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Humboldt Bay Power Plant
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10 CFR 50, Appendix I
10 CFR 50.36

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-133, OL-DPR-7
Humboldt Bay Power Plant Unit 3
Annual Radioactive Effluent Release Report for 2012

Dear Commissioners and Staff:

Enclosure 1 contains the Humboldt Bay Power Plant Unit 3 "Annual Radioactive Effluent Release Report," covering the period January 1 through December 31, 2012. This report is required by Appendix B, Section 8.3 of the Humboldt Bay Quality Assurance Plan.

Enclosure 2 contains Revision 22 to the "SAFSTOR Offsite Dose Calculation Manual" as required by Specification Section 4.2 of the "SAFSTOR Offsite Dose Calculation Manual."

There are no regulatory commitments made in this letter.

If you have any questions concerning this information, please do not hesitate to contact Mr. David Sokolsky at 415-973-5024.

Sincerely,

A handwritten signature in black ink that reads 'Loren D. Sharp'. The signature is written in a cursive, flowing style.

Loren D. Sharp

cc: Elmo E. Collins, Jr.
John B. Hickman
HBPP Humboldt Distribution
Enclosures

A009
IE48
F51E20

**PACIFIC GAS AND ELECTRIC COMPANY
HUMBOLDT BAY POWER PLANT
DOCKET NO. 50-133, LICENSE NO. DPR-7**

**HUMBOLDT BAY POWER PLANT UNIT 3
ANNUAL RADIOACTIVE
EFFLUENT RELEASE REPORT**

January 1 through December 31, 2012

TABLE OF CONTENTS

INTRODUCTION	1
I. SUPPLEMENTAL INFORMATION	2
II. GASEOUS AND LIQUID EFFLUENTS	5
Table 1 - Gaseous Effluents - Summation of All Releases	6
Table 2A - Gaseous Effluents - Elevated Release - Nuclides Released	7
Table 2B - Gaseous Effluents - Ground-Level Releases - Nuclides Released	7
Table 3 - Liquid Effluents - Summation of All Releases	8
Table 4 - Liquid Effluents - Nuclides Released	9
III. SOLID RADIOACTIVE WASTE	9
Table 5 - Solid Waste and Irradiated Fuel Shipments	9
IV. RADIOLOGICAL IMPACT ON MAN	12
Table 6 - Radiation Dose for Maximally Exposed Individuals	13
V. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM).....	14
VI. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP).....	16
VII. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS.....	16
VIII. INOPERABLE EFFLUENT MONITORING INSTRUMENTATION.....	16
IX. ERRATA	16

INTRODUCTION

This report summarizes gaseous and liquid radioactive effluent releases from Humboldt Bay Power Plant (HBPP) Unit 3 for the four quarters of 2012. The report includes calculated potential radiation doses from these radioactive effluents and a comparison with the numerical guidelines of 10 CFR 50, Appendix I, as well as a summary of shipments of solid radioactive waste. The concentrations of plant effluent releases during the reporting period were well below Offsite Dose Calculation Manual (ODCM) limits.

During 2008, all of the spent nuclear fuel was transferred from the Spent Fuel Pool to the Independent Spent Fuel Storage Installation (ISFSI). Therefore, there no longer will be a source term for noble gases.

The information is reported as required by Appendix B, Section 8.3 of the Humboldt Bay Quality Assurance Plan and Section 4.2 of the ODCM, and it is presented in the general format of Regulatory Guide 1.21, Appendix B (except for the topics identified below).

Meteorology

The meteorological data logging system was removed from service in 1967 so the information specified by Regulatory Guide 1.21 is not available. Previous HBPP Annual Radioactive Effluent Release Reports summarized the cumulative joint frequency distribution of wind speed, direction, and atmospheric stability for the period April 1962 through June 1967, when the meteorological data logging system was in service.

Short-lived Nuclides

The Unit was last operated on July 2, 1976. Due to the long decay time since operation, short-lived radionuclides are neither expected nor reported. This includes Iodines and noble gases. Kr-85 is no longer an issue since the spent fuel has been relocated to the ISFSI.

Air Particulate Filter Composites – Sr-90

Air particulate sample filters are composited quarterly and analyzed off-site for Sr-90.

Air Particulate Filter Composites – Am-241

Air particulate sample filters are composited quarterly and analyzed off-site for Am-241.

Air Particulate Filter Composites – Gross Alpha

Each weekly sample filter is individually counted for gross alpha activity, rather than analyzing a monthly composite of the filters, as described in Regulatory Guide 1.21.

