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CO 92 001127

Department of Energy
Oak Ridge Operations
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

June 24, 1992

COPY

Mr. Winston A. Smith, Director
Air, Pesticides and Toxics Management Division
U.S. Environmental Protection Agency
Region IV
345 Courtland Street, NE
Atlanta, Georgia 30365

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS) 1991 REPORT

Dear Mr. Smith:

Attached is the 1991 NESHAPS Report which addresses airborne radionuclide emissions from the Paducah Gaseous Diffusion Plant (PGDP). The report is required by 40 Code of Federal Regulations (CFR) 61, Subpart H. Changes have been made in the final report to make it more accurate and concise. Those changes are listed as follows:

1. Section II - Air Emission Data has been revised to contain one major point source and six grouped sources rather than one major point source, 16 minor point sources and 11 grouped sources.

2. The number of C-710 laboratories "using" uranium was changed based on guidance from the Environmental Protection Agency (EPA). Emissions from the C-710 laboratory were estimated using 40 CFR 61, Appendix D, which requires a determination of the curies "used" at a source.

3. The Pigtail Exhaust section has been renamed to Cylinder Valve Connection Activities.

4. Radionuclide emissions from the C-400 decontamination spray booth and rotary vacuum filter have been estimated using guidance contained in 40 CFR 61, Appendix D, rather than evaporative emission estimates.

5. Additional information requested by EPA is included in Section IV - Supplemental Information.

If you have any questions or require additional information, please contact Charles W. Martin at (502) 441-6818.

Sincerely,

[signature] FOR

Donald C. Booher, Site Manager
Paducah Site Office

EO-24:Arendale

Attachment

cc w/att:
D. Bartlett, CC-10
C. E. Bradley, NE-33
P. J. Gross, SE-31
C. W. Martin, EO-24
J. W. Parks, EO-22
H. Pulley/J.C. Massey/C. G. Giltner/D. R. Guminski, PGDP

CONCURRENCE
RTG. SYMBOL E0-24
INITIALS/SIG. Arendale
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INITIALS/SIG. Booher
DATE 6-24-92
RTG. SYMBOL E0-24
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U. S. Department of Energy
Air Emissions Annual Report
(under Subpart H, 40 CFR 61.94)
Calendar Year 1991

Site Name: Paducah Gaseous Diffusion Plant

Operations Office Information

Office: Paducah Site Office

Address: P. O. Box 1410

Paducah, Kentucky 42002-1410

Contact: Charles W. Martin Phone: 502-441-6818

Site Information

Operating Contractor: Martin Marietta Energy System, Inc.

Address: P. O. Box 1410

Paducah, Kentucky 42002-1410

Contact: Douglas W. Jones Phone: 502-441-6684

SECTION I. FACILITY INFORMATION

SITE DESCRIPTION

The Department of Energy (DOE), Paducah Gaseous Diffusion Plant (PGDP) is an active uranium enrichment facility consisting of a diffusion cascade and extensive support facilities. The cascade, including product and tails withdrawal, is housed in six process buildings covering a total of approximately 80 acres. The plant is located on a reservation consisting of approximately 1350 acres in western McCracken County about 10 miles west of Paducah, Kentucky, and approximately 3 miles south of the Ohio River. Roughly 740 acres of the reservation are enclosed within a fenced security area. The raw water treatment plant, residential landfill, and inert landfill are the only operating areas outside of the security area. An uninhabited buffer zone of at least 400 yards surrounds the entire fenced area. Beyond the DOE-owned buffer zone is an extensive wildlife management area consisting of 2100 acres either deeded or leased to the Commonwealth of Kentucky. During World War II, the Kentucky Ordnance Works, a trinitrotoluene (TNT) production facility, was operated in an area southwest of the plant on what is now the wildlife management area. The water treatment plant used by the plant was originally a Kentucky Ordnance Works facility.

