Attachment 1
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Summary of Radioactive Liquid and Gaseous Effluents Released from TMI during 2002

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

	UNITS	2002 1ST QUARTER	2002 2ND QUARTER	2002 3RD QUARTER	2002 4TH QUARTER	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION GASES						
1. TOTAL RELEASE	Ci	2.22E-03	8.44E-03	5.82E-03	4.35E-03	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	2.85E-04	1.07E-03	7.32E-04	5.47E-04	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	
B. IODINES						
1. TOTAL IODINE I-131	Ci	6.37E-08	5.87E-08	1.11E-07	1.02E-07	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	8.19E-09	7.46E-09	1.40E-08	1.29E-08	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	
C. PARTICULATES						
1. PARTICULATES WITH HALF-LIVES > 8 DAYS	Ci	<1.E-04	<1.E-04	<1.E-04	<1.E-04	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	NA	NA	NA	NA	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	
4. GROSS ALPHA RADIOACTIVITY	Ci	<1.E-11	<1.E-11	<1.E-11	<1.E-11	
D. TRITIUM						
1. TOTAL RELEASE	Ci	4.85E+01	1.44E+01	3.86E+01	2.21E+01	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	6.24E+00	1.84E+00	4.86E+00	2.79E+00	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	

* % ODCM LIMITS: LISTED ON DOSE SUMMARY TABLE
NOTE: ALL LESS THAN (<) VALUES ARE IN uCi/ml

TABLE 1C
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (2002)
GASEOUS EFFLUENTS - GROUND LEVEL RELEASES
TMI-1

		CONTINUOUS		BATCH		CONTINUOUS		BATCH	
NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
1. FISSION GASES									
AR 41	Ci	<3 E-07	<3 E-07	<3 E-07	3.85E-03	<3 E-07	<3 E-07	<3 E-07	<3 E-07
KR 85M	Ci	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08
KR 85	Ci	<2 E-05	<2 E-05	<2 E-05	<2 E-05	<2 E-05	<2 E-05	<2 E-05	<2 E-05
KR 87	Ci	<1 E-07	<1 E-07	<1 E-07	<1 E-07	<1 E-07	<1 E-07	<1 E-07	<1 E-07
KR 88	Ci	<2 E-07	<2 E-07	<2 E-07	<2 E-07	<2 E-07	<2 E-07	<2 E-07	<2 E-07
XE131M	Ci	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6
XE 133	Ci	<2 E-07	<2 E-07	2.22E-03	4.59E-03	<2 E-07	<2 E-07	5.82E-03	4.35E-03
XE133M	Ci	<3 E-7	<3 E-7	<3 E-7	<3 E-7	<3 E-7	<3 E-7	<3 E-7	<3 E-7
XE 135M	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
XE 135	Ci	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08
XE 138	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
TOTAL FOR PERIOD	Ci	NA	NA	2.22E-03	8.44E-03	NA	NA	5.82E-03	4.35E-03
2. IODINES									
I 131	Ci	6.37E-08	4.87E-08	<1 E-08	9.95E-09	1.11E-07	1.02E-07	<1 E-08	<1 E-08
I 133	Ci	<1 E-08	7.68E-07	<1 E-08	<1 E-08	1.33E-06	9.46E-07	<1 E-08	<1 E-08
TOTAL FOR PERIOD	Ci	6.37E-08	8.17E-07	NA	9.95E-09	1.44E-06	1.05E-06	NA	NA
3. PARTICULATES									
C0 58	Ci	<1 E-11	<1 E-11	<1 E-08	<1 E-08	<1 E-11	<1 E-11	<1 E-08	<1 E-08
CS 137	Ci	<1 E-11	<1 E-11	<1 E-08	<1 E-08	<1 E-11	<1E-11	<1 E-08	<1 E-08

NOTE: ALL LESS THAN VALUES (<) ARE IN uCi/ml

TABLE 2A
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES
TMI-1

	UNITS	2002 1ST QUARTER	2002 2ND QUARTER	2002 3RD QUARTER	2002 4TH QUARTER	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION PRODUCTS						
1. TOTAL RELEASES (NOT INCLUDING TRITIUM, GASES, ALPHA)	Ci	1.77E-04	1.85E-04	1.89E-04	1.10E-04	25%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	3.25E-11	2.76E-11	2.50E-11	1.70E-11	
3. PERCENT OF APPLICABLE LIMIT	%	*	*	*	*	
B. TRITIUM						
1. TOTAL RELEASE	Ci	5.95E+00	3.61E+01	6.01E+01	4.85E+01	25%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	1.09E-06	5.37E-06	7.95E-06	7.49E-06	
3. PERCENT OF APPLICABLE LIMIT	%	*	*	*	*	
C. DISSOLVED AND ENTRAINED GASES						
1. TOTAL RELEASE	Ci	<1.E-04	1.81E-05	<1.E-04	<1.E-04	25%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	NA	2.69E-12	NA	NA	
3. PERCENT OF APPLICABLE LIMIT	%	*	*	*	*	
D. GROSS ALPHA ACTIVITY						
1. TOTAL RELEASE	Ci	<1.E-07	<1.E-07	<1.E-07	<1.E-07	25%
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	liters	8.89E+06	7.66E+06	1.04E+07	6.83E+06	10%
F. VOLUME OF DILUTION WATER USED	liters	5.45E+09	6.71E+09	7.56E+09	6.48E+09	10%

* % ODCM LIMITS: LISTED ON DOSE SUMMARY TABLE
NOTE: ALL LESS THAN (<) VALUES ARE IN uCi/ml

TABLE 2B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT (2002)
LIQUID EFFLUENTS
TMI-1

		CONTINUOUS		BATCH		CONTINUOUS		BATCH	
NUCLIDES RELEASED	UNIT	QUARTER 1	QUARTER 2	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
CR 51	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5.E-07	<5.E-07
MN 54	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5.E-07	<5.E-07
FE 59	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5.E-07	<5.E-07
CO 58	Ci	<5 E-07	<5 E-07	1.12E-05	<5 E-07	<5 E-07	<5 E-07	7.31E-06	<5.E-07
CO 60	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	3.08E-06	<5.E-07
ZN 65	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5.E-07	<5.E-07
SR 89	Ci	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08	<5 E-08
SR 90	Ci	<5 E-08	<5 E-08	<5 E-08	2.27E-06	<5 E-08	<5 E-08	2.51E-06	<5 E-08
ZR 95	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
NB 95	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
MO 99	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
TC 99M	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
I 131	Ci	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06
CS 134	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
CS 137	Ci	1.49E-04	1.63E-04	1.74E-05	2.05E-05	1.18E-04	4.43E-05	5.86E-05	6.58E-05
BA 140	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
LA 140	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
CE 141	Ci	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07	<5 E-07
FE 55	Ci	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06	<1 E-06
TOTAL FOR PERIOD	Ci	1.49E-04	1.63E-04	2.86E-05	2.28E-05	1.18E-04	4.43E-05	7.15E-05	6.58E-05
XE 133	Ci	<1.E-04	<1.E-04	<1.E-04	1.81E-05	<1.E-04	<1.E-04	1.84E-06	<1.E-04
XE 135	Ci	<1.E-04	<1.E-04	<1.E-04	<1.E-04	<1.E-04	<1.E-04	1.63E-06	<1.E-04

NOTE: ALL LESS THAN VALUES (<) ARE IN uCi/ml

SUPPLEMENTAL INFORMATION

FACILITY: TMI UNIT 1 LICENSE: DPR 50-289

1. REGULATORY LIMITS - - - REFER TO TMI OFFSITE DOSE CALCULATION MANUAL

A. FISSION AND ACTIVATION GASES:
B. IODINES:
C. PARTICULATES, HALF-LIVES > 8 DAYS:
D. LIQUID EFFLUENTS:

2. MAXIMUM EFFLUENT CONCENTRATIONS - - - TEN TIMES 10 CFR 20, APPENDIX B TABLE 2

PROVIDE THE MAXIMUM EFFLUENT CONCENTRATIONS USED IN DETERMINING ALLOWABLE RELEASE RATES OR CONCENTRATIONS.

A. FISSION AND ACTIVATION GASES:
B IODINES:
C. PARTICULATES, HALF-LIVES > 8 DAYS:
D. LIQUID EFFLUENTS:

3. AVERAGE ENERGY

PROVIDE THE AVERAGE ENERGY (E-BAR) OF THE RADIONUCLIDE MIXTURE IN RELEASES OF FISSION AND ACTIVATION GASES, IF APPLICABLE

E-BAR BETA =	1.69E-01 MeV
E-BAR GAMMA =	2.74E-01 MeV
E-BAR BETA AND GAMMA =	4.42E-01 MeV

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 SPECTROMETRY, LIQUID SCINTILLATION
B. IODINES: HPGE SPECTROMETRY
C PARTICULATES HPGE SPECTROMETRY, GAS FLOW PROPORTIONAL, BETA SPECTROMETRY
D. LIQUID EFFLUENTS: HPGE SPECTROMETRY, LIQUID SCINTILLATION

5. BATCH RELEASES

PROVIDE THE FOLLOWING INFORMATION RELATING TO BATCH RELEASES OF RADIOACTIVITY MATERIALS IN LIQUID AND GASEOUS EFFLUENTS.

A. LIQUID (ALL TIMES IN MINUTES)	QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4
1. NUMBER OF BATCH RELEASES:	7	3	17	7
2. TOTAL TIME PERIOD FOR BATCH RELEASES:	1796	835	4407	1797
3. MAXIMUM TIME PERIOD FOR A BATCH RELEASE:	276	300	285	325
4. AVERAGE TIME PERIOD FOR BATCH RELEASES:	256	278	259	256
5. MINIMUM TIME PERIOD FOR A BATCH RELEASE:	205	255	230	160
6. AVERAGE STREAM FLOW DURING PERIODS OF RELEASE				
OF EFFLUENT INTO A FLOWING STREAM: (CFM)	1.75E+06	3.16E+06	3.62E+05	1.99E+06

B. GASEOUS (ALL TIMES IN MINUTES)				
1. NUMBER OF BATCH RELEASES:	3	6	4	3
2. TOTAL TIME PERIOD FOR BATCH RELEASES:	2370	2983	2830	2225
3. MAXIMUM TIME PERIOD FOR A BATCH RELEASE:	830	763	745	780
4. AVERAGE TIME PERIOD FOR BATCH RELEASES:	790	497	707	741
5. MINIMUM TIME PERIOD FOR A BATCH RELEASE:	750	7	680	720

6. ABNORMAL RELEASES

A. LIQUID				
1. NUMBER OF RELEASES:	-0-	-0-	-0-	-0-
2. TOTAL ACTIVITY RELEASED: (CURIES)	N/A	N/A	N/A	N/A

B. GASEOUS				
1. NUMBER OF RELEASES:	-0-	-0-	-0-	-0-
2. TOTAL ACTIVITY RELEASED: (CURIES)	N/A	N/A	N/A	N/A

TABLE 1A
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES
TMI-2

	UNITS	2002 1ST QUARTER	2002 2ND QUARTER	2002 3RD QUARTER	2002 4TH QUARTER	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION GASES						
1. TOTAL RELEASE	Ci	<LLD	<LLD	<LLD	<LLD	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	N/A	N/A	N/A	N/A	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	
B. IODINES		NOT APPLICABLE FOR TMI-2				
C. PARTICULATES						
1. PARTICULATES WITH HALF-LIVES > 8 DAYS	Ci	<LLD	<LLD	<LLD	<LLD	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	N/A	<N/A	<N/A	<N/A	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	
4. GROSS ALPHA RADIOACTIVITY	Ci	<LLD	<LLD	<LLD	<LLD	
D. TRITIUM						
1. TOTAL RELEASE	Ci	2.95E-01	4.33E-01	1.22E-01	5.59E-02	25%
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/sec	3.80E-02	5.51E-02	1.53E-02	7.03E-03	
3. PERCENT OF TECH SPEC LIMIT	%	*	*	*	*	
# BATCH RELEASES		0	0	0	0	

* % ODCM LIMITS: LISTED ON DOSE SUMMARY TABLE
NOTE: ALL LESS THAN (<) VALUES ARE IN uCi/ml

TABLE 1C
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
TMI-2
2002

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE		CONTINUOUS MODE		BATCH MODE	
		1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
1. FISSION GASES									
KRYPTON-85	Ci	<8.00E-6	<8.00E-6	<8.00E-6	<8.00E-6	<8.00E-6	<8.00E-6	<8.00E-6	<8.00E-6
KRYPTON-85M	Ci	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8
KRYPTON-87	Ci	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8
KRYPTON-88	Ci	<1.00E-7	<1.00E-7	<1.00E-7	<1.00E-7	<1.00E-7	<1.00E-7	<1.00E-7	<1.00E-7
XENON-133	Ci	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8	<8.00E-8
XENON-135	Ci	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8
XENON-135M	Ci	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7
XENON-138	Ci	<3.00E-7	<3.00E-7	<3.00E-7	<3.00E-7	<3.00E-7	<3.00E-7	<3.00E-7	<3.00E-7
AR-41	Ci	<1.00E-4	<1.00E-4	<1.00E-4	<1.00E-4	<1.00E-4	<1.00E-4	<1.00E-4	<1.00E-4
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2. IODINES		NOT APPLICABLE TO TMI-2							
3. PARTICULATES									
STRONTIUM-90	Ci	<1.00E-11	<1.00E-11	N/A	N/A	<1.00E-11	<1.00E-11	N/A	N/A
COBALT 60	Ci	<1.00E-10	<1.00E-10	N/A	N/A	<1.00E-10	<1.00E-10	N/A	N/A
ANTIMONY 125	Ci	<1.00E-10	<1.00E-10	N/A	N/A	<1.00E-10	<1.00E-10	N/A	N/A
CESIUM-134	Ci	<1.00E-10	<1.00E-10	N/A	N/A	<1.00E-10	<1.00E-10	N/A	N/A
CESIUM-137	Ci	<1.00E-10	<1.00E-10	N/A	N/A	<1.00E-10	<1.00E-10	N/A	N/A
TOTAL FOR PERIOD	Ci	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4. TRITIUM									
TRITIUM	Ci	2.95E-01	4.33E-01	<1.00E-6	<1.00E-6	1.22E-01	5.59E-02	<1.00E-6	<1.00E-6