Gaseous Effluents – Tritium

Tritium releases during plant operation were less than detection levels. Because the plant was permanently shutdown in 1976, current tritium release levels are less than the release levels that occurred during plant operations. Therefore, no tritium samples were collected during this reporting period. Since the fuel has been relocated to the ISFSI and the Spent Fuel Pool water is below the drinking water standard, no significant tritium can be released by the gaseous mode.

Liquid Effluents – Sr-90

Batch releases are analyzed individually offsite for Sr-90, rather than analyzed as a quarterly composite as described in Regulatory Guide 1.21.

Liquid Effluents – Ni-63

Batch releases are analyzed individually offsite for Ni-63, rather than analyzed as a quarterly composite as described in Regulatory Guide 1.21.

Average Energy

Calculations for the average energy of gaseous releases of fission and activation gases are not required for HBPP.

I. SUPPLEMENTAL INFORMATION

A. Regulatory Limits

1. Gaseous Effluents

a. Noble Gas Release Rate Limit

Noble gases are no longer an issue since the spent nuclear fuel has been relocated to the ISFSI.

b. Iodine Release Rate Limit

Due to the long decay time since the Unit was shutdown, the license does not define an iodine release rate limit.

c. Particulate Release Rate Limit

The radioactive particulate release rate limit is based on concentration limits from 10 CFR 20, divided by an annual average dispersion factor for the sector with the least favorable atmospheric dispersion. The applicable annual average dispersion factors for elevated releases and for ground-level releases are $1.0E-5$ and $6.59E-3$ seconds per cubic meter, respectively. When both elevated and ground-level releases occur, the “percent of applicable limit” in Table 1 is the sum of the values for “percent of applicable limit” for each of the release paths.

2. Liquid Effluents

a. Concentration Limit

Concentration limits for liquid effluent radioactivity released to Humboldt Bay are taken from 10 CFR 20.

B. Maximum Permissible Concentrations

1. Gaseous Effluents

Maximum Permissible Concentrations for gaseous effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 1.

2. Liquid Effluents

Maximum Permissible Concentrations for liquid effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 2.

C. Measurements and Approximations of Total Radioactivity

1. Gaseous Effluents – Elevated Release

The original plant stack (an elevated release point) was removed in 1998 and replaced with a roof-level discharge point that is considered a ground level release point. All ventilation and system vents are routed to this release point referred to as the current plant stack. Therefore, elevated releases did not occur at HBPP during 2012.

2. Gaseous Effluents – Ground-level Release

a. Fission and Activation Gases

Fission and activation gases are no longer an issue since the spent fuel has been relocated to the ISFSI.

b. Iodines

Due to the long decay time since operation (shutdown July 2, 1976), no detectable releases of radioactive Iodines can be expected. Therefore, neither the Technical Specifications nor the ODCM require that these radionuclides be monitored.

c. Particulates

A continuous monitor equipped with an alpha spectrometer, with its response calibrated for Am-241, monitors the alpha particulate activity

released from the stack. This monitor was installed in December of 2009.

Radioactive particulates released from the plant stack are monitored by continuous sample collection on particulate filters. Filter papers are removed from the stack sampling system weekly, and are analyzed for the concentration of gamma-emitting nuclides using an intrinsic germanium detector. All statistically significant gamma peaks are identified.

After decaying at least seven days, the filters are analyzed for gross alpha radioactivity using a scintillation counter.

Filters are composited and analyzed quarterly for Strontium-90 (the only radioactive Strontium present) and Americium-241 by alpha spectroscopy.

The estimated error of the reported particulate release values is based on uncertainty in sample flow rate, stack flow rate, detector calibration, and typical sample counting statistics.

The Minimum Detectable Activity (MDA) for all particulate filter samples was less than the applicable Lower Limit of Detection (LLD) presented in the ODCM.

Samples are assigned to calendar quarters as of the termination of the sample period. The amount of activity reported for a calendar quarter is the activity for the combined sample time, multiplied by the ratio of the length of the calendar quarter to the sample period.

3. Liquid Effluents

a. Batch Releases

Water from contaminated plant systems was collected, filtered, and treated with Cesium-specific ion-exchange media, and analyzed before discharge (on a batch basis) through the liquid radwaste process monitor. During periods of inoperability of the liquid radwaste process monitor, two samples were collected and analyzed as required in the ODCM.

Samples of liquid waste batches were analyzed for the concentration of gamma-emitting nuclides (intrinsic germanium detector). All statistically important peaks were identified. Additionally, all batches were analyzed for radioactive strontium (Sr-90), gross alpha, Ni-63 and tritium by an off-site laboratory.

