically identified. Thus, the reported Sr-90 value represents a conservative estimate (i.e. overestimate) and contains activity from other beta-gamma emitters which were not positively identified during conduct of analytical procedures.

TABLE 2B
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT
LIQUID EFFLUENTS

Nuclides Released	UNIT II	Continuous Mode 1986		Batch Mode 1986	
		1st QUARTER	2nd QUARTER	1st QUARTER	2nd QUARTER
Strontium-89	C1	See Note (2)	See Note (2)	<LLD	<LLD
Strontium-90	C1			2.40E-5	2.21E-5
cesium-134	C1			<LLD	<LLD
cesium-137	C1			1.13E-5	1.16E-5
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-99	C1			<LLD	<LLD
barium-lanthanum-140	C1			<LLD	<LLD
cerium-141	C1			<LLD	<LLD
others (specify)	C1				
	C1				
Unidentified	C1			<LLD	<LLD
Total for period	C1			3.53E-5	3.37E-5
xenon-133	C1			<LLD	<LLD
xenon-135	C1			<LLD	<LLD

TABLE 4

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

<u>ISOTOPE</u>		<u>μCi/cc LLD</u>	<u>NOTES</u>
Gross Alpha	α	4E-9	Counted with proportional counter
Gross Beta	β	7E-8	Counted with proportional counter
Tritium	H-3	4E-6	Counted with liquid scintillation counter
Krypton-85	Kr-85	1E-4	
Xenon-131m	Xe-131m	2E-5	
Xenon-133	Xe-133	1E-6	
Xenon-135	Xe-135	3E-7	
Chromium-51	Cr-51	3E-6	
Manganese-54	Mn-54	4E-7	
Cobalt-58	Co-58	4E-7	
Iron-59	Fe-59	9E-7	
Cobalt-60	Co-60	6E-7	
Zinc-65	Zn-65	1E-6	
Zirconium-95	Zr-95	7E-7	
Niobium-95	Nb-95	4E-7	
Molybdenum-99	Mo-99	3E-7	
Technetium-99m	Tc-99m	3E-7	
Silver-110m	Ag-110m	6E-7	
Antimony-125	Sb-125	3E-7	
Cesium-134	Cs-134	5E-7	
Cesium-136	Cs-136	4E-7	
Cesium-137	Cs-137	5E-7	
Barium-140	Ba-140	1E-6	
Lanthanum-140	La-140	7E-7	
Cerium-141	Ce-141	5E-7	
Cerium-144	Ce-144	3E-6	
Iodine-131	I-131	3E-7	
Iodine-133	I-133	4E-7	
Phosphorus-32	P-32	1E-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	5E-8	
Strontium-89	Sr-89	5E-8	
Strontium-90	Sr-90	5E-8	
Gross Alpha	α	1E-7	

TABLE 5

TYPICAL GASEOUS EFFLUENT LLD (Lower Limit of Detection) VALUES

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

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

TABLE 3A
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL 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 ³ Ci	19.9m ³ 10.39 Ci	5%
b. Dry compressible waste, contaminated equipment, etc.	m ³ Ci	N/A	N/A
c. Irradiated components, control rods, etc.	m ³ Ci	N/A	N/A
d. Other (describe)	m ³ Ci	N/A	N/A

2. Estimate of major nuclide composition (by type of waste)		
a. Sb125	42.92%	
Pm147	18.40%	
Sr90	16.05%	
Tel25m	9.87 %	
b. N/A	%	
	%	
	%	
	%	
	%	
c. N/A	%	
	%	
	%	
	%	
	%	
d. N/A	%	
	%	
	%	
	%	

3. Solid Waste Disposition Number of Shipments	Mode of Transportation	Destination
3 Shipments	Tractor-Cask(NuPac 14/190M)	Hanford -Richland,WA.
1 Shipment	Tractor-Cask(HN-100,series2)	Hanford-Richland,WA.
1 Shipment	Tractor-Flatbed	Hanford-Richland,WA.

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
N/A		

*This material was shipped as follows: one(1) 50 ft³ steel liner, three(3) steel liners 161 ft³ each, and one(1) 170 Ft³ steel liner

Unit II LSA (DRUMS & BOXES)

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 ³ Ci	N/A	N/A
b. Dry compressible waste, contaminated equipment, etc.	m ³ Ci	141m ³ 1.02Ci.	5%
c. Irradiated components, control rods, etc.	m ³ Ci	N/A	N/A
d. Other (describe)	m ³ Ci	N/A	N/A

2. Estimate of major nuclide composition (by type of waste)		
a. N/A	%	
	%	
	%	
	%	
b. Cs137	83.88%	
Sr90	10.95%	
Cs134	3.037%	
Pm147	.7913%	
Co60	.299 %	
c. N/A	%	
	%	
	%	
	%	
	%	
d. N/A	%	
	%	
	%	
	%	

3. Solid Waste Disposition		
Number of Shipments	Mode of Transportation	Destination
3 Shipments	Tractor-Closed Van	Hanford-Richland, WA.
2 Shipments	Tractor-Flatbed	Hanford-Richland, WA.
1 Shipment	Tractor-Shielded Van	Hanford, Richland, WA.

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
N/A		

*This waste was shipped in 299 steel drums @ 7.5 ft³ each.
28 steel boxes @ 98 ft³ each.

TABLE 3A
EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL 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 ³ Ci	N/A	N/A
b. Dry compressible waste, contaminated equipment, etc.	m ³ Ci	1.416m ³ .874 Ci.	5%
c. Irradiated components, control rods, etc.	m ³ Ci	N/A	N/A
d. Other (describe)	m ³ Ci	N/A	N/A

2. Estimate of major nuclide composition (by type of waste)		
a. N/A	%	
	%	
	%	
	%	
b. Cs137	58.92 %	
Sr90	38.33 %	
Cs134	1.945 %	
Sb125	.398 %	
Pm147	.178 %	
c.	%	
	%	
	%	
	%	
d.	%	
	%	
	%	
	%	

3. Solid Waste Disposition	Mode of Transportation	Destination
Number of Shipments		
* 1 Shipment	Tractor-Cask (NuPac 14D-2.0)	Hanford-Richland, WA.

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
N/A		

*Shipped in one(1) 50 cubic foot High Integrity Container



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May 16, 1988
4410-88-0022/0145P

Atmospheric Sciences Division
Attn: Ms. J. Tichler
Brookhaven National Laboratory
Upton, NY 11973

Dear Ms. Tichler:

SUBJECT: TMI-2 Semi-Annual Effluent Report

In response to your March 30, 1988, request, attached is a copy of the data on effluents from TMI-2 for the first half of 1986. We are currently reviewing the data provided for the second half of 1986. Following receipt of the complete annual report from you, we shall expeditiously provide our comments.

Sincerely,

/s/ J. J. Byrne for

R. E. Rogan
Director, Licensing and Nuclear Safety

EDS/emf

Attachment

cc: Senior Resident Inspector, TMI - R. J. Conte
Regional Administrator, Region 1 - W. T. Russell
Director, Plant Directorate IV - J. F. Stolz
Systems Engineer, TMI Site - L. H. Thonus

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