Pacific Gas and Electric Company®

Jon A. Franke
Vice President
Power Generation

P.O. Box 56
Avila Beach, CA 93424

805.545.4888
E-Mail: Jon.Franke@pge.com

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PG&E Letter HBL-18-003

10 CFR 50, Appendix I
10 CFR 50.36a

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 2017

Reference: 1. PG&E Letter HBL-17-005, Annual Radioactive Effluent Release Report for 2016, dated March 30, 2017

Dear Commissioners and Staff:

The Enclosure contains the Humboldt Bay Power Plant Unit 3 "Annual Radioactive Effluent Release Report," covering the period January 1 through December 31, 2017. This report is required by Appendix B, Section 6.3 of the Humboldt Bay Quality Assurance Plan.

Revision 27 to the "SAFSTOR Offsite Dose Calculation Manual" was not changed during the reporting period and was previously submitted in Reference 1.

There are no new or revised regulatory commitments (as defined by NEI 99-04) made in this letter.

If you have any questions regarding this submittal, please contact Mr. Philippe Soenen at 805-595-6461.

Sincerely,

Jon A. Franke

Enclosure
cc: HBPP Humboldt Distribution
cc/enc: John B. Hickman, NRC Project Manager
Kriss M. Kennedy, NRC Region IV Administrator

Enclosure
PG&E Letter HBL-18-003

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, 2017

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INTRODUCTION

This report summarizes gaseous and liquid radioactive effluent releases from Humboldt Bay Power Plant (HBPP) Unit 3 for the four quarters of 2017. The report includes calculated potential radiation doses 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.

The HBPP Main Plant Stack, a ground level release path, and Stack Particulate Airborne Monitoring System (SPAMS), the real time effluent monitor, were shut down on October 14, 2015, and permanently removed from service to facilitate partial demolition of the Reactor Building. Modular HEPA units are available to monitor potential gaseous effluent pathway.

The information is reported as required by Appendix B, Section 6.3 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, Iodine and Noble Gasses

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 other than Kr-85. During 2008, all of the spent nuclear fuel was transferred from the spent fuel pool to the independent spent fuel storage installation (ISFSI), so there is now no source term for Kr-85.

Air Particulate Filter Composites – Sr-90 and Am-241

No modular HEPA ventilation units were used during the reporting period. No weekly sampling was required for monitoring effluents by the ODCM. Airborne radioactivity samplers were established in the vicinity of the Caisson excavation and samples were collected weekly and evaluated for gross alpha and gross beta to identify any adverse trends. No identifiable alpha or beta airborne radioactivity was identified in these weekly samples above effluent concentration limits of 10 CFR 20, Appendix B. Since no gross alpha or beta result identified an adverse trend, no separate analysis for Sr-90 or Am-241 was warranted.

Gaseous Effluents – Tritium

Tritium sampling is not required by the HBPP ODCM. No tritium samples were collected during this reporting period.

Liquid Effluents

The last batch discharge of radioactive liquid effluent occurred on December 11, 2013. Subsequent radioactive liquid effluent batches were transported to US Ecology for offsite disposal under the 10 CFR 20.2002 exemption. These shipments, volumes, and activity totals are included in Table 5 of this report.

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 shut down, 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. 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, for which the mixture was determined to be 84 percent Cs-137, 11 percent Co-60 and 5 percent Sr-90.

The applicable annual average dispersion factor for incidental releases is 6.59E-3 seconds per cubic meter.

2. Liquid Effluents

a. Concentration Limit

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

B. Effluent Concentration Limits

1. Gaseous Effluents

Effluent Concentration Limits for gaseous effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 1.

2. Liquid Effluents

Effluent Concentration Limits 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

Elevated releases did not occur at HBPP during 2017.