The estimated error of the reported release values is estimated based on uncertainty in sample volume, batch volume, detector calibration, and typical sample counting statistics.

The MDA for all batch samples was less than the applicable LLD presented in the ODCM.

b. Continuous Releases

There were no continuous liquid effluent releases during this report period.

D. Batch Release Statistics

1. Liquid

- a. Number of batch releases..... 16
- b. Total time period for batch releases.....2519 minutes
- c. Maximum time period for a batch release..... 175 minutes
- d. Average time period for a batch release 157.4 minutes
- e. Minimum time period for a batch release..... 142 minutes

2. Gaseous

- a. Number of batch releases..... 0
- b. Total time period for batch releases..... N/A
- c. Maximum time period for a batch release..... N/A
- d. Average time period for a batch release N/A
- e. Minimum time period for a batch release..... N/A

E. Abnormal Release Statistics

1. Liquid

- a. Number of abnormal releases..... 0
- b. Total activity released N/A

2. Gaseous

- a. Number of abnormal releases..... 0
- b. Total activity released N/A

II. GASEOUS AND LIQUID EFFLUENTS

A. Gaseous Effluents

Table 1 summarizes the total quantities of radioactive gaseous effluents released. Table 2A is for reporting the quantities of each of these nuclides determined to be released from an elevated release point (there are none). Table 2B presents the quantities of each of the nuclides determined to be released by the stack or other routes (i.e, ground level release points).

B. Liquid Effluents

Table 3 summarizes the total quantities of radioactive liquid effluents. Table 4 presents the quantities of each of the nuclides determined to be released.

The quantity of radionuclides released in 2012 is similar to that released in 2011.

TABLE 1
GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES

B. Particulates

Continuous Mode						
	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Error %
Total Release	Ci	<5.06E-6	<4.96E-6	<5.18E-6	<4.83E-6	2.80E+01
Average Release Rate	$\mu\text{Ci/sec}$	<6.44E-7	<6.30E-7	<6.51E-7	<6.08E-7	
Percent of Applicable Limit	%	<7.14E-6	<7.00E-6	<7.23E-6	<6.74E-6	
Applicable Limit	$\mu\text{Ci/cc}$	9.01E-11	9.01E-11	9.01E-11	9.01E-11	
Gross Alpha	Ci	<2.70E-7	<2.57E-7	<2.70E-7	<2.59E-7	

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected. The < symbol is applied if less than 50% of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g. activity totals of multiple nuclides), values with the < symbol are ignored (i.e. treated as zero). When combining non-detected results for different nuclides (e.g. activity totals of multiple nuclides, when none were detected), all values with the < symbol are used. If the total release for a period is determined to be a "less than" value, the limits are based on analytical results obtained in November, 2005, the mixture was determined to be 84% Cs-137, 11% Co-60 and 5% Sr-90.

TABLE 2A

**GASEOUS EFFLUENTS – ELEVATED RELEASE – PARTICULATES
CONTINUOUS MODE - NUCLIDES RELEASED**

2. Particulates

Nuclides Released	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Co60	Ci	NA	NA	NA	NA
Sr90	Ci	NA	NA	NA	NA
Cs137	Ci	NA	NA	NA	NA
Am241	Ci	NA	NA	NA	NA
Total	Ci	NA	NA	NA	NA

Table Notes:

N/A – There were no elevated gaseous effluents during the report period.

TABLE 2B

**GASEOUS EFFLUENTS – GROUND-LEVEL RELEASES
NUCLIDES RELEASED**

2. Particulates

Nuclides Released	Units	Continuous Mode				
		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Error %
Co60	Ci	<1.90E-06	<1.89E-06	<1.94E-06	<1.81E-06	2.80E+01
Sr90	Ci	<2.38E-07	<1.63E-07	<4.60E-08	<1.97E-07	
Cs137	Ci	<1.73E-06	<1.74E-06	<1.92E-06	<1.69E-06	
Am241	Ci	<1.20E-06	<1.17E-06	<1.27E-06	<1.13E-06	
Total	Ci	<5.06E-6	<4.96E-6	<5.18E-6	<4.83E-6	

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50% of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g. activity totals of multiple nuclides), values with the < symbol are ignored (i.e. treated as zero). When combining non-detected results for different nuclides (e.g. activity totals of multiple nuclides, when none were detected), all values with the < symbol are used.

