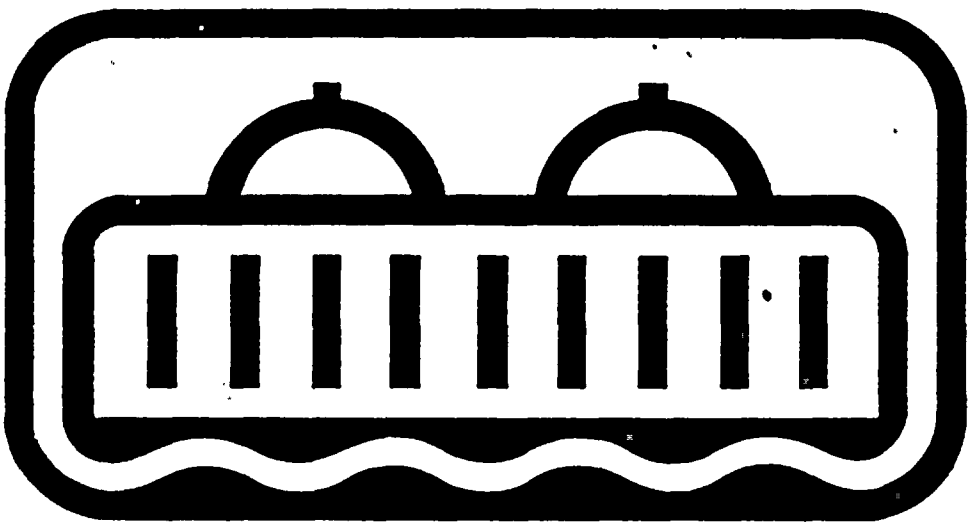
DIABLO CANYON POWER PLANT

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY 1 - JUNE 30, 1987



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INTRODUCTION

This Semiannual Radioactive Effluent Release Report summarizes the gaseous and liquid effluent releases made from Diablo Canyon Power Plant's Units 1 and 2 for the first and second quarters of 1987. This report also includes the doses due to the release of radioactive liquid and gaseous effluents and a summary of solid radwaste shipments. This report contains the information required by Unit 1 and 2 Technical Specification 6.9.1.6 and is generally presented in the format of Regulatory Guide 1.21, Appendix B.

The Unit 1 reactor was in power ascension during January and then at full power throughout the report period except for short period outages in February, March, and May. The Unit 2 reactor was in power descension during March to prepare for the refueling outage which commenced on April 4, and the reactor remained shutdown for the remainder of the report period.

I. SUPPLEMENTAL INFORMATION

A. Regulatory Limits

1. Gaseous Effluents

a. Noble Gas Dose Rate Limit

The dose rate in unrestricted areas due to radioactive noble gases released in gaseous effluents is limited to less than or equal to 500 millirem per year to the total body and less than or equal to 3000 millirem per year to the skin. (Technical Specification 3.11.2.1.a.)

b. Particulate and Iodine Dose Rate Limit

The dose rate in unrestricted areas due to Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents is limited to less than or equal to 1500 millirem per year to any organ. (Technical Specification 3.11.2.1.b.)

c. Noble Gas Dose Limit

The air dose due to noble gases released in gaseous effluents, from each reactor unit, from the site, is limited to the following.

	CALENDAR QUARTER	CALENDAR YEAR
Gamma radiation	5 millirad	10 millirad
Beta radiation	10 millirad	20 millirad

(Tech. Spec. 3.11.2.2)

d. Particulate and Iodine Dose Limit

The dose to an individual from Iodine-131, Iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days in gaseous effluents released, from each reactor unit, from the site, is limited to less than or equal to 7.5 millirem to any organ in any calendar quarter and less than or equal to 15 millirem to any organ during a calendar year. (Technical Specification 3.11.2.3)

2. Liquid Effluents

a. Concentration

The concentration of radioactive material released from the site is limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration is limited to 2 x 10-4 microcuries/ml total activity. (Technical Specification 3.11.1.1)

b. Dose

The dose or dose commitment to an individual from radioactive materials in liquid effluents released, from each reactor unit, from the site, is limited to the following:

	CALENDAR QUARTER	CALENDAR YEAR
Total Body	1.5 millirem	3 millirem
Any Organ	5 millirem	10 millirem

(Technical Specification 3.11.1.2)

B. Maximum Permissible Concentrations

1. Gaseous Effluents

Maximum permissible concentrations are not used in the methodology for determining allowable release rates for gaseous effluents at Diablo Canyon Power Plant.

2. Liquid Effluents

The concentrations listed in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases are used for determining the allowable release rate at the point of discharge from the site for liquid effluents. For dissolved or entrained noble gases, the allowable release rate concentration at the point of discharge is limited to 2 x 10^{-4} microcuries per milliliter total activity for liquid effluents.