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 Iodine can be expected. Therefore, neither the Technical Specifications nor the ODCM require that these radionuclides be monitored.

c. Particulates

Radioactive particulates released from modular HEPA ventilation units are monitored by continuous sample collection on particulate filters when used. No areas involving elevated airborne radioactivity were identified in 2017, so no modular HEPA ventilation units were used in 2017.

3. Liquid Effluents

a. Batch Releases

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

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 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

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.

Section A of Table 1, 2A, and 2B have been omitted as Fission & Activation Gases are neither expected or measured.

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 ground level release points (there are none).

There were no "Batch Mode" gaseous releases during this report period.

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.

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

TABLE 1

GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Est. Total Error, %
B. Particulates						
1. Total release	Ci	N/A	N/A	N/A	N/A	N/A
2. Average release rate	μCi/sec	N/A	N/A	N/A	N/A	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	
4. Applicable limit	μCi/cc	N/A	N/A	N/A	N/A	
5. Gross alpha radioactivity	Ci	N/A	N/A	N/A	N/A	

Table Notes:

N/A – There were no Gaseous Effluent Releases during the reporting period.

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Stack Release Path	%	N/A	N/A	N/A	N/A
Incidental Release Path	%	N/A	N/A	N/A	N/A

No operating Modular HEPA units after 6/7/16.

TABLE 2A

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

Nuclides Released	Unit	Continuous Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Particulates					
Cobalt-60	Ci	N/A	N/A	N/A	N/A
Strontium-90	Ci	N/A	N/A	N/A	N/A
Cesium-137	Ci	N/A	N/A	N/A	N/A
Am-241	Ci	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A

Table Notes:

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

TABLE 2B

GASEOUS EFFLUENTS – GROUND-LEVEL RELEASES NUCLIDES RELEASED

Nuclides Released	Unit	Continuous Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2. Particulates					
Cobalt-60	Ci	N/A	N/A	N/A	N/A
Strontium-90	Ci	N/A	N/A	N/A	N/A
Cesium-137	Ci	N/A	N/A	N/A	N/A
Americium-241	Ci	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A

Table Notes:

N/A - There were no ground-level gaseous effluents during the report period.

TABLE 3

LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Est. Total Error, %
A. Fission & Activation Products						
1. Total release (not including tritium, gases, alpha)	Ci	N/A	N/A	N/A	N/A	N/A
2. Average diluted concentration	µCi/ml	N/A	N/A	N/A	N/A	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	
4. Applicable limit	µCi/ml	N/A	N/A	N/A	N/A	
B. Tritium						
1. Total release	Ci	N/A	N/A	N/A	N/A	N/A
2. Average diluted concentration	µCi/ml	N/A	N/A	N/A	N/A	
3. Percent of applicable limit	%	N/A	N/A	N/A	N/A	
4. Applicable limit	µCi/ml	N/A	N/A	N/A	N/A	
C. Gross Alpha Radioactivity						
1. Total release	Ci	N/A	N/A	N/A	N/A	N/A
D. Volume of waste released (prior to dilution)	Liters	N/A	N/A	N/A	N/A	N/A
E. Volume of dilution water	Liters	N/A	N/A	N/A	N/A	N/A

Table Notes:

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

TABLE 4

LIQUID EFFLUENTS – NUCLIDES RELEASED

Nuclides Released	Unit	Batch Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Strontium-90	Ci	N/A	N/A	N/A	N/A
Cesium-137	Ci	N/A	N/A	N/A	N/A
Cobalt-60	Ci	N/A	N/A	N/A	N/A
Americium-241	Ci	N/A	N/A	N/A	N/A
Nickel-63	Ci	N/A	N/A	N/A	N/A
Tritium	Ci	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A

Table Notes:

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

III. SOLID RADIOACTIVE WASTE

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

Note: Table reflects all waste shipped from HBPP in the reporting 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.	There were no spent resins, filter sludges, evaporator bottoms, etc. shipments during this reporting period.		
b. Dry compressible waste, soils, contaminated equipment, etc. (1,2)	Cubic Meter	2.44E+04	1.00E1
	Ci	1.34E+01	5.60E1
c. Irradiated components, control rods, etc.	There were no irradiated components, control rods, etc. shipments during this reporting period.		
d. Other (Processed Waste from HBPP via processor to burial) (5)	Cubic Meter	3.64E+00	1.00E1
	Ci	7.93E-03	5.60E1