TABLE 3

LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES

A. Fission & Activation Product	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total Error, %
Not including alpha, gases & H3	Ci	7.49E-04	4.64E-04	6.13E-05	6.44E-04	1.30E+01
Avg Diluted Conc.	μCi/ml	2.17E-09	1.34E-09	1.78E-10	1.87E-09	
Percent of Applicable Limit	%	1.93E-01	1.05E-01	1.50E-02	1.66E-01	
Applicable Limit	μCi/ml	1.12E-06	1.27E-06	1.19E-06	1.13E-06	
B. Tritium	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total Error, %
Total Release	Ci	3.42E-04	3.78E-04	2.47E-04	2.18E-03	1.50E+01
Avg Diluted Conc.	μCi/ml	9.92E-10	1.10E-09	7.16E-10	3.53E-09	
Percent of Applicable Limit	%	9.92E-05	1.10E-04	7.16E-05	3.53E-04	
Applicable Limit	μCi/ml	1.00E-03	1.00E-03	1.00E-03	1.00E-03	
C. Gross Alpha	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total Error, %
Total Release	Ci	9.68E-07	4.69E-07	8.21E-08	<4.95E-7	1.00E+01
D. Volume of Water released	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total Error, %
	Liters	1.00E+05	1.27E+05	2.27E+04	1.50E+05	3.00E+00
E. Volume of Dilution Water	Units	1st Qtr	2nd Qtr	3rd Qtr *	4th Qtr *	Est. Total Error, %
	Liters	3.45E+08	3.45E+08	6.18E+08	6.18E+08	0.00E+00

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50% of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g. activity totals of multiple nuclides), values with the < symbol are ignored (i.e. treated as zero).

* Tidal Dilution Volume recalculated to be 2.47E+09 Liters/Year, as documented in the HBPP procedure TBD-208, rev.1, *OUTFALL CANAL EFFLUENT DILUTION FACTORS*, effective 7/5/12

TABLE 4
LIQUID EFFLUENTS – NUCLIDES RELEASED

Nuclides Released	Units	Batch Mode				
		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Sr90	Ci	1.27E-04	9.28E-06	8.98E-07	7.62E-06	1.45E-04
Cs137	Ci	4.04E-04	3.41E-04	4.94E-05	5.52E-04	1.35E-03
Co60	Ci	1.96E-05	1.09E-05	1.39E-06	1.24E-05	4.43E-05
Am241	Ci	4.03E-06	3.90E-06	6.30E-07	5.65E-06	1.42E-05
Ni63	Ci	1.99E-04	1.03E-04	9.66E-06	7.22E-05	3.83E-04
H3	Ci	3.42E-04	3.78E-04	2.47E-04	2.18E-03	3.15E-03
Alpha Emitters	Ci	9.68E-07	4.69E-07	8.21E-08	<4.95E-7	2.01E-06
Total for Period	Ci	1.10E-03	8.46E-04	3.09E-04	2.83E-03	5.08E-03

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50% of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g. activity totals of multiple nuclides), values with the < symbol are ignored (i.e. treated as zero).

III. SOLID RADIOACTIVE WASTE

Table 5 summarizes the disposal of solid radioactive waste made during the report period.

TABLE 5
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite For Burial Or Disposal			
1. Type of Waste	Unit	12 Month Period	Estimated Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	Cubic Meter	5.73E+00	1.00E+01
	Ci	3.85E+01	5.60E+01
b. Dry compressible waste, contaminated equipment, etc.	Cubic Meter	2.82E+02	1.00E+01
	Ci	6.33E-01	5.60E+01
c. Irradiated components, control rods, etc.	Cubic Meter	3.26E-01	1.00E+01
	Ci	3.45E+02	5.60E+01
d. Other (Processed Waste)	Cubic Meter	5.53E+01	1.00E+01
	Ci	5.77E+00	5.60E+01