C. Measurements and Approximations of Total Radioactivity

1. Gaseous Effluents

a. Fission and Activation Gases

The gaseous radioactivity released from the plant vent is measured by a pair of off-line monitors each using Geiger-Mueller detector readings from these monitors. These monitor readings are correlated to isotopic concentration based on isotopic analysis of a grab sample using a germanium detector. A noble gas grab sample is obtained and analyzed at least weekly. The isotopic mixture is assumed to remain constant between grab sample analyses. Containment purges, gas decay tank releases and air ejector discharge are all routed through the plant vent for release. The gaseous radioactivity released from the steam generator blowdown tank vent is measured by analyzing grab samples with a germanium detector. The isotopic concentrations are assumed to remain constant between grab samples.

When the plant vent measurements as indicated by the process monitors are below the lower limit of detection, the results of the grab samples are used to quantify releases. In addition, the individual batch release data are used to quantify the radioactivity discharged from the gas decay tanks and containment.

Other potential pathways for releasing gaseous radioactivity are periodically monitored by collecting grab samples and analyzing these samples with a germanium detector system.

b. Iodines

Radioiodines released from the plant vent are monitored by continuous sample collection on silver zeolite cartridges. The cartridges are changed at least weekly and analyzed with a germanium detector. The radioiodine releases are averaged over the period of cartridge sample collection.

Other potential pathways for releasing radioiodines are periodically monitored by collecting samples using charcoal cartridges and analyzing these cartridges with a germanium detector.

c. Particulates

Radioactive materials in particulate form released from the plant vent are monitored by continuous sample collection on particulate filters. The filters are changed at least weekly and analyzed with a germanium detector. The particulate radioactivity is averaged over the period of particulate filter sample collection. Each filter is analyzed for alpha emitters using an internal proportional counter. All of the plant vent particulate filters collected during a quarter are used for the composite analysis for strontium-89 and-90 which is counted on an internal proportional counter after chemical separation.

Other potential pathways for releasing radioactive particulates are periodically monitored by collecting samples using particulate filters and analyzing these filters with a germanium detector.

d. Tritium

Tritium released from the plant vent is monitored by passing a measured volume of plant vent sample through a water column and determining the tritium increase in the water. An aliquot of the water is counted in a liquid scintillation spectrometer. Tritium is determined at a minimum sample frequency of weekly. The tritium concentration is assumed to remain constant between samples.

2. Liquid Effluents

a. Batch Releases

Each tank of liquid radwaste is analyzed for principal gamma emitters using a germanium detector prior to release. The pre-release analysis includes dissolved and entrained gases. Volume proportional monthly and quarterly composites are prepared from aliquots of each tank released. The monthly composite is analyzed for tritium using a liquid scintillation spectrometer and gross alpha radioactivity using an internal proportional counter. The quarterly composite is analyzed for iron-55 using a liquid scintillation spectrometer and for strontium-89 and-90 using an internal proportional detector following chemical separations.

b. Continuous releases

For the continuous liquid releases of steam generator blowdown tank and turbine building sump oily water separator, daily grab samples are collected and volume proportioned for weekly, monthly and quarterly composites. The oily water separator weekly composite is analyzed for gross gamma and principal gamma emitters using a germanium detector. The steam generator blowdown tank weekly composite is analyzed for principal gamma emitters and iodine 131. The steam generator blowdown tank monthly composite is analyzed for tritium using a liquid scintillation spectrometer and for gross alpha using an internal proportional counter. The steam generator blowdown tank quarterly composite is analyzed for iron-55 using a liquid scintillation spectrometer and for strontium-89 and-90 using an internal proportional counter following chemical separations. The results for each of the composites are averaged over the period of the composite. In addition, one grab sample of the steam generator blowdown tank is analyzed monthly for dissolved and entrained gases using a germanium detector. The results of this analysis are assumed to remain constant over the period of one month.

D. Batch Releases

1. Liquid

a.	Number of batch releases.....	529
b.	Total time period for batch releases.....	1471 hours
c.	Maximum time period for a batch release.....	15 hours
d.	Average time period for a batch release.....	2.78 hours
e.	Minimum time period for a batch release.....	0.017 hours
f.	Average saltwater flow during batch releases...	1.37E+6 GPM

2. Gaseous

a.	Number of batch releases.....	184
b.	Total time period for batch releases.....	1806.15 hours
c.	Maximum time period for a batch release.....	24.00 hours
d.	Average time period for a batch release.....	9.82 hours
e.	Minimum time period for a batch release.....	0.03 hours

E. Abnormal Releases

There were no abnormal releases during the report period.