Construction of the PGDP facility began in 1951 and the plant was fully operational by 1955, supplying enriched uranium for commercial reactors and military defense reactors. Enriched uranium is defined as uranium in which the concentration of the fissionable ^{235}U has been increased from its natural assay. Natural uranium is mostly ^{238}U with about 0.72 percent ^{235}U and 0.0051 percent ^{234}U. Uranium mills process the ores to produce concentrated uranium oxide (U_3O_8) which is then commercially converted to gaseous uranium hexafluoride (UF_6) for enrichment at a gaseous diffusion plant. The Paducah plant serves as a first step in the uranium enrichment process. Product from PGDP must be further enriched prior to its use as a nuclear fuel; thus the plant provides an enriched feed stream to the Portsmouth, Ohio, Gaseous Diffusion Plant and provided a similar feed stream to the Oak Ridge Gaseous Diffusion Plant in Oak Ridge, Tennessee, prior to its shutdown. Hazardous, nonhazardous, and radioactive wastes are generated and disposed as a result of plant operations.

The Paducah plant enriches the uranium isotope, ^{235}U, via a physical separation process. The separation is based on the faster rate at which ^{235}U diffuses through a barrier compared with the heavier ^{238}U isotope. During enriching operations from 1953 to 1975, feed material (called "reactor tails") from government reactors was also used intermittently in addition to the UF_6 typically used. Reactor tails are the fuel from nuclear reactors that have had its ^{235}U content depleted, have been reprocessed to remove most of the fission products, and which must have its ^{235}U content replenished before it can be recycled. The reactor fuel rods were processed at other DOE facilities (where much of the fission products were removed) and the enriched uranium and fission products were fed into the PGDP cascade system. Use of the reactor tails resulted in the introduction of technetium-99 (^{99}Tc), a contaminant in the feed material, and transuranics, most notably neptunium 237 (^{237}Np) and plutonium-239 (^{239}Pu), into the cascade. ^{99}Tc is a man-made radioactive substance (radionuclide) having a half-life estimated at between 212,000 and 250,000 years. It decays by emitting beta radiation.

Extensive support facilities are required to maintain the diffusion process. Some of the major support facilities include a steam plant, four major electrical switchyards, four sets of cooling towers, a chemical cleaning and decontamination building, a water treatment plant, a cooling water blowdown treatment facility, maintenance facilities, laboratory facilities, and two active landfills. Several inactive facilities are also located on the plant site.

The West Kentucky Wildlife Management Area and lightly populated farmlands are in the immediate environs of PGDP. The population within the 50 mile radius is about 535,000 persons. Of these, about 36,500 live within 10 miles of the plant and about 104,000, within 20 miles. The unincorporated communities of Grahamville and Heath are 1.24 and 1.86 miles east of the plant, respectively. Portions of 28 counties, 11 of which are in Kentucky, 4 in Missouri, 10 in Illinois, and 3 in Tennessee, are included within a 50-mile radius of the plant. The largest cities in the region are Paducah, Kentucky, located approximately 10 air miles east of the plant, and Cape Girardeau, Missouri, located approximately 40 air miles to the west.

Paducah is located in the humid continental zone. Summers are generally dry; precipitation occurs mainly in the spring and fall. Winters are characterized by moderately cold days; the average temperature during the coldest month, January, averages about 35°F. Summers are warm and humid; the average temperature in July is 79°F. Yearly precipitation averages about 44 inches. The prevailing wind direction is south to southwest.

SOURCE DESCRIPTION

C-310 Stack

The primary source of potential radionuclide air emissions is the vent stack which serves the "top end" of the cascade process and the cylinder burping facility. This 200-foot stack, known as the C-310 stack, is located at the southwest corner of the C-310 product withdrawal building. Low molecular weight gas compounds such as fluorides and chlorides, and contaminants which have traveled up the cascade are vented to the atmosphere via the C-310 purge vent stack. Small quantities of ^{234}U, ^{235}U, ^{238}U, ^{99}Tc, ^{237}Np, ^{239}Pu and ^{230}Th are also emitted. The cascade effluent is routed through alumina traps prior to being emitted via the C-310 stack. The alumina traps were upgraded in 1990 to provide greater criticality safety. The improved system consists of an on-line bank of 13 traps and a stand-by bank of 13 traps. Each traps contains approximately 200 pounds of alumina.

The cylinder burp facility, located on the east side of C-310, is used to vent the low molecular weight gases from product cylinders. This facility is also a potential source of uranium, ^{99}Tc, minute quantities of transuranics, and ^{230}Th. The effluent from the burp facility is routed through a bank of sodium fluoride (NaF) traps prior to being emitted from the C-310 stack. There are three sets of traps; a primary set, a secondary set, and a standby set. Each trap contains approximately 300 pounds of NaF.