TABLE 5 - Continued

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
Continued

2. Estimate of major nuclide by waste type											
a. Spent resins, filter sludges,			b. Dry compressible waste,			c. Irradiated components, control rods, etc.			d. Other (Processed Waste)		
Unit	Nuclide	12 Month Period	Unit	Nuclide	12 Month Period	Unit	Nuclide	12 Month Period	Unit	Nuclide	12 Month Period
%	H-3	6.23E-02	%	H-3	5.91E-01	%	H-3	1.37E-04	%	H-3	3.91E-02
%	C-14	2.77E-03	%	C-14	2.10E-01	%	C-14	1.17E-01	%	C-14	2.23E-02
%	Fe-55	1.72E-01	%	Fe-55	1.14E+01	%	Fe-55	1.40E-01	%	Fe-55	6.21E-01
%	Co-60	4.94E-01	%	Co-60	1.06E+01	%	Co-60	1.89E+01	%	Co-60	8.58E+01
%	Ni-59	0.00E+00	%	Ni-59	6.61E+00	%	Ni-59	7.19E-01	%	Ni-59	1.12E-01
%	Ni-63	1.30E+01	%	Ni-63	2.44E+01	%	Ni-63	8.02E+01	%	Ni-63	1.05E+01
%	Sr-90	8.42E+00	%	Sr-90	2.43E+00	%	Sr-90	2.52E-04	%	Sr-90	1.57E-01
%	Nb-94	0.00E+00	%	Nb-94	0.00E+00	%	Nb-94	6.61E-04	%	Nb-94	0.00E+00
%	Tc-99	5.34E-03	%	Tc-99	0.00E+00	%	Tc-99	6.44E-04	%	Tc-99	3.74E-02
%	I-129	1.79E-04	%	I-129	4.16E-02	%	I-129	0.00E+00	%	I-129	2.48E-03
%	Cs-137	7.62E+01	%	Cs-137	2.13E+01	%	Cs-137	2.28E-03	%	Cs-137	1.69E+00
%	Eu-152	0.00E+00	%	Eu-152	1.93E-01	%	Eu-152	0.00E+00	%	Eu-152	0.00E+00
%	Eu-154	0.00E+00	%	Eu-154	1.85E-02	%	Eu-154	0.00E+00	%	Eu-154	1.30E-01
%	U-233	0.00E+00	%	U-233	4.61E-02	%	U-233	0.00E+00	%	U-233	3.34E-04
%	U-234	0.00E+00	%	U-234	2.04E-02	%	U-234	0.00E+00	%	U-234	2.90E-04
%	U-235	1.65E-05	%	U-235	0.00E+00	%	U-235	0.00E+00	%	U-235	1.36E-05
%	U-Nat	0.00E+00	%	U-Nat	0.00E+00	%	U-Nat	0.00E+00	%	U-Nat	2.27E-02
%	U-238	0.00E+00	%	U-238	5.37E-02	%	U-238	0.00E+00	%	U-238	1.83E-03
%	Pu-238	1.03E-01	%	Pu-238	4.20E-01	%	Pu-238	8.94E-04	%	Pu-238	3.23E-02
%	Pu-239	7.84E-02	%	Pu-239	2.59E-01	%	Pu-239	3.39E-04	%	Pu-239	2.05E-02
%	Pu-240	7.84E-02	%	Pu-240	2.54E-01	%	Pu-240	0.00E+00	%	Pu-240	2.05E-02
%	Pu-241	1.12E+00	%	Pu-241	1.98E+01	%	Pu-241	6.73E-03	%	Pu-241	6.25E-01
%	Pu-242	3.73E-03	%	Pu-242	1.14E-01	%	Pu-242	8.15E-05	%	Pu-242	3.29E-05
%	Am-241	2.31E-01	%	Am-241	1.38E+00	%	Am-241	7.05E-03	%	Am-241	4.03E-02
%	Cm-242	1.79E-04	%	Cm-242	0.00E+00	%	Cm-242	0.00E+00	%	Cm-242	1.37E-03
%	Cm-243	4.75E-03	%	Cm-243	1.07E-02	%	Cm-243	4.78E-05	%	Cm-243	1.82E-03
%	Cm-244	3.70E-03	%	Cm-244	1.07E-02	%	Cm-244	0.00E+00	%	Cm-244	3.18E-03
%	Sum of Activity	9.99E+01	%	Sum of Activity	1.00E+02	%	Sum of Activity	1.00E+02	%	Sum of Activity	9.99E+01

TABLE 5 - Continued
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
Continued

3. Solid Waste Disposition	Number of Shipments	Mode of Transportation	Destination
	26	Truck - Hittman	Energy Solutions LLC - Clive Utah
	58	Truck - NCF/Savage	US Ecology - Grand View, Idaho
	4	Truck - Hittman	Waste Control Specialists (WCS), Andrews TX

Note: 58 shipments were made to US Ecology under a 10 CFR 20.2002 exemption. These shipments included 1.61E-01 curies of Cs-137 and 1.05E-02 curies of Co-60.

B. Irradiated Fuel Shipments			
1. Irradiated Fuel Disposition	Number of Shipments	Mode of Transportation	Destination
	None	N/A	N/A

IV. RADIOLOGICAL IMPACT ON MAN

A comparison of calculated doses from various paths has shown that the offsite doses are primarily due to direct radiation and to the consumption of aquatic foods. Maximum doses to individuals (for the maximally exposed organs and age groups) are summarized in Table 6. These doses comply with 40 CFR 190 as there are no other uranium fuel cycle facilities within 8 km of the Humboldt Bay Power Plant.