F. Effluent Monitoring Instrumentation Out of Service For Greater Than 30 Days

Flowrate measurement device FR-251 (oil water separator flow recorder) was declared inoperable on December 7, 1986 at 9:00 am due to a failed functional test. Design Change DCO-SJ-35925 Rev. 1, which replaced FR-251 with a new design, was implemented concurrently with the Waste Handling and Treatment (WHAT) project. The new FR-251 was calibrated and installed by January 2, 1987, however, several active clearances were in effect for the WHAT project. These clearances prevented the timely completion of the functional test and subsequently FR-251 was not declared operable until January 7, 1987 at 10:30 am.

II. MAJOR CHANGES TO LIQUID, GASEOUS AND SOLID RADWASTE TREATMENT SYSTEMS

There were no major changes to liquid, gaseous, and solid radwaste treatment systems during the report period.

III. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

One revision to Diablo Canyon Power Plant Administrative Procedure AP C-253, Process Control Program, was made during the report period. This revision was reviewed and found acceptable by the Plant Staff Review Committee (PSRC) on March 5, 1987. The vendor revised their site specific PCP procedure and generic oil solidification PCP procedure. The site specific PCP procedure was revised in letter designation to implement the previous revision in the correct format. The previous revision was reported in the last Semiannual Effluent Report. This revision to the vendor's PCP procedure was for format reasons only and did not change the solidification parameters. The change to the vendor PCP procedure for oil solidification involved a slight change in the chemistry to enable stabilization of oil and a new recipe for synthetic oil. Both of these changes are within the scope of the Topical Report for Solidification. A copy of the changed pages are included as Attachment 1.

IV. CHANGES TO THE ENVIRONMENTAL RADIOLOGICAL MONITORING PROCEDURE (ERMP)

One revision to Planning and Research Department Procedure A-7, Environmental Radiological Monitoring Procedure - DCPP (Normal Operations), was made during this report period. This revision was reviewed and found acceptable by the Plant Staff Review Committee (PSRC) on February 13, 1987. The majority of the changes made in this revision were administrative in nature and did not change the conduct or methodology of the Radiological Environmental Monitoring Program. One change required a request to modify the environmental Technical

Specifications to replace the background locations (PON and POS) for fish and invertebrates sampling with one that is not influenced by the plant discharge (7C2). This revision to the procedure will increase the accuracy and reliability of the Environmental Monitoring Program. A copy of the changed pages are included as Attachment 2.

V. CHANGES TO THE OFFSITE DOSE CALCULATION PROCEDURE (ODCP)

The following changes to the ODCP were made in 1987. These revisions were reviewed and found acceptable by the plant staff review committee (PSRC) on February 12, 1987:

a. The expression for calculating doses due to liquid effluents was re-arranged (not changed) to more effectively represent releases on a batch rather than time basis.

b. Added an improved calculational method for determining "31 day dose projections" for liquid releases.

c. Made the perennial update to "5 year-running historical average" meteorological dispersion factors - χ/Q and D/Q (Tables 5A and 5B) because 1981 was dropped, while 1986 was added.

d. Re-located into a new appendix section (Appendix 2) from CAP A-6 (Gaseous Radwaste Management Procedure) all calculational expressions for determining "Percent of Release Rate Limit" (PRRL) on noble gas and Iodine, Particulate and Tritium (IPT) releases.

e. Added to Appendix 1 an explanation of the methodology for displaying how liquid discharges can be volume or flowrate limited because of either: HASP (high alarm setpoint), or "31 day dose projections," or simple MPC, or just the rating on the pump.

f. Other minor miscellaneous changes such as:

1) added Table of Contents
2) changed Regenerant Reviewer Tank SRRT flowrate from 180 gpm to 70 gpm due to equipment modifications
3) corrected error in expression for interpolating meteorological dispersions for on-site doses to members of the public, plus revised some distances based on more accurate maps
4) added liquid dose factors to Table 1 for the isotopes of As-76, Br-82, Cd-115, Sn-117m, Sb-122, and Ce-139
5) consolidated the numbering on a couple of equations.

The changes enumerated above improve the reliability and accuracy of the dose calculations and setpoint determinations.