Seal Exhausts

Seals on the UF_6 compressors are supplied with an intricate array of air pressures to reduce any UF_6 release which may occur in the unlikely event of a seal failure. The seal air flow is supplied by large, oil-filled vacuum pumps and is routed from the seals, through alumina traps, the pump, and to a common exhaust vent. There is one seal exhaust vent per cascade building, one on the C-310 product withdrawal building, and one on the C-315 tails withdrawal building. Under normal operations, no UF_6 is present in the seal exhaust system. Occasionally, a seal or seal control system malfunction will allow UF_6 to enter the exhaust system. If the UF_6 is allowed to enter the pump, it reacts with the pump oil creating a thick, gummy sludge which overloads the pump in a short time. The alumina traps therefore serve a twofold purpose; first to protect the pump and pump oil, and second to prevent UF_6 emissions to the atmosphere. Due to the reaction between UF_6 and pump oil, the oil also serves as an excellent uranium emission control device. No credit is taken for the oil as a pollution abatement system, however, because the oil is an integral part of the pumping system and in no way is included for emission control. The list below indicates locations of the seal exhausts at PGDP:

C-331 Process Building
C-333 Process Building
C-335 Process Building
C-337 Process Building
C-310 Product Withdrawal Building
C-315 Tails Withdrawal Building

Wet Air Exhaust

When maintenance is required on cascade piping and equipment, the process gas (UF_6) is evacuated to other sections of the cascade or surge drums. The subject equipment and piping are swept in a series of purges with "dry" plant air. The time of each sweep varies, but generally lasts approximately 30 minutes. After maintenance, the system is closed and the ambient (wet) air is pumped from the system by the wet air pumps. The ambient air withdrawal time varies, but generally lasts approximately four hours. In both the dry air purges and the wet air withdrawal, the air is routed through alumina traps for uranium trapping, and then to an exhaust vent. In process buildings C-310, C-333, C-335 and C-337, the exhaust vent is the same one which services the seal exhaust system for those buildings. The list below indicates locations of wet air exhausts at PGDP.

C-310 Product Withdrawal Building (same as seal exhaust)
C-331 Process Building
C-333 Process Building (same as seal exhaust)
C-335 Process Building (same as seal exhaust)
C-337 Process Building (same as seal exhaust)

Cylinder Valve Connection Activities

Activities involving the connection and disconnection to UF_6 cylinders include cold pressure checks, sampling of feed, product, and tails cylinders, product withdrawal, tails withdrawal and cylinder burping. The cylinder valves are connected to the associated process via a "pigtail." Cylinder pigtails consist of a single length of copper tubing and threaded couplings. Pigtail disconnection procedures require a series of doubling purges to ensure that no UF_6 remains in the pigtail prior to disconnection. Although adherence to these procedures minimizes UF_6 emissions, occasionally a "puff" of UF_6 is observed during disconnection of the pigtails. As an additional measure to control radionuclide emissions, personnel performing the pigtail disconnects employ the use of portable high efficiency particulate filters. These portable control devices, known as HEPA-VACs, are placed so that any minute "whiff" or "puff" of UF_6 which is emitted from the pigtail disconnect process is captured by the HEPA-VAC. Furthermore, some of the pigtail connect/disconnect areas are serviced by large HEPA-equipped exhaust hood systems which exhaust any "puffs" not contained by the HEPA-VACs from the area to a vent stack. Stack sampling, Health Physics data and Appendix D emission factors were used to estimate emissions from cylinder valve connection activities. The list below indicates locations of the pigtail exhaust systems.

C-310 Burp Station (located outside--no exhaust system)
C-310 Product Withdrawal Building (HEPA failed test--exhaust system not used in 1991, portable HEPA-VACs used))
C-315 Tails Withdrawal Building (controlled by HEPA equipped exhaust system)
C-333-A Feed Facility (UF_6 Vaporizer--facility did not operate in 1991)(No exhaust hood)
C-337-A Feed Facility (UF_6 Vaporizer)(No exhaust hood)
C-360 Toll Transfer and Sampling Facility (controlled by HEPA-equipped exhaust system)