NOTE: ALL LESS THAN (<) VALUES ARE IN uCi/ml

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

	UNITS	2002 1ST QUARTER	2002 2ND QUARTER	2002 3RD QUARTER	2002 4TH QUARTER	EST. TOTAL ERROR %
A. FISSION AND ACTIVATION PRODUCTS						
1. TOTAL RELEASES (NOT INCLUDING TRITIUM, GASES, ALPHA)	Ci	<LLD	<LLD	9.79E-06	<LLD	25%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	N/A	N/A	1.28E-12	N/A	
3. PERCENT OF APPLICABLE LIMIT	%	*	*	*	*	
B. TRITIUM						
1. TOTAL RELEASE	Ci	<LLD	1.42E-05	5.13E-04	<LLD	25%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	N/A	2.12E-12	6.71E-11	N/A	
3. PERCENT OF APPLICABLE LIMIT	%	*	*	*	*	
C. DISSOLVED AND ENTRAINED GASES						
1. TOTAL RELEASE	Ci	<LLD	<LLD	<LLD	<LLD	25%
2. AVERAGE DILUTED CONCENTRATION DURING PERIOD	uCi/ml	N/A	N/A	N/A	N/A	
3. PERCENT OF APPLICABLE LIMIT	%	*	*	*	*	
D. GROSS ALPHA ACTIVITY						
1. TOTAL RELEASE	Ci	<LLD	<LLD	<LLD	<LLD	25%
E. VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)	liters	NONE	2.63E+03	1.96E+04	1.35E+05	10%
F. VOLUME OF DILUTION WATER USED	liters	5.45E+09	6.71E+09	7.64E+09	6.48E+09	10%
NUMBER OF BATCH RELEASES		0	1	4	1	

* % ODCM LIMITS: LISTED ON DOSE SUMMARY TABLE
NOTE: ALL LESS THAN (<) VALUES ARE IN uCi/ml

TABLE 2B
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS
TMI-2
2002

NUCLIDES RELEASED	UNIT	CONTINUOUS MODE		BATCH MODE		CONTINUOUS MODE		BATCH MODE	
		1ST QUARTER	2ND QUARTER	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	3RD QUARTER	4TH QUARTER
CO 60	Ci	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7
SR 90	Ci	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	<5.00E-8	1.08E-06	<5.00E-8
SB 125	Ci	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7
CS 134	Ci	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7
CS 137	Ci	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	<5.00E-7	8.71E-06	<5.00E-7
H-3	Ci	<1.00E-5	<1.00E-5	<1.00E-5	1.42E-05	<1.00E-5	<1.00E-5	5.13E-04	<1.00E-5
TOTAL FOR PERIOD	Ci	0.00E+00	0.00E+00	0.00E+00	1.42E-05	0.00E+00	0.00E+00	5 22E-04	0.00E+00

NOTE: ALL LESS THAN VALUES (<) ARE IN uCi/ml

Attachment 2
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Solid Waste Shipped Offsite during 2002

TMI-1 TABLE 3 EFFLUENT AND WASTE DISPOSAL 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	12 month period	EST. Total Error %
a. Spent resins, filter sludges, Evaporator bottoms, etc.	m^3 Ci	56.5 m3 1.58 Ci	25%
b. Dry compressible waste, contaminated equipment, etc.	m^3 Ci	373.9 m3 .9 Ci	25%
c. Irradiated components, control rods, etc.	m^3 Ci	N/A	N/A
d. Other (describe) : Mixed Waste	m^3 Ci	2.75 m3 .031 Ci	25%
2. Estimate of major nuclide composition (by type of waste)			
a. H3	28.9%		
Co58	21.8%		
Ni63	20.3%		
Cs137	23.8%		
b. Co58	44.1%		
Ni63	9.5%		
Cs137	40%		
c. N/A			
d Co58	44.1%		
Ni63	9.5%		
Cs137	40%		
3. Solid Waste Disposition Number of Shipments	Mode of Transportation		Destination
See attached for this information			
B. Irradiated Fuel Shipments (Disposition)			
Number of Shipments	Mode of Transportation		Destination
N/A			

WASTE SHIPPED AS FOLLOWS

A.1.a

Four (4) – Poly Liners @ 150 ft3 each – Evaporator Bottoms

Nineteen(19) – Steel Boxes @ 80 ft3 each- Dewatered Powdex Resin

A.1.b

Eleven (11) – Steel Cargo Containers @ 1040 ft3 each- noncompacted DAW

Fifteen (15) – Steel Boxes @ 92 ft3 each – Metal/noncompacted DAW

Twelve (12) Steel Drums @ 7.0 ft3 each – noncompacted DAW

Five (5) – Steel Boxes @ 60ft3 each – noncompacted DAW

A.1.c

No Shipments of material in this category for this report period

A-1-d

Thirteen (13) Steel drums at 7.0 ft3 each – Mixed Waste

Three (3) Steel Drums @ 2.0 ft3 each – Mixed Waste

A.3.a

Four Shipments	Kindrick Trucking/ Cask	Duratek –Oak Ridge,TN

A.3.b

Four Shipments	Hittman Transport/Flatbed	Duratek- Oak Ridge,TN
Three Shipments	TSMT/Flatbed	Duratek-Oak Ridge,TN
Two Shipments	Kindrick/Flatbed	U.S.Ecology- Oak Ridge,TN.
Two Shipments	Kindrick Trucking/Flatbed	RACE ,LLC- Memphis,TN
One Shipment	R&R Trucking/Flatbed	RACE LLC - Memphis,TN.
One Shipment	Kindrick Trucking/Flatbed	ALARON-Wampum.Pa

A.3.c

No Shipments of material in this category for this report period

A.3.d

One Shipment	Kindrick/ Closed Van	Perma-Fix- Gainesville,FL.

* ALL SHIPMENT WERE TYPE A- LSA-II

TMI-2 TABLE 3 EFFLUENT AND WASTE DISPOSAL 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	12 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	64.9 m3 .02 Ci	25%
c. Irradiated components, control rods, etc.	m^3 Ci	N/A	N/A
d. Other (describe) : N/A	m^3 Ci	N/A	N/A
2. Estimate of major nuclide composition (by type of waste)			
a. N/A			
b.Cs137	70.4%		
Sr90	27.7%		
Ni63	1.39%		
c. N/A			
d.			
3. Solid Waste Disposition Number of Shipments	Mode of Transportation		Destination
See attached for this information			
B. Irradiated Fuel Shipments (Disposition)			
Number of Shipments	Mode of Transportation		Destination
N/A			

WASTE SHIPPED AS FOLLOWS

A.1.a

No Shipment of spent resin. filter sludges , or evaporator bottoms

A.1.b

Two(2) Steel Cargo Containerss @ 1040 ft3 each- noncompactable DAW

One(1) Steel box @ 92 ft^3 – Metal

One(1) Steel Liner @ 120 ft^3- Metal

A.1.c

No Shipments of material in this category for this report period

A-1-d

No Shipments of material in this category for this report period

A.3.a

No Shipments of material in this category for this report period

A.3.b

Two Shipments R& R Trucking/Flatbed RACE LLC- Memphis,Tn

A.3.c

No Shipments of material in this category for this report period

A.3.d

No Shipments of material in this category for this report period

* ALL SHIPMENT WERE TYPE A- LSA-II

Attachment 3
2002 Annual Radioactive Effluent Releases Report for TMI
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Summary of Unplanned Releases from the TMI Site During 2002

There were no unplanned releases to unrestricted areas from either the TMI-1 or TMI-2 site during 2002.

Attachment 4
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Changes to the Process Control Program and the Offsite Dose Calculation Manual during 2002, And a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census

1. Changes to the Process Control Program

The Process Control Program for Radioactive Waste is implemented in accordance with Procedure RW-AA-100. This procedure provides the boundaries and parameters for the preparation of procedures for processing, sampling, analysis, packaging, storage and shipment of solid radwaste. It also provides the local, state, federal, and burial site requirements.

Revision 2 of RW-AA-100 became effective on January 11, 2002. The changes associated with revision 2 are editorial in nature. The changes provide clarification to ensure compliance with the applicable regulations for preparation of Radioactive Waste for transportation. These changes do not change the intent of the previous revision.

2. Changes to the Offsite Dose Calculation Manual during 2002

The Offsite Dose Calculation Manual (ODCM) was modified once during 2002. These changes did not reduce the accuracy or reliability of dose calculations or setpoint determinations. The level of effluent controls required by 10 CFR 20.1301, 40 CFR 190, 10 CFR 50.36a, and Appendix I to 10 CFR 50 was not reduced and the accuracy or reliability of effluent, dose or setpoint calculations was not adversely impacted for the reasons stated below.

Revision 23 of the ODCM was issued on March 19, 2002. Revision 23 made the following changes to the ODCM:

- Added a note to make clear the LLD needed for noble gas in liquid effluent.
- Correct the table of context
- Change ventilation indicator from pen to point due to changing from a chart recorder to a digital recorder.
- To make clear when the 30 day clock applies when the Unit 2 effluent ventilation flow rate is out of service.

3. A listing of new locations for dose calculations and/or environmental monitoring identified by the land use census

Based on the results of the 2002 land use census, no changes to the radiological environmental monitoring program or the dose model are required.

Attachment 5
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Instrumentation not returned to Operable status within 30 days during 2002

There was no instrumentation not returned to operable status within 30 days per the TMI ODCM Part 1, Sections 2.1.1.b and 2.1.2.b and Part 2, Section 2.1.2.b during 2002.

Attachment 6
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Annual Summary of Hourly Meteorological Data for 2002

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: A

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	2	22	11	1	0	0	36
NNE	SSW	11	59	36	10	0	0	116
NE	SW	10	45	28	3	1	0	87
ENE	WSW	23	24	4	3	0	0	54
E	W	16	12	4	5	1	0	38
ESE	WNW	31	47	34	13	1	0	126
SE	NW	50	104	45	8	2	0	209
SSE	NNW	41	103	25	9	0	0	178
S	N	11	23	13	1	0	0	48
SSW	NNE	3	6	1	0	0	0	10
SW	NE	3	5	2	0	0	0	10
WSW	ENE	3	8	1	0	0	0	12
W	E	4	12	1	0	0	0	17
WNW	ESE	5	15	7	4	0	0	31
NW	SE	6	12	5	0	0	0	23
NNW	SSE	4	16	2	0	0	0	22
TOTAL HRS		223	513	219	57	5	0	1017

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: B

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	2	10	10	1	0	0	23
NNE	SSW	1	17	16	5	0	0	39
NE	SW	6	9	10	1	0	0	26
ENE	WSW	2	4	2	1	0	0	9
E	W	4	6	5	3	3	0	21
ESE	WNW	5	14	16	9	4	0	48
SE	NW	5	26	25	12	8	0	76
SSE	NNW	7	20	10	7	0	0	44
S	N	0	5	1	0	0	0	6
SSW	NNE	0	2	0	0	0	0	2
SW	NE	2	1	0	0	0	0	3
WSW	ENE	3	4	0	0	0	0	7
W	E	4	6	4	0	0	0	14
WNW	ESE	3	6	3	0	0	0	12
NW	SE	7	3	3	0	0	0	13
NNW	SSE	2	5	0	0	0	0	7
TOTAL HRS		53	138	105	39	15	0	350

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: C

		WIND SPEED (MPH)						
SECTOR WINDS TO	FROM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	0	6	5	0	0	0	11
NNE	SSW	1	7	4	5	0	0	17
NE	SW	3	5	5	1	0	0	14
ENE	WSW	2	2	3	0	0	0	7
E	W	1	5	7	4	0	0	17
ESE	WNW	0	11	14	7	5	0	37
SE	NW	2	17	11	10	5	1	46
SSE	NNW	2	8	5	3	0	0	18
S	N	1	6	1	1	0	0	9
SSW	NNE	1	4	0	0	0	0	5
SW	NE	0	2	0	0	0	0	2
WSW	ENE	2	2	0	0	0	0	4
W	E	2	5	2	0	0	0	9
WNW	ESE	0	5	3	0	0	0	8
NW	SE	1	2	2	0	0	0	5
NNW	SSE	1	2	1	0	0	0	4
TOTAL HRS		19	89	63	31	10	1	213