VI. GASEOUS AND LIQUID EFFLUENTS

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TABLE 1

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Est. Total Error, %
A. Fission & activation gases				
1. Total release	Ci	2.08 E+2	1.76 E+2	5.5 E+1
2. Average release rate for period	µCi/sec	2.67 E+1	2.24 E+1	
3. Percent of technical specification limit[2]	%	8.68 E-3	6.28 E-3	
B. Iodines				
1. Total iodine-131	Ci	7.68 E-4	8.26 E-4	2.4 E+1
2. Average release rate for period	µCi/sec	9.88 E-5	1.05 E-4	
3. Percent of technical specification limit[2]	%	1.60 E-3	1.69 E-3	
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	MDA[1]	4.79 E-4	2.4 E+1
2. Average release rate for period	µCi/sec	MDA[1]	6.09 E-5	
3. Percent of technical specification limit[2]	%	0.00 E0	1.42 E-4	
4. Gross alpha radioactivity	Ci	MDA[1]	MDA[1]	
D. Tritium				
1. Total release	Ci	1.50 E0	4.73 E0	1.3 E+1
2. Average release rate for period	µCi/sec	1.93 E-1	6.02 E-1	
3. Percent of technical specification limit[2]	%	6.34 E-5	1.98 E-4	

NOTE:

[1] MDA = Less than the "a posteriori" minimum detectable activity (microcuries per unit mass or volume). This note applies to all tables.

[2] Technical Specification 3.11.2.1 Limit

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TABLE 2

GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES

Nuclides Released	Unit	FIRST QUARTER		SECOND QUARTER	
		CONTINUOUS MODE	BATCH MODE	CONTINUOUS MODE	BATCH MODE
1. Fission gases					
krypton-85	Ci	MDA	MDA	MDA	1.12 E0
Krypton-85m	Ci	8.13 E-5	3.21 E-2	MDA	7.62 E-2
Krypton-87	Ci	MDA	2.65 E-4	MDA	MDA
Krypton-88	Ci	MDA	2.73 E-2	MDA	9.95 E-2
xenon-131m	Ci	MDA	1.53 E0	MDA	1.72 E0
xenon-133	Ci	1.08 E+2	8.62 E+1	3.42 E+1	1.34 E2
xenon-133m	Ci	MDA	5.42 E-1	MDA	1.11 E0
xenon-135	Ci	1.01 E+1	6.23 E-1	7.40 E-1	1.86 E0
xenon-135m	Ci	MDA	MDA	MDA	MDA
xenon-138	Ci	MDA	MDA	MDA	MDA
argon-41	Ci	2.10 E-1	1.10 E0	MDA	1.03 E0
TOTAL FOR PERIOD	Ci	1.18 E+2	9.01 E+1	3.49 E+1	1.41 E+2
2. Iodines					
iodine-131	Ci	7.68 E-4		8.26 E-4	
iodine-133	Ci	8.33 E-4		1.30 E-4	
iodine-135	Ci	MDA		MDA	
TOTAL FOR PERIOD	Ci	1.60 E-3		9.56 E-4	

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TABLE 2 (Continued)

GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES

Nuclides Released	Unit	CONTINUOUS MODE	
		First Quarter	Second Quarter
3. Particulates			
cesium-134	Ci	MDA	MDA
cesium-137	Ci	MDA	1.02 E-6
cerium-141	Ci	MDA	MDA
cerium-144	Ci	MDA	MDA
chromium-51	Ci	MDA	6.81 E-5
cobalt-58	Ci	MDA	2.24 E-4
cobalt-60	Ci	MDA	1.28 E-4
iron-59	Ci	MDA	MDA
manganese-54	Ci	MDA	1.89 E-5
molybdenum-99[1]	Ci	MDA	MDA
ruthenium-103	Ci	MDA	1.21 E-6
strontium-89	Ci	MDA	MDA
strontium-90[1]	Ci	MDA	MDA
zinc-65	Ci	MDA	MDA
zirconium-95[1]	Ci	MDA	3.74 E-5
TOTAL FOR PERIOD	Ci	MDA	4.79 E-4

Note:

[1] Includes Daughters

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TABLE 3

GASEOUS EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	Continuous Mode	Batch Mode	
			Containment Purge	Gas Decay Tank
1. Fission gases				
krypton-85	µCi/ml	8.49 E-6	8.49 E-6	2.22 E-3
krypton-85m	µCi/ml	1.70 E-8	1.70 E-8	4.32 E-6
krypton-87	µCi/ml	7.76 E-8	7.76 E-8	1.29 E-5
krypton-88	µCi/ml	5.24 E-8	5.24 E-8	1.47 E-5
xenon-131m	µCi/ml	8.01 E-7	8.01 E-7	2.06 E-4
xenon-133	µCi/ml	4.40 E-8	4.40 E-8	1.28 E-5
xenon-133m	µCi/ml	1.28 E-7	1.28 E-7	3.10 E-5
xenon-135	µCi/ml	1.67 E-8	1.67 E-8	5.11 E-6
xenon-135m	µCi/ml	3.76 E-7	3.76 E-7	2.52 E-5
xenon-138	µCi/ml	1.25 E-6	1.25 E-6	4.75 E-5
argon-41	µCi/ml	6.71 E-8	6.71 E-8	1.04 E-5
2. Tritium				
hydrogen-3	µCi/ml	1.27 E-8	1.27 E-8	
3. Iodines				
iodine-131	µCi/ml	2.71 E-13		
iodine-133	µCi/ml	3.41 E-13		
iodine-135	µCi/ml	3.99 E-12		