Laboratory Hoods

The C-710 laboratory is the main facility for sample analysis and research at PGDP and is operated by the Technical Services Division. There are a total of 114 laboratory hoods and canopies in the C-710 building. In 1991, 30 of the hoods were used for exhaust of analyses and research involving radionuclides. This number does not include hoods which contain closed systems with no potential for radionuclide emissions under normal conditions. The radionuclide involved in analyses consists primarily of uranium, with a slight potential for emissions of ^{99}Tc, ^{237}Np, ^{239}Pu, and the daughters of uranium, thorium-230, thorium-234, and protactinium-234. In some cases the hood exhausts combine with other hood exhausts, creating a discrepancy between the number of hoods and actual emission points. There are three HEPA filters in the C-710 laboratory. These HEPA filters serve as the control system for six of the hoods. The experimentation and analysis which occurs in these hoods pertain to closed systems, with no continuous or intermittent emissions of radionuclides. Therefore, the HEPA filters serve as controls only in accidental release situations. There are also eight laboratory hoods in the C-409 stabilization facility. Analysis and research in these hoods did not involve radionuclides in 1991. Three laboratory hoods in the C-410 feed plant are permanently shut down. Although only 30 of the C-710 hoods dealt with exhaust of activities involving radionuclides in 1991, it can be assumed that many of the hoods plantwide have historically dealt with radionuclide exhaust at some time. Appendix D factors were used to estimate emissions from laboratory hoods. The list below indicates the laboratory exhaust systems at PGDP:

Building	Hoods/Canopies	Radionuclide Analyses in 1991
C-710 Laboratory	114	30
C-409	8	0
C-410	3	0

Freon (R-114) UF_6 Separator

The R-114/UF_6 separator is located in C-335 and can be used to separate relatively large amounts of R-114 coolant which has entered the cascade system and mixed with UF_6. The separator was installed in 1978. Pilot tests were conducted in 1979. The unit has been used twice since installation, and has not been used since 1985. When in use, the separator air effluent is passed through a cold trap at O°F which condenses approximately 98.5 percent of the gaseous UF_6. The residual UF_6 in the effluent is trapped by two NaF traps containing 900 pounds of NaF each. The outlet of the NaF traps is monitored by a flow through ionization chamber. The effluent passes from the NaF traps through a header to the C-335 wet air/seal exhaust system. The alumina traps and the motor oil of this system provide additional emission control. This facility did not operate in 1991.

C-400 Decontamination Spray Booth

This facility is used to decontaminate equipment. It consists of a large booth equipped with a high pressure sprayer which sprays a water/sodium carbonate solution on the contaminated machinery. The potential of radionuclide emissions arises from entrainment of radionuclides in the spray solution during the decontamination process. The booth is equipped with a mist eliminator as an emission control device. The mist eliminator is not listed as a pollution control device in 40 CFR 61, Appendix D, and no credit was taken for it. The booth was used 10 times in 1991 for a total of 50 hours.

C-400 No. 5 Dissolver/Rotary Vacuum Filter

This facility is used to dissolve and precipitate the uranium in the sodium carbonate solution from the C-400 cylinder wash and the C-400 decontamination spray booth. The solution is chemically treated to precipitate the uranium, which forms a slurry. The slurry is then passed through a rotary vacuum filter which collects the precipitate (filter cake) for future disposal. After sampling, the filtrate is then discharged via normal outfalls. The possibility for radionuclide emissions arises from the vent on the pump which pulls the slurry through the rotary vacuum filter. Emissions from this vent should be minimal because the pump and its vent are downstream of the rotary vacuum filter, which should trap the uranium as filter cake. Appendix D factors were used to estimate emissions from this facility.

C-400 Cylinder Drying Station

This facility is used to dry UF_6 cylinders after the "heel" has been removed in the C-400 cylinder wash stand. Dry "plant air" is passed through the cylinder to evaporate any moisture from the washing process. This facility was not used in 1991.

C-746-A Low-Level Waste Compactor

This facility is used to compact bagged, low-level radiological waste. The facility consists of a telescoping compacting arm which very slowly compacts bags of low level contaminated material into a storage drum. It is equipped with a HEPA filter. This facility was not used in 1991.