2. Estimate of major nuclide composition (by type of waste)	Unit	Nuclide	12 Month Period
a. Spent resins, filter sludges, evaporator bottoms, etc.	There were no spent resins, filter sludges, evaporator bottoms, etc. shipments during this reporting period.		
b. Dry compressible waste, soils, contaminated equipment, etc. (2,3)	%	H-3	6.66E+01
	%	C-14	4.4E-01
	%	Fe-55	3.2E-01
	%	Co-60	2.85E+00
	%	Ni-63	1.40E+01.
	%	Cs-137	1.23E+01
	%	Eu-152	2.76E+00
	%	U-238	2.30E-01
	%	Pu-241	1.10E-01
c. Irradiated components, control rods, etc.	There were no irradiated components, control rods, etc. shipments during this reporting period.		

TABLE 5 – Continued

2. Estimate of major nuclide composition (by type of waste)	Unit	Nuclide	12 Month Period
d. Other (processed waste – activated concrete and instrument check sources)[3, 5]	%	H-3	2.54E+01
	%	Co-60	1.66E+01
	%	Ni-59	4.13E-01
	%	Ni-63	5.21E+01
	%	Cs-137	5.15E+00
	%	U-238	1.23E-01

3.a. Solid Waste Disposition from HBPP	Number of Shipments	Mode of Transportation	Destination
	391 [4]	Truck – NCF/MP	US Ecology
	372 [1]	Truck / Rail - MP	WCS
	33	Truck - Hittman	Clive
3.b. Solid Waste Disposition via processor to disposal [5]	2	Truck - Hittman	via Toxco to Clive or WCS
B.1 Irradiated Fuel Shipments	None	N/A	N/A

Table Notes:

[1] Confirmation of the final disposal volume for 29 shipments was not received by year end, but disposal volumes are not expected to change substantially.

[2] HBPP no longer performs batch liquid effluent discharges. Volumes and activity totals for liquid shipments are included in Table 5.

[3] Radionuclides contributing less than 0.1% to the total activity are not listed in Table 5.2.b and d.

[4] 391 shipments (including 2 liquid shipments) were made to US Ecology under a 10 CFR 20.2002 exemption.

[5] Shipments in 3.b above are primarily activated steel and instrument check sources being prepared by the processor for final disposal. The activity and nuclide distribution is reflected in 1.d. and 2.d.

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. Maximum doses to individuals (for the maximally exposed organs and age groups) are summarized in Table 6. Doses from Noble Gases are not reported, as noble gas releases were neither expected nor measured. There are no airborne or liquid dose pathways from the adjacent ISFSI, and the direct radiation measurement locations for HBPP include the contribution from the ISFSI. Therefore, these doses comply with 40 CFR 190 as there are no other uranium fuel cycle facilities within 8 km of the HBPP and ISFSI.

A. Doses to the average individual in the population, based on the guidance of Regulatory Guide 1.109, from all receiving-water-related pathways were not calculated for 2017, because there were no batch liquid effluent releases during this report period. The last batch liquid effluent discharge occurred on December 11, 2013.

With no batch liquid effluent discharge, doses continue to be well below the 10 CFR 50, Appendix I numerical guidelines for limiting effluents as low as is reasonably achievable (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 (determined with the same dispersion and deposition parameters as used to calculate maximum exposure) was not explicitly calculated as there were no releases.

C. Total body doses (to the average individual in unrestricted areas from direct radiation from the facility) are based on thermoluminescent dosimeter (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 (teenage group). For this group, direct radiation would result in an exposure of 0.1 mrem/yr, calculated as follows:.