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TABLE 3 (Continued)

GASEOUS EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	Continuous Mode
4. Particulates		
cesium-134	µCi/ml	3.10 E-13
cesium-137	µCi/ml	2.64 E-13
cerium-141	µCi/ml	1.97 E-13
cerium-144	µCi/ml	1.02 E-12
chromium-51	µCi/ml	1.71 E-12
cobalt-58	µCi/ml	2.78 E-13
cobalt-60	µCi/ml	3.10 E-13
iron-59	µCi/ml	4.16 E-13
manganese-54	µCi/ml	1.39 E-13
molybdenum-99[1]	µCi/ml	2.77 E-12
ruthenium-103	µCi/ml	2.19 E-13
strontium-89	µCi/ml	1.30 E-14
strontium-90[1]	µCi/ml	3.61 E-15
zinc-65	µCi/ml	3.63 E-13
zirconium-95	µCi/ml	3.42 E-13
gross alpha	µCi/ml	7.13 E-15

Note:

[1] Includes daughters

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TABLE 4

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Est Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	5.70 E-1	5.96 E-1	2.1 E+1
2. Average diluted concentration during period	µCi/ml	1.78 E-9	4.38 E-9	
3. Percent of applicable limit[1]	%	9.89 E-2	9.73 E-2	
B. Tritium				
1. Total release	Ci	2.61 E+2	1.48 E+2	1.3 E+1
2. Average diluted concentration during period	µCi/ml	8.13 E-7	1.09 E-6	
3. Percent of applicable limit[1]	%	2.71 E-2	3.63 E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	1.02 E0	1.75 E-1	2.1 E+1
2. Average diluted concentration during period	µCi/ml	3.18 E-9	1.29 E-9	
3. Percent of applicable limit[1]	%	1.59 E-3	6.45 E-4	
D. Gross alpha radioactivity				
1. Total release	Ci	MDA	MDA	6.0 E+1

[1] Technical Specification 3.11.1.1 Limit

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TABLE 4 (Continued)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Est Total Error, %
E. Volume of waste released (prior to dilution)	liters	8.95 E+7	4.33 E+7	5.0 E0
F. Volume of circulating saltwater used during release	liters	3.21 E+11	1.36 E+11	6.6 E0

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TABLE 5

LIQUID EFFLUENTS

Nuclides Released	Unit	FIRST QUARTER		SECOND QUARTER	
		CONTINUOUS MODE	BATCH MODE	CONTINUOUS MODE	BATCH MODE
antimony-122	Ci	MDA	MDA	MDA	3.77 E-5
antimony-124	Ci	MDA	1.46 E-5	MDA	2.47 E-3
antimony-125	Ci	MDA	5.59 E-4	MDA	1.31 E-2
beryllium-7	Ci	MDA	MDA	MDA	MDA
cerium-141	Ci	MDA	MDA	MDA	4.60 E-4
cerium-144	Ci	MDA	MDA	MDA	5.02 E-4
cesium-134	Ci	MDA	1.90 E-2	MDA	3.20 E-2
cesium-136	Ci	MDA	2.23 E-3	MDA	2.14 E-3
cesium-137	Ci	MDA	2.55 E-2	MDA	3.57 E-2
cesium-138	Ci	MDA	2.69 E-6	MDA	MDA
chromium-51	Ci	MDA	1.19 E-3	MDA	5.01 E-2
cobalt-57	Ci	MDA	6.68 E-4	MDA	6.48 E-4
cobalt-58	Ci	MDA	1.36 E-1	MDA	2.76 E-1
cobalt-60	Ci	MDA	6.92 E-2	MDA	3.66 E-2
iron-55	Ci	MDA	1.12 E-1	MDA	6.51 E-2
iron-59	Ci	MDA	3.17 E-3	MDA	4.07 E-3
lanthanum-140[1]	Ci	MDA	6.65 E-3	MDA	2.05 E-3
manganese-54	Ci	MDA	5.00 E-2	MDA	1.14 E-2
manganese-56	Ci	MDA	6.22 E-4	MDA	MDA

Note:

[1] Includes daughters

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TABLE 5 (CONTINUED)