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: D

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	11	26	40	14	0	0	91
NNE	SSW	8	48	43	14	2	0	115
NE	SW	14	31	27	5	0	0	77
ENE	WSW	8	32	14	5	0	0	59
E	W	15	60	111	53	2	0	241
ESE	WNW	7	85	164	110	20	3	389
SE	NW	22	82	121	106	34	6	371
SSE	NNW	31	64	36	27	2	0	160
S	N	13	44	14	1	0	0	72
SSW	NNE	4	34	5	0	0	0	43
SW	NE	12	52	4	0	0	0	68
WSW	ENE	15	41	12	0	0	0	68
W	E	17	75	52	3	0	0	147
WNW	ESE	19	32	80	2	0	0	133
NW	SE	11	34	33	3	0	0	81
NNW	SSE	14	27	24	0	0	0	65
TOTAL HRS		221	767	780	343	60	9	2180

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: E

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	20	109	79	13	2	0	223
NNE	SSW	32	104	86	13	1	0	236
NE	SW	49	130	39	2	0	0	220
ENE	WSW	37	97	18	2	0	0	154
E	W	51	136	75	15	0	0	277
ESE	WNW	58	116	94	29	4	1	302
SE	NW	52	84	84	35	2	0	257
SSE	NNW	61	90	20	6	0	0	177
S	N	45	82	8	0	0	0	135
SSW	NNE	36	44	2	0	0	0	82
SW	NE	47	36	1	0	0	0	84
WSW	ENE	49	60	5	0	0	0	114
W	E	37	84	36	1	0	0	158
WNW	ESE	38	55	51	1	0	0	145
NW	SE	33	49	29	0	0	0	111
NNW	SSE	24	83	13	1	0	0	121
TOTAL HRS		669	1359	640	118	9	1	2796

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: F

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	32	16	7	0	0	0	55
NNE	SSW	37	57	6	0	0	0	100
NE	SW	63	36	5	0	0	0	104
ENE	WSW	52	36	3	0	0	0	91
E	W	72	37	1	0	0	0	110
ESE	WNW	67	10	3	1	0	0	81
SE	NW	62	20	2	0	0	0	84
SSE	NNW	69	68	2	0	0	0	139
S	N	28	29	1	0	0	0	58
SSW	NNE	19	12	0	0	0	0	31
SW	NE	25	10	0	0	0	0	35
WSW	ENE	18	13	0	0	0	0	31
W	E	38	20	0	0	0	0	58
WNW	ESE	35	9	0	0	0	0	44
NW	SE	21	6	0	0	0	0	27
NNW	SSE	18	9	0	0	0	0	27
TOTAL HRS		656	388	30	1	0	0	1075

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: G

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	33	14	0	0	0	0	47
NNE	SSW	28	33	0	0	0	0	61
NE	SW	34	13	0	0	0	0	47
ENE	WSW	39	12	1	0	0	0	52
E	W	28	12	0	0	0	0	40
ESE	WNW	28	8	0	0	0	0	36
SE	NW	23	8	4	0	0	0	35
SSE	NNW	30	16	0	0	0	0	46
S	N	12	11	0	0	0	0	23
SSW	NNE	14	2	0	0	0	0	16
SW	NE	13	0	0	0	0	0	13
WSW	ENE	28	3	0	0	0	0	31
W	E	34	9	0	0	0	0	43
WNW	ESE	48	6	0	0	0	0	54
NW	SE	31	2	0	0	0	0	33
NNW	SSE	25	3	0	0	0	0	28
TOTAL HRS		448	152	5	0	0	0	605

THREE MILE ISLAND METEROLOGICAL DATA
JOINT FREQUENCY TABLES

HOURS (HRS) AT EACH WIND SPEED AND DIRECTION
PERIOD OF RECORD: JANUARY 1, 2002 TO DECEMBER 31, 2002
STABILITY CLASS: ALL

SECTOR WINDS TO	FROM	WIND SPEED (MPH) 1-3	4-7	8-12	13-18	19-24	>24	TOTAL HRS
N	S	100	203	152	29	2	0	486
NNE	SSW	118	325	191	47	3	0	684
NE	SW	179	269	114	12	1	0	575
ENE	WSW	163	207	45	11	0	0	426
E	W	187	268	203	80	6	0	744
ESE	WNW	196	291	325	169	34	4	1019
SE	NW	216	341	292	171	51	7	1078
SSE	NNW	241	369	98	52	2	0	762
S	N	110	200	38	3	0	0	351
SSW	NNE	77	104	8	0	0	0	189
SW	NE	102	106	7	0	0	0	215
WSW	ENE	118	131	18	0	0	0	267
W	E	136	211	95	4	0	0	446
WNW	ESE	148	128	144	7	0	0	427
NW	SE	110	108	72	3	0	0	293
NNW	SSE	88	145	40	1	0	0	274
TOTAL HRS		2289	3406	1842	589	99	11	8236

HRS OF MISSING/INVALID DATA: 524

Attachment 7
2002 Annual Radioactive Effluent Releases Report for TMI
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Assessment of Radiation Doses Due to Radioactive Liquid and Gaseous Effluents Released from TMI during 2002

TMI-1

The attached table presents the maximum hypothetical doses to an individual and the general population resulting from 2002 TMI-1 releases of gaseous and liquid effluents. Provided below is a brief explanation of the table.

A. Liquid (Individual)

Calculations were performed on the four age groups and seven organs recommended in Regulatory Guide 1.109. The pathways considered for TMI-1 were the consumption of drinking water and fish and standing on the shoreline influenced by TMI-1 effluents. The latter two pathways are considered to be the primary recreational activities associated with the Susquehanna River in the vicinity of TMI. The "critical receptor" or Receptor 1 was that individual who 1) consumed Susquehanna River water from the nearest downstream drinking water supplier (Wrightsville Water Supply), 2) consumed fish residing in the vicinity of the TMI-1 liquid discharge outfall and 3) occupied an area of shoreline influenced by the TMI-1 liquid discharge.

For 2002, the calculated maximum whole body (or total body) dose from TMI-1 liquid effluents was 1.77E-2 mrem to an adult (line 1). The maximum organ dose was 2.53E-2 mrem to the liver of a teen (line 2).

B. Gaseous (Individual)

There were six major pathways considered in the dose calculations for TMI-1 gaseous effluents. These were: (1) plume exposure (2) inhalation, consumption of; (3) cow milk, (4) vegetables and fruits, (5) meat, and (6) standing on contaminated ground. Real-time meteorology was used in all dose calculations for gaseous effluents.

Lines 3 and 4 present the maximum plume exposure at or beyond the site boundary. The notation of "air dose" is interpreted to mean that these doses are not to an individual, but are considered to be the maximum doses that would have occurred at or beyond the site boundary. The table presents the distance in meters to the location in the affected sector (compass point) where the theoretical maximum plume exposures occurred. The calculated maximum plume exposures were 1.36E-5 mrad and 5.71E-6 mrad for gamma and beta, respectively.

The maximum organ dose due to the release of iodines, particulates and tritium from TMI-1 in 2001 was 9.63E-3 mrem to the thyroid of an child residing 2150 meters from the site in the NNE sector (line 5). This dose again reflects the maximum exposed organ for the appropriate age group.

For 2002, TMI-1 liquid and gaseous effluents resulted in maximum hypothetical doses that were a small fraction of the quarterly and yearly ODCM dose limits.

TMI-1
SUMMARY OF MAXIMUM INDIVIDUAL DOSES FOR TMI-1 FROM
January 1, 2002 through December 31, 2002

Effluent	Applicable Organ	Estimated Dose (mrem)	Age Group	Location Dist (m)	Location Dir (to)	% of ODCM Dose Limit		ODCM Dose Limit (mrem)	
						Quarter	Annual	Quarter	Annual
(1) Liquid	Total Body	1.77E-2	Adult	Receptor 1		1.18E+0	5.90E-1	1.5	3
(2) Liquid	Liver	2.53E-2	Teen	Receptor 1		3.54E-1	2.53E-1	5	10
(3) Noble Gas	Air Dose (gamma-mrad)	1.36E-5	---	4000	ESE	2.72E-4	1.36E-4	5	10
(4) Noble Gas	Air Dose (beta-mrad)	5.71E-6	---	4000	ESE	5.71E-5	2.86E-5	10	20
(5) Iodine, Tritium & Particulates	Thyroid	9.63e-3	Child	2150	NNE	1.28E-1	6.42E-2	7.5	15

TMI-2

The attached table presents the maximum hypothetical doses to an individual and the general population resulting from 2002 TMI-2 releases of gaseous and liquid effluents. Provided below is a brief explanation of the table.

A. Liquid (Individual)

Calculations were performed on the four age groups and seven organs recommended in Regulatory Guide 1.109. The pathways considered for TMI-2 were the consumption of drinking water and fish and standing on the shoreline influenced by TMI-2 effluents. The latter two pathways are considered to be the primary recreational activities associated with the Susquehanna River in the vicinity of TMI. The "critical receptor" or Receptor 1 was that individual who 1) consumed Susquehanna River water from the nearest downstream drinking water supplier (Wrightsville Water Supply), 2) consumed fish residing in the vicinity of the TMI-2 liquid discharge outfall and 3) occupied an area of shoreline influenced by the TMI-2 liquid discharge.

For 2002, the calculated maximum whole body (or total body) dose from TMI-2 liquid effluents was 1.71E-4 mrem to an adult (line 1). The maximum organ dose was 2.72E-4 mrem to the bone of a child (line 2).

B. Gaseous (Individual)

There were six major pathways considered in the dose calculations for TMI-2 gaseous effluents. These were: (1) plume exposure (2) inhalation, consumption of; (3) cow milk, (4) vegetables and fruits, (5) meat, and (6) standing on contaminated ground. Real-time meteorology was used in all dose calculations for gaseous effluents.

Since there were no noble gases released from TMI-2 during 2002, the gamma and beta air doses (lines 3 and 4, respectively) were zero.

The maximum organ dose due to the release of particulates and tritium from TMI-2 in 2002 was 3.85E-5 mrem to the liver, total body, thyroid, kidney, lung and GI tract of a child residing 2150 meters from the site in the NNE sector (line 5).

For 2002, TMI-2 liquid and gaseous effluents resulted in maximum hypothetical doses that were a small fraction of the quarterly and yearly ODCM dose limits.

TMI-2
SUMMARY OF MAXIMUM INDIVIDUAL DOSES FOR TMI-2 FROM
January 1, 2002 through December 31, 2002

Effluent	Applicable Organ	Estimated Dose (mrem)	Age Group	Location Dist (m)	Location Dir (to)	% of ODCM Dose Limit Quarter	% of ODCM Dose Limit Annual	ODCM Dose Limit (mrem) Quarter	ODCM Dose Limit (mrem) Annual
(1) Liquid	Total Body	1.71E-4	Adult	Receptor 1		1.14E-2	5.70E-3	1.5	3
(2) Liquid	Bone	2.72E-4	Child	Receptor 1		5.44E-3	2.72E-3	5	10
(3) Noble Gas	Air Dose (gamma-mrad)	0	---	---	---	0	0	5	10
(4) Noble Gas	Air Dose (beta-mrad)	0	---	---	---	0	0	10	20
(5) Tritium & Particulate	Liver, Total Body, Thyroid, Kidney, Lung & GI Tract	3.85E-5	Child	2150	NNE	5.13E-4	2.57E-4	7.5	15

Attachment 8
2002 Annual Radioactive Effluent Releases Report for TMI
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Assessment of Radiation Doses from Liquid and Gaseous Effluents Releases to Members of the Public within the TMI Site Boundaries during 2002

The Offsite Dose Calculation Manual requires an assessment of the radiation doses from radioactive liquid and gaseous effluents to members of the public due to their activities inside the site boundary during the reporting period.

The following are the assumptions made in this assessment:

1. A member of the public stays in the owner controlled area for 3000 hours. The 3000 hours is based upon the State Police or National Guard personnel who is stationed at the site at the directive of the Governor. This time selected is conservative, as it is higher than full time employment with consideration for substantial overtime.

2. The highest dose individual is standing next to a radiologically controlled area for 10 hours, where the dose rate is 0.5 mR/hr. In areas where the dose rate is greater than 0.5 mR/hr, the area would be posted as a TLD or RWP required area. This is a conservative assumption, as any person would normally be moving around the island during their visit and would not spend it next to a restricted area posting. This calculation would also bound all personnel that visited the site or spent time in areas of lower dose rate for longer periods of time. The members of longest times on the site were the National Guard or State Police. They normally spent their time at the north gate or along the perimeter of the island with the exception for breaks/snack/lunch in the cafeteria.

3. Direct radiation to the north gate is best represented by the environmental TLD located at the North Bridge

4. Liquid effluents are not a pathway to the individual on site.

5. The estimated airborne dose is based on the annual dose to the boundary for year 2002. To correct for any period of time within the boundary, a 10% factor was used or 300 hours would be spend with the maximum dispersion factor and the average discharge rate for the year.

6. Highest dispersion factor for gaseous effluents to personnel outside restricted area is 4.99e-5 sec/m^3. This is the value used in FSAR section 2.5.4.2.1 Containment release to Yard intake for a 4 day to 30 day period. This intake is very close to the protected area and is very close to where the Reactor Building (Containment) would

release. This is calculated in the FSAR for postulated accident conditions and is a very conservative dispersion factor to be used for this calculation. This would be very conservative as the members of the public spend most of their time along the site boundary fence line and rarely near the protected area boundary.