RADIOLOGICAL AREAS

Radiological areas are established under specific criteria listed in various worker protection procedures and standards. There are a number of minor radiological areas at PGDP for which radionuclide emission estimates have been developed from Health Physics air sampling data. The data was generated from air samplers located in the radiological areas. The samplers consist of a low volume pump (20 liters per minute) drawing the ambient building air through a Whatman No. 40 cellulose filter. The samplers run 24 hours per day and the filters are changed on 3, 4, or 5 day basis, depending upon weekend and holiday schedules. A minimum of three days of sample air is collected on each filter. After sample collection, the filters are counted for gross alpha emissions. The 20 filters with the highest gross alpha emissions are transported to the Oak Ridge National Laboratory (ORNL) for further analysis. At ORNL, the filters undergo a chemical extraction to separate transuranic elements from uranium. After the separation, another gross alpha count is performed on the uranium and transuranic components. The results of this analysis provide a uranium and transuranic concentration in the building air. Ventilation rates of the building, determined from engineering data, can then be utilized to determine radionuclide emissions from the buildings. Since the chemical extraction analysis of the filter is not isotopically specific for transuranics, it was assumed that any transuranic results consisted of the radiological isotope which would produce the highest dose via airborne emissions.

The following is a list of PGDP radiological areas from which emissions were estimated using Health Physics data and building ventilation rates.

C-310	Product Withdrawal Building
C-315	Tails Withdrawal Building
C-331	Uranium Enrichment Process Building
C-333	Uranium Enrichment Process Building
C-335	Uranium Enrichment Process Building
C-337	Uranium Enrichment Process Building
C-360	Toll Transfer/Sampling Building
C-400	Decontamination Building
C-409	Stabilization Building - The stabilization process is shutdown. This building now houses some laboratory hoods (discussed under the laboratory hood section) and decontamination equipment to be used after the proposed increase to 5 percent enrichment assay.
C-720	Maintenance Building - This building is the primary maintenance building at PGDP. Maintenance on contaminated and uncontaminated machinery is performed here. Transferrable contamination has been removed prior to maintenance, however; there is a potential for airborne radionuclide emissions from fixed contamination during maintenance procedures. Portable Negative Air Machines (NAMs) which are equipped with HEPA filters are utilized whenever there is a potential for airborne radionuclide emissions.

Buildings C-340, C-410, C-420, and C-746Q are also categorized as radiological areas. However, the ventilation systems in buildings C-340, C-410 and C-420 are shut down and building C-746-Q has no ventilation system.

In addition to the general emissions from radiological areas, PGDP also has a number of minor sources which do not have direct exhausts into the ambient air. These minor sources are located in radiological areas and contribute to the emissions from the radiological areas as calculated by the Health Physics samplers and building ventilation rates. A list of these minor sources with no direct exhaust to the ambient air and which are located in radiological areas is as follows: (This list also contains sources which did not operate in 1991).

C-333-A and C-337-A Feed Cylinder Vaporizer Pigtail Emissions

These pigtail systems, unlike those in the C-360 toll transfer building, the C-310 product withdrawal building, and the C-315 tails withdrawal building have no specific ventilation system. Furthermore, the C-337-A and C-333-A feed cylinder vaporizers are not located in completely enclosed buildings. As stated previously, HEPA-VACs are used to control any potential radionuclide emissions during the disconnection of the pigtails. The C-333-A vaporizer was not used in 1991. The C-337-A vaporizer building is enclosed on three sides only. Since the C-337-A vaporizer is not located in an enclosed structure, building ventilation data could not be used to estimate emissions. However, according to the DOE Occurrence Reporting and Processing System, there were no "whiffs or puffs" reported in C-337-A in 1991.

C-400 Compressor Pit

This area was used for maintenance on UF_6 compressors and has not been used since 1989.

C-400 Cylinder Wash

This facility is used to remove the solid UF_6 "heel" from cylinders. The cylinder heel is dissolved in a sodium carbonate solution and the solution is transferred to the C-400 No. 5 dissolver for uranium recovery. The only potential for radionuclide emissions is when the cylinder valve is opened for introduction of the sodium carbonate solution. Any potential emissions will be included in the estimates from the C-400 Health Physics air samplers.