LIQUID EFFLUENTS

Nuclides Released	Unit	FIRST QUARTER		SECOND QUARTER	
		CONTINUOUS MODE	BATCH MODE	CONTINUOUS MODE	BATCH MODE
molybdenum-99[1]	Ci	MDA	2.99 E-3	MDA	5.37 E-4
rubidium-88	Ci	MDA	1.15 E-3	MDA	MDA
ruthenium-103	Ci	MDA	MDA	MDA	5.58 E-4
silver-110m	Ci	MDA	2.50 E-7	MDA	8.30 E-5
sodium-24	Ci	MDA	1.90 E-3	MDA	2.73 E-4
strontium-89	Ci	MDA	3.20 E-3	MDA	5.80 E-4
strontium-90[1]	Ci	MDA	7.83 E-5	MDA	5.15 E-5
strontium-91	Ci	MDA	MDA	MDA	1.06 E-4
tellurium-129m	Ci	MDA	4.83 E-6	MDA	7.68 E-4
tellurium-132	Ci	MDA	MDA	MDA	1.05 E-3
tin-113[1]	Ci	MDA	MDA	MDA	4.02 E-4
tin-117m	Ci	MDA	MDA	MDA	1.22 E-5
tungsten-187	Ci	MDA	MDA	MDA	3.73 E-5
zirconium-95[1]	Ci	MDA	1.25 E-3	MDA	1.59 E-2
zinc-65	Ci	MDA	MDA	MDA	MDA
iodine-131	Ci	1.16 E-4	7.90 E-2	MDA	3.44 E-2
iodine-132	Ci	MDA	2.44 E-3	MDA	1.44 E-3

Note:

[1] Includes daughters

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TABLE 5 (CONTINUED)

LIQUID EFFLUENTS

Nuclides Released	Unit	FIRST QUARTER		SECOND QUARTER	
		CONTINUOUS MODE	BATCH MODE	CONTINUOUS MODE	BATCH MODE
iodine-133	Ci	MDA	3.84 E-2	MDA	6.23 E-3
iodine-134	Ci	MDA	2.16 E-5	MDA	MDA
iodine-135	Ci	MDA	1.32 E-2	MDA	7.67 E-4
TOTAL FOR PERIOD	Ci	1.16 E-4	5.70 E-1	0.00 E+0	5.96 E-1
xenon-131m	Ci	MDA	8.01 E-3	MDA	2.69 E-3
xenon-133	Ci	1.37 E-6	9.60 E-1	MDA	1.68 E-1
xenon-133m	Ci	MDA	9.44 E-3	MDA	5.77 E-4
xenon-135	Ci	MDA	4.03 E-2	MDA	3.28 E-3
krypton-85m	Ci	MDA	5.90 E-4	MDA	3.80 E-4

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TABLE 6

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	LLD
antimony-122	µCi/ml	6.61 E-8
antimony-124	µCi/ml	1.23 E-7
antimony-125	µCi/ml	1.06 E-7
beryllium-7	µCi/ml	2.86 E-7
cerium-141	µCi/ml	4.93 E-8
cerium-144	µCi/ml	2.53 E-7
cesium-134	µCi/ml	4.61 E-8
cesium-136	µCi/ml	6.12 E-8
cesium-137	µCi/ml	4.65 E-8
cesium-138	µCi/ml	5.09 E-8
chromium-51	µCi/ml	2.50 E-7
cobalt-57	µCi/ml	3.15 E-8
cobalt-58	µCi/ml	4.78 E-8
cobalt-60	µCi/ml	9.45 E-8
iron-55	µCi/ml	3.00 E-7
iron-59	µCi/ml	7.35 E-8
lanthanum-140[1]	µCi/ml	9.74 E-8
manganese-54	µCi/ml	3.65 E-8
manganese-56	µCi/ml	1.42 E-6
molybdenum-99[1]	µCi/ml	2.32 E-8
rubidium-88	µCi/ml	2.51 E-5

Note:

[1] Includes Daughters

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TABLE 6 (CONTINUED)

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	LLD
ruthenium-103	µCi/ml	4.75 E-8
silver-110m	µCi/ml	4.39 E-8
sodium-24	µCi/ml	8.68 E-8
strontium-89	µCi/ml	2.80 E-8
strontium-90[1]	µCi/ml	9.19 E-9
strontium-91	µCi/ml	2.80 E-7
tellurium-129m	µCi/ml	9.05 E-7
tellurium-132	µCi/ml	2.87 E-8
tin-113[1]	µCi/ml	7.39 E-8
tin-117m	µCi/ml	2.15 E-8
tungsten-187	µCi/ml	2.24 E-7
zirconium-95[1]	µCi/ml	7.21 E-8
zinc-65	µCi/ml	8.24 E-8
gross alpha	µCi/ml	8.75 E-8
hydrogen-3	µCi/ml	5.58 E-6
iodine-131	µCi/ml	4.26 E-8
iodine-132	µCi/ml	8.52 E-7
iodine-133	µCi/ml	6.25 E-8
iodine-134	µCi/ml	5.98 E-5
iodine-135	µCi/ml	5.72 E-7

Note:

[1] Includes daughters

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TABLE 6 (CONTINUED)

LIQUID EFFLUENTS - LOWER LIMITS OF DETECTION

Nuclide	Unit	LLD
xenon-131m	µCi/ml	1.05 E-6
xenon-133	µCi/ml	9.56 E-8
xenon-133m	µCi/ml	3.14 E-7
xenon-135	µCi/ml	7.63 E-8
krypton-85m	µCi/ml	1.82 E-7

Note:

[1] Includes daughters

VII. SOLID RADWASTE SHIPMENTS

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SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

1.