- A. Doses to the average individual in the population from all receiving-water-related pathways were calculated for detected releases, based on the guidance of Regulatory Guide 1.109. The highest results were less than 0.01 mrem/yr (total body) for the Adult age group, and 0.010 mrem/yr for the bone of the Adult age group.

These doses are well below the 10 CFR 50, Appendix I numerical guidelines for limiting effluents as low as is reasonably achievable (ALARA) (3 mrem/yr to the total body and 10 mrem/yr to any organ).

- B. Total body doses to the average individual in the population from gaseous effluents to a distance of 50 miles from the site are not calculated, but this dose is less than the total body dose to an average individual present at the maximally exposed location. For an average individual at the maximally exposed location, the total body dose (calculated with the same dispersion and deposition parameters as were used to calculate maximum exposure) was less than 0.001 mrem/yr.

This maximum calculated dose is well below the 10 CFR 50, Appendix I numerical ALARA guidelines (10 mrem/yr for gamma radiation and 20 mrad/yr for beta radiation from noble gases and 15 mrem/yr to any organ from tritium and radionuclides in particulate form).

- C. Total body doses (to the average individual in unrestricted areas from direct radiation from the facility) are based on TLD results of stations at the site boundary, using the shoreline occupancy factors given in Regulatory Guide 1.109 for the highest average potential individual (Teen age group). For this group, direct radiation would result in an exposure of <0.01mrem/yr.

This maximum potential dose is well below the 10 CFR 20.1302(b)(2)(ii) limit of 50 mrem/yr from external sources necessary to demonstrate compliance with the 10 CFR 20.1301 dose limit for individual members of the public.

TABLE 6
RADIATION DOSE FOR MAXIMALLY EXPOSED INDIVIDUALS

Dose, milli-rem					
Dose Source	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Liquid Effluents					
Water-related Pathways (1)	<0.01 (4)	<0.01 (4)	<0.01 (4)	<0.01 (4)	<0.01 (4)
	<0.01 (5)	<0.01 (5)	<0.01 (5)	<0.01 (5)	<0.01 (5)
Airborne Effluents					
Particulates (2)	0.00 (6)	0.00 (6)	0.00 (6)	0.00 (6)	0.00 (6)
	0.00 (6)	0.00 (6)	0.00 (6)	0.00 (6)	0.00 (6)
Direct Radiation (3)	0.01	<0.01	<0.01	<0.01	<0.01

Notes

1. Maximum total body and organ doses to individuals in unrestricted areas from receiving-water-related exposure pathways were calculated from the average concentrations of liquid releases detected during the report period, following the applicable portions of Regulatory Guide 1.109 and NUREG-4013.
2. Maximum total body and organ doses to individuals in unrestricted areas from airborne-particulate-related exposure pathways were calculated from the average concentrations of airborne particulate releases detected during the report period, following the applicable portions of Regulatory Guide 1.109 and NUREG-4013.
3. Total body doses (to the maximum individual in the population) are based on TLD results of stations at the site boundary, using the shoreline occupancy factors of Regulatory Guide 1.109 for the maximum potential individual (Teen age group).
4. Total body (Adult age group).
5. Bone (Adult and Child age group).
6. For stack releases for all four quarters of 2012, a majority of the results were "not detected", resulting in a total activity considered "not detected", for which no dose is calculated.

V. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

As decommissioning proceeds at HBPP, systems change, or get removed requiring that changes be made to the ODCM. During the last year there were four revisions made to reflect these changes: Revision 19, Revision 20, Revision 21, and Revision 22. The specific changes to the procedure are as follows:

Revision 19

Sections 3.2.2 – Steps a. through e. were deleted. This listing of “major components” of the Liquid Waste Treatment Systems was a redundant listing with the HBPP DSAR, step 2.2.2.3.

Revision 20

In Table 2-3, Action A and Action B were revised for purposes of clarification. The intent of these revisions is to ensure that in the event of a Continuous Alpha Monitor (CAM) failure, the project places all work in a safe condition and will not return to work until the CAM is restored to operation. Similarly, if the particulate sampler fails while work is in progress, the intent is for the work to be placed in a safe condition and for work to cease until the sampler can be returned to service.