SECTION II - AIR EMISSIONS DATA

MAJOR POINT SOURCE

Major Point Source	Type Control	Efficiency	Distance to Receptor
C-310 Purge Stack	NaF Traps	>99.9%	3050 m
	Alumina Traps	≈98.6%	

GROUPED SOURCES

Grouped Sources	Type Control	Efficiency %	Distance to Receptor	Date of initial measurement for monitored stacks
Wet air/seal exhausts (6)	Alumina traps	≈ 98.6	2377 M N 1524 M ESE	1992
Cylinder valve connection activities (5)	HEPA & HEPA-VACS	99.95	N/A[1]	1992
Cylinder valve connection activities not included above - 1991 (2)	HEPA-VACS	99.99 (Appendix D)	3050 M NNE	N/A Appendix D factors used
C-400 sources (3)	None	0	2073 M N	1990 (1 source) Appendix D used for 2 sources.
C-710 laboratory hoods (30)	None	0	3050 M NNE	N/A Appendix D factors used
Building ventilation (10)	None	0	1524 M ESE	Health Physics Building Ventilation Data - 1991

[1] Stack sampling data results indicated that emissions were not distinguishable from zero, based on a statistical one-tailed test of significant difference from zero. Therefore, dose modeling was not performed and no receptor was determined.

PGDP RADIONUCLIDE EMISSIONS

Nuclide	Solu. Class	AMAD (aem)	Emission (Ci) C-310[2]	Grouped Sources (est.)
234U	D	1.0	6.08E-6	4.54E-3
235U	D	1.0	2.30E-7	1.70E-4
236U	D	1.0	6.81E-10	5.29E-7
238U	D	1.0	1.75E-6	1.28E-3
99Tc[3]	D	1.0	3.06E-3	1.10E-3
230Th[3]	W	1.0	3.15E-6	1.20E-4
237Np[3]	W	1.0	3.04E-6	5.40E-6
239Pu[3]	W	1.0	2.80E-6	4.09E-4

[2] For release of 5.32 grams of 2 percent enriched uranium (isotopic composition: 234U, 0.018 percent; 235U, 2.0 percent; 236U, 0.00020 percent; and 238U, 98.0 percent).

[3] PGDP is only required to sample for uranium from the C-310 stack since none of the other potential radionuclide emissions comprise ten percent of the resulting potential dose (See correspondence from W. L. Smith to D. C. Booher dated January 10, 1992). Emission data pertaining to the other radionuclides, if available, is included in the actual dose calculations, and is presented in this report for informational purposes only. Also, the uranium emissions from the C-310 stack were enriched to a 1.9 percent ^{235}U assay or less for 1991. As a conservative measure, dose assessment was based on enrichment to 2.0 percent assay.

SECTION III - DOSE ASSESSMENT

DESCRIPTION OF DOSE MODEL

The radiation dose calculations were performed using the CAP-88 package of computer codes. This package contains the Environmental Protection Agency's (EPA) most recent version of the AIRDOS-EPA computer code, which implements a steady-state, Gaussian plume, atmospheric dispersion model to calculate environmental concentrations of released radionuclides and Regulatory Guide 1.109 food chain models to calculate human exposures, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by the EPA's latest version of the DARTAB computer code to calculate radiation doses to man from radionuclides released during the year. The dose calculations use dose conversion factors in the latest version of the RADRISK data file, which is provided by the EPA with the CAP-88 package.

SUMMARY OF INPUT PARAMETERS

Except for the radionuclide parameters given in Section II and those given below, all important input parameter values used are the default values provided with the CAP-88 computer codes and data bases.

Joint frequency distribution: 1991 data from 60m station on Paducah meteorological tower
Rainfall rate: 146.2 cm/year
Average air temperature: 20°C
Average mixing layer height: 930 m

Fraction of foodstuffs from:	Local area	50-mile radius	Beyond 50 mile
Vegetables and produce:	0.700	0.300	0.000
Meat:	0.442	0.558	0.000
Milk:	0.399	0.601	0.000

SOURCE CHARACTERISTICS

Source Name	Type	Height (m)	Diameter (m)	Gas exit velocity (m/s)	Gas exit temperature (oC)	Distance (m) and direction to maximally exposed individual	
						Source	Plant
C-310 purge stack	Point	61.0	0.31	0	Ambient	3050 NNE	3050 NNE
C-400	Point[4]	11.3	None	0	Ambient	2070 N	2740 NNE
C-710	Point[4]	7.1	None	0	Ambient	3050 NNE	3050 NNE
Wet air/seal exhausts	Point[4]	21.0	None	0	Ambient	1520 ESE	2380 N
Cylinder valve connection	Point[4]	1.0	None	0	Ambient	3050 NNE	3050 NNE
Building ventilation	Point[4]	19.0	None	0	Ambient	1520 ESE	2380 N

[4] Modeling was performed assuming an imaginary stack located at the approximate center of each grouped source.