Type of Waste	Unit	6-Month Period	Est. Total Error, %
a. Spent Resins, sludges	m^3 Ci	9.86 E0 3.25 E0	10.0
b. Dry Compressible Waste, Contaminated Equip. Etc.	m^3 Ci	3.01 E+1 1.40 E-1	11.0
c. Irradiated Components, Control Rods, Etc.	m^3 Ci	0.00 E0 0.00 E0	N/A
d. Sand, Building Rubble, Biological Waste	m^3 Ci	0.00 E0 0.00 E0	N/A

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

a.

Co-60	%	29
H-3	%	22
Fe-55	%	18
Ni-63	%	17
Co-58	%	14

b.

Co-58	%	42
H-3	%	58

c.

NOT APPLICABLE	%	N/A

d.

NOT APPLICABLE	%	N/A

3. Supplemental Information Required by T.S. 6.9.1.6

Solidification Agent	Type of Container	Number of Containers	10 CFR 61 Waste Class
Cement	LSA	1	A
None	LSA	13	A

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SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

4. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
3	Truck	Hanford, WA

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
NONE	N/A	N/A

VIII. RADIATION DOSE DUE TO GASEOUS AND LIQUID EFFLUENTS

RADIATION DOSES

A. Radiation doses due to radioactive liquid effluents

The radiation dose contributions due to releases of radioactive liquid effluents to the total body and each individual organ for the maximum exposed adult have been calculated in accordance with the methodology in the Offsite Dose Calculation Procedure. Since the liquid radwaste system is common to both units, no attempt has been made to segregate each unit's contribution to the total dose. For the purposes of comparison with the Plant Technical Specifications,tThe dose contributions conservatively have been assumed to be due to a single unit. Dose contributions, listed in Table 7, show conformance with Technical Specification 3.11.1.2.

B. Radiation doses due to radioactive gaseous effluents

The radiation dose contributions due to radioactive gaseous effluents at the site boundary for the land sectors have been calculated in accordance with the calculational methodology in the offsite Dose Calculation Procedure. Each unit's dose contribution has been calculated separately. The meteorology conditions concurrent with the time of discharge were used in these calculations. In addition to the site boundary doses, the dose to all age groups at the nearest residence within the low population zone for each of the land sectors and a five mile infant milk dose in each of the land sectors is included. Dose contributions, listed in Table 8 for the first and second quarters, show conformance with Technical Specifications 3.11.2.2 and 3.11.2.3.

C. Radiation doses due to direct radiation (Line-of-Sight Plus Sky-Shine) - Closest site boundary (800 m)

For the First and Second Quarters of 1987, the radiation dose is evaluated to be 7.48 E-5 mrem due to the presence of radioactive waste containers outside of plant buildings.

D. Radiation Doses Due to Chemistry Laboratory Radioactive Gaseous Effluents - Closest Site Boundary (800m)

The radiation doses due to Chemistry Laboratory Radioactive Gaseous Effluents for the report period is evaluated to be 3.07 E-7 mrem.

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TABLE 7

RADIATION DOSE DUE TO THE RELEASE OF RADIOACTIVE LIQUID EFFLUENTS

ORGAN	millirem	
	First Quarter	Second Quarter
Total Body	1.25 E-3	1.95 E-3
Bone	3.55 E-3	3.97 E-3
Liver	3.27 E-3	4.09 E-3
Thyroid	4.60 E-3	3.25 E-3
Kidney	2.47 E-4	3.56 E-4
Lung	1.40 E-3	1.55 E-3
G. I. LLI	6.10 E-3	2.21 E-2

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TABLE 8A

RADIATION DOSE[1] DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

		First Quarter		Second Quarter	
		Sector[2]	Dose	Sector	Dose
Site Boundary					
Noble Gas					
Gamma air dose	mrad	NW	4.94 E-3	NNE	5.01 E-3
Beta air dose	mrad	NW	1.01 E-2	NNE	8.72 E-3
I,P,T[3]					
Child[4] (Thyroid)	mrem	NNW	1.42 E-4	NNE	1.22 E-3
Residence					
Noble Gas					
Gamma air dose	mrad	NNW	6.59 E-4	N	2.25 E-4
Beta air dose	mrad	NNW	1.17 E-3	N	4.03 E-4
I,P,T					
Child[5] (Thyroid)	mrem	ESE	1.80 E-4	ESE	1.12 E-3
Five Mile Dairy					
I,P,T					
Infant (Thyroid)	mrem	ESE	2.77 E-4	ESE	1.32 E-3