Revision 21

This revision adjusts liquid effluent dilution factors to account for the continued silting, that reduces the dilution volume of the discharge canal. It also revises the near-shore dilution factor and the annual tidal dilution volume. Specific changes are as follows:

Part II

Section 1.1.1

This revision included text was to remove references to circulating water flow. A comment was added regarding 12.1 data comparison. The Canal dilution factor was changed from 100 to 50, specific to 7500 gallon LRW batches, released during optimum tidal period, and to 1 (no dilution credited) for other releases. Also, alternative calculations were added for larger batches, and for specific tidal conditions.

Section 2.4

Text was revised to reduce the Bay dilution factor form 80 to 20 for all releases. Revised the $C_{i-Bay-diluted}$ to use the factor of 20 and recalculated the tidal flow for the outfall canal.

Section 1.2.9

Text was revised to clarify offsite doses for NUE and Alert.

Part I

Section 2.11.2

Note: There were changes to environmental sample analysis location, as listed in Table 2-7. These changes were made after HBPP considered the modifications from a technical and decommissioning perspective.

Airborne: Deleted superscript 2 under "Type of Analysis" denoting "Performed by offsite laboratory" for both gross alpha and gross beta radioactivity following filter change and gamma isotopic analysis on quarterly composite (by station), to remove the specific identification of "offsite laboratory" for the analysis of environmental air samples.

Waterborne, Surface Water: Deleted superscript 2 under "Type of Analysis" denoting "Performed by offsite laboratory" for discharge canal effluent, to remove the specific identification of "offsite laboratory" for the analysis of the discharge canal effluent.

Waterborne, Groundwater Monitoring: Delete superscript 2 under "Type of Analysis" denoting "Performed by offsite laboratory" for quarterly groundwater monitoring, to remove the specific identification of "offsite laboratory" for the analysis of the groundwater sampling.

Waterborne, Sediment: Deleted collection of sediment samples from 3 locations within Humboldt Bay.

Ingestion, Fish and Invertebrates: Deleted quarterly collection of fish, clams, and oysters for gamma isotopic analysis.

Terrestrial, Deleted quarterly soil collection for gamma isotopic analysis

Program Basis: Deleted the State of California (NQR) and PG&E/HBPP Elective notations for airborne and direct radiation pathways.

Part I, Section 2.11.2 Updated sample/monitoring locations to better identify actual current locations by GPS Survey. This affects Table 2-10 and figures 2-1 through 2-5.

Revision 22

Step 9.3 was revised to reflect the modification of reduction of environmental requirements in the ODCM provided HBPP considers the modifications form a technical and decommissioning perspective.

VI. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

There were no changes to the Process Control Program during the report period.

VII. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

There were no changes to the Radioactive Waste Treatment Systems during the report period.

VIII. INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

Liquid Effluent Monitoring

Radioactive Liquid Effluent Monitoring System (RLEMS)

The RLEMS was out of service once during 2012 from 9/11/12, 1330 hrs until 9/21/12, 1325 hrs.

Airborne Effluent Monitoring Instrumentation

Stack Particulate Airborne Monitoring System (SPAMS)

The SPAMS had one unplanned out of service period during 2012. On 3/31/12, there was an unplanned outage that lasted from 0550 hrs until 1015 hrs.

IX. ERRATA

1. SAPN 1290898 detailed a problem with the HBPP 2011 Annual Radioactive Effluent Release Report, submitted under letter HBL-12-007. An incorrect date was reported. The specific date in question was in Section IX, ERRATA, fourth sentence.

It read: "The alpha monitor was determined to have been inoperable from the time of the initial design acceptance (12/9/2012) to 3/22/2010, when during the performance of the Surveillance Test Procedure (STP) 3.16.10, "Calibration of the Stack Particulate Airborne Monitoring System (SPAMS)," it was discovered that the detector was not set to perform its intended function of detecting alpha radioactivity.

It should have read: "The alpha monitor was determined to have been inoperable from the time of the initial design acceptance (12/9/2009) to 3/22/2010, when during the performance of the Surveillance Test Procedure (STP) 3.16.10, "Calibration of the Stack Particulate Airborne Monitoring System (SPAMS)," it was discovered that the detector was not set to perform its intended function of detecting alpha radioactivity." The only difference between the two sentences is changing the 12/9/2012 date to 12/9/2009.

2. SAPN 1296008 was written to document the need to correct known errors from the

HBPP 2011 Annual Effluent Release Report.

- a. A typographical error was found on Table 3 of the 2011 HBPP Annual Effluent Release Report. While reviewing last year's report, it was noted that the units "Ci/ml" for Fission & Activation Product - Avg. Diluted Conc., and Tritium – Avg. Diluted Conc. were incorrectly reported for what should have been "μCi/ml".