Distances and directions to the maximum individual for the plant are to the historic maximum. An individual, located 1700 m ESE of C-310, could have received an EDE slightly lower than the historic individual's EDE (see maximum individual EDE table in the Compliance Assessment).

Source Name	Nearest individual	Distances (m) to selected receptors				
		Nearest Business	Nearest School	Nearest Farms		
				Dairy	Beef	Vegetable
C-310 purge stack	1700	2705	3962	>5000	2896	1700
C-400	1940	2819	4267	>5000	3124	1943
C-710	1700	2705	3962	>5000	2896	1700
Wet air/seal exhausts	1520	2438	3962	>5000	3124	1524
Cylinder valve connection	1700	2705	3962	>5000	2896	1700
Building ventilation	1520	2438	3962	>5000	3124	1524

COMPLIANCE ASSESSMENT

Effective dose equivalent (millirem [mrem]) to maximally exposed individual for:

Emission Source	Maximum Individual per Source	NNE[5]	ESE[5]
C-310 purge stack	0.00043	0.00043	0.00029
C-400	0.0046	0.0042	0.0028
C-710	0.00021	0.00021	0.00020
Wet air/seal exhausts	0.00012	0.00012	0.00012
Cylinder valve connection	0.00000013	0.00000013	0.00000012
Building ventilation	0.023	0.022	0.023
Total		0.027 (max. individual)	0.026

[5] There were two individuals with very similar maximum effective dose equivalents.

There were no construction projects or modifications at PGDP in 1991.

Maximum effective dose equivalent = 0.027 mrem

SECTION IV - SUPPLEMENTAL INFORMATION REQUESTED BY EPA

DIFFUSE AND FUGITIVE EMISSIONS

EPA and DOE have not defined methodology or requirements for the measurement and reporting of fugitive and diffuse emissions, nor does PGDP currently have available methods to estimate emissions from specific fugitive sources selectively and accurately. The largest sources of possible fugitive and diffuse emissions at PGDP are the C-746-E and C-746-E1 contaminated scrapyards. Although these are the largest and most significant sources of diffuse and fugitive emissions, other areas at PGDP may have potential diffuse and fugitive emissions since most of the manufacturing and research areas at PGDP have handled radioactive materials in the past.

It is anticipated that emissions due to these potential sources of diffuse and fugitive emissions are insignificant as compared to releases for points sources. However, plant-wide dose calculations based on radionuclide deposition on ambient air monitoring filters indicate an average EDE of 0.218 mrem. The ambient air monitoring station, which resulted in the highest EDE calculation of 0.38 mrem, was also the station located nearest the maximally affected resident. Although the ambient air results indicate a higher EDE than predicted by computer dose modeling, there is presently no way to determine if that dose level is due to radionuclide emissions from PGDP, background concentrations, or emissions from the nearby fossil fuel burning power plants. The existing ambient air monitoring network has no background monitor for results comparisons and was not designed for isotopic analysis. Results are provided only in gross alpha and gross beta counts. However, PGDP does perform isotopically specific analysis on soil samples, and intended to use the isotopic distribution of the soil sample results to estimate the EDE based on ambient air monitoring. The soil sample analysis results detected no concentrations of ^{237}Np, ^{239}Pu, ^{230}Th, or ^{99}Tc. Therefore, it was assumed the dose resulting from the ambient air gross alpha resulted from two percent assay uranium and the dose resulting from gross beta resulted from ^{99}Tc (event though no ^{99}Tc was detected in the soil samples). Ultimately, the ambient air monitoring results indicate an EDE of 0.38 mrem at the highest location, which is 3.8 percent of the standard established in 40 CFR 61, Subpart H. Although it is the position of PGDP that computer modeling provides a more accurate indication of off-site dose, the ambient air and soil results indicate PGDP emissions result in a dose well below the standard.

CERTIFICATION

I certify under penalty of law I have personally examined and am familiar with the information submitted herein. Based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate, and complete. I am aware there are significant penalties for submitting false information including the possibility of fine and imprisonment. (See U.S.C. 1001)

FOR
Donald C. Booher, DOE Site Manager, Paducah Site Office

6-24-92
Date