The maximum total body dose to an individual is 11 mrem.

Attachment 9
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Assessment of Radiation Dose to Most Likely Exposed Real Individual per 40 CFR 190

Dose calculations were performed to demonstrate compliance with 40 CFR 190 (ODCM Part IV Section 2.10). Gaseous and liquid effluents released from TMI-1 and TMI-2 in 2002 resulted in maximum individual doses (regardless of age group) of 0.01 mrem to the thyroid and 0.04 mrem to any other organ including the whole (total) body. The direct radiation component was determined using the highest quarterly fence-line exposure rate as measured by an environmental TLD, and subtracting from it, the lowest quarterly environmental TLD exposure rate.

Based on the maximum exposure rate of 5.4 mR/standard month, a person residing at the fence-line for 67 hours (shoreline exposure from Reg. Guide 1.109) received an exposure of 0.50 mR. Based on the lowest exposure rate of 3.4 mR/standard month and converting it by the same method yielded a background exposure of 0.31 mR. Therefore, the net exposure from direct radiation from TMINS was 0.19 mR. Combining the direct radiation exposure (assumed to be equal to dose) with the maximum organ doses from liquid and gaseous releases, the maximum potential (total) doses were 0.20 mrem to the thyroid and 0.23 mrem to any other organ. Both doses were well below the limits specified in 40 CFR 190.

Attachment 10
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

Deviation from the ODCM Sampling and Analysis Regime during 2002

There was one deviation from the effluent sampling and analysis regime specified in the TMI Offsite Dose Calculation Manual during 2002.

The deviation was not obtaining a grab sample on a sump prior to discharging that sump. A condition report (TMI's corrective action system) was submitted as a result of the missed sample.

The average concentration value for the same type of water that was obtained during the month of release was used to account for the activity discharged. The dose and activity of this discharge is an insignificant value when compared to the plant's annual effluent.

Enclosure 1
2002 Annual Radioactive Effluent Releases Report for TMI
5928-03-20051

TMI Offsite Dose Calculation Manual, Revision 23
6610-PLN-4200.01

(Revision 23 was issued on
March 19, 2002)

AmerGen	TMI - Unit 1 Radiological Controls Procedure	Number 6610-PLN-4200.01
Title **Offsite Dose Calculation Manual (ODCM)**		Revision No 23
Applicability/Scope TMI Division	USAGE LEVEL 3	Effective Date 03/19/02

This document is within QA plan scope	X	Yes		No
50.59 Applicable	X	Yes		No

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INTRODUCTION

The OFFSITE DOSE CALCULATION MANUAL (ODCM) is a supporting document of the Three Mile Island Nuclear Station (TMI) Unit 1 and Unit 2 PDMS Technical Specifications and implements TMI radiological effluent controls. The ODCM contains the controls, bases, and surveillance requirements for liquid and gaseous radiological effluents. In addition, the ODCM describes the methodology and parameters to be used in the calculation of off-site doses due to radioactive liquid and gaseous effluents. This document also describes the methodology used for calculation of the liquid and gaseous effluent monitoring instrumentation alarm/trip set points. Liquid and Gaseous Radwaste Treatment System configurations are also included.

The ODCM also is used to define the requirements for the TMI radiological environmental monitoring program (REMP) and contains a list and graphical description of the specific sample locations used in the REMP.

The ODCM is maintained at the Three Mile Island (TMI) site for use as a reference guide and training document of accepted methodologies and calculations. Changes in the calculation methods or parameters will be incorporated into the ODCM to ensure the ODCM represents the present methodology in all applicable areas. Changes to the ODCM will be implemented in accordance with the TMI-1 and TMI-2 PDMS Technical Specifications.

The ODCM follows the methodology and models suggested by NUREG-0133, and Regulatory Guide 1.109, Revision 1 for calculation of off-site doses due to plant effluent releases. Simplifying assumptions have been applied in this manual where applicable to provide a more workable document for implementation of the Radiological Effluent Controls requirements.

TMI implements the TMI Radiological Effluent Controls Program and Regulatory Guide 1.21, Revision 1 (Annual Radioactive Effluent Release Report) requirements by use of a computerized system used to determine TMI effluent releases and to update cumulative effluent doses.

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PART I

TMI-1 RADIOLOGICAL EFFLUENT CONTROLS

1.0 DEFINITIONS

The following terms are defined for uniform interpretation of these controls and surveillances.

1.1 Reactor Operating Conditions

1.1.1 Cold Shutdown

The reactor is in the cold shutdown condition when it is subcritical by at least one percent delta k/k and Tavg is no more than 200°F. Pressure is defined by Technical Specification 3.1.2.

1.1.2 Hot Shutdown

The reactor is in the hot shutdown condition when it is subcritical by at least one percent delta k/k and Tavg is at or greater than 525°F.

1.1.3 Reactor Critical

The reactor is critical when the neutron chain reaction is self-sustaining and Keff = 1.0.

1.1.4 Hot Standby

The reactor is in the hot standby condition when all of the following conditions exist.

a. Tavg is greater than 525°F

b. The reactor is critical

c. Indicated neutron power on the power range channels is less than two percent of rated power. Rated power is defined in Technical Specification Definition 1.1.

1.1.5 Power Operation

The reactor is in a power operating condition when the indicated neutron power is above two percent of rated power as indicated on the power range channels. Rated power is defined in Technical Specification Definition 1.1.

1.1.6 Refueling Shutdown

The reactor is in the refueling shutdown condition when, even with all rods removed, the reactor would be subcritical by at least one percent delta k/k and the coolant temperature at the decay heat removal pump suction is no more than 140°F. Pressure is defined by Technical Specification 3.1.2. A refueling shutdown refers to a shutdown to replace or rearrange all or a portion of the fuel assemblies and/or control rods.

1.1.7 Refueling Operation

An operation involving a change in core geometry by manipulation of fuel or control rods when the reactor vessel head is removed.

1.1.8 Refueling Interval

Time between normal refuelings of the reactor. This is defined as once per 24 months.

1.1.9 Startup

The reactor shall be considered in the startup mode when the shutdown margin is reduced with the intent of going critical.

1.1.10 Tave

Tave is defined as the arithmetic average of the coolant temperatures in the hot and cold legs of the loop with the greater number of reactor coolant pumps operating, if such a distinction of loops can be made.

1.1.11 Heatup - Cooldown Mode

The heatup-cooldown mode is the range of reactor coolant temperature greater than 200°F and less than 525°F.

1.2 Operable

A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

1.3 Instrument Channel

An instrument channel is the combination of sensor, wires, amplifiers, and output devices which are connected for the purpose of measuring the value of a process variable for the purpose of observation, control, and/or protection. An instrument channel may be either analog or digital

1.4 Instrumentation Surveillance

1.4.1 Channel Test

A CHANNEL TEST shall be the injection of a simulated signal into the channel as close to the sensor as practical to verify OPERABILITY, including alarm and/or trip functions.

1.4.2 Channel Check

A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrumentation channels measuring the same parameter.

1.4.3 Source Check

A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

1.4.4 Channel Calibration

An instrument CHANNEL CALIBRATION is a test, and adjustment (if necessary), to establish that the channel output responds with acceptable range and accuracy to known values of the parameter which the channel measures or an accurate simulation of these values Calibration shall encompass the entire channel, including equipment actuation, alarm, or trip and shall be deemed to include the channel test.

1.5 Dose Equivalent I-131

The DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID 14844, "Calculation of Distance Factors for Power and Test Reactor Sites". [Or in Table E-7 of NRC Regulatory Guide 1.109, Revision 1, October 1977.]

1.6 Offsite Dose Calculation Manual (ODCM)

The OFFSITE DOSE CALCULATION MANUAL (ODCM) contains the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluent, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. The ODCM also contains (1) the Radiological Effluent Controls, (2) the Radiological Environmental Monitoring Program and (3) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports.

1.7 Gaseous Radwaste Treatment

The GASEOUS RADWASTE TREATMENT SYSTEM is the system designed and installed to reduce radioactive gaseous effluent by collecting primary coolant system off gases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

1.8 Ventilation Exhaust Treatment System

A VENTILATION EXHAUST TREATMENT SYSTEM is any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluent by passing ventilation or vent exhaust gases through charcoal absorbers and/or HEPA filters for the purpose of removing iodine or particulates from the gaseous exhaust system prior to the release to the environment. Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEMS.

1.9 Purge - Purging

PURGE or PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating conditions in such a manner that replacement air or gas is required to purify the confinement.

1.10 Venting

VENTING is the controlled process of discharging air as gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating conditions in such a manner that replacement air or gas is not provided. Vent used in system name does not imply a VENTING process.

1.11 Member(s) of the Public

MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the GPU System, GPU contractors or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries.

1.12 Site Boundary

The SITE BOUNDARY used as the basis for the limits on the release of gaseous effluents is as defined in Section 2.1.2.2 and shown on Figure 2.1-3 of the TMI-1 FSAR. This boundary line includes portions of the Susquehanna River surface between the east bank of the river and Three Mile Island and between Three Mile Island and Shelley Island.

The SITE BOUNDARY used as the basis for the limits on the release of liquid effluents is as shown in Figure 1.1 in Part I of this ODCM.

1.13 Frequency Notation

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1-1. All Surveillance Requirements shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. The 25% extension applies to all frequency intervals with the exception of "F." No extension is allowed for intervals designated "F."

Table 1-1

Frequency Notation

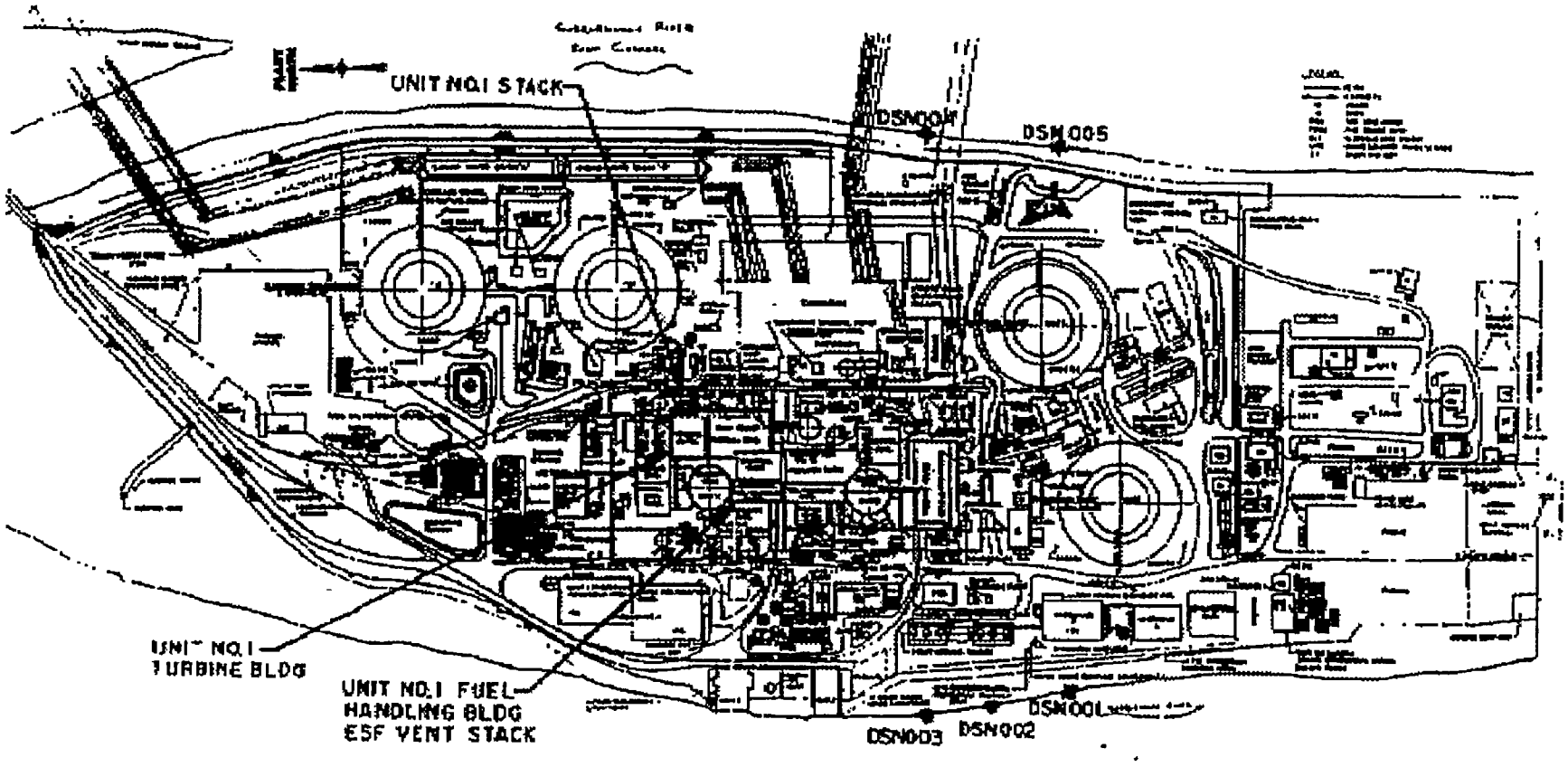
Notation	Frequency
S	Shiftly (once per 12 hours)
D	Daily (once per 24 hours)
W	Weekly (once per 7 days)
M	Monthly (once per 31 days)
Q	Quarterly (once per 92 days)
S/A	Semi-Annually (once per 184 days)
R	Refueling Interval (once per 24 months)
P S/U	Prior to each reactor startup, if not done during the previous 7 days
P	Completed prior to each release
N/A (NA)	Not applicable
E	Once per 18 months
F	Not to exceed 24 months

Bases

Section 1.13 establishes the limit for which the specified time interval for Surveillance Requirements may be extended. It permits an allowable extension of the normal surveillance interval to facilitate surveillance scheduling and consideration of plant operating conditions that may not be suitable for conducting the surveillance; e.g., transient conditions or other ongoing surveillance or maintenance activities. It also provides flexibility to accommodate the length of a fuel cycle for surveillances that are specified to be performed at least once each REFUELING INTERVAL. It is not intended that this provision be used repeatedly as a convenience to extend surveillance intervals beyond that specified for surveillances that are not performed once each REFUELING INTERVAL. Likewise, it is not the intent that REFUELING INTERVAL surveillances be performed during power operation unless it is consistent with safe plant operation. The limitation of Section 1.13 is based on engineering judgement and the recognition that the most probable result of any particular surveillance being performed is the verification of conformance with the Surveillance Requirements. This provision is sufficient to ensure that the reliability ensured through surveillance activities is not significantly degraded beyond that obtained from the specified surveillance interval.