Corrected 2011 HBPP Annual Release Report Table 3

Table 3		Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Est. Total
A. Fission & Activation Product							Error, %
1	Not including alpha, gases & Avg Diluted Conc.	Ci	1.13E-03	1.16E-03	NA	2.19E-03	1.00E+01
2	Percent of Applicable Limit	μCi/ml	3.28E-09	3.35E-09	NA	6.36E-09	
3	Applicable Limit	%	4.32E-01	3.09E-01	NA	3.80E-01	
4	Applicable Limit	μCi/ml	7.60E-07	1.08E-06	NA	1.67E-06	
B Tritium							
1	Total Release	Ci	4.00E-04	2.19E-04	NA	1.47E-04	1.50E+01
2	Avg Diluted Conc.	μCi/ml	1.16E-09	6.35E-10	NA	4.26E-10	
3	Percent of Applicable Limit	%	1.16E-04	6.35E-05	NA	4.26E-05	
4	Applicable Limit	μCi/ml	1.00E-03	1.00E-03	NA	1.00E-03	
C Gross Alpha							
1	Total Release	Ci	<4.81e-6	<2.26e-6	NA	4.60E-06	1.00E+01
D. Volume of Water released		Liters	9.69E+04	1.01E+05	NA	4.91E+04	3.00E+00
E Volume of Dilution Water		Liters	3.45E+08	3.45E+08	3.45E+08	3.45E+08	0.00E+00

- b. A typographical error was also found on Table 5 of the 2011 report. The table in the report, as submitted, had no entries for "Estimated Total Error %" in rows a. & d. The corrected table should be as follows:

Corrected 2011 HBPP Annual Release Report Table 5

1. Type of Waste	Unit	12 Month Period	Estimated Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	Cubic Meter	9.93E+00	1.00E+01
	Ci	2.31E+00	5.60E+01
b. Dry compressible waste, contaminated equipment,	Cubic Meter	6.12E+02	1.00E+01
	Ci	1.32E+00	5.60E+01
c. Irradiated components, control rods, etc.	Cubic Meter	0.00E+00	NA
	Ci	0.00E+00	NA
d. Other (Processed Waste)	Cubic Meter	3.28E+01	1.00E+01
	Ci	3.10E-02	5.60E+01

- c. 2010 HBPP Annual Effluent Release Report Table Corrections were not included in the 2011 HBPP Annual Effluent Release Report's Errata Section. The corrected table is shown below.

SAPN 1275622 documented the difference in flow rates between the old and new stack monitors. The new monitor has a 1 cfm flow rate as opposed to 2 cfm, as annotated in the SAPN.

Result: The Sr-90 and Gross Alpha Activity particulate activities sent for off-site determinations are doubled. The Gross Alpha results were reported in the 2010 report on Table 1, and the Sr-90 results were reported on Table 2B. They were reported in Curies released by quarter. The corrected results are:

Corrected 2010 HBPP Annual Release Report Table 1

**TABLE 1
GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES**

Continuous Mode						
	Units	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Error %
Total Release	Ci	<3.42E-06	<3.66E-06	<3.68E-06	<3.95E-06	3.60E1
Average Release Rate	µCi/sec	<4.40E-07	<4.66E-07	<4.63E-07	<4.97E-07	
Percent of Applicable Limit	%	<4.88E-06	<5.17E-06	<5.14E-06	<5.22E-06	
Applicable Limit	µCi/cc	9.01E-11	9.01E-11	9.01E-11	9.01E-11	
Gross Alpha	Ci	7.86E-08	1.23E-07	1.10E-07	3.36E-08	

Corrected 2010 HBPP Annual Release Report Table 2B

TABLE 2B

**GASEOUS EFFLUENTS – GROUND-LEVEL RELEASES
 NUCLIDES RELEASED**

Nuclides Released	Units	Continuous Mode				
		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Error %
Co60	Ci	<8.46E-07	<8.17E-07	<8.41E-07	<1.20E-06	3.60E+01
Sr90	Ci	<5.46E-07	<6.92E-07	<6.43E-07	<7.48E-07	
Cs137	Ci	<6.21E-07	<8.29E-07	<8.02E-07	<1.10E-06	
Am241	Ci	<1.68E-06	<1.67E-06	<1.72E-06	<1.28E-06	
Total	Ci	<3.69E-06	<4.01E-06	<4.01E-06	<4.33E-06	

HUMBOLDT BAY POWER PLANT UNIT 3
SAFSTOR/DECOMMISSIONING OFFSITE DOSE CALCULATION MANUAL
REVISION 22
INCLUDING CHANGES MADE DURING 2012

Figure 1-1
SITE BOUNDARY