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TABLE 8B

RADIATION DOSE[1] DUE TO THE RELEASE OF RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

		First Quarter		Second Quarter	
		Sector	Dose	Sector	Dose
Site Boundary					
Noble Gas					
Gamma air dose	mrad	NW	2.80 E-2	SE	2.71 E-3
Beta air dose	mrad	NW	5.73 E-2	SE	8.08 E-3
I,P,T[3]					
Child[4] (Thyroid)	mrem	NW	2.62 E-3	NNW	1.42 E-3
Residence					
Noble Gas					
Gamma air dose	mrad	NNW	8.28 E-4	ESE	3.43 E-4
Beta air dose	mrad	NNW	2.31 E-3	ESE	1.02 E-3
I,P,T					
Child[5] (Thyroid)	mrem	NNW	1.88 E-3	ESE	2.91 E-3
Five Mile Dairy					
I,P,T					
Infant (Thyroid)	mrem	NNW	2.74 E-3	ESE	4.40 E-3

TABLE 8 (Continued)

NOTES:

1. This represents the maximum dose of age groups, organs, and geographic locations for the quarter.

2. The ocean sectors SSE, S, SSW, SW, WSW, W, and WNW are not included.

3. Radioiodines, Radioactive Material in Particulate Form and Radionuclides Other Than Noble Gases With Half-lives Greater Than Eight Days.

4. The inhalation, ground plane and animal-meat pathways are included in this dose calculation.

5. The inhalation, ground plane, animal-meat and vegetable pathways are included for this location. An occupancy factor of 0.5 was used for the inhalation and ground plane pathways. The child age group had the highest calculated dose for this location.

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TABLE 9

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE LIQUID EFFLUENTS

	percent	
ORGAN	First Quarter	Second Quarter
Total Body	8.33 E-2	1.30 E-1
Bone	7.10 E-2	7.94 E-2
Liver	6.54 E-2	8.18 E-2
Thyroid	9.20 E-2	6.50 E-2
Kidney	4.94 E-3	7.12 E-3
Lung	2.80 E-2	3.10 E-2
G. I. LLI	1.22 E-1	4.42 E-1

Note:

[1] Technical Specification 3.11.1.2

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SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1987

TABLE 10A

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 1)

		First Quarter		Second Quarter	
		Sector	% of T.S. Limit	Sector	% of T.S. Limit
Site Boundary					
Noble Gas					
Gamma air dose	mrad	NW	9.88 E-2	NNE	1.00 E-1
Beta air dose	mrad	NW	1.01 E-1	NNE	8.72 E-2
I,P,T					
Child (Thyroid)	mrem	NNW	1.89 E-3	NNE	1.63 E-2
Residence					
Noble Gas					
Gamma air dose	mrad	NNW	1.32 E-2	N	4.50 E-3
Beta air dose	mrad	NNW	1.17 E-2	N	4.03 E-3
I,P,T					
Child (Thyroid)	mrem	ESE	2.40 E-3	ESE	1.49 E-2
Five Mile Dairy					
I,P,T					
Infant (Thyroid)	mrem	ESE	3.69 E-3	ESE	1.76 E-2

Note:

[1] Technical Specification 3.11.2.2 and 3.11.2.3

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TABLE 10B

PERCENT OF TECHNICAL SPECIFICATION LIMITS[1] FOR RADIOACTIVE GASEOUS EFFLUENTS (UNIT 2)

		First Quarter		Second Quarter	
		Sector	% of T.S. Limit	Sector	% of T.S. Limit
Site Boundary					
Noble Gas					
Gamma air dose	mrad	NW	5.60 E-1	SE	5.42 E-2
Beta air dose	mrad	NW	5.73 E-1	SE	8.08 E-2
I,P,T					
Child (Thyroid)	mrem	NW	3.49 E-2	NNW	1.89 E-2
Residence					
Noble Gas					
Gamma air dose	mrad	NNW	1.66 E-2	ESE	6.86 E-3
Beta air dose	mrad	NNW	2.31 E-2	ESE	1.02 E-2
I,P,T					
Child (Thyroid)	mrem	NNW	2.51 E-2	ESE	3.88 E-2
Five Mile Dairy					
I,P,T					
Infant (Thyroid)	mrem	NNW	3.65 E-2	ESE	5.87 E-2

Note:

1 Technical Specification 3.11.2.2 and 3.11.2.3

ATTACHMENT 1

ATTACHMENT 1

CHANGES TO THE PROCESS CONTROL PROGRAM