FIGURE 1.1

Gaseous Effluent Release Points and Liquid Effluent Outfall Locations



2.0 RADIOLOGICAL EFFLUENT CONTROLS AND BASES

2.1 Radioactive Effluent Instrumentation

2.1.1 Radioactive Liquid Effluent Instrumentation

CONTROL:

The radioactive liquid effluent monitoring instrumentation channels shown in Table 2.1-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Control 2.2.1.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY: At all times *

ACTION.

a. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive liquid effluent monitored by the affected channel or declare the channel inoperable.

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2.1-1. Exert best efforts to return the instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Annual Effluent Release Report why the inoperability was not corrected in a timely manner.

* For FT-84, and RM-L6, operability is not required when discharges are positively controlled through the closure of WDL-V257.

* For RM-L12 and associated IWTS/IWFS flow interlocks, operability is not required when discharges are positively controlled through the closure of IW-V72, 75 and IW-V280, 281.

* For FT-146, operability is not required when discharges are positively controlled through the closure of WDL-V257, IW-V72, 75 and IW-V280, 281.

BASES

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in liquid effluent during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with NRC approved methods in the ODCM to ensure that the alarm/trip will occur prior to exceeding ten times the effluent concentrations of 10 CFR Part 20.

Table 2.1-1

Radioactive Liquid Effluent Instrumentation

	Instrument	Minimum Channels Operable	ACTION
1.	Gross Radioactivity Monitors Providing Automatic Termination of Release		
a.	Unit 1 Liquid Radwaste Effluent Line (RM-L6)	1	18
b.	IWTS/IWFS Discharge Line (RM-L12)	1	20
2.	Flow Rate Measurement Devices		
a.	Unit 1 Liquid Radwaste Effluent Line (FT-84)	1	21
b.	Station Effluent Discharge (FT-146)	1	21

Table Notation

ACTION 18 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may continue, provided that prior to initiating a release:

1. At least two independent samples are analyzed in accordance with Surveillances 3.2.1.1.1 and 3.2.1.1.2 and;

2. At least two technically qualified members of the Unit staff independently verify the release rate calculations and verify the discharge valve lineup.

3. The TMI Plant Manager shall approve each release.

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 20 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may commence or continue provided that grab samples are collected and analyzed for gross radioactivity (beta or gamma) at a limit of detection of at least $1x10^{-7}$ microcuries/ml, prior to initiating a release and at least once per 12 hours during release.

ACTION 21 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, radioactive effluent releases via this pathway may continue, provided the flow rate is estimated at least once per 4 hours during actual releases. Pump curves may be used to estimate flow.

2.1.2 Radioactive Gaseous Process and Effluent Monitoring Instrumentation

CONTROL:

The radioactive gaseous process and effluent monitoring instrumentation channels shown in Table 2.1-2 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Control 2.2.2.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY: As shown in Table 2.1-2.

ACTION

a. With a radioactive gaseous process or effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive effluent monitored by the affected channel or declare the channel inoperable.

b. With less than the minimum number of radioactive gaseous process or effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2.1-2. Exert best efforts to return the instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Annual Effluent Release Report why the inoperability was not corrected in a timely manner.

BASES

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluent during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with NRC approved methods in the ODCM to provide reasonable assurance that the annual releases are within the limits specified in 10 CFR 20.1301.

The low range condenser offgas noble gas activity monitors also provide data for determination of steam generator primary to secondary leakage rate. Channel operability requirements are based on an ASLB Order No LBP-84-47 dated October 31, 1984, and as cited in 20 NRC 1405 (1984).

Table 2.1-2

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1.	Waste Gas Holdup System			
a.	Noble Gas Activity Monitor (RM-A7)	1	***	25
b.	Effluent System Flow Rate Measuring Device (FT-123)	1	***	26
2.	Waste Gas Holdup System Explosive Gas Monitoring System			
a.	Hydrogen Monitor	2	**	30
b.	Oxygen Monitor	2	**	30
3.	Containment Purge Monitoring System			
a.	Noble Gas Activity Monitor (RM-A9)	1	#	27
b.	Iodine Sampler (RM-A9)	1	#	31
c.	Particulate Sampler (RM-A9)	1	#	31
d.	Effluent System Flow Rate Measuring Device (FR-148)	1	#	26
e.	Sampler Flow Rate Monitor	1	#	26

Table 2.1-2 (Cont'd)

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
4.	Condenser Vent System			
a.	Low Range Noble Gas Activity Monitor (RM-A5Lo and Suitable Equivalent)	2(1)	##	32

NOTE (1): For one of the channels, an operable channel may be defined for purposes of this control and 3.1.2 1 only as a suitable equivalent monitoring system capable of being placed in service within one hour. A suitable equivalent system shall include instrumentation with comparable sensitivity and response time to the RM-A5Lo monitoring channel. When the equivalent monitoring system is in service, indication will be continuously available to the operator, either through indication and alarm in the Control Room or through communication with a designated individual continuously observing local indication.

Table 2.1-2 (Cont'd)

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
5.	Auxiliary and Fuel Handling Building Ventilation System			
a.	Noble Gas Activity Monitor (RM-A8) or (RM-A4 and RM-A6)	1	*	27
b.	Iodine Samples (RM-A8) or (RM-A4 and RM-A6)	1	*	31
c.	Particulate Sampler (RM-A8) or (RM-A4 and RM-A6)	1	*	31
d.	Effluent System Flow Rate Measuring Devices (FR-149 and FR-150)	1	*	26
e.	Sampler Flow Rate Monitor	1	*	26
6.	Fuel Handling Building ESF Air Treatment System			
a.	Noble Gas Activity Monitor (RM-A14 or Suitable Equivalent)	1	****	27, 33
b.	Iodine Cartridge	N/A[(2)]	****	31, 33
c.	Particulate Filter	N/A[(2)]	****	31, 33
d.	Effluent System Flow (UR-1104A/B)	1	****	26, 33
e.	Sampler Flow Rate Monitor	1	****	26, 33

NOTE 2: No instrumentation channel is provided. However, for determining operability, the equipment named must be installed and functional or the ACTION applies.

Table 2.1-2 (Cont'd)

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
7.	Chemical Cleaning Building Ventilation System			
a.	Noble Gas Activity Monitor (ALC RM-I-18)	1[(3)]	###	27
b.	Iodine Sampler (ALC RM-I-18)	1[(3)]	###	31
c.	Particulate Sampler (ALC RM-I-18)	1	###	31
8.	Waste Handling and Packaging Facility Ventilation System			
a.	Particulate Sampler (WHP-RIT-1)	1	###	31
9.	Respirator and Laundry Maintenance Facility Ventilation System			
a.	Particulate Sampler (RLM-RM-1)	1	###	31

NOTE 3: Channel only required when liquid radwaste is moved or processed within the facility.

Table 2.1-2

Table Notation

* At all times.
** During waste gas holdup system operation.
*** Operability is not required when discharges are positively controlled through the closure of WDG-V47 and where RM-A8 (or RM-A4 and RM-A6), FT-149, and FT-150 are operable.
**** During Fuel Handling Building ESF Air Treatment System Operation.
# At all times during containment purging.
At all times when condenser vacuum is established.
During operation of the ventilation system.

ACTION 25 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank may be released to the environment provided that prior to initiating the release·

1. At least two independent samples of the tank's contents are analyzed in accordance with Table 3.2-2, Item A, and

2. At least two technically qualified members of the Unit staff independently verify the release rate calculations and verify the discharge valve lineup.

3. The TMI Plant Manager shall approve each release

Otherwise, suspend release of radioactive effluent via this pathway.

ACTION 26 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours.

ACTION 27 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and the initial samples are analyzed for gross activity (gamma scan) within 24 hours after the channel has been declared inoperable. If RM-A9 is declared inoperable, see also Technical Specification 3.5.1, Table 3-5.1, Item C.3.f.

ACTION 30 1. With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, a grab sample shall be collected and analyzed for the inoperable gas channel(s) at least once per 24 hours. With both channels inoperable, a grab sample shall be collected and analyzed for the inoperable gas channel(s):

(a) at least once per 4 hours during degassing operations.

(b) at least once per 24 hours during other operations (e.g. Feed and Bleed).

Table 2.1-2

2. If the inoperable gas channel(s) is not restored to service within 14 days, a special report shall be submitted to the Regional Administrator of the NRC Region I Office and a copy to the Director, Office of Inspection and Enforcement within 30 days of declaring the channel(s) inoperable. The report shall describe (a) the cause of the monitor inoperability, (b) action being taken to restore the instrument to service, and (c) action to be taken to prevent recurrence.

ACTION 31 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that within four hours after the channel has been declared inoperable, samples are continuously collected with auxiliary sampling equipment.

ACTION 32 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue for up to 28 days, provided that one OPERABLE channel remains in service or is placed in service within 1 hour. **After 28 days, or if one OPERABLE channel does not remain in service or is not placed in service within 1 hour, the provisions of Technical Specification 3.0.1 apply, as if this Control were a Tech Spec Limiting Condition for Operation.**

ACTION 33 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, either restore the inoperable channel to OPERABLE status within 7 days, or prepare and submit a special report within 30 days outlining the action(s) taken, the cause of the inoperability, and plans and schedule for restoring the system to OPERABLE status.

2.2 Radioactive Effluent Controls

2.2.1 Liquid Effluent Controls

2.2.1.1 Liquid Effluent Concentration

CONTROL:

The concentration of radioactive material released at anytime from the unit to unrestricted areas shall be limited to ten times the concentrations specified in 10 CFR Part 20.1001-20 2401, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 3×10^{-3} uCi/cc total activity.

APPLICABILITY: At all times

ACTION.

With the concentration of radioactive material released from the unit to unrestricted areas exceeding the above limits, immediately restore concentrations within the above limits.

BASES

This control is provided to ensure that the concentration of radioactive materials released in liquid waste effluent from the unit to unrestricted areas will be less than ten times the concentration levels specified in 10 CFR Part 20.1001-20.2401, Appendix B, Table 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will not result in exposures with (1) the Section II.A design objectives of Appendix I, 10 CFR Part 50, to a MEMBER OF THE PUBLIC and (2) the limits of 10 CFR Part 20.1301 to the population. The concentration limit for noble gases is based upon the assumption the Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

2.2.1.2 Liquid Effluent Dose

CONTROL

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released from the unit to the SITE BOUNDARY shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ.

b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

APPLICABILITY: At all times

ACTION:

a. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce the releases of radioactive materials in liquid effluents during the remainder of the current calendar quarter and during the subsequent 3 calendar quarters so that the cumulative dose or dose commitment to any individual from such releases during these four calendar quarters is within 3 mrem to the total body and 10 mrem to any organ. This Special Report shall also include (1) the result of radiological analyses of the drinking water source, and (2) the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act.

BASES

This control and associated action is provided to implement the requirements of Sections II.A, III.A, and IV.A of Appendix I, 10 CFR Part 50. The Control implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable". Also, for fresh water sites with drinking water supplies which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 10 CFR 20. The dose calculations in the ODCM implement The requirements in Section III.A. of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October, 1977, and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April, 1977. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.113.

2.2.1.3 Liquid Radwaste Treatment System

CONTROL:

The appropriate portions of the liquid radwaste treatment system shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses due to the liquid effluent from the unit to unrestricted areas would exceed 0.06 mrem to the total body or 0.2 mrem to any organ in any calendar month.

APPLICABILITY: At all times

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which includes the following information:

1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for inoperability,

2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and,

3. A summary description of action(s) taken to prevent a recurrence.

BASES

The requirement that the appropriate portions of this system be used, when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept as low as is reasonably achievable. This control implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The intent of Section II.D. is to reduce effluents to as low as is reasonably achievable in a cost effective manner. This control satisfies this intent by establishing a dose limit which is a small fraction (25%) of Section II.A of Appendix I, 10 CFR Part 50 dose requirements. This margin, a factor of 4, constitutes a reasonable reduction.