Specification 2.10 of the ODCM limits the calendar year dose or dose commitment to any MEMBER OF THE PUBLIC, due to releases of radioactivity and radiation, from uranium fuel cycle sources 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).

Potential direct radiation exposure to an individual at the site boundary is highest at the north boundary of the site. Due to the possibility that an individual at the shoreline (fishing, bird watching, etc.) may use the path along the Coastal Trail, TLD stations T8, T9, and T10 along the path are used to estimate an annual radiation exposure. The ODCM calculation model for the direct radiation exposure pathway assumes a maximum occupancy factor of 67 hours per year, based on regulatory guidance for shoreline recreation for the teenage group.

During 2017, a "haul road" was constructed along the Coastal Trail fence line to allow trucks and transfer equipment access to the two soil management facilities (SMFs) Tents during the Circulating Water line excavation. Direct radiation at T9 has steadily increased during 2017, most likely due to the transportation of radioactive soil and concrete from the caisson to the SMFs, as well as radioactive waste bags and intermodals from the SMFs to the waste management facility for shipment offsite. The increase was noted in the HBPP corrective action program (SAPN 1439150).

Examination of TLD doses for 2017 includes the following:

2017 Quarter	Average Bkg (mrem)	T8 Average Dose (mrem)	T9 Average Dose (mrem)	T10 Average Dose (mrem)
2017 Q1	14.2	14.7	15.1	15.3
2017 Q2	11.2	11.0	14.6	12.3
2017 Q3	11.9	11.9	16.1	13.0
2017 Q4	13.0	13.5	17.8	14.0

Using the maximum quarterly dose as seen on TLDs T8, T9, and T10 from the table:

15.3 + 14.6 + 16.1 + 17.8 = 63.8 maximum mrem for the year

Total Background dose for the year based on quarterly mean dose from offsite TLDs 1, 2, 14, 25 and 17 = 14.2 + 11.2 + 11.9 + 13.0 = 50.3 mrem

Subtracting the yearly background dose from the maximum dose at T8, T9, and T10:

63.8 mrem – 50.3 mrem = 13.5 mrem above background for the year

13.5 mrem corrected to the 67 hour occupancy: 13.5 x 67 hrs / 8760 hrs per yr = 0.1 mrem additional mrem at the fence line.

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)	-	-	-	-	-
	-	-	-	-	-
Airborne Effluents					
Particulates (2)	-	-	-	-	-
	-	-	-	-	-
Direct Radiation (3)	<0.01	0.03	0.03	0.04	0.1

Notes

1. Maximum total body and organ doses to individuals in unrestricted areas from receiving-water-related exposure pathways were not calculated as there were no batch liquid effluent releases during this report period. The last batch liquid effluent discharge occurred on December 11, 2013.
2. Maximum total body and organ doses to individuals in unrestricted areas from airborne effluent-related exposure pathways were not calculated as there were no airborne effluent releases during this report period. The plant stack was shut down in October 2015. Modular HEPA ventilation units are available for localized airborne radioactivity control, but were not used during the reporting period because no elevated airborne radioactivity areas were observed.
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 (teenage group).

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

As decommissioning proceeds at HBPP, system changes or removal may require changes to the ODCM. No changes were made to the ODCM during the reporting period. ODCM, Revision 27, as previously submitted, remains in effect.

VI. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

There were no changes to the PCP during the report period.

VII. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

HBPP no longer performs batch liquid effluent discharges.

VIII. INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

Liquid Effluent Monitoring

Effective December 23, 2013, HBPP no longer uses outfall canal dilution for liquid effluents. There were no batch liquid effluent releases during this report period.

Airborne Effluent Monitoring Instrumentation

No airborne radioactivity areas were identified in 2017. Therefore, no modular HEPA ventilation units were used during the reporting period.

SPAMS was removed from service on October 14, 2015.

IX. ERRATA

2016 Annual Radioactive Effluent Release Report Errata:

None