2.2.1.4 Liquid Holdup Tanks

CONTROL

The quantity of radioactive material contained in each of the following tanks shall be limited to less than or equal to 10 curies, excluding tritium and dissolved or entrained noble gases.

a. Outside temporary tank

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material in any of the above listed tanks exceeding the above limit, immediately suspend all additions of radioactive material to the tank and within 48 hours reduce the tank contents to within the limit.

BASES

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20.1001-20-20.2401, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.

2.2.2 Gaseous Effluent Controls

2.2.2.1 Gaseous Effluent Dose Rate

CONTROL:

The dose rate due to radioactive materials released in gaseous effluent from the site shall be limited to the following:

a. For noble gases: less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin, and

b. For I-131, I-133, tritium and all radionuclides in particulate form with half lives greater than 8 days: less than or equal to 1500 mrem/yr to any organ.

APPLICABILITY: At all times.

ACTION:

With the release rate(s) exceeding the above limits, immediately decrease the release rate to comply with the above limit(s).

BASES

The control provides reasonable assurance that the annual dose at the SITE BOUNDARY from gaseous effluent from all units on the site will be within the annual dose limits of 10 CFR Part 20 for unrestricted areas while providing sufficient operational flexibility in establishing effluent monitor setpoints. These gaseous release rates provide reasonable assurance that radioactive material discharged in gaseous effluent will not result in the exposure of a MEMBER OF THE PUBLIC in an unrestricted area, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the values specified in Appendix B, Table 2 of 10 CFR Part 20. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of the MEMBER OF THE PUBLIC will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the exclusion area boundary. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year (NUREG 0133).

2.2.2.2 Gaseous Effluents Dose-Noble Gases

CONTROL:

The air dose due to noble gases released in gaseous effluents from the unit to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation and,

b. During any calendar year: less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

APPLICABILITY: At all times.

ACTION:

a. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

BASES

This control applies to the release of radioactive materials in gaseous effluents from TMI-1.

This control and associated action is provided to implement the requirements of Section II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Control implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through the appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Release of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

2.2.2.3 Dose - Iodine-131, Iodine-133, Tritium, and Radionuclides In Particulate Form

CONTROL:

The dose to a MEMBER OF THE PUBLIC from Iodine-131, Iodine-133, Tritium, and all radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents released from the unit to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: less than or equal to 7.5 mrem to any organ, and

b During any calendar year: less than or equal to 15 mrem to any organ.

APPLICABILITY: At all times.

ACTION:

With the calculated dose from the release of Iodine-131, Iodine-133, Tritium, and radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

BASES

This control applies to the release of radioactive materials in gaseous effluents from TMI-1.

This control and associated action is provided to implement the requirements of Section II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Controls are the guides set forth in Section II.C of Appendix I. The ACTION statement provides the required operating flexibility and at the same time implements the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable " The ODCM calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October, 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July, 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions The release rate controls for iodine-131, iodine-133, tritium and radionuclides in particulate form with half lives greater than 8 days are dependent upon the existing radionuclide pathways to man, in areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man.

2.2.2.4 Gaseous Radwaste Treatment System

CONTROL

The GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be OPERABLE. The appropriate portions of the GASEOUS RADWASTE TREATMENT SYSTEM shall be used to reduce radioactive materials in the gaseous waste prior to their discharge when the monthly projected gaseous effluent air doses due to untreated gaseous effluent releases from the unit would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The appropriate portions of the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the monthly projected doses due to gaseous effluent releases from the site would exceed 0.3 mrem to any organ

APPLICABILITY: At all times.

ACTION:

a. With the GASEOUS RADWASTE TREATMENT SYSTEM and/or the VENTILATION EXHAUST TREATMENT SYSTEM inoperable for more than a month or with gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which includes the following information:

   1. Identification of the inoperable equipment or subsystems and the reason for inoperability,

   2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

   3. A summary description of action(s) taken to prevent a recurrence.

BASES

The use of the GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM ensures that gaseous effluents are treated as appropriate prior to release to the environment. The appropriate portions of this system provide reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This control implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the guide set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

2.2.2.5 Explosive Gas Mixture

CONTROL

The concentration of oxygen in the Waste Gas Holdup System shall be limited to less than or equal to 2% by volume whenever the concentration of hydrogen in the Waste Gas Holdup System is greater than or equal to 4% by volume.

AVAILABILITY: At all times.

ACTION:

Whenever the concentration of hydrogen in the Waste Gas Holdup System is greater than or equal to 4% by volume, and:

a. The concentration of oxygen in the Waste Gas Holdup System is greater than 2% by volume, but less than 4% by volume, without delay begin to reduce the oxygen concentration to within its limit.

b. The concentration of oxygen in the Waste Gas Holdup System is greater than or equal to 4% by volume, immediately suspend additions of waste gas to the Waste Gas Holdup System and without delay begin to reduce the oxygen concentration to within its limit.

BASES:

Based on experimental data (Reference 1), lower limits of flammability for hydrogen is 5% and for oxygen is 5% by volume. Therefore, if the concentration of either gas is kept below it lower limit, the other gas may be present in higher amounts without the danger of an explosive mixture. Maintaining the concentrations of hydrogen and oxygen such that an explosive mixture does not occur in the waste gas holdup system provides assurance that the release of radioactive materials will be controlled in conformance with the requirements of General Design Criterion 60 of Appendix A to 10 CFR 50.

REFERENCES

(1) Bulletin 503, Bureau of Mines; Limits of Flammability of Gases and Vapors.

2 2.2.6 Waste Gas Decay Tanks

CONTROL:

The quantity of radioactivity contained in each waste gas decay tank shall be limited to less than or equal to 8800 curies noble gases (considered as Xe-133).

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material in any waste gas decay tank exceeding the above limit, immediately suspend all additions of radioactive material to the tank and within 48 hours reduce the tank contents to within the limit.

BASES

Restricting the quantity of radioactivity contained in each waste gas decay tank provides assurance that in the event of an uncontrolled release of the tanks contents, the resulting total body exposure to a MEMBER OF THE PUBLIC at the nearest exclusion area boundary will not exceed 0.5 rem. This is consistent with Standard Review Plan 15.7.1, "Waste Gas System Failure."

2.2.3 Total Radioactive Effluent Controls

2.2.3.1 Total Dose

CONTROL:

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC, due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ except the thyroid, which shall be limited to less than or equal to 75 mrem.

APPLICABILITY: At all times.

ACTION:

With the calculated dose from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Controls 2.2.1.2.a, 2.2.1.2.b, 2.2.2.2.a, 2.2.2.2.b, 2.2.2.3.a, or, 2.2.2.3.b, calculations should be made including direct radiation contributions from the unit and from outside storage tanks to determine whether the above limits of Control 2.2.3.1 have been exceeded. If such is the case, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in

10 CFR Part 20.2203(b), shall include an analysis which estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceed the above limits, and if the release condition resulting in violation of 40 CFR 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

BASES

This control is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20.1301(d). This control requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation exceed 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem. For sites containing up to 4 reactors, it is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the reactor units and outside storage tanks are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the member of the public from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any member of the public is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20 2203(b), is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in Controls 2.2 1.1 and 2.2.2.1. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.

3.0 **SURVEILLANCES**

3.1 Radioactive Effluent Instrumentation

3.1.1 Radioactive Liquid Effluent Instrumentation

Surveillance Requirements

3.1.1.1 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, AND CHANNEL TEST operations during the MODES and at the frequencies shown in Table 3.1-1.

Table 3.1-1

Radioactive Liquid Effluent Monitoring Instrumentation Surveillance Requirements

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL TEST
1.	Radioactivity Monitors Providing Alarm and Automatic Isolation				
a.	Unit 1 Liquid Radwaste Effluents Line (RM-L-6)	D	P	R(2)	Q(1)
b	IWTS/IWFS Discharge Line (RM-L-12)	D	P	R(2)	Q(1)
2.	Flow Rate Monitors				
a.	Unit 1 Liquid Radwaste Effluent Line (FT-84)	D(3)	N/A	R	Q
b.	Station Effluent Discharge (FT-146)	D(3)	N/A	R	Q

Table 3.1-1

Table Notation

(1) The CHANNEL TEST shall also demonstrate that automatic isolation of this pathway and control room alarm annunciation occurs if the following condition exists:

1. Instrument indicates measured levels above the high alarm/trip setpoint. (Includes - circuit failure)

2. Instrument indicates a down scale failure. (Alarm function only.) (Includes - circuit failure)

3. Instrument controls moved from the operate mode (Alarm function only).

(2) The initial CHANNEL CALIBRATION for radioactivity measurement instrumentation shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology or using standards that have been obtained from suppliers that participated in measurement assurance activities with NIST. These standards should permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration should be used. (Operating plants may substitute previously established calibration procedures for this requirement)

(3) CHANNEL CHECK shall consist of verifying indication of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or batch releases are made.

Table 3.1-2

Radioactive Gaseous Process and Effluent Monitoring Instrumentation Surveillance Requirements

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL TEST	APPLICABILITY
1.	Waste Gas Holdup System					
a.	Noble Gas Activity Monitor (RM-A7)	P	P	E(3)	Q(1)	***
b.	Effluent System Flow Rate Measuring Device (FT-123)	P	N/A	E	Q	***
2.	Waste Gas Holdup System Explosive Gas Monitoring System					
a.	Hydrogen Monitor	D	N/A	Q(4)	M	**
b.	Oxygen Monitor	D	N/A	Q(5)	M	**
3.	Containment Purge Vent System					
a.	Noble Gas Activity Monitor (RM-A9)	D	P	E(3)	M(1)	#
b.	Iodine Sampler (RM-A9)	W	N/A	N/A	N/A	#
c.	Particulate Sampler (RM-A9)	W	N/A	N/A	N/A	#
d.	Effluent System Flow Rate Measuring Device (FR-148)	D	N/A	E	Q	#
e.	Sampler Flow Rate Monitor	D	N/A	E	N/A	#
4.	Condenser Vent System					
a.	Noble Gas Activity Monitor (RM-A5 and Suitable Equivalent - See Table 2.1-2, Item 4.a)	D	M	E(3)	Q(2)	##

Table 3.1-2

Radioactive Gaseous Process and Effluent Monitoring Instrumentation Surveillance Requirements

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL TEST	APPLICABILITY
5.	Auxiliary and Fuel Handling Building Ventilation System					
a.	Noble Gas Activity Monitor (RM-A8) or (RM-A4 and RM-A6)	D	M	E(3)	Q(1)	*
b.	Iodine Sampler (RM-A8) or (RM-A4 and RM-A6)	W	N/A	N/A	N/A	*
c.	Particulate Sampler (RM-A8) or (RM-A4 and RM-A6)	W	N/A	N/A	N/A	*
d.	System Effluent Flow Rate Measurement Devices (FR-149 and FR-150)	D	N/A	E	Q	*
e.	Sampler Flow Rate Monitor	D	N/A	E	N/A	*
6.	Fuel Handling Building ESF Air Treatment System					
a.	Noble Gas Activity Monitor (RM-A14)	D	M	R(3)	Q(2)	****
b.	System Effluent Flow Rate (UR-1104 A/B)	D	N/A	R	Q	****
c.	Sampler Flow Rate Measurement Device	D	N/A	R	Q	****

Table 3.1-2

Radioactive Gaseous Process and Effluent Monitoring Instrumentation Surveillance Requirements

	INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL TEST	APPLICABILITY
7.	Chemical Cleaning Building Ventilation System					
	a. Noble Gas Activity Monitor (ALC RM-I-18)	D	M	E(3)	Q(2)	###
	b. Iodine Sampler (ALC RM-I-18)	W	N/A	N/A	N/A	###
	c. Particulate Sampler (ALC RM-I-18)	W	N/A	N/A	N/A	###
8.	Waste Handling and Packaging Facility Ventilation System					
	a. Particulate Sampler (WHP-RIT-1)	D	W	SA	W	###
9.	Respirator and Laundry Maintenance Ventilation System					
	a. Particulate Sampler (RLM-RM-1)	D	W	SA	W	###

Table 3.1-2

Table Notation

* At all times.
** During waste gas holdup system operation.
*** Operability is not required when discharges are positively controlled through the closure of WDG-V47, and where RM-A8 (or RM-A4 and RM-A6), FT-149, and FT-150 are operable.
**** During Fuel Handling Building ESF Air Treatment System Operation.
# At all times during containment purging.
At all times when condenser vacuum is established.
During operation of the ventilation system.

(1) The CHANNEL TEST shall also demonstrate that automatic isolation of this pathway for the Auxiliary and Fuel Handling Building Ventilation System, the supply ventilation is isolated and control room alarm annunciation occurs if the following condition exists:

1. Instrument indicates measured levels above the high alarm/trip setpoint (Includes circuit failure)

2. Instrument indicates a down scale failure (Alarm function only) (Includes circuit failure).

3. Instrument controls moved from the operate mode (Alarm function only).

(2) The CHANNEL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exist:

1 Instrument indicates measured levels above the alarm setpoint. (includes circuit failure)

2. Instrument indicates a down scale failure (includes circuit failure).

3. Instrument controls moved from the operate mode

(3) The initial CHANNEL CALIBRATION for radioactivity measurement instrumentation shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards should permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration should be used. (Operating plants may substitute previously established calibration procedures for this requirement.)

(4) The CHANNEL CALIBRATION shall include the use of standard gas samples containing a nominal.

1. One volume percent hydrogen, balance nitrogen, and

2. Four volume percent hydrogen, balance nitrogen.

(5) The CHANNEL CALIBRATION shall include the use of standard gas samples containing a nominal:

1. One volume percent oxygen, balance nitrogen, and

2. Four volume percent oxygen, balance nitrogen.

3.2 Radiological Effluents

3.2.1 Liquid Effluents

SURVEILLANCE REQUIREMENTS

3.2.1.1 Concentration

3.2.1.1.1 The radioactivity content of each batch of radioactive liquid waste shall be determined prior to release by sampling and analysis in accordance with Table 3.2-1. The results of pre-release analyses shall be used with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Control 2.2.1.1.

3.2.1.1.2 Post-release analysis of samples composited from batch releases shall be performed in accordance with Table 3.2-1. The results of the previous post-release analysis shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Control 2.2.1.1.

3 2.1.1.3 The radioactivity concentration of liquids discharged from continuous release points shall be determined by collection and analysis of samples in accordance with Table 3.2-1. The results of the analysis shall be used with the calculational methods of the ODCM to assure that the concentration at the point of release is maintained within the limits of Control 2.2.1.1.

3.2.1.2 Dose Calculations

3.2.1.2.1 Cumulative dose contributions from liquid effluents shall be determined in accordance with the Offsite Dose Calculation Manual (ODCM) at least once a month.

3.2.1.3 Liquid Waste Treatment

3.2.1.3.1 Doses due to liquid releases shall be projected at least once a month, in accordance with the ODCM.

3.2.1.4 Liquid Holdup Tanks

3.2.1.4.1 The quantity of radioactive material contained in each of the tanks specified in Control 2.2.1.4 shall be determined to be within the limit by analyzing a representative sample of the tank's content weekly when radioactive materials are being added to the tank.

Table 3.2-1

Radioactive Liquid Waste Sampling and Analysis Program

	Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml) (Note a)
A.1	Batch Waste Release Tanks (Note d)	P Each Batch	P Each Batch	H-3 Principal Gamma Emitters (Note f) I-131 Dissolved and Entrained Gases (Gamma Emitters) (Note g)	1×10^{-5} 5×10^{-7} 1×10^{-6} 1×10^{-4}
		P Each Batch	Q Composite (Note b)	Gross alpha Sr-89, Sr-90 Fe-55	1×10^{-7} 5×10^{-8} 1×10^{-6}
A.2	Continuous Releases (Note e)	Continuous (Note c)	W Composite (Note c)	Principal Gamma Emitters (Note f) I-131 Dissolved and Entrained Gases (Gamma Emitters) (Note g)	5×10^{-7} 1×10^{-6} 1×10^{-5}
		Continuous (Note c)	M Composite (Note c)	H-3 Gross alpha	1×10^{-5} 1×10^{-7}
		Continuous (Note c)	Q Composite (Note c)	Sr-89, Sr-90 Fe-55	5×10^{-8} 1×10^{-6}

Table 3.2-1

Table Notation

a. The LLD is defined, for purposes of this surveillance, as the smallest concentration of radioactive material in a sample that will yield a net count above system background that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 S_b}{E \times V \times 2.22 \times 10^6 \times Y \times \exp(-\lambda \Delta t)}$$

Where.

LLD is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per disintegration),

V is the sample size (in units of mass or volume),

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting.

Typical values of E, V, Y and Δt shall be used in the calculation.

It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement

b. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

c. To be representative of the quantities and concentrations of radioactive materials in liquid effluent, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

Table 3.2-1

d. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and be thoroughly mixed, by a method described in the ODCM, to assure representative sampling.

e. A continuous release is the discharge of liquid wastes of a non- discrete volume; e.g., from a volume or system that has an input flow during the continuous release.

f. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radioactive Effluent Release Report pursuant to TS 6.9 4.

g. The gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, and Xe-135. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Effluent Release Report pursuant to T.S. 6.9.4.

3.2.2 Gaseous Effluents

SURVEILLANCE REQUIREMENTS

3.2.2.1 Dose Rates

3 2.2.1.1 The dose rate due to noble gases in gaseous effluents shall be determined to be within the limits of Control 2.2.2.1.a in accordance with the methods and procedures of the ODCM.

3 2.2.1.2 The dose rate of radioactive materials, other than noble gases, in gaseous effluents shall be determined to be within the limits of Control 2.2.2.1.b in accordance with methods and procedures of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program, specified in Table 3.2-2.

3.2.2.2 Dose, Noble Gas

3.2.2.2.1 Cumulative dose contributions from noble gas effluents for the current calendar quarter and current calendar year shall be determined in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM) monthly.

3.2.2.3 Dose, Iodine-131, Iodine-133, Tritium, and Radionuclides In Particulate Form

3.2.2.3.1 Cumulative dose contributions from Iodine-131, Iodine-133, Tritium, and radionuclides in particulate form with half lives greater than 8 days for the current calendar quarter and current calendar year shall be determined in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM) monthly.

3.2.2.4 Gaseous Waste Treatment

3.2.2.4.1 Doses due to gaseous releases from the unit shall be projected monthly in accordance with the ODCM.

3.2.2.5 Explosive Gas Mixture

3 2.2.5.1 The concentrations of hydrogen and oxygen in the waste gas holdup system shall be determined to be within the limits of Control 2.2.2.5 by monitoring the waste gases in the Waste Gas Holdup System with the hydrogen and oxygen monitors covered in Table 2.1-2 of Control 2.1.2.

3 2.2.6 Waste Gas Decay Tank

3.2.2.6.1 The concentration of radioactivity contained in the vent header shall be determined weekly. If the concentration of the vent header exceeds 10.7 Ci/cc, daily samples shall be taken of each waste gas decay tank being added to, to determine if the tank(s) is less than or equal to 8800 Ci/tank.

Table 3.2-2

Radioactive Gaseous Waste Sampling and Analysis Program

	Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) μCi/ml) (Note a)
A.	Waste Gas Decay Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters (Note g)	1×10^{-4}
B.	Containment Purge	P (Note b) Each Purge Grab Sample	P (Note b) Each Purge	H-3 Principal Gamma Emitters (Note g)	1×10^{-6} 1×10^{-4}
C.	Auxiliary and Fuel Handling Building Air Treatment System	M (Notes c, e) Grab Sample	M	H-3 Principal Gamma Emitters (Note g)	1×10^{-6} 1×10^{-4}
D.	Fuel Handling Building ESF Air Treatment System	M (during System Operation) Grab Sample	M (during System Operation)	H-3 Principal Gamma Emitters (Note g)	1×10^{-6} 1×10^{-4}
E.	Condenser Vacuum Pumps Exhaust (Note h)	M (Note h) Grab Sample	M (Note h)	H-3 Principal Gamma Emitters (Note g)	1×10^{-6} 1×10^{-4}
F.	Chemical Cleaning Building Air Treatment System	M (Note I) Grab Sample	M	H-3 Principal Gamma Emitters (Note g)	1×10^{-6} 1×10^{-4}
G.	Waste Handling and Packaging Facility Air Treatment System	See Section I of this table	See Section I of this table	See Section I of this table	See Section I of this table
H.	Respirator and Laundry Maintenance Facility Air Treatment System	See Section I of this table	See Section I of this table	See Section I of this table	See Section I of this table

Table 3.2-2

Radioactive Gaseous Waste Sampling and Analysis Program

	Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml) (Note a)
I.	All Release Types as Listed Above in B, C, D, F, G, and H (During System Operation	Continuous (Note f)	W (Note d) Charcoal Sample	I-131	1×10^{-12}
		Continuous (Note f)	W (Note d) Particulate	Principal Gamma Emitters (Note g) (I-131, Others)	1×10^{-11}
		Continuous (Note f)	Q Composite Particulate Sample	Gross Alpha	1×10^{-11}
		Continuous (Note f)	Q Composite Particulate Sample	Sr-89, Sr-90	1×10^{-11}
J.	Condenser Vent Stack Continuous Iodine Sampler (Note j)	Continuous (Note k)	W (Note d) Charcoal Sample	I-131	1×10^{-12}

Table 3.2-2

Table Notation

a. The LLD is defined, for purposes of this surveillance, as the smallest concentration of radioactive material in a sample that will yield a net count above system background that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 S_b}{E \times V \times 2.22 \times 10^6 \times Y \times \exp(-\lambda \Delta t)}$$

Where:

LLD is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

S_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per disintegration),

V is the sample size (in units of mass or volume),

2.22×10^6 is the number of disintegrations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting.

Typical values of E, V, Y and Δt shall be used in the calculation

It should be recognized that the LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement system and not as an "a posteriori" (after the fact) limit for a particular measurement.

b. Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER within one hour unless (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3.

c. Tritium grab samples from the spent fuel pool area shall be taken at least once per 24 hours when the refueling canal is flooded.

Table 3.2-2

d. Charcoal cartridges and particulate filters shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler)

e. Tritium grab samples shall be taken weekly from the spent fuel pool area whenever spent fuel is in the spent fuel pool.

f. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Controls 2.2.2.1, 2.2.2.2, and 2.2.2.3.

g. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135 and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radioactive Effluent Release Report pursuant to TS 6.9.4.

h. Applicable only when condenser vacuum is established. Sampling and analysis shall also be performed following shutdown, startup, or a THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER within one hour unless (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has not increased more than a factor of 3; and (2) the noble gas activity monitor shows that effluent activity has not increased by more than a factor of 3.

i. Gross Alpha, Sr-89, and Sr-90 analyses do not apply to the Fuel Handling Building ESF Air Treatment System.

j. If the Condenser Vent Stack Continuous Iodine Sampler is unavailable, then alternate sampling equipment will be placed in service within 48 hours or a report will be prepared and submitted within 30 days from the time the sampler is found or made inoperable which identifies (a) the cause of the inoperability, (b) the action taken to restore representative sampling capability, (c) the action taken to prevent recurrence, and (d) quantification of the release via the pathway during the period and comparison to the limits prescribed by Control 2.2.2.1.b.

k. Applicable only when condenser vacuum is established.

l. Applicable when liquid radwaste is moved or processed within the facility.

m. Iodine samples only required in the Chemical Cleaning Building when TMI-1 liquid radwaste is stored or processed in the facility.

3.2.3 Total Radioactive Effluents

3.2.3.1 Dose Calculation

3.2.3.1.1 Cumulative annual dose contributions from liquid and gaseous effluents shall be determined in accordance with Surveillances 3.2.1.2.1, 3.2.2.2.1, and 3.2.2.3.1, including direct radiation contributions from the Unit and from outside storage tanks, and in accordance with the methodology contained in the ODCM.

4.0 PART I REFERENCES

4.1 Title 10, Code of Federal Regulations, "Energy"

4.2 Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routing Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, "Revision 1, October 1977

4.3 TMI-1 Technical Specifications, attached to Facility Operating License No. DPR-50

4.4 TMI-1 FSAR

PART II

TMI-2 RADIOLOGICAL EFFLUENT CONTROLS

PART II

Definitions

1.0 DEFINITIONS

DEFINED TERMS

1.1 The DEFINED TERMS of this section appear in capitalized type and are applicable throughout Part II of the ODCM.

PDMS

1.2 Post-Defueling Monitored Storage (PDMS) is that condition where TMI-2 defueling has been completed, the core debris removed from the reactor during the clean-up period has been shipped off-site and the facility has been placed in a stable, safe and secure condition.

ACTION

1.3 ACTION shall be those additional requirements specified as corollary statements to each control and shall be part of the controls.

OPERABLE - OPERABILITY

1.4 A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s) Implicit in this definition shall be the assumption that all necessary attendant instrumentation, controls, normal and emergency electrical power sources, cooling or seal water, lubrication or other auxiliary equipment, that are required for the system, subsystem, train, component or device to perform its function(s), are also capable of performing their related support function(s).

CHANNEL CALIBRATION

1.5 A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds with necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL FUNCTIONAL TEST. CHANNEL CALIBRATION may be performed by any series of sequential, overlapping or total channel steps such that the entire channel is calibrated.

CHANNEL CHECK

1.6 A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

CHANNEL FUNCTIONAL TEST

1.7 A CHANNEL FUNCTIONAL TEST shall be·

a. Analog channels - the injection of a simulated signal into the channel as close to the primary sensor as practicable to verify OPERABILITY including alarm and/or trip functions.

b. Bistable channels - the injection of a simulated signal into the channel sensor to verify OPERABILITY including alarm and/or trip functions

SOURCE CHECK

1.8 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

COMPOSITE SAMPLE

1.9 A COMPOSITE SAMPLE is a combination of individual samples obtained at regular intervals over a time period. Either the volume of each individual sample is proportional to the flow rate discharge at the time of sampling or the number of equal volume samples is proportional to the time period used to produce the composite.

GRAB SAMPLE

1.10 A GRAB SAMPLE is an individual sample collected in less than fifteen minutes.

BATCH RELEASE

1.11 A BATCH RELEASE is the discharge of fluid waste of a discrete volume.

CONTINUOUS RELEASE

1.12 A CONTINUOUS RELEASE is the discharge of fluid waste of a non-discrete volume, e.g., from a volume or system that has an input flow during the CONTINUOUS RELEASE.

SITE BOUNDARY

1.13 The SITE BOUNDARY used as the basis for the limits on the release of gaseous effluents is as defined in Section 2.1.2.2 and shown on Figure 2.1-3 of the TMI-1 FSAR. This boundary line includes portions of the Susquehanna River surface between the east bank of the river and Three Mile Island and between Three Mile Island and Shelley Island

The SITE BOUNDARY used as the basis for the limits on the release of liquid effluents is as shown in Figure 1.1 in Part I of this ODCM.

FREQUENCY NOTATION

1 14 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1. All Surveillance Requirements shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval.

TABLE 1.1

Frequency Notation

NOTATION	FREQUENCY
S (Shiftly)	At least once per 12 hours.
D (Daily)	At least once per 24 hours.
W (Weekly)	At least once per 7 days.
M (Monthly)	At least once per 31 days.
Q (Quarterly)	At least once per 92 days.
SA (Semi-Annually)	At least once per 184 days.
A (Annually)	At least once per 12 months.
E	At least once per 18 months.
N.A	Not applicable.
P	Completed prior to each release

2.0 CONTROLS AND BASES

2.0.1 Controls and ACTION requirements shall be applicable during the conditions specified for each control.

2.0.2 Adherence to the requirements of the Control and/or associated ACTION within the specified time interval shall constitute compliance with the control. In the event the Control is restored prior to expiration to the specified time interval, completion of the ACTION statement is not required.

2.0.3 In the event the Control and associated ACTION requirements cannot be satisfied because of circumstances in excess of those addressed in the Control, initiate appropriate actions to rectify the problem to the extent possible under the circumstances, and submit a special report to the Commission pursuant to TMI-2 PDMS Technical Specification (Tech. Spec.) Section 6.8 2 within 30 days unless otherwise specified.

2.1 Radioactive Effluent Instrumentation

2.1.1 Radioactive Liquid Effluent Instrumentation

Radioactive Liquid Effluent Instrumentation is common between TMI-1 and TMI-2. Controls, applicability, and actions are specified in ODCM Part I, Control 2.1.1

2.1.2 Radioactive Gaseous Process and Effluent Monitoring Instrumentation

CONTROL:

The radioactive gaseous process and effluent monitoring instrumentation channels shown in Table 2.1-2 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Control 2.2.2.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY: As shown in Table 2.1-2.

ACTION:

a. With a radioactive gaseous process or effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above control, immediately suspend the release of radioactive effluent monitored by the affected channel or declare the channel inoperable.

b. With less than the minimum number of radioactive gaseous process or effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2.1-2. Exert best efforts to return the instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Annual Effluent Release Report why the inoperability was not corrected in a timely manner.

BASES

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluent during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with NRC approved methods in the ODCM to provide reasonable assurance that the annual releases are within the limits specified in 10 CFR 20.1301.

Table 2.1-2

Radioactive Gaseous Process and Effluent Monitoring Instrumentation

	INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1.	Containment Purge Monitoring System			
a.	Noble Gas Activity Monitor (2HP-R-225)	1	NOTE 1	NOTE 2
b.	Particulate Monitor (2HP-R-225)	1	NOTE 1	NOTE 2
c.	Effluent System Flow Rate Measuring Device (2AH-FR-5907 Point 1)	1	NOTE 1	NOTE 3
2.	Station Ventilation System			
a.	Noble Gas Activity Monitor (2HP-R-219) or (2HP-R-219A)	1	NOTE 1	NOTE 2
b.	Particulate Monitor (2HP-R-219) or (2HP-R-219A)	1	NOTE 1	NOTE 2
c.	Effluent System Flow Rate Monitoring Device (2AH-FR-5907 Point 6)	1	NOTE 1	NOTE 3

NOTES:

1. During operation of the monitored system.

2. With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, secure Reactor Building Purge if in progress.

3. With flow rate monitoring instrumentation out of service, flow rates from the Auxiliary, Fuel Handling, and Reactor Buildings may be summed individually. Under these conditions, the flow rate monitoring device is considered operable. If the flow rates cannot be summed individually, they may be estimated using the maximum design flow for the exhaust fans, and the reporting requirements of Control 2.1.2.b are applicable.

2.2 Radioactive Effluent Controls

2.2.1 Liquid Effluent Controls

2.2.1.1 Liquid Effluent Concentration

CONTROL:

The concentration of radioactive material released at anytime from the unit to unrestricted areas shall be limited to ten times the concentrations specified in 10 CFR Part 20.1001-20.2401, Appendix B, Table 2, Column 2.

APPLICABILITY: At all times

ACTION:

With the concentration of radioactive material released from the unit to unrestricted areas exceeding the above limits, immediately restore concentrations within the above limits.

BASES

This control is provided to ensure that the concentration of radioactive materials released in liquid waste effluent from the unit to unrestricted areas will be less than ten times the concentration levels specified in 10 CFR Part 20.1001-20.2401, Appendix B, Table 2. These Controls permit flexibility under unusual conditions, which may temporarily result in higher than normal releases, but still within ten times the concentrations, specified in 10 CFR 20. It is expected that by using this flexibility under unusual conditions, and exerting every effort to keep levels of radioactive material in liquid wastes as low as practicable, the annual releases will not exceed a small fraction of the annual average concentrations specified in 10 CFR 20. As a result, this Control provides reasonable assurance that the resulting annual exposure to an individual in off-site areas will not exceed the design objectives of Section II.A of Appendix I to 10 CFR Part 50, which were established as requirements for the cleanup of TMI-2 in the NRC's Statement of Policy of April 27, 1981.

2.2.1.2 Liquid Effluent Dose

CONTROL

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released from the unit to the SITE BOUNDARY shall be limited.

a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ.

b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

APPLICABILITY: At all times

ACTION:

a. With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce the releases of radioactive materials in liquid effluents during the remainder of the current calendar quarter and during the subsequent 3 calendar quarters so that the cumulative dose or dose commitment to any individual from such releases during these four calendar quarters is within 3 mrem to the total body and 10 mrem to any organ. This Special Report shall also include (1) the result of radiological analyses of the drinking water source, and (2) the radiological impact on finished drinking water supplies with regard to the requirements of 40 CFR 141, Safe Drinking Water Act.

BASES

This Control requires that the dose to offsite personnel be limited to the design objectives of Appendix I of 10 CFR Part 50. This will assure the dose received by the public during PDMS is equivalent to or less than that from a normal operating reactor. The limits also assure that the environmental impacts are consistent with those assessed in NUREG-0683, the TMI-2 Programmatic Environmental Impact Statement (PEIS). The ACTION statements provide the required flexibility under unusual conditions and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable". The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October, 1977, and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April, 1977. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.113.

2.2.1.3 Liquid Radwaste Treatment System

CONTROL:

The appropriate portions of the liquid radwaste treatment system shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses due to the liquid effluent from the unit to unrestricted areas would exceed 0.06 mrem to the total body or 0.2 mrem to any organ in any calendar month.

APPLICABILITY: At all times

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which includes the following information:

1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for inoperability,

2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and,

3. A summary description of action(s) taken to prevent a recurrence.

BASES

The requirement that the appropriate portions of this system (shared with TMI-1) be used, when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept as low as is reasonably achievable. This control implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The intent of Section II.D. is to reduce effluents to as low as is reasonably achievable in a cost effective manner. This control satisfies this intent by establishing a dose limit which is a small fraction (25%) of Section II.A of Appendix I, 10 CFR Part 50 dose requirements. This margin, a factor of 4, constitutes a reasonable reduction.

2.2.2 Gaseous Effluent Controls

2.2.2.1 Gaseous Effluent Dose Rate

CONTROL:

The dose rate due to radioactive materials released in gaseous effluent from the site shall be limited to the following:

a. For noble gases: less than or equal to 500 mrem/yr to the total body and less than or equal to 3000 mrem/yr to the skin, and

b. For tritium and all radionuclides in particulate form with half lives greater than 8 days: less than or equal to 1500 mrem/yr to any organ.

APPLICABILITY: At all times.

ACTION:

With the release rate(s) exceeding the above limits, immediately decrease the release rate to comply with the above limit(s).

BASES

The control provides reasonable assurance that the annual dose at the SITE BOUNDARY from gaseous effluent from all units on the site will be within the annual dose limits of 10 CFR Part 20 for unrestricted areas. At the same time, these Controls permit flexibility under unusual conditions, which may temporarily result in higher than the design objective levels, but still within the dose limits specified in 10 CFR 20 and within the design objectives of Appendix I to 10 CFR 50. It is expected that using this flexibility under unusual conditions, and by exerting every effort to keep levels of radioactive material in gaseous wastes as low as practicable, the annual releases will not exceed a small fraction of the annual dose limits specified in 10 CFR 20 and will not result in doses which exceed the design objectives of Appendix I to 10 CFR 50, which were endorsed as limits for the cleanup of TMI-2 by the NRC's Statement of Policy of April 27, 1981. These gaseous release rates provide reasonable assurance that radioactive material discharged in gaseous effluent will not result in the exposure of a MEMBER OF THE PUBLIC in an unrestricted area, either within or outside the SITE BOUNDARY, to annual average concentrations exceeding the values specified in Appendix B, Table 2 of 10 CFR Part 20. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of the MEMBER OF THE PUBLIC will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the exclusion area boundary.

The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. The absence of iodine ensures that the corresponding thyroid dose rate above background to an infant via the inhalation pathway is less than or equal to 1500 mrem/yr (NUREG 0133), thus there is no need to specify dose rate limits for these nuclides.

2.2.2.2 Gaseous Effluents Dose-Noble Gases

CONTROL:

The air dose due to noble gases released in gaseous effluents from the unit to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation and,

b. During any calendar year: less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

APPLICABILITY: At all times.

ACTION.

a With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits

BASES

This control applies to the release of radioactive materials in gaseous effluents from TMI-2.

This control and associated action is provided to implement the requirements of Section II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Control implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide flexibility under unusual conditions and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through

the appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Release of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions. NUREG-0133 provides methods for dose calculations consistent with Regulatory Guides 1.109 and 1.111.

2.2.2.3 Dose - Iodine-131, Iodine-133, Tritium, and Radionuclides In Particulate Form

CONTROL:

The dose to a MEMBER OF THE PUBLIC from Tritium and all radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents released from the unit to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: less than or equal to 7.5 mrem to any organ, and

b. During any calendar year: less than or equal to 15 mrem to any organ.

APPLICABILITY: At all times.

ACTION:

With the calculated dose from the release of Tritium and radionuclides in particulate form with half lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

BASES

This control applies to the release of radioactive materials in gaseous effluents from TMI-2.

This control and associated action is provided to implement the requirements of Section II.C, III.A and IV.A of Appendix I, 10 CFR Part 50. The Controls are the guides set forth in Section II.C of Appendix I. The ACTION statement provides flexibility during unusual conditions and at the same time implements the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The ODCM calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October, 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Revision 1, July, 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate controls for iodine-131, iodine-133, tritium and radionuclides in particulate form with half lives greater than 8 days are dependent upon the existing radionuclide pathways to man, in areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were: 1) individual inhalation of airborne radionuclides, 2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and 4) deposition on the ground with subsequent exposure of man. The absence of iodines at the site eliminates the need to specify dose limits for these nuclides.

2.2.2.4 Ventilation Exhaust Treatment System

CONTROL

The VENTILATION EXHAUST TREATMENT SYSTEM shall be OPERABLE. The appropriate portions of the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the monthly projected doses due to gaseous effluent releases from the site would exceed 0.3 mrem to any organ.

APPLICABILITY: At all times.

ACTION:

a. With the VENTILATION EXHAUST TREATMENT SYSTEM inoperable for more than a month or with gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which includes the following information:

   1. Identification of the inoperable equipment or subsystems and the reason for inoperability,

   2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

   3. A summary description of action(s) taken to prevent a recurrence.

BASES

The use of the VENTILATION EXHAUST TREATMENT SYSTEM ensures that gaseous effluents are treated as appropriate prior to release to the environment. The appropriate portions of this system provide reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This control implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the guide set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

2.2.3 Total Radioactive Effluent Controls

2.2.3.1 Total Dose

CONTROL:

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC, due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ except the thyroid, which shall be limited to less than or equal to 75 mrem.

APPLICABILITY: At all times.

ACTION:

With the calculated dose from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Controls 2.2.1.2.a, 2.2.1.2.b, 2.2.2.2.a, 2.2.2.2.b, 2.2.2.3.a, or, 2.2.2.3.b, calculations should be made including direct radiation contributions from the unit and from outside storage tanks to determine whether the above limits of Control 2.2.3.1 have been exceeded. If such is the case, prepare and submit to the NRC Region I Administrator within 30 days, a Special Report which defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR Part 20.2203(b), shall include an analysis which estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceed the above limits, and if the release condition resulting in violation of 40 CFR 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR 190. Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete.

BASES

This control is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR Part 20.1301(d). This control requires the preparation and submittal of a Special Report whenever the calculated doses from plant generated radioactive effluents and direct radiation exceed 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem. For sites containing up to 4 reactors, it is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the reactor units and outside storage tanks are kept small The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the member of the public from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any member of the public is estimated to exceed the requirements of 40 CFR Part 190, the Special Report with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20.2203(b), is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to the other requirements for dose limitation of 10 CFR Part 20, as addressed in Controls 2.2.1.1 and 2.2.2.1. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle.