Appendix H:

Subpart-Specific Cost Summaries
Greenhouse Gas Reporting Program
ICR Renewal

June 2019

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Cost Appendix Introduction

This Appendix documents the costs that are expected to be associated with compliance with the Greenhouse Gas Reporting Program (GHGRP). As shown in the Table of Contents, the costs are presented in subpart-specific sections. Each section includes a description of the industry covered by the subpart, the methodological option(s) given in Part 98 for determining greenhouse gas (GHG) emissions from the subpart, and the number of facilities expected to use each option over the three-year period of the ICR.

Costs are divided between Labor Costs, which are included in Table 1 for each subpart and Capital and Operation and Maintenance (O&M) costs, which are included in Table 2 for each subpart. Depending on the specific requirements within the subpart, costs for multiple methodological options may be included, therefore some subparts have Table 1a, Table 1b, etc. There are three exceptions to this labeling scheme throughout this Cost Appendix: for Subpart C, Subpart Y, and Subpart HH labor costs are shown in Table 2 and capital and O&M costs are shown in Table 3 due to an added Table 1 that details facility counts for each GHG calculation option.

When compared to the numbers in the individual columns in Table 1 and Table 2, the totals may not add up due to rounding of the labor hours to the nearest tenth of an hour and rounding of costs to the nearest dollar.

If one facility is subject to more than one subpart, note that the costs incurred for that facility are the sum of the costs for each subpart.

Labor Costs

Labor costs are the costs expected to be incurred by facilities that comply with the requirements of the GHGRP. Labor categories are typically Lawyer, Industrial Manager, Industrial Engineer/Technician and Administrative Support. For subparts with labor categories that vary from this list, the differences are discussed in the corresponding section of this appendix. Labor costs are calculated by multiplying the number of labor hours for a specific labor category by the labor rate for that specific labor category. The labor rates used in this Cost Appendix are largely based on calendar year 2017 data tables available from the Bureau of Labor and Statistics (BLS). For specific source details, which vary by labor category, see Appendix D to the Supporting Statement.

Specific activities that incur labor costs are classified into the following categories: Planning, Quality Assurance/Quality Control (QA/QC), Recordkeeping, Sampling and Analysis (Calculations), and Reporting. Planning activities generally include reading the Part 98 rule to become familiar with any changes to the rule requirements, planning for equipment shutdown for annual performance testing, contacting the test company, setting up the testing, asking questions about applicability, reviewing any overlap in existing reporting programs, etc. QA/QC activities may include many types of review, including review of calculations, testing, and reports. Sampling and Analysis (Calculations) costs include all labor costs associated with sampling, operating and maintaining all sampling equipment, performing calculations and analysis of samples or data, other than times when an independent contractor is hired to perform the testing. Hiring of an independent contractor is represented in the corresponding Table 2 as a capital cost. The activities listed here are illustrative and not exhaustive. Specific subpart requirements are included in Part 98.

As shown in Table 1 within each subpart-specific section of this Cost Appendix, planning activities often include more hours for new facilities, that is those reporting to the GHGRP for the first time, (in the Initial Year columns) than for existing facilities, that is those that have already been reporting, (in the Subsequent Years columns). New facilities require more time to read Part 98, become familiar with the requirements for their subpart, plan and set up any facility-specific procedures required for reporting.

For reporting costs, all subparts were classified with a "high bin," "medium bin" or "low bin" designation based on the number of pieces of data reported by the average facility complying with that subpart in RY2016. These costs represent only the time required to enter the data into EPA's electronic Greenhouse Gas Reporting Tool (e-GGRT) and do not include the time for calculations or QA/QC. Recordkeeping labor costs were assigned as half the time necessary to report, in order to account for the time needed to create paper copies, backup to the cloud, or utilize another recordkeeping method; therefore the tables will show half as many hours for recordkeeping as shown for reporting.

In cases where labor efforts are required by another regulation, these expenses are excluded from the total cost expected to be incurred for the GHGRP. Additionally, the labor costs related to normal business operations are not considered an additional cost for complying with the GHGRP. For example, labor costs to conduct regular calibration of measurement devices or performance of safety inspections, etc., are expected to be a part of normal business operations; therefore, those costs are not included as costs related to the GHGRP.

Capital Costs and Operation and Maintenance Costs

Capital costs and O&M costs are non-labor costs associated with compliance. These costs vary more significantly subpart-to-subpart, and may include costs to hire a contractor, purchase capital equipment, those associated with O&M (such as equipment calibration), etc. Recordkeeping costs were designated as $50 per year, which will cover the cost of whatever method facilities use to store their records, such as a flash drive, paper file or cloud storage. Due to the updates to the tax law for future years (Tax Cuts and Jobs Act, Pub. L. No. 115–97 (2017)) and the benefit of writing off expenses in a higher-tax-rate period, we determined that the majority of reporting facilities will have paid off any remaining annualized capital costs associated with equipment that was purchased during initial compliance prior to the three years covered by this ICR (e.g. installation of a Continuous Emissions Monitoring System (CEMS)); therefore, those costs are not included in Table 2 of the applicable subparts. The only exception in this appendix is for Subpart C, which requires that new facilities using Tier 4 are required to purchase CEMS. It is not clear how this tax law (or any other future tax laws) will affect new facilities that purchase equipment in 2019, 2020, or 2021; therefore, those capital costs are included in the applicable table of Subpart C as a conservative estimate of costs.

Facilities in some subparts will already have the equipment required to comply with the GHGRP because that equipment is required for compliance with another regulation. In these cases (e.g., CEMS required by New Source Performance Standards (NSPS) or state programs) these equipment costs are not attributed to the GHGRP and therefore are not included in these estimates. Additionally, facilities are expected to have a means of electronically reporting, and therefore, no expenses for computer equipment, monthly internet access, or other computer-related items are included in the cost estimates.

Total Costs

At the end of each section, the total annual costs for existing and new facilities, the total cost per year, and the total cost over the three-year period covered by this ICR (2019-2021) are presented for that subpart. Throughout this document, total costs are rounded to the nearest $100 for total costs less than $50,000 and to the nearest $1,000 for total costs greater than $50,000.

Total costs for the subpart are calculated using the total labor costs in Table 1 and the total capital/O&M costs in Table 2, multiplied by the total number of new and existing facilities using each presented methodological option. Initial Year costs apply to new facilities and Subsequent Year costs apply to existing facilities. If the subpart has zero new facilities, the Initial Year costs are $0. Some subparts have multiple options that can be used by each facility and other subparts only have one option for all facilities. The number of options and the number of facilities using each option are detailed in each individual section.

As an example, the Subpart E section contains two options for calculating GHG emissions from the adipic acid industry. Option "a" is the annual performance test option and option "b" is the alternative monitoring method option. The labor costs for option "a" are shown in Table 1a and the capital/O&M costs for option "a" are shown in Table 2a. The labor costs for option "b" are shown in Table 1b and the capital/O&M costs for option "b" are shown in Table 2b. Subpart E is not expected to have any new facilities; one existing facility is expected to use option "a"; and one existing facility is expected to use option "b."

Example Table 1. Labor Costs – Subpart E – Option "a" – Annual Performance Test

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	1.2	0	12	0	0.6	$0	$1,096
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1	0	0.1	$0	$82
Reporting	0	0	0	1	0	4	0	1	$0	$410
Total	**0**	**1**	**0**	**2.8**	**0**	**19**	**0**	**2.2**	**$0**	**$1,793**

Example Table 2. Capital and O&M Costs – Subpart E – Option "a" – Annual Performance Test

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$0	$0	$0
Performance testing	$0		$0	$5,437	$0	$5,437
Recordkeeping	$0		$0	$50	$0	$50
Travel	$0		$0	$0	$0	$0
Sampling and Analysis Costs	$0		$0	$0	$0	$0
Total	**$0**		**$0**	**$5,487**	**$0**	**$5,487**

The annual costs for existing facilities using option "a" are $1,793 per facility for labor plus $5,487 per facility for O&M, for a total of $7,290 per facility (using the "Subsequent Years" columns in Table 1a and Table 2a). The costs for new facilities using option "a" are $0. One existing facility is expected to use option "a."

Example Table 3. Labor Costs – Subpart E – Option "b" – Alternative Monitoring Method

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.2	0	2	0	0.1	$0	$276
QA/QC	0	0	0	0.5	0	5	0	0.3	$0	$410
Record-keeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1	0	0.1	$0	$82
Reporting	0	0	0	1	0	4	0	1.0	$0	$410
Total	**0**	**1**	**0**	**2.3**	**0**	**14**	**0**	**1.9**	**$0**	**$1,383**

Example Table 4. Capital and O&M Costs – Subpart E – Option "b" – Alternative Monitoring Method

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$0	$0	$0
Performance testing	$0		$0	$0	$0	$0
Recordkeeping	$0		$0	$50	$0	$50
Travel	$0		$0	$0	$0	$0
Sampling and Analysis Costs	$0		$0	$0	$0	$0
Total	**$0**		**$0**	**$50**	**$0**	**$50**

The annual costs for existing facilities using option "b" are $1,383 per facility for labor plus $50 per facility for O&M, for a total of $1,433 per facility. The costs for new facilities using option "b" are $0. One existing facility expected to use this option.

The total annual costs for Subpart E are approximately $8,700 per year ($7,290 plus $1,433, rounded to the nearest one hundred dollars) and the total cost over the three-year period is this total cost multiplied by three, or approximately $26,100.

The total cost calculations for subparts with new sources are the same as for Subpart E, with an additional calculation for new facilities using the "Initial Year" column instead of the "Subsequent Years" column and the count of new facilities instead of the count of existing facilities.

In each of the three years covered by this ICR, the total annual costs are the sum of the annual costs for the existing facilities and the annual costs for the new facilities. The only difference is the number of facilities classified as existing facilities in each year. New facilities only incur the "Initial Year" costs for one year. After the first year, the new facilities become existing facilities and incur the "Subsequent Year" costs. For example, if a subpart has 15 existing facilities in Year 1 and 5 new facilities are expected in each subsequent year, the number of facilities each year are shown in Example Table 5. To calculate total costs, multiply the number of facilities from Example Table 5 by the costs in Table 1 and Table 2 for each year of the three-year period of the ICR.

Example Table 5. Facility Counts per Year Example

ICR Period	Number of existing facilities (use "Subsequent Year" costs)	Number of new facilities (use "Initial Year" costs)
2019	15	5
2020	20	5
2021	25	5

Acronyms

AMA	Active Monitoring Area
ASTM	American Society for Testing and Materials
BLS	Bureau of Labor and Statistics
BTU	British Thermal Unit
C_2F_6	Perfluoroethane
CaO	Calcium oxide
$CaCO_3$	Calcium carbonate
CO	Carbon monoxide
CO_2	Carbon dioxide
CF_4	Perfluoromethane
CH_4	Methane
CEMS	Continuous Emissions Monitoring System
CEPCI	Chemical Engineering Plant Cost Index
CFC	Chlorofluorocarbons
CKD	Cement kiln dust
DCU	Delayed coking units
DOC	Degradable organic carbon
DOE	Department of Energy
DRE	Destruction or removal efficiency
e-GGRT	electronic Greenhouse Gas Reporting Tool
EAF	Electric arc furnace
EGU	Electricity-generating units
EIA	DOE's Energy Information Administration
EPA	Environmental Protection Agency
FCCU	Fluid catalytic cracking units
FCU	Fluid coking units
GHG	Greenhouse Gas
GHGs	Greenhouse Gases
GHGRP	Greenhouse Gas Reporting Program
HCFC	Hydrochloroflurocarbons

HF	Hydrogen fluoride
HFC	Hydrofluorocarbon
HFE	Hydrofluoroether
HHV	High heat values
HTF	Heat transfer fluid
LCD	Liquid crystal displays
LDC	Local distribution companies
LNG	Liquefied Natural Gas
MEMS	Micro-Electromechanical Systems
MgO	Magnesium oxide
mmBTU	Million BTU
MRV	Monitoring, reporting, and verification
MSHA	Mine Safety and Health Administration
MSW	Municipal Solid Waste
N_2O	Nitrous oxide
NESHAP	National Emission Standards for Hazardous Air Pollutants
NF3	Nitrogen Trifluoride
NGL	Natural Gas Liquids
NLA	National Lime Association
NSPS	New Source Performance Standard
O&M	Operation and Maintenance
PFC	Perfluorocarbons
PV	Photovoltaic Cells
QA/QC	Quality Assurance / Quality Control
RCRA	Resource Conservation and Recovery Act
RY2011	Reporting Year 2011 of the GHGRP
RY2016	Reporting Year 2016 of the GHGRP
RY2017	Reporting Year 2017 of the GHGRP
RY2019	Reporting Year 2019 of the GHGRP
RY2020	Reporting Year 2020 of the GHGRP
RY2021	Reporting Year 2021 of the GHGRP

SF_6	Sulfur hexafluoride
TOC	Total organic carbon
TSCA	Toxic Substances Control Act
UIC	Underground Injection Control
XML	eXtensible Markup Language

Cost Appendix for Subpart C – General Stationary Combustion Sources

Description of Subpart C

For purposes of the GHGRP, stationary fuel combustion source emissions reported under Subpart C are from fuel combustion, resulting in the release of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). In RY2017, 5,276 facilities reported to Subpart C. The actual number of Subpart C facilities changes every year; on average, there were approximately 256 new facilities per year, over the past 5 years.

Facilities reporting to Subpart C must calculate CO_2 emissions for each fuel combusted in each applicable unit using one of four methodological tiers, subject to certain restrictions based on unit size and fuel combusted; facilities that report year-round heat input data under 40 CFR Part 75 can use 40 CFR Part 75 methods. Included in Subpart C is Table C-1, which contains default CO_2 emission factors and high heat values (HHV) for various types of fuel. Reporting of CO_2 emissions is required for all fuel types, including those not listed in Tables C-1, with the exception of non-Table C-1 fuels combusted in units that are smaller than 250 million British thermal units per hour (mmBtu/hr). To calculate CH_4 and N_2O emissions, facilities must use default emission factors for each fuel, which are provided in Table C-2. CH_4 and N_2O emissions are not required to be reported for those fuels that are not listed in Table C-1, regardless of unit size. Facilities reporting to Subpart C determine fuel level emissions using one of the following approaches:

- Tier 1 – CO_2, CH_4, and N_2O emissions are estimated with Table C-1/C-2 default emission factors and default HHVs from Table C-1 multiplied by annual fuel use.
- Tier 2 – CO_2, CH_4, and N_2O emissions are estimated with Table C-1/C-2 default emission factors and measured HHV multiplied by annual fuel use. HHV sampling frequency (e.g., monthly, quarterly, semiannually, annually, or by lot) is fuel-specific and is provided in §98.34. Units that combust municipal solid waste (MSW) or other solid fuels and generate steam can use steam production (in place of fuel use) and Table C-1/C-2 default emission factors to estimate emissions.
- Tier 3 – CO_2 emissions are estimated with measured carbon content, annual fuel use, and molecular weight (for gaseous fuels). Carbon content and molecular weight sampling frequency (e.g., monthly, quarterly, semiannually, annually, or by lot) is fuel-specific and is provided in §98.34. CH_4, and N_2O emissions are estimated with Table C-2 default emission factors, annual fuel use, and default or measured (optional) HHVs.
- Tier 4 – CO_2 emissions are estimated with CEMS. CH_4 and N_2O emissions are estimated with Table C-2 default emission factors and cumulative annual heat input.
- Alternative 40 CFR Part 75 – CO_2 emissions are estimated using the alternative CO_2 mass emissions calculation methods in 40 CFR Part 75. CH_4 and N_2O emissions are estimated with Table C-2 default emission factors and cumulative annual heat input.

In addition, Subpart C provides alternative reporting options for facilities with two or more small units that have a combined maximum rated heat input capacity of 250 mmBtu/hr or less. Those facilities may choose to report the combined emissions for the group of units in lieu of itemizing the GHG emissions from the individual units.

Facilities must also estimate biogenic CO_2 emissions from combustion of the biomass fuels listed in Table C-1. Emissions generally may be estimated using the Tier 1 methodology described above. For units that combust municipal solid waste as the primary fuel or as the only fuel with a biogenic component, Subpart C requires quarterly American Society for Testing and Materials (ASTM) method D7459-08 sampling and ASTM method D6866-08 analysis for determining the biogenic portion of CO_2

emissions. These procedures also may be used for any unit that co-fires biomass and fossil fuels, including units equipped with a CO_2 CEMS, and units for which optional separate reporting of biogenic CO_2 emissions from the combustion of tires is selected.

Labor Costs for Subpart C

Appendix F to the Supporting Statement contains the burden and costs for Subpart C, including the detailed labor assumptions used for each activity required for each tier-specific approach in Subpart C. Subpart C costs are presented separately for facilities that reported only to Subpart C and for facilities that reported two or more subparts (i.e., Subpart C and an additional subpart). This is primarily due to differing planning costs, projected growth rates, and usage of each tier between facilities that report only to Subpart C and those that report Subpart C and at least one additional subpart. The costs in Appendix F to the Supporting Statement were calculated using the average number of fuels and the average number of combustion units per facility. The costs for Subpart C are presented as costs per facility to be consistent with all other subparts.

For facilities that reported only to Subpart C, costs and calculations are provided in Appendices F-1, F-2, and F-3 to the Supporting Statement for Years 1, 2, and 3 of the ICR Renewal period, respectively. The assumptions used to develop these costs are documented in Appendix F-4 to the Supporting Statement. For facilities that reported to Subpart C with at least one additional subpart, costs and calculations are provided in Appendices F-5, F-6, and F-7 to the Supporting Statement for Years 1, 2, and 3 of the ICR Renewal period, respectively, with assumptions provided in Appendix F-8 to the Supporting Statement. The total burden and costs for Subpart C are presented in Appendix F-9 to the Supporting Statement.

In RY2017, 1,808 facilities reported only to Subpart C and 3,468 facilities reported Subpart C with at least one additional subpart. Note that facilities typically have multiple units and each unit may combust several fuels; as a result, facilities often report using multiple tier calculation methodologies. Therefore, the total number of facilities using each tier methodology will be greater than the total number of facilities that reported to Subpart C. It is expected that facility usage rate of each tier methodology will remain constant in future years. Of the Subpart C only facilities that reported in RY2017:

- 1,419 facilities used the Tier 1 methodology,
- 598 facilities used the Tier 2 methodology,
- 69 facilities used the Tier 3 methodology,
- 63 facilities used the Tier 4 methodology, and
- 31 facilities used the Alternative 40 CFR Part 75 methodology.

In RY2017, the facilities that reported to Subpart C with at least one additional subpart used the following methodologies:

- 1,980 facilities used the Tier 1 methodology,
- 1,828 facilities used the Tier 2 methodology,
- 234 facilities used the Tier 3 methodology,
- 63 facilities used the Tier 4 methodology, and
- 31 facilities used the Alternative 40 CFR Part 75 methodology.

On average, approximately 256 new facilities reported to Subpart C per reporting year. Of those new facilities, 95 facilities reported only to Subpart C, while the remaining 161 facilities reported to Subpart C with at least one additional subpart. In RY2017. the new facilities were divided among the five CO_2 calculation methodologies as shown below:

- Tier 1 methodology – 75 facilities per year reported only to Subpart C and 92 facilities per year reported to Subpart C with at least one additional subpart,
- Tier 2 methodology – 31 facilities per year reported only to Subpart C and 85 facilities per year reported to Subpart C with at least one additional subpart,
- Tier 3 methodology – 4 facilities per year reported only to Subpart C and 11 facilities per year reported to Subpart C with at least one additional subpart,
- Tier 4 methodology – 3 facilities per year reported only to Subpart C and 3 facilities per year reported to Subpart C with at least one additional subpart, and
- Alternative 40 CFR Part 75 methodology – 2 facilities per year reported only to Subpart C and 1 facility per year reported to Subpart C with at least one additional subpart.

Table C-1a and Table C-1b provide the new and existing facility counts (rounded) that have been used for each year of this ICR. It is expected that the same number of new facilities with the same breakdown among methodologies will report to Subpart C in each of the three years of this ICR. Note, the total number of new and existing facilities using each tier methodology, both in RY2017 and in Table C-1a and Table C-1b below, will be greater than the total number of new and existing facilities that reported to Subpart C because facilities typically have multiple units and each unit may combust several fuels; as a result, facilities may report using multiple calculation methodologies.

Table C-1a. Facility Counts Per Year by Calculation Methodology – Subpart C Only

Calculation Methodology	RY2019		RY2020		RY2021	
	New Facilities	Existing Facilities	New Facilities	Existing Facilities	New Facilities	Existing Facilities
Tier 1	75	1,494	75	1,568	75	1,643
Tier 2	31	629	31	661	31	692
Tier 3	4	73	4	76	4	80
Tier 4	3	66	3	70	3	73
40 CFR Part 75	2	33	2	34	2	36
Total	**95**	**1,903**	**95**	**1,998**	**95**	**2,093**

Table C-1b. Facility Counts Per Year by Calculation Methodology – Subpart C With At Least One Additional Subpart

Calculation Methodology	RY2019		RY2020		RY2021	
	New Facilities	Existing Facilities	New Facilities	Existing Facilities	New Facilities	Existing Facilities
Tier 1	92	2,072	92	2,164	92	2,256
Tier 2	85	1,913	85	1,998	85	2,083
Tier 3	11	245	11	256	11	267
Tier 4	3	66	3	69	3	72
40 CFR Part 75	1	32	1	34	1	35
Total	**161**	**3,629**	**161**	**3,790**	**161**	**3,951**

Table C-2a through Table C-2f summarize the expected labor costs for Subpart C. Most of the time required to comply with Subpart C is expected to be completed by the industrial engineer/technician labor category. Labor costs incurred for planning, QA/QC, recordkeeping, and reporting activities by any

facility reporting to Subpart C are detailed as General Facility costs in Table C-2a only. Recordkeeping and reporting labor costs are based on the "medium bin" designation as discussed in the Cost Appendix Introduction. Additional sampling and analysis labor costs specific to each tier approach are detailed in Table C-2b through Table C-2f. These costs are incurred only by the facilities that report using the specified tier. Activities included in each labor category are detailed in Appendix F to the Supporting Statement. In the tables below, costs are provided on a per facility basis and are presented separately for facilities that reported only to Subpart C and for facilities that reported to Subpart C with at least one additional subpart.

Table C-2a. Labor Costs – Subpart C – General Facility

Subpart C only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	7	7	0	0	$500	$500
QA/QC	0	0	1	1	0	0	0	0	$87	$87
Recordkeeping	0	0	0.5	0.5	5	5	0.5	0.5	$419	$419
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–
Reporting	0	0	0	0	10	10	1	1	$751	$751
Total	**0**	**0**	**1.5**	**1.5**	**22**	**22**	**1.5**	**1.5**	**$1,757**	**$1,757**

Subpart C with at least one additional subpart

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	5	5	0	0	$357	$357
QA/QC	0	0	1	1	0	0	0	0	$87	$87
Recordkeeping	0	0	0.5	0.5	5	5	0.5	0.5	$419	$419
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–
Reporting	0	0	0	0	10	10	1	1	$751	$751
Total	**0**	**0**	**1.5**	**1.5**	**20**	**20**	**1.5**	**1.5**	**$1,615**	**$1,615**

Table C-2b. – Labor Costs – Subpart C – Facilities reporting using Tier 1

Subpart C only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	–	–	–	–	7.1	7.1	–	–	$510	$510
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**7.1**	**7.1**	**0**	**0**	**$510**	**$510**

Subpart C with at least one additional subpart

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	6.8	6.8	0	0	$488	$488
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**6.8**	**6.8**	**0**	**0**	**$488**	**$488**

Table C-2c. Labor Costs – Subpart C – Facilities reporting using Tier 2

Subpart C only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	20	20	0	0	$1,426	$1,426
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**20**	**20**	**0**	**0**	**$1,426**	**$1,426**

Subpart C with at least one additional subpart

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	21	21	0	0	$1,500	$1,500
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**21**	**21**	**0**	**0**	**$1,500**	**$1,500**

Table C-2d. Labor Costs – Subpart C – Facilities reporting using Tier 3

Subpart C only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	32.6	32.6	0	0	$2,328	$2,328
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**32.6**	**32.6**	**0**	**0**	**$2,328**	**$2,328**

Subpart C with at least one additional subpart

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	68.5	68.5	0	0	$4,895	$4,895
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**68.5**	**68.5**	**0**	**0**	**$4,895**	**$4,895**

Table C-2e. Labor Costs – Subpart C – Facilities reporting using Tier 4

Subpart C only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	80	80	0	0	$5,716	$5,716
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**80**	**80**	**0**	**0**	**$5,716**	**$5,716**

Subpart C with at least one additional subpart

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	80	80	0	0	$5,716	$5,716
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**80**	**80**	**0**	**0**	**$5,716**	**$5,716**

Table C-2f. Labor Costs – Subpart C – Facilities reporting using Alternative 40 CFR Part 75

Subpart C only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	0.5	0.5	0	0	$37	$37
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**0.5**	**0.5**	**0**	**0**	**$37**	**$37**

Subpart C with at least one additional subpart

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	0.7	0.7	0	0	$47	$47
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**0.7**	**0.7**	**0**	**0**	**$47**	**$47**

Capital and O&M Costs for Subpart C

Appendix F to the Supporting Statement provides the capital and O&M costs required for each tier in Subpart C. Capital and O&M costs are detailed in Appendices F-1, F-2, and F-3 to the Supporting Statement for facilities that reported only to Subpart C for Years 1, 2, and 3 of the ICR Renewal period, respectively, and in Appendices F-5, F-6, and F-7 to the Supporting Statement for facilities that reported to Subpart C with at least one additional subpart for Years 1, 2, and 3 of the ICR Renewal period, respectively.

Table C-3a through C-Table 3d summarize the capital and O&M costs expected for Subpart C. Capital and O&M costs incurred for performance testing (including biogenic sampling and analysis), recordkeeping, and travel activities by any facility reporting to Subpart C are detailed as General Facility costs in Table C-3a. Additional capital and O&M costs related to equipment and sampling specific to a tier approach are detailed in Table C-3b through Table C-3d and are incurred only by facilities that report using that tier approach. Table C-3b details the sampling O&M costs applicable to all facilities using Tier 2. Tier 3 facilities are expected to have sampling O&M costs and an additional equipment O&M cost in their initial year, as shown in Table C-3c. Due to the low cost of this O&M equipment expenditure in the Tier 3 facility's first year ($1,000), the costs were classified as O&M costs rather than capital costs; reporters are not expected to classify such a small annual cost as a capital expenditure, which would accrue interest payments over time.

Table C-3d provides the capital cost associated with Tier 4 reporting, which is only applicable to new Tier 4 facilities reporting during the three years of this ICR Renewal period. It should be noted that subsequent year costs are provided in addition to initial year costs in Table C-3d, as the total capital equipment cost has been annualized. The subsequent year costs are only applicable to Tier 4 facilities with units that have become subject to Subpart C in the previous reporting year. For example, for Tier 4 facilities only reporting for Subpart C:

- In 2019, 3 new facilities are expected to incur initial year costs, and no facilities are expected to incur subsequent year costs;
- In 2020, 3 new facilities are expected to incur initial year costs, and the 3 facilities which began reporting in 2019 are expected to incur subsequent year costs; and
- In 2021, 3 new facilities are expected to incur initial year costs, and the 3 facilities which began reporting in 2019 and the 3 facilities which began reporting in 2020 are both expected to incur subsequent year costs.

Facilities using Tier 1, Alternative 40 CFR Part 75, and existing facilities using Tier 4 are not expected to have additional O&M or capital costs associated with the use of that calculation methodology. Facilities reporting using these methodological tiers will only incur General Facility capital and O&M costs as shown in Table C-3a. Costs are provided on a per facility basis and are presented separately for facilities that report only to Subpart C and for facilities that report to Subpart C and at least one additional subpart. Similar to the labor costs, projected growth rate and average usage of each tier causes variances between facility-level costs for facilities that report only to Subpart C and for facilities that report to Subpart C and at least one additional subpart. A detailed explanation of the activities included in the capital and O&M costs are included in Appendix F to the Supporting Statement.

Table C-3a. Capital and O&M Costs – Subpart C – General Facility

Subpart C only

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	$0		$0	$563	$563	$563
Recordkeeping	$0		$0	$50	$50	$50
Travel	$0		$0	$0	$0	$0
Sampling and Analysis Costs	–	–	–	–	–	–
Total	$0		$0	$613	$613	$613

Subpart C with at least one additional subpart

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–	–	–	–	–	–
Performance testing	$0		$0	$189	$189	$189
Recordkeeping	$0		$0	$50	$50	$50
Travel	$0		$0	$0	$0	$0
Sampling and Analysis Costs	–	–	–	–	–	–
Total	$0		$0	$239	$239	$239

.

Table C-3b. Capital and O&M Costs – Subpart C – Tier 2 Facilities

Subpart C only

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$942	$942	$942
Total	$0		$0	$942	$942	$942

Subpart C with at least one additional subpart

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,018	$1,018	$1,018
Total	$0		$0	$1,018	$1,018	$1,018

Table C-3c. Capital and O&M Costs – Subpart C – Tier 3 Facilities

Subpart C only

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$1,819	$1,819	0
Performance testing	–		–	–	–	–
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,593	$1,593	$1,593
Total	$0		$0	$3,412	$3,412	$1,593

Subpart C with at least one additional subpart

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		0	$11,726	$11,726	$0
Performance testing	–		–	–	–	–
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,369	$1,369	$1,369
Total	$0		$0	$13,096	$13,096	$1,369

Table C-3d. Capital and O&M Costs – Subpart C – Tier 4 Facilities (New Facilities Only)

Subpart C only

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	244,063	10	34,749	0	34,749	34,749
Performance testing						
Recordkeeping						
Travel						
Sampling and Analysis Costs	$0	0	$0	$0	$0	$0
Total	$244,063		$34,749	$0	$34,749	$34,749

Subpart C with at least one additional subpart

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost ($)	Equipment Lifetime	Annualized Capital Cost ($/year)	O&M Costs ($/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$218,476	10	$31,106	$0	$31,106	$31,106
Performance testing	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	$218,476		$31,106	$0	$31,106	$31,106

Total Costs for Subpart C

The total costs related to Subpart C for existing facilities are approximately $21.9 million in 2019, $23.1 million in 2020, and $24.3 million in 2021. The total cost for new facilities to Subpart C is approximately $1.4 million per year for a total of approximately $24.5 million per year. The total industry cost for Subpart C is approximately $73.4 million over the three-year period of the ICR. A detailed explanation of these totals is provided in Appendix F to the Supporting Statement.

Cost Appendix for Subpart D – Electricity Generation

Description of Subpart D

Per the applicability of §98.40(a), the electricity generation source category consists of electricity-generating units (EGUs) that are either subject to the requirements of the Acid Rain Reporting Program or are otherwise required to monitor and report CO_2 emissions year-round according to 40 CFR Part 75. In RY2017, 1,124 power plants reported their GHG emissions under Subpart D. The number of facilities has decreased since 2010; therefore, no new facilities are expected to report to Subpart D during the three-year period covered by this ICR.

Labor Costs for Subpart D

Labor costs for Subpart D are shown in Table D-1. Facilities must utilize the same CO_2 calculation methodologies for Part 98 as are used for Part 75 reporting purposes. Therefore, no planning costs or QA/QC costs are attributed to Subpart D. The only calculations that would be required by Subpart D but are not already required by Part 75 are the conversion of CO_2 emissions from short tons to metric tons, the calculation of CH_4 and nitrous oxide N_2O emissions, and the calculation of biogenic CO_2 emissions. These calculations are automatically generated by e-GGRT, when each facility submits the GHGRP report. Therefore, those costs are not attributed to Subpart D calculation costs but are included as part of reporting costs. Starting in RY2017, EPA simplified reporting for Subpart D by allowing data submitted for Part 75 to be carried over into e-GGRT. Therefore, recordkeeping and reporting costs in Table D-1 are based on 50% of the usual hours assigned to the "low bin" designation to reflect this simplified reporting for Subpart D.

Table D-1. Labor Costs – Subpart D

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	0	0	0	0	$0	$0
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.3	0	1	0	0.3	$0	$102
Sampling and Analysis (Calculations)	0	0	0	0	0	0	0	0	$0	$0
Reporting	0	0	0	0.5	0	2	0	0.5	$0	$205
Total	**0**	**0**	**0**	**0.8**	**0**	**3**	**0**	**0.8**	**$0**	**$307**

Capital and O&M Costs for Subpart D

Capital and O&M costs are shown in Table D-2. Per the applicability of §98.40(a), Subpart D comprises EGUs that are subject to the requirements of the Acid Rain Program and any other electricity-generating units that are required to monitor and report to EPA CO_2 mass emissions year-round according to 40 CFR part 75, therefore no capital and O&M costs are attributed to Part 98 other than recordkeeping costs. The O&M costs associated with recordkeeping are discussed in the Cost Appendix Introduction.

Table D-2. Capital and O&M Costs – Subpart D

Activity	Cost Categories				Total Capital and O&M Cost per Year Per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart D

The total industry costs related to Subpart D are approximately $401,000 per year for a total of $1,204,000 over the three-year period of the ICR. Approximately 1,124 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart E – Adipic Acid Production

Description of Subpart E

For purposes of the GHGRP, the adipic acid production source category consists of facilities that use oxidation to produce adipic acid. In RY2017, two facilities reported to Subpart E, each with one adipic acid production unit. The number of facilities that are subject to Subpart E has not changed since the inception of the program. Based on available information, zero new facilities are expected during the three-year period covered by this ICR. Initial year costs apply only to new facilities; therefore, these costs are zero in the tables below.

There are two options for determining emissions under Subpart E. The annual performance test option at 98.54(a)(1) requires an annual performance test to determine the N_2O emission factor, which is then used to calculate N_2O emissions, using the total annual adipic acid production rate. The alternative monitoring method option at 98.53(b) allows facilities to use existing monitoring equipment (such as continuous monitoring of N_2O emissions) to determine total N_2O emissions. For the two facilities that report to Subpart E, one uses the annual performance test option and the other uses the alternative monitoring method option.

Labor Costs for Subpart E - Annual Performance Test Option

Table E-1a below includes the labor hours for the annual performance test option. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. Labor hours related to the required annual performance test include planning for equipment shutdown prior to testing, contacting the test company, setting up the testing, attending the performance test, etc. Recordkeeping and reporting hours for Subpart E are based on the "low bin" designation, as discussed in the Cost Appendix Introduction. Unlike most subparts, Subpart E is not expected to have labor hours related to QA/QC because the annual performance test is performed by a contractor and these costs are represented as O&M costs (see Table E-2a below) rather than as labor costs.

Sampling and analysis costs for the annual performance test option include time to calculate the N_2O emission factor using the information gathered during the performance test and calculate total N_2O emissions from the adipic acid production unit. Because the facility using the annual performance test option does not have an abatement device, no additional labor hours are expected to determine the destruction efficiency of an N_2O abatement device.

Table E-1a. Labor Costs – Subpart E – Annual Performance Test Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	1.2	0	12	0	0.6	$0	$1,096
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1	0	0.1	$0	$82
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**1**	**0**	**2.8**	**0**	**19**	**0**	**2.2**	**$0**	**$1,793**

Capital and O&M Costs for Subpart E -Annual Performance Test Option

Table E-2a below includes the capital and O&M costs for the annual performance test option. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction.

$5,437 will be incurred per year for performance testing. The cost estimate is based on a comment letter from Dow Chemical Company, dated June 9, 2009. Comment letter EPA-HQ-OAR-2008-0508-0533 stated that for Subpart V, nitric acid production, the “cost to perform the tests would be $5,000 per test" (page 21 of 37). The test methods used in Subpart E, adipic acid production, are identical to the test methods used in Subpart V, nitric acid production. Therefore, the costs suggested for Subpart V have also been applied to Subpart E. The costs from 2009 have been scaled up to 2017 dollars.

Table E-2a. Capital and O&M Costs – Subpart E - Annual Performance Test Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	$0		$0	$5,437	$0	$5,437
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$5,487	$0	$5,487

Labor Costs for Subpart E - Alternative Monitoring Method Option

Table E-1b below includes the labor hours for the alternative monitoring method option. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours for Subpart E are based on the "low bin" designation, as discussed in the Cost Appendix Introduction. For the alterative monitoring method option, the facility is expected to have QA/QC hours related to maintaining the equipment used to comply with the alternative monitoring method option in 98.53(b), along with review of all measurements and calculations used to determine emissions. Sampling and analysis costs include time to calculate the total N_2O emissions using the alternative monitoring procedures already in place.

Table E-1b. Labor Costs – Subpart E – Alternative Monitoring Method Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.2	0	2	0	0.1	$0	$276
QA/QC	0	0	0	0.5	0	5	0	0.3	$0	$410
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1	0	0.1	$0	$82
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**1**	**0**	**2.3**	**0**	**14**	**0**	**1.9**	**$0**	**$1,383**

Capital and O&M Costs for Subpart E – Alternative Monitoring Method Option

Table E-2b below includes the capital and O&M costs for the alternative monitoring method option. The costs related to recordkeeping are discussed in the Cost Appendix Introduction. The alternative monitoring method option at 98.53(b) allows facilities to use existing monitoring equipment to determine total N_2O emissions; therefore, there are no equipment costs related to the GHGRP in Table E-2b.

Table E-2b. Capital and O&M Costs – Subpart E – Alternative Monitoring Method Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart E

The total industry costs related to Subpart E are approximately $8,700 per year for a total of approximately $26,100 over the three-year period of the ICR. Two facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart F – Aluminum Production

Description of Subpart F

For purposes of the GHGRP, the aluminum production source category consists of facilities that produce primary aluminum using the Hall-Héroult process. The primary aluminum process includes electrolysis in prebake and Søderberg cells, and anode baking for prebake cells. Over the course of the GHGRP, the number of facilities subject to Subpart F has dropped from 12 in RY2010 to 7 in RY2017. There has been no growth in Subpart F since RY2010; therefore, zero new facilities are expected during the three year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below.

Under Subpart F, facilities must report perfluoromethane (CF_4), and perfluoroethane (C_2F_6) emissions from anode effects in all prebake and Søderberg electrolysis cells; CO_2 emissions from anode consumption during electrolysis in all prebake and Søderberg electrolysis cells; and CO_2 emissions from onsite anode baking.

Anode effect frequency and duration are monitored and recorded using computer systems already in place at smelters. Because these systems are instrumental to the proper functioning of the smelter, the capital costs of these systems are not included as costs attributed to the GHGRP. Similarly, metal production and carbon anode consumption are routinely monitored and recorded using systems already in place at smelters, therefore these costs are not included in the GHGRP costs for tracking emissions of CO_2.

To calculate CF_4 emissions, smelter specific slope coefficients are used in Equation F-2. The slope coefficients must be measured once every 10 years according to §98.64(a). There are two options for complying with this requirement. Subpart F facilities can either use in-house testing equipment or opt to use a contractor and rented testing equipment. While CEMS are an option for Subpart F, no facilities currently use CEMS and no facilities are expected to begin using CEMS in the next three years.

Because facilities are not required to provide information on the option used to derive the slope coefficients, the cost estimates below are based on direct knowledge of the 14 aluminum production facilities that were operating in 2009. To update the costs for the years of this ICR, the same ratio of total facilities using each option in 2009 (ten with in-house slope coefficient equipment and four without in-house slope coefficient equipment) was used to estimate the current number of facilities using each option (five with in-house slope coefficient equipment and two without in-house slope coefficient equipment).

Labor Costs for Subpart F- Measurement of Slope Coefficients using a Contractor and Rented Equipment

Table F-1a below includes the labor hours for each of the two facilities using a contractor to measure the slope coefficients to comply with Subpart F. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. In addition, sampling and analysis activities for Subpart F include time for scheduling and oversight of contractor testing (50 hours per test, performed once every 10 years, for a total of 5 hours per year) and for calculating GHGRP emissions (4 hours per year). Recordkeeping and reporting hours for Subpart F are based on the "low bin" designation, as discussed in the Cost Appendix Introduction.

Table F-1a. Labor Costs – Subpart F – Measurement of Slope Coefficients Using a Contractor and Rented Equipment

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.2	0	2	0	0.1	$0	$276
QA/QC	0	0	0	0.1	0	1	0	0.1	$0	$82
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	1.9	0	19	0	1.0	$0	$1,558
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**1.0**	**0**	**3.7**	**0**	**28**	**0**	**2.6**	**$0**	**$2,531**

Capital and O&M Costs for Subpart F– Measurement of Slope Coefficients using a Contractor and Rented Equipment

Table F-2a below includes the capital and O&M costs for each of the two facilities using a contractor and rented equipment to comply with Subpart F. Typical costs related to equipment and recordkeeping are discussed in the Cost Appendix Introduction.

Sampling costs for contractors to be hired to conduct the slope coefficient test are based on actual costs of $6,250 per test in 2008$ (includes $2,250 for equipment rental costs and $4,000 for travel, food, and lodging for contracted consultant). These costs were scaled to $6,164 per test in 2017$. Each Subpart F facility has an average of 3 smelters for a total testing cost of $18,492 per facility. However, the tests are only required once every ten years, for a yearly cost of $1,849 per facility to use a contractor and rented equipment. The number of facilities using this option was scaled to RY2017 facility counts, as discussed above.

Table F-2a. Capital and O&M Costs – Subpart F – Measurement of Slope Coefficients Using a Contractor and Rented Equipment

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,849	$0	$1,849
Total	$0		$0	$1,899	$0	$1,899

Labor Costs for Subpart F- Measurement of Slope Coefficients using In-House Equipment

Table F-1b below includes the labor hours for each of the five facilities using in-house equipment to measure the slope coefficients to comply with Subpart F. Typical activities related to planning and recordkeeping and reporting are discussed in the Cost Appendix Introduction. In addition, QA/QC activities for Subpart F include time to maintain measurement equipment and review the calculations. Sampling and analysis activities for Subpart F include time for conducting slope coefficient measurements. According to documentation from 2008, the labor costs for conducting a slope coefficient test was $35,000 in 2008$, which assumed 185 hours of technical labor and 20.5 hours of managerial labor per test. Each facility has an average of 3 smelters for a total of 3 slope coefficients that are measured for each facility, and a total of 555 technical hours and 61.5 managerial hours per facility. However, the tests are performed once every 10 years, for a total of 55.5 technical hours and 6.15 (rounded to 6.2) managerial hours per facility per year. Recordkeeping and reporting hours for Subpart F are based on the "low bin" designation, as discussed in the Cost Appendix Introduction.

Table F-1b. Labor Costs – Subpart F – Measurement of Slope Coefficients using In-House Equipment

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.2	0	2	0	0.1	$0	$276
QA/QC	0	0	0	0.1	0	1	0	0.1	$0	$82
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	6.2	0	55.5	0	0.0	$0	$4,503
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**1.0**	**0**	**8.0**	**0**	**64.5**	**0**	**1.7**	**$0**	**$5,476**

Capital and O&M Costs for Subpart F – Measurement of Slope Coefficients using In-House Equipment

Table F-2b below includes the capital and O&M costs for each of the five facilities using in-house slope coefficient measurement equipment to comply with Subpart F. The O&M costs related to recordkeeping are discussed in the Cost Appendix Introduction. No capital costs are expected because in-house equipment is expected to have been installed prior to the GHGRP; therefore, these costs are not attributed to the GHGRP.

Table F-2b. Capital and O&M Costs – Subpart F – Measurement of Slope Coefficients using In-House Equipment

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart F

The total industry costs related to Subpart F are approximately $36,500 per year for a total of $110,000 over the three-year period of the ICR. Seven facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart G – Ammonia Manufacturing

Description of Subpart G

For purposes of the GHGRP, ammonia manufacturing consists of facilities that manufacture ammonia from a fossil-based feedstock via steam reforming of a hydrocarbon or through the gasification of solid and liquid raw material. In RY2017, 28 facilities reported to Subpart G. Most facilities reporting to Subpart G have 1 or 2 ammonia production units per facility, with an average of 1.3 ammonia production units per facility. Based on the number of facilities reporting to Subpart G over the most recent period, two new facilities are expected to report in each of the next 3 reporting years. Due to this industry growth, the number of facilities per year will vary from 30 existing facilities and two new facilities in RY2019 to 32 existing facilities and two new facilities in RY2020 to 34 existing facilities and two new facilities in RY2021. Initial year costs apply only to new facilities.

There are two options for determining GHG emissions under Subpart G. The CEMS option at §98.73(a) allows the use of CEMS to comply with Subpart G. The second option in §98.73(b) allows the use of monitoring and calculations to estimate process-related emissions under Subpart G. Because no facilities reporting to Subpart G have used CEMS since the GHGRP began, zero facilities are expected to use CEMS under Subpart G in the next three years. Therefore, the costs for using the CEMS option were not estimated. Facilities using monitoring and calculations requirements in Subpart G to estimate process-related emissions have two options for determining carbon content of feedstock. They can either use feedstock supplier data to determine carbon content of feedstocks or conduct monthly sampling of feedstocks to determine carbon content. Of the 28 facilities currently reporting to Subpart G, 16 use supplier data, and 12 use monthly sampling. Because the facility cost of using supplier data for the carbon content of feedstock is lower than the facility cost of sampling the feedstock on a monthly basis to determine the carbon content, new sources are expected to use feedstock supplier data rather than conducting monthly sampling.

Labor Costs for Subpart G – Using Supplier Data to Determine Carbon Content

Table G-1a below includes the labor hours for each of the 18 existing facilities (in RY2019) and any new facilities (shown as initial costs) reporting to Subpart G to use supplier data to determine carbon content. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. In addition, sampling and analysis costs include time to contact the feedstock supplier(s) to obtain carbon content of feedstock. Recordkeeping and reporting hours for Subpart G are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table G-1a. Labor Costs – Subpart G – Using Supplier Data to Determine Carbon Content

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	1.0	1.0	0.5	0.3	5.3	2.6	0.3	0.1	$546	$329
QA/QC	0.0	0.0	0.3	0.3	2.6	2.6	0.1	0.1	$217	$217
Recordkeeping	0.0	0.0	0.5	0.5	5.0	5.0	0.5	0.5	$419	$419
Sampling and Analysis (Calculations)	0.0	0.0	0.9	0.9	8.9	8.9	0.4	0.4	$732	$732
Reporting	0.0	0.0	1.0	1.0	10.0	10.0	1.0	1.0	$838	$838
Total	**1.0**	**1.0**	**3.2**	**2.9**	**31.9**	**29.2**	**2.3**	**2.2**	**$2,752**	**$2,535**

Capital and O&M Costs for Subpart G – Using Supplier Data to Determine Carbon Content

Table G-2a below includes the capital and O&M costs for each of the 18 existing facilities (in RY2019) and any new facilities (shown as initial year costs) reporting to Subpart G. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction.

For quality assurance and quality control of the supplier data, §98.74(c) requires facilities to sample and determine the carbon contents of all feedstocks consumed on a yearly basis. An internet search of costs for performing ASTM D1945-03 (testing carbon content of natural gas by gas chromatography) or ASTM 5373-08 (testing carbon content of solid feedstock) yielded no results. To be conservative, a cost of $1,000 per sample was used. Each ammonia manufacturing facility uses one feedstock per year, either natural gas or solid feedstock, so the costs are based on a sample of one feedstock per facility.

Table G-2a. Capital and O&M Costs – Subpart G – Using Supplier Data to Determine Carbon Content

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/ year)	O&M Costs (2017$/ year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,000	$1,000	$1,000
Total	**$0**		**$0**	**$1,050**	**$1,050**	**$1,050**

Labor Costs for Subpart G – Using Monthly Sampling Data to Determine Carbon Content

Table G-1b below includes the labor hours for each of the 12 facilities reporting to Subpart G per year to use monthly sampling data to determine carbon content. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction.

Sampling and analysis costs also include time to collect samples of feedstocks on a monthly basis. All Subpart G facilities report a single feedstock. Recordkeeping and reporting hours for Subpart G are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table G-1b. Labor Costs – Subpart G – Using Monthly Sampling Data to Determine Carbon Content

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	1.0	0.0	0.3	0.0	2.6	0.0	0.1	$0	$329
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0.0	0.0	0.0	0.5	0.0	5.0	0.0	0.5	$0	$419
Sampling and Analysis (Calculations)	0.0	0.0	0.0	3.2	0.0	31.9	0.0	1.6	$0	$2,618
Reporting	0.0	0.0	0.0	1.0	0.0	10.0	0.0	1.0	$0	$838
Total	**0.0**	**1.0**	**0.0**	**5.0**	**0.0**	**49.6**	**0.0**	**3.2**	**$0**	**$4,205**

Capital and O&M Costs for Subpart G – Using Monthly Sampling Data to Determine Carbon Content

Table G-2b below includes the capital and O&M costs for each of the 12 facilities reporting to Subpart G using monthly sampling data to determine carbon content. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction.

For monthly sampling of each feedstock, the same testing costs as discussed above were used ($1,000 per sample or $12,000 per year).

Table G-2b. Capital and O&M Costs – Subpart G – Using Monthly Sampling Data to Determine Carbon Content

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$12,000	$0	$12,000
Total	**$0**		**$0**	**$12,050**	**$0**	**$12,050**

Total Costs for Subpart G

The total industry costs related to Subpart G average approximately $266,800 per year for existing sources and approximately $7,600 per year for new sources, for a total of approximately $274,000 per year and approximately $823,000 over the three-year period of the ICR. Total costs are based on 32 facilities in 2019, 34 in 2020, and 36 in 2021, which accounts for the 2 new facilities per year.

Cost Appendix for Subpart H – Cement Production

Description of Subpart H

For purposes of the GHGRP, cement production includes Portland cement facilities that process limestone and other materials in high temperature kilns to produce clinker, which is then used to produce cement. For RY2017, 94 Portland cement facilities reported to Subpart H. The number of operating Portland cement facilities has changed little in recent years. Based on available information, no new facilities are expected to begin operation during the three-year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below.

For Subpart H, facilities have two options to determine CO_2 emissions from cement production. Facilities have the option to calculate and report process and combustion CO_2 emissions separately according to §98.83(d) or to operate and maintain a CEMS to measure combined process and combustion CO_2 emissions according to §98.83(a). A total of 83 cement facilities monitor their GHG emissions using CEMS and 11 cement facilities calculate CO_2 emissions according to §98.83(d).

Under the GHGRP, all cement facilities must report their clinker and cement production (§98.86). Clinker and cement production are monitored by cement facilities as part of normal business operations. In addition, clinker production is required to be reported for compliance with EPA's NSPS and NESHAP regulations; therefore, no costs are attributed to the GHGRP for the monitoring of clinker or cement production. Cement facilities that do not use CEMS to monitor GHG emissions must also report the calcium oxide (CaO) and magnesium oxide (MgO) content of clinker and cement kiln dust (CKD), and the total organic carbon (TOC) of raw materials (§98.84). Measurements of CaO, MgO, and TOC are already conducted as part of normal business operations and Subpart H also allows the use of default factors in place of actual measurement data; therefore, no costs are attributed to the GHGRP for these activities.

Despite some differences in the types of information reported, labor and capital and O&M costs are estimated to be the same for facilities that use CEMS and those that do not.

Labor Costs for Subpart H

Table H-1 below summarizes the labor costs for Subpart H. Typical activities for each of the labor activities are included in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations detailed in §98.83(a) and (d).

Table H-1. Labor Costs – Subpart H

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq Year Hours	Initial Year	Subseq. Year
Planning	0	0.3	0	0.5	0	1	0	1	$0	$180
QA/QC	0	0	0	0.5	0	1	0	1	$0	$151
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0	0	1	0	0	$0	$71
Reporting	0	0	0	1.0	0	10	0	1	$0	$838
Total	**0**	**0.3**	**0**	**2.5**	**0**	**18**	**0**	**3.5**	**$0**	**$1,660**

Capital and O&M Costs for Subpart H

Table H-2 below summarizes the capital and O&M costs for all Subpart H facilities. Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected for Subpart H.

Table H-2. Capital and O&M Costs – Subpart H

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/ year)	O&M Costs (2017$/ year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	-		-	-	-	-
Performance testing	-		-	-	-	-
Recordkeeping	$0		$0	$50	$0	$50
Travel	-		-	-	-	-
Sampling and Analysis Costs	-		-	-	-	-
Total	$0		$0	$50	$0	$50

Total Costs for Subpart H

The total industry costs related to Subpart H are approximately $161,000 per year for a total of $482,000 over the three-year period of the ICR. An estimated 94 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart I – Electronics Manufacturing

Description of Subpart I

For purposes of the GHGRP, electronics manufacturing includes, but is not limited to, facilities that manufacture semiconductors (including light-emitting diodes), micro-electromechanical systems (MEMS), liquid crystal displays (LCDs), and photovoltaic cells (PV). Specifically, this sector consists of electronics manufacturing facilities with production processes that use plasma-generated fluorine atoms and other reactive fluorine-containing fragments to etch thin films, clean chambers for depositing thin films, clean wafers, or remove residual material. It also includes electronics manufacturing facilities with chemical vapor deposition processes or other production processes that use N_2O, and facilities with processes that use fluorinated GHGs as heat transfer fluids (HTF) to control temperature or clean surfaces. Facilities reporting under Subpart I have the option to calculate their emissions or use stack testing methods to comply with the rule. Currently, none of the existing facilities use the stack testing method; therefore, cost estimates for this method are not included here. In RY2017, 52 facilities reported, and it is anticipated that Subpart I will have one additional facility per year during the three-year period covered by this ICR.

Labor Costs for Subpart I

Table I-1 below includes the labor hours for each of the facilities reporting to Subpart I using the emissions calculation method. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. Recordkeeping and Reporting hours are based on the "high bin" designation. Planning costs also include the completion of a technology assessment report (submission of which occurs once every three years) for approximately one third of the facilities each year of this ICR. For some facilities with shared parent companies, the technology assessment report is submitted jointly, and this reduced cost was accounted for in the cost estimates below.

New facilities in their initial year of reporting will incur additional time associated with planning, reading the rule and development of the QA/QC plan, in addition to calculation hours.

Table I-1. Labor Costs – Subpart I

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	1.2	1.2	2.6	1.6	4.6	1.6	2.0	0	$726	$388
QA/QC	0	0	1.0	1.0	5.0	5.0	0.5	0.5	$463	$463
Recordkeeping	0	0	1.0	1.0	13.0	13.0	1.0	1.0	$1,053	$1,053
Sampling and Analysis (Calculations)	0	0	11.9	11.9	183.3	163.3	7.4	7.4	$14,403	$12,974
Reporting	0	0	2.0	2.0	26.0	26.0	1.0	1.0	$2,105	$2,105
Total	**1.2**	**1.2**	**18.45**	**17.45**	**231.93**	**208.93**	**12.86**	**10.86**	**$18,786**	**$16,982**

Capital and O&M Costs for Subpart I – All facilities

As shown in Table I-2a all new and existing facilities will incur an O&M cost of $50 per year for recordkeeping, as discussed in the Cost Appendix Introduction. If a facility has abatement tools, they have 3 options on how to report their emissions: (1) use the default destruction or removal efficiency (DRE) for each abatement tool provided in Table I-16 of Part 98, (2) measure site-specific DRE for each abatement tool and/or (3) not claim abatement (or any combination of the 3). Options 1 and 3 do not incur a measurement/sampling cost.

Table I-2a. Capital and O&M Costs – Subpart I – All facilities

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$50	$50

Capital and O&M Costs for Subpart I – Facilities with Abatement Systems That Measure DRE

As shown in Table I-2b, six facilities incur a cost of $36,971 per year per facility as O&M costs related to measuring site-specific DRE. Costs were based on petitions and public comments indicating that facilities typically incur $71,766 to measure 10 abatement tools per year[1,2]. Costs were annualized based on scaling the dollars to 2017 dollars using the Chemical Engineering Plant Cost Index (CEPCI) and the fact that facilities were estimated to have to test 5 abatement tools per facility per year, instead of 10. It is anticipated that no new facilities will incur this cost.

[1] *Semiconductor Industry Association Petition For Reconsideration And Request For Stay Pending Reconsideration Of Subpart I Of The Final Rule For Mandatory Reporting Of Greenhouse Gases* (January 31, 2011).

[2] Reporting of Greenhouse Gases –Revisions to the Electronics Manufacturing Category of the Greenhouse Gas Reporting Rule: EPA's Responses to Public Comments (August 2013).

Table I-2b. Capital and O&M Costs – Subpart I – Facilities with Abatement Tools That Measure DRE

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$36,971	$0	$36,971
Total	$0		$0	$36,971	$0	$36,971

Total Costs for Subpart I

The total industry costs related to Subpart I average $1,142,000 per year for existing sources and approximately $19,000 per year for each new source, for a total of $1,160,000 per year and $3,481,000 over the three-year period of the ICR. Total costs are based on 54 facilities in 2019, 55 in 2020 and 56 in 2021, which accounts for the one new facility per year.

Cost Appendix for Subpart K – Ferroalloy Production

Description of Subpart K

For purposes of the GHGRP, the ferroalloy production source category consists of any facility that uses pyrometallurgical techniques to produce any of the following metals: ferrochromium, ferromanganese, ferromolybdenum, ferronickel, ferrosilicon, ferrotitanium, ferrotungsten, ferrovanadium, silicomanganese, or silicon metal. Facilities typically contain one or more electric arc furnaces (EAF) to produce their ferroalloy products. In RY2017, 10 facilities reported to Subpart K. This number has not changed in many years; therefore, no new facilities are expected during the three year period covered by this ICR. Initial year costs apply only to new facilities; therefore, these costs are zero in the tables below.

There are two options for determining emissions under Subpart K. Facilities may either report using a carbon mass balance procedure specified in §98.113(b) or by using a CEMS per §98.113(a). There are no Subpart K facilities that use CEMS; therefore, costs were not estimated for the CEMS option.

Labor Costs for Subpart K

Table K-1 estimates the expected labor costs for each of the ten facilities to use the carbon mass balance option. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.113, including calculation of the CO_2 emissions from each EAF and the carbon mass balance for each input and output included in Equation K-1. There are an average of two EAFs per facility. Recordkeeping and reporting hours for Subpart K are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table K-1. Labor Costs – Subpart K

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.3	0	3	0	0.2	$0	$358
QA/QC	0	1	0	0.2	0	2	0	0.1	$0	$276
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	1.2	0	12	0	0.6	$0	$984
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	**0**	**2**	**0**	**3.2**	**0**	**32**	**0**	**2.4**	**$0**	**$2,876**

Capital and O&M Costs for Subpart K

There are no anticipated capital costs attributed to Subpart K. The only O&M costs attributed to Subpart K are those for recordkeeping as discussed in the Cost Appendix Introduction.

Table K-2. Capital and O&M Costs – Subpart K

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart K

The total industry costs related to Subpart K are approximately $29,300 per year for a total of $88,000 over the three-year period of the ICR. Ten facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart L – Fluorinated Gas Production

Description of Subpart L

For purposes of the GHGRP, the fluorinated gas production source category consists of facilities that produce fluorinated gases. Facilities report fluorinated GHG emissions from fluorinated gas production processes, transformation processes, and destruction of fluorinated gases previously produced. Fluorinated gas production includes fluorinated GHGs (HFCs, PFCs, SF_6, NF_3, HFEs, etc.), chlorofluorocarbons (CFCs), and hydrochlorofluorocarbons (HCFCs). Since RY2011, the number of Subpart L facilities has ranged from 16 to 14. In RY2017, 14 facilities reported to Subpart L. No new facilities are expected to report to Subpart L in the three years of this ICR. Initial year costs apply to new facilities; therefore, these costs are zero in the tables below. Reporting emissions from destruction of previously produced gases is required under Subpart L, however, currently no facilities conduct this type of activity, and none are expected to do so in the three years of this ICR.

Facilities must estimate their fluorinated GHG emissions for each process vent using either an emission factor or an emission calculation factor, based on whether the preliminary emissions estimate was high or low and whether the process was batch or continuous. In RY2017, six facilities used the emission calculation factor method for all of their processes, and the other eight facilities used both methods. If applicable, facilities must also estimate their fluorinated GHG emissions from equipment leaks. In RY2017, eight facilities reported emissions from equipment leaks. Facilities are required to measure the destruction efficiency of their destruction device every 10 years if they vent emissions to a destruction device and claim GHG emission reductions. For purposes of this analysis, it is expected that 2.6 facilities will perform this measurement each year of the ICR. If applicable, facilities are also required to report emissions from container venting. In RY2017, 6 facilities reported emissions from container venting. The same number, 6 facilities, are expected to report emissions from container venting for each of the three years of this ICR. Facilities with a new process must conduct an initial scoping speciation study to identify potential fluorinated GHGs in the process streams that are emitted. It is expected that one facility each year will have a new process and will therefore incur costs for one scoping speciation study each year of this ICR.

Labor Costs for Subpart L – Estimating Process Vent Emissions

For Subpart L, the number of processes at facilities were summarized using known data for Fluorinated Gas Production facilities. An average facility was characterized for most of Subpart L; however, a single outlier facility has many more processes than the average facility and the cost for the large outlier facility is not representative of the cost that an average facility will incur. The outlier facility was separated from the analysis that characterized the average, typical facility. All facilities, however, including the outlier facility costs, are included in the total costs for Subpart L.

Table L-1a below includes the labor hours for estimating process vent emissions for each of the 13 average sized facilities, and Table L-1b includes the labor hours for estimating process vent emissions for the large facility. Typical activities for each of the labor categories are discussed in the Cost Appendix Introduction. Additional activities expected to require labor hours include completing emission calculations, conducting performance testing to develop emission factors or conducting calculations to determine emission calculation factors, and estimating emissions during startup, shutdown, and malfunction periods. Recordkeeping and reporting labor costs are based on the “high bin” designation.

Table L-1a. Labor Costs – Subpart L – Estimating Process Vent Emissions for Average Facility

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	1.0	0	0	$0	$383
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	0	0	0	1.0	0	13.0	0	1.0	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	8.6	0	172.2	0	17.2	$0	$13,681
Reporting	0	0	0	2.0	0	26.0	0	2.0	$0	$2,105
Total	**0**	**2**	**0**	**17.6**	**0**	**212.2**	**0**	**20.2**	**$0**	**$17,660**

Table L-1b. Labor Costs – Subpart L – Estimating Process Vent Emissions for Large Facility

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	1	0	0	$0	$383
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	0	0	0	1.0	0	13	0	1.0	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	197.8	0	3,955	0	395.5	$0	$314,227
Reporting	0	0	0	2.0	0	26	0	2.0	$0	$2,105
Total	**0**	**2**	**0**	**206.8**	**0**	**3,995**	**0**	**398.5**	**$0**	**$318,205**

Labor Costs for Subpart L – Conducting Scoping Speciation Study

An initial scoping speciation study is required for new processes to identify potential fluorinated GHGs in the process streams that are emitted. The costs for conducting a scoping speciation study are provided in Table L-1c. Typical activities for the QA/QC and sampling and analysis labor categories are discussed in the Cost Appendix Introduction. No additional hours are allocated for the planning, recordkeeping, or reporting labor categories, as these are already addressed in Table L-1a. It is anticipated that only one facility within the source category will have a new process each year and will conduct a scoping speciation study each year of this ICR.

Table L-1c. Labor Costs – Subpart L – Conducting Scoping Speciation Study

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	12.5	0	250	0	25	$0	$19,863
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**17.5**	**0**	**250**	**0**	**25**	**$0**	**$20,300**

Labor Costs for Subpart L – Estimating Equipment Leak Emissions

The costs for estimating equipment leak emissions are provided in Table L-1d for an average facility and in Table L-1e for the large facility. Typical activities expected for the QA/QC and sampling and analysis labor categories include completing emission calculations and monitoring of equipment components. No additional hours are allocated for the planning, recordkeeping, or reporting labor categories, as these are already addressed in Table L-1a. It is expected that the large facility and 7 of the average facilities will incur costs for equipment leak emission estimates each year of this ICR.

Table L-1d. Labor Costs – Subpart L – Estimating Equipment Leak Emissions from Average Size Facility

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	4.0	0	80.6	0	8.1	$0	$6,404
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**9.0**	**0**	**80.6**	**0**	**8.1**	**$0**	**$6,841**

Table L-1e. Labor Costs – Subpart L – Estimating Equipment Leak Emissions from Large Facility

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	72.8	0	1,455	0	145.5	$0	$115,600
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**77.8**	**0**	**1,455**	**0**	**145.5**	**$0**	**$116,038**

Labor Costs for Subpart L – Conducting Destruction Efficiency Testing

For the 2.6 facilities that are expected to conduct measurement of the destruction efficiency of their destruction device for each year of this ICR, the labor costs are provided in Table L-1f and are assumed to be the same for each facility regardless of size. Typical activities for the planning, QA/QC and sampling and analysis labor categories are discussed in the Cost Appendix Introduction. No additional hours are allocated for the recordkeeping or reporting labor categories, as these are already addressed in Table L-1a.

Table L-1f. Labor Costs – Subpart L – Conducting Destruction Efficiency Testing

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0	0	0	0	0	$0	$224
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	18.2	0	363	0	36.3	$0	$28,841
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**2**	**0**	**23.2**	**0**	**363**	**0**	**36.3**	**$0**	**$29,502**

Labor Costs for Subpart L – Estimating Container Venting Emissions

For the six facilities expected to conduct container venting emissions estimates each year of this ICR, the labor costs are provided in Table L-1g and are assumed to be the same for each facility regardless of size. Typical activities for the planning, QA/QC and sampling and analysis labor categories are discussed in the Cost Appendix Introduction. No additional hours are allocated for the recordkeeping or reporting labor categories, as these are already addressed in Table L-1a.

Table L-1g. Labor Costs – Subpart L – Estimating Container Venting Emissions

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	0	0	0	$0	$312
QA/QC	0	0	0	1.0	0	0	0	0	$0	$87
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0.7	0	13.6	0	1.4	$0	$1,081
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**2**	**0**	**2.7**	**0**	**13.6**	**0**	**1.4**	**$0**	**$1,480**

Capital and O&M Costs for Subpart L

Table L-2 provides a summary of the capital and O&M costs expected for Subpart L. Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table L-2. Capital and O&M Costs – Subpart L

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart L

The total industry costs related to Subpart L are approximately $818,000 per year for a total of $2,455,000 over the three-year period of the ICR. Fourteen facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart N – Glass Production

Description of Subpart N

For purposes of the GHGRP, the glass production source category includes facilities that produce flat glass, container glass, pressed and blown glass, or wool fiberglass using one or more continuous glass melting furnaces. For RY2017, 100 facilities reported to Subpart N. The number of facilities in Subpart N has varied over the course of the GHGRP. Based on the number of facilities over the most recent years, one new facility is expected in each of the three years covered by this ICR.

There are two options for determining GHG emissions under Subpart N. The option at §98.143(a) allows the use of CEMS. The second option in §98.143(b) allows the use of monitoring and calculations to estimate process-related emissions from Subpart N. For RY2017, two facilities used the CEMS option and 98 used the non-CEMS option. It is expected that any new facilities will determine GHG emissions using the non-CEMS option. As a result of growth in Subpart N, the number of facilities per year is expected to vary from 102 total facilities in RY2019 (99 existing facilities without CEMS, two existing facilities with CEMS, and one new facility without CEMS) to 104 total facilities in RY2021 (101 existing facilities without CEMS, two existing facilities with CEMS, and one new facility without CEMS).

Sampling and analysis costs for facilities using the non-CEMS option include two options for determining the carbonate-based mineral mass fraction. A facility can obtain the carbonate-based mineral mass fraction of each carbonate-based raw material directly from the supplier according to §98.143(b)(2)(i) or use a default value of 1.0 according to §98.143(c). For RY2017, 11 facilities using the non-CEMS option contacted the supplier and 87 facilities using the non-CEMS option used the default mass fraction value of 1.0 in their calculations. It is expected that all new facilities to Subpart N will use the default mass fraction value of 1.0 in their calculations. As a result of growth in Subpart N, the number of facilities using the default mass fraction value of 1.0 in their calculations is expected to vary from 88 facilities in 2019 to 90 facilities in 2021. The number of facilities contacting the supplier to obtain the mass fraction is expected to remain at 11 for all three years of this ICR.

The tables below account for an average of 1.9 glass melting furnaces per facility and 2.4 raw carbonates per facility, where appropriate.

Labor Costs for Subpart N – CEMS Option

Table N-1a below includes the labor hours for each of the two facilities using the CEMS option to comply with Subpart N. There is no advantage to installing CEMS for the GHGRP, therefore it is expected that the CEMS were most likely installed as part of another state or Federal regulation. As a result, for the CEMS option, the only labor costs attributed to the GHGRP are those for reporting and recordkeeping. Recordkeeping and reporting hours for Subpart N are based on the "low bin" designation, as discussed in the Cost Appendix Introduction.

Table N-1a. Labor Costs – Subpart N – CEMS Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	0	0	0	0	$0	$0
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0	0	0	0	0	$0	$0
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**1.5**	**0**	**6**	**0**	**1.5**	**$0**	**$614**

Capital and O&M Costs for Subpart N – CEMS Option

Capital and O&M costs for each of the two facilities using the CEMS option to comply with Subpart N are shown in Table N-2a. Facilities only incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table N-2a. Capital and O&M Costs – Subpart N –CEMS Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/ year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Labor Costs for Subpart N – Non-CEMS Option

The tables below include the labor hours for each facility using the non-CEMS option to comply with Subpart N. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours for Subpart N are based on the "low bin" designation, as discussed in the Cost Appendix Introduction.

Table N-1b below includes time for each of the 11 facilities to contact the supplier(s) to obtain the carbonate-based mineral mass fraction of each carbonate-based raw material, per 98.143(b)(2)(i). Time to calculate monthly CO_2 emissions are also included. Table N-1c below only includes time for each of the 88 existing facilities and one new facility (in RY2019) to calculate monthly CO_2 emissions because these facilities use the provided default value of 1.0 in their calculations.

Table N-1b. Labor Costs – Subpart N – Non-CEMS Supplier Mass Fraction Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	1.0	0.0	0.4	0.0	3.8	0.0	0.2	$0	$424
QA/QC	0.0	0.0	0.0	0.5	0.0	4.6	0.0	0.2	$0	$374
Recordkeeping	0.0	0.0	0.0	0.5	0.0	2.0	0.0	0.5	$0	$205
Sampling and Analysis (Calculations)	0.0	0.0	0.0	2.8	0.0	28.4	0.0	1.4	$0	$2,326
Reporting	0.0	0.0	0.0	1.0	0.0	4.0	0.0	1.0	$0	$410
Total	**0.0**	**1.0**	**0.0**	**5.2**	**0.0**	**42.7**	**0.0**	**3.3**	**$0**	**$3,738**

Table N-1c. Labor Costs – Subpart N – Non-CEMS Default Mass Fraction Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	1.0	1.0	0.4	0.4	3.8	3.8	0.2	0.2	$424	$424
QA/QC	0.0	0.0	0.2	0.2	2.3	2.3	0.1	0.1	$187	$187
Recordkeeping	0.0	0.0	0.5	0.5	2.0	2.0	0.5	0.5	$205	$205
Sampling and Analysis (Calculations)	0.0	0.0	2.7	2.7	27.4	27.4	1.4	1.4	$2,244	$2,244
Reporting	0.0	0.0	1.0	1.0	4.0	4.0	1.0	1.0	$410	$410
Total	**1.0**	**1.0**	**4.8**	**4.8**	**39.4**	**39.4**	**3.2**	**3.2**	**$3,469**	**$3,469**

Capital and O&M Costs for Subpart N – Non-CEMS Option

Table N-2b below includes the capital and O&M costs for each of the 11 facilities (in RY2019) using the non-CEMS option along with the supplier mass fraction to comply with Subpart N. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction. No O&M costs are expected for equipment, travel, or performance testing. For quality assurance and quality control of the mineral mass fraction data obtained from the supplier as required in 98.144(b), facilities will incur sampling costs to determine the mass fraction of all carbonate-based raw materials each year.

Table N-2c below includes the capital and O&M costs for each of the 88 facilities (in RY2019) using the non-CEMS option along with the default mass fraction to comply with Subpart N. Facilities only incur O&M costs related to recordkeeping as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table N-2b. Capital and O&M Costs – Subpart N –Non-CEMS Supplier Mass Fraction Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$480	$0	$480
Total	**$0**		**$0**	**$530**	**$0**	**$530**

Table N-2c. Capital and O&M Costs – Subpart N – Non-CEMS Default Mass Fraction Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$50**	**$50**

Total Costs for Subpart N

The total industry costs related to Subpart N average approximately $361,000 per year for existing sources and approximately $3,500 per year for new sources, for a total of approximately $364,500 per year, and approximately $1,095,000 over the three-year period of the ICR. Total costs are based on 102 facilities in 2019, 103 in 2020, and 104 in 2021, which accounts for the one new facility per year.

Cost Appendix for Subpart O – HCFC-22 Production and HFC-23 Destruction

Description of Subpart O

For purposes of the GHGRP, the HCFC-22 production and HFC-23 destruction source category includes facilities that produce HCFC-22 from chloroform and hydrogen fluoride (HF) and facilities that destroy HFC-23. An HFC-23 destruction process may or may not be co-located with an HCFC-22 production process at the same facility. Subpart O requires affected facilities to report HFC-23 emissions from HCFC-22 production processes and HFC-23 destruction processes. Some facilities destroy their HFC-23 onsite and some ship the HFC-23 offsite for destruction. In RY2017, there were 4 facilities that reported to the GHGRP. (The number of facilities has declined over time due to phase-out of HCFC-22. When the GHGRP began, 5 facilities reported to Subpart O.) No new facilities are expected to report during the three-year period covered by this ICR. Initial costs apply to new facilities; therefore, initial costs are zero in the tables below.

Facilities must calculate HFC-23 emissions from HCFC-22 production processes using one of two methods. Facilities may use what is essentially a material balance approach in §98.153(c) or they may use emission estimates for each emission point type using the equations in §98.153(d). Facilities must also calculate HFC-23 emissions from HFC-23 destruction processes using the method described in §§98.153(d)(3) and (4). Of the 4 facilities reporting under Subpart O, one facility produced HCFC-22 (emissions calculated by mass balance approach) and sent HFC-23 off site for destruction, one facility produced HCFC-22 (emissions calculated by emission point testing approach) and destroyed HFC-23 on site, and two facilities destroyed HFC-23 on site but did not produce HCFC-22.

Labor Costs for Subpart O

Tables O-1a through O-1c include the labor hours for Subpart O. Typical activities for each of the labor categories are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation.

Table O-1a depicts labor hours needed for the single facility that produces HCFC-22 and estimates emissions using the mass balance approach.

Table O-1a. Labor Costs – Subpart O – Mass Balance Approach

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	1	0	0	$0	$383
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	4.7	0	93	0	9.3	$0	$7,389
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	**0**	**2**	**0**	**7.2**	**0**	**109**	**0**	**10.8**	**$0**	**$9,030**

Table O-1b below indicates the labor hours needed for the single facility that produces HCFC-22 and also destroys HFC-23. This facility estimates process emissions from the individual emission points (process vents and equipment leaks).

Table O-1b. Labor Costs – Subpart O – Emission Point Testing Approach and Destruction of HFC-23

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	1	0	0	$0	$383
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	5.7	0	113	0	11.3	$0	$8,978
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	**0**	**2**	**0**	**8.2**	**0**	**129**	**0**	**12.8**	**$0**	**$10,619**

Table O-1c shows the labor hours needed for each of the two facilities that destroys HFC-23 but does not produce HCFC-22.

Table O-1c. Labor Cost – Subpart O – Destruction of HFC-23

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	1	0	0	$0	$383
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	2.9	0	57	0	5.7	$0	$4,529
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	**0**	**2**	**0**	**5.4**	**0**	**73**	**0**	**7.2**	**$0**	**$6,169**

Capital and O&M Costs for Subpart O

Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table O-2. Capital and O&M Costs – Subpart O

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart O

The total industry costs related to Subpart O are approximately $32,200 per year for a total of $97,000 over the three-year period of the ICR. Four facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart P – Hydrogen Production

Description of Subpart P

For purposes of the GHGRP, the hydrogen production source category applies to facilities that produce hydrogen gas sold as a product to other entities. This source category comprises process units that produce hydrogen by reforming, gasification, oxidation, reaction, or other transformations of feedstocks. It also includes merchant hydrogen production facilities located within another facility if they are not owned by, or under the direct control of, the other facility's owner and operator. Additionally, petroleum refineries that operate captive hydrogen production units (other than catalytic reforming units) must report emissions related to hydrogen production under Subpart P. In RY2017, 114 facilities report to Subpart P. In RY2012, there were 109 facilities reporting under Subpart P. On average, one new facility has reported under Subpart P in each of the past 5 years. Therefore, one new facility per year is expected in each of the three years covered by the ICR.

Facilities reporting to Subpart P, are required to report their hydrogen production unit CO_2 emissions (both process emissions and hydrogen production unit-specific combustion emissions) to Subpart P, and their emissions of CO_2, CH_4, and N_2O from other stationary combustion sources to Subpart C. Additionally, facilities that collect CO_2 to be transferred off site must follow the requirements of Subpart PP. Facilities may determine their emissions by either using a CEMS or using a fuel and feedstock mass balance approach. Facilities using a CEMS must follow the Tier 4 methodology listed in Subpart C. Facilities using the mass balance approach described in §98.163 must determine the carbon content of each fuel and feedstock used in the hydrogen production unit. Different fuels have different sampling frequencies. Natural gas must be sampled at least annually, fuel gas must be sampled at least weekly, and liquid/solid fuel must be sampled either monthly or annually depending on the type of fuel used. All hydrogen production units are expected to have a natural gas fuel or feedstock, but some units may also use fuel gas or solid fuels. Additionally, some facilities have multiple hydrogen production units. Therefore, 4 model plants were developed to cover the range of labor costs under the mass balance compliance option. The first model plant has one unit that only uses natural gas, the second model plant has one unit and uses both natural gas and fuel gas, the third model plant has two units and must monitor one natural gas stream and two fuel gas streams, and the fourth model plant has one unit that uses both natural gas and liquid/solid fuels.

Labor Costs for Subpart P – CEMS Option

Table P-1a presents the estimated labor costs for compliance with Subpart P using CEMS. Three existing facilities use this option. It is expected that no new reporting facilities will use the CEMS approach in the 3-year period covered by the ICR. Initial year costs apply to new reporting facilities; therefore, those costs are zero in the table below. Recordkeeping and reporting hours are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table P-1a. Labor Costs –Subpart P – CEMS Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.4	0	4	0	0.4	$0	$560
QA/QC	0	0	0	1	0	10	0	1	$0	$838
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**2.9**	**0**	**29**	**0**	**2.9**	**$0**	**$2,655**

Capital and O&M Costs for Subpart P – CEMS Option

Table P-2a presents the capital and O&M costs estimated for each of the three facilities that use CEMS. No capital costs are projected for these facilities because they are expected to already have all equipment needed to comply.

Facilities will incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction.

Table P-2a. Capital and O&M Costs – Subpart P – CEMS Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Labor Costs for Subpart P – Mass Balance Option; Natural Gas Only

Table P-1b presents the estimated labor costs for 50 existing facilities and one new facility per year to use the mass balance option with natural gas for fuel or feedstock. This facility count reflects the number of reporting facilities expected to have this configuration as of RY2019, the first year of this ICR. As noted above, one new reporting facility is expected in each year of the 3-year period covered by the ICR; and it is expected that this facility will use the mass balance approach and have natural gas only for fuel and feedstock. Sampling and analysis to determine the molecular weight and carbon content of the natural gas is performed annually. Recordkeeping and reporting hours are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table P-1b. Labor Costs – Subpart P – Mass Balance Option; Natural Gas Only

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	8	2	1.6	0.4	16	4	1.6	0.4	$2,239	$560
QA/QC	0	0	0.4	0.2	4	2	0.4	0.2	$335	$168
Recordkeeping	0	0	0.5	0.5	5	5	0.5	0.5	$419	$419
Sampling and Analysis (Calculations)	0	0	0.2	0.1	2	1	0.2	0.1	$168	$84
Reporting	0	0	1	1	10	10	1	1	$838	$838
Total	**8**	**2**	**3.7**	**2.2**	**37**	**22**	**3.7**	**2.2**	**$3,999**	**$2,069**

Capital and O&M Costs for Subpart P – Mass Balance Option; Natural Gas Only

Table P-2b presents the capital and O&M costs estimated for each of the 50 existing facilities and one new facility using the mass balance option with natural gas for fuel or feedstock. No capital costs are projected for these facilities because they are expected to already have all equipment needed to collect data and samples for the rule. For new facilities, it is expected that the flow monitors typically needed for process control would also meet the requirements for flow monitoring equipment in Subpart P, such that no additional capital costs would be incurred. It is expected that other carbon content analyses for natural gas would be out-sourced, leading to O&M costs for sampling and analyses for natural gas. Based on analytical price lists,[3] the costs of shipping and analyzing a natural gas sample are expected to be $210. Natural gas analyses are required once per year. Facilities (both existing and new) will also incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction.

Table P-2b. Capital and O&M Costs – Subpart P – Mass Balance Option; Natural Gas Only

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$210	$210	$210
Total	$0		$0	$260	$260	$260

[3] Wyoming Analytical Laboratories, Inc. Analytical Services Fee Schedule. July 29, 2016.

Labor Costs for Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Single Unit

Table P-1c presents the estimated labor costs for using the mass balance option for a facility that has one unit that uses both natural gas and fuel gas. Twenty existing facilities use this combination of option and fuel or feedstock with a single unit. No new reporting facilities are expected to have this configuration. Sampling and analysis to determine the molecular weight and carbon content of natural gas streams is performed annually, whereas sampling and analysis of fuel gas streams to determine molecular weight and carbon content is performed weekly. Initial year costs apply to new reporting facilities; therefore, those costs are zero in the table below. Recordkeeping and reporting hours are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table P-1c. Labor Costs – Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Single Unit

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0.4	0	4	0	0.4	$0	$335
QA/QC	0	0	0	0.4	0	4	0	0.4	$0	$335
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	1.1	0	11.4	0	1.1	$0	$956
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**0**	**0**	**3.4**	**0**	**34.4**	**0**	**3.4**	**$0**	**$2,884**

Capital and O&M Costs for Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Single Unit

Table P-2c presents the capital and O&M costs estimated for each of the 20 facilities using the mass balance option for both natural gas and fuel gas with a single unit. No capital costs are projected for these facilities because they are expected to already have all equipment needed to comply, including compositional analyzers to determine carbon content of fuel gas. It is projected that other carbon content analyses for natural gas would be out-sourced, leading to O&M costs for sampling and analyses for natural gas. Based on analytical price lists, the costs of shipping and analyzing a natural gas sample is estimated at $200. Natural gas analyses are required once per year.

Facilities are expected to incur an O&M cost associated with recordkeeping as discussed in the Cost Appendix Introduction.

Table P-2c. Capital and O&M Costs – Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Single Unit

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$210	$0	$210
Total	$0		$0	$260	$0	$260

Labor Costs for Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Multiple Units

Table P-1d presents the estimated labor costs for the mass balance option using both natural gas and fuel gas with multiple units. There are 34 existing facilities using this combination of methodological option and fuel or feedstock with multiple units. No new reporting facilities are expected to use the mass balance approach with both natural gas and fuel gas in the 3-year period covered by the ICR. Sampling and analysis to determine the molecular weight and carbon content of natural gas streams is performed annually, whereas sampling and analysis of fuel gas streams to determine molecular weight and carbon content is performed weekly. Initial year costs apply to new reporting facilities; therefore, those costs are zero in the table below. Recordkeeping and reporting hours are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table P-1d. Labor Costs – Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Multiple Units

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0.4	0	4	0	0.4	$0	$335
QA/QC	0	0	0	0.8	0	8	0	0.8	$0	$671
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	2.3	0	22.8	0	2.3	$0	$1,911
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**0**	**0**	**5.0**	**0**	**49.8**	**0**	**5.0**	**$0**	**$4,174**

Capital and O&M Costs for Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Multiple Units

Table P-2d presents the capital and O&M costs estimated for each of the 34 facilities using the mass balance option using both natural gas and fuel gas with multiple units. No capital costs are projected for these facilities because they are expected to already have all equipment needed to comply, including compositional analyzers to determine carbon content of fuel gas. It is expected that other carbon content analyses for natural gas would be out-sourced, leading to O&M costs for sampling and analyses for natural gas. Based on analytical price lists, that the costs of shipping and analyzing a natural gas sample is estimated to be $210. Natural gas analyses are required once per year.

Facilities are expected to incur an O&M cost associated with recordkeeping as discussed in the Cost Appendix Introduction.

Table P-2d. Capital and O&M Costs – Subpart P – Mass Balance Option; Natural Gas and Fuel Gas, Multiple Units

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$420	$0	$420
Total	$0		$0	$470	$0	$470

Labor Costs for Subpart P – Mass Balance Option; Natural Gas and Liquid/Solid Fuel

Table P-1e presents the estimated labor costs for the mass balance option using both natural gas and liquid/solid fuels. 9 existing facilities using this combination of methodology option and fuel or feedstock. No new reporting facilities are expected with this configuration. Sampling and analysis to determine the molecular weight and carbon content of natural gas streams is performed annually, whereas sampling and analysis of liquid/solid fuel streams to determine molecular weight and carbon content is performed monthly. Initial year costs apply to new reporting facilities; therefore, those costs are zero in the table below. Recordkeeping and reporting hours are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table P-1e. Labor Costs – Subpart P – Mass Balance Option; Natural Gas and Liquid/Solid Fuel

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0.4	0	4	0	0.4	$0	$335
QA/QC	0	0	0	0.2	0	2	0	0.2	$0	$168
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1	0	0.1	$0	$84
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**0**	**0**	**2.2**	**0**	**22**	**0**	**2.2**	**$0**	**$1,844**

Capital and O&M Costs for Subpart P – Mass Balance Option; Natural Gas and Liquid/Solid Fuel

Table P-2e presents the capital and O&M costs estimated for each of the nine facilities using the mass balance option using both natural gas and liquid/solid fuels. No capital costs are projected for these facilities because they are expected to already have all equipment needed to comply, including compositional analyzers to determine carbon content of fuel gas. It is expected that other carbon content analyses for natural gas or liquid/solid fuels would be out-sourced, leading to O&M costs for sampling and analyses for natural gas and liquid/solid fuels. Based on analytical price lists, the costs of shipping and analyzing a natural gas sample is estimated to be $200 and shipping and analyzing a liquid/solid sample is estimated be $128. Natural gas analyses are required once per year; the frequency for liquid sample analyses are dependent on the type of fuel/feedstock and is either monthly or annually. Monthly sampling for all liquid/solid fuels is used in the costs below.

Facilities are expected to incur an O&M cost associated with recordkeeping as discussed in the Cost Appendix Introduction.

Table P-2e. Capital and O&M Costs – Subpart P – Mass Balance Option; Natural Gas and Liquid/Solid Fuel

Activity	Cost Categories			Total Capital and O&M Cost per Year per Facility (2017$)		
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,746	$0	$1,746
Total	$0		$0	$1,796	$0	$1,796

Total Costs for Subpart P

The total industry costs related to Subpart P are approximately $378,000 per year for existing facilities and approximately $4,300 per year for new facilities for a total of approximately $380,000 per year and approximately $1,147,000 over the three-year period of the ICR. Total costs are based on 116 facilities in 2019, 117 in 2020, and 118 in 2021, which accounts for the one new facility per year.

Cost Appendix for Subpart Q – Iron and Steel Production

Description of Subpart Q

For purposes of the GHGRP, the iron and steel production source category consists of any facility that produces iron and steel products. It includes emissions from the following production processes: taconite indurating furnaces, basic oxygen furnaces, non-recovery coke oven battery combustion stacks, coke pushing processes, sinter processes, electric arc furnaces (EAF), decarburization vessels, and direct reduction furnaces. Generally, the emissions in Subpart Q are a result of the melting of iron ore, resulting in the release of CO_2.

In RY2017, 122 facilities reported to Subpart Q. Based on the number of facilities over the most recent years, no new facilities are expected during the three year period covered by this ICR. Initial year costs apply to new facilities only; therefore, those costs are zero in the tables below.

All facilities reporting to Subpart Q are required to report their production CO_2 emissions from the above listed processes, as well as CO_2, CH_4, and N_2O emissions from flares that burn blast furnace gas or coke oven gas. Facilities may report their production CO_2 emissions from the above listed processes using a carbon mass balance procedure specified in §98.173(b)(1), by calculating a site-specific emissions factor as specified in §98.173(b)(2), or by using a CEMS. Facilities using a CEMS must follow the Tier 4 methodology listed in Subpart C. The following sections describe the costs for Subpart Q facilities to estimate CO_2 emissions using each of the methods above.

Labor Costs for Subpart Q – Carbon Mass Balance Option

Subpart Q facilities have the option to perform a carbon mass balance to calculate their process CO_2 emissions. Of the 77 facilities that use this method, 52 facilities sample their exhaust streams using ASTM methods listed in §98.174(b)(2) and 25 facilities use information they received either from their supplier or by a company that has bought and analyzed their waste products (e.g. coal ash or dust). Sampling combined with calculations is estimated to take roughly 12 hours, whereas using supplied information to calculate emissions is estimated to only take 2 hours (see Table Q-1a(1) and Table Q-1a(2) respectively). No planning or QA/QC is necessary when using supplied information, however it is expected when sampling. Other typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation.

Table Q-1a(1). Labor Costs – Subpart Q – Carbon Mass Balance Option – Sampling

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.3	0	3	0	0.2	$0	$358
QA/QC	0	1	0	0.2	0	2	0	0.1	$0	$276
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	1.2	0	12	0	0.6	$0	$984
Reporting	0	0	0	1	0	4	0	1	$0	$410
Total	**0**	**2**	**0**	**3.2**	**0**	**23**	**0**	**2.4**	**$0**	**$2,233**

Table Q-1a(2). Labor Costs – Subpart Q – Carbon Mass Balance Option – Supplier

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.2	0	2	0	0.1	$0	$164
Reporting	0	0	0	1	0	4	0	1	$0	$410
Total	**0**	**0**	**0**	**1.7**	**0**	**8**	**0**	**1.6**	**$0**	**$778**

Capital and O&M Costs for Subpart Q – Carbon Mass Balance Option

Facilities that sample their gas streams incur sampling costs for each ASTM test, which is estimated to be $1,000 total per facility (see Table Q-2a(1)). Facilities also incur recordkeeping costs discussed in the Cost Appendix Introduction.

Facilities that use supplied information instead of sampling their gas streams only incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction (see Table Q-2a(2)). No capital costs are expected for either version of the carbon mass balance option.

Table Q-2a(1). Capital and O&M Costs – Subpart Q – Carbon Mass Balance Option – Sampling

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,000	$0	$1,000
Total	**$0**		**$0**	**$1,050**	**$0**	**$1,050**

Table Q-2a(2). Capital and O&M Costs – Subpart Q – Carbon Mass Balance Option – Supplier

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Labor Costs for Subpart Q – Site-Specific Emission Factor Option

Table Q-1b below includes the labor hours for the 29 facilities that used the site-specific emission factor option to calculate CO_2 emissions. This approach requires a performance test of three representative production cycles from each unit. Testing for different process equipment varies, but tests typically run 3 hours and facilities average 4 units per facility, Therefore, performance testing and calculations are expected to take an average of 12 hours. Other typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation.

Table Q-1b. Labor Costs –Subpart Q – Site-Specific Emission Factor Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.3	0	3	0	0.2	$0	$358
QA/QC	0	1	0	0.2	0	2	0	0.1	$0	$276
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	1.2	0	12	0	0.6	$0	$984
Reporting	0	0	0	1	0	4	0	1	$0	$410
Total	**0**	**2**	**0**	**3.2**	**0**	**23**	**0**	**2.4**	**$0**	**$2,233**

Capital and O&M Costs for Subpart Q – Site-Specific Emission Factor Option

Table Q-2b below includes the labor hours for the 29 facilities that used the site-specific emission factor option to calculate CO_2 emissions. Facilities that use a site-specific emission factor incur sampling costs, which are estimated to be $2,000 total per facility and includes items like hotel, food, etc. for the personnel performing the sampling. Facilities also incur recordkeeping costs discussed in the Cost Appendix Introduction. No capital costs are expected for this method.

Table Q-2b. Capital and O&M Costs – Subpart Q – Site-Specific Emission Factor Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$2,000	$0	$2,000
Total	$0		$0	$2,050	$0	$2,050

Labor Costs for Subpart Q – CEMS Option

Table Q-1c below includes the labor hours for each of the 16 facilities using the CEMS option to quantify CO_2 emissions from Subpart Q. There is no advantage to installing CEMS for the GHGRP, therefore, it is expected that CEMS were installed as part of another state or Federal regulation. As a result, for the CEMS option, the only labor costs attributed to the GHGRP are those for reporting and recordkeeping and for calculations of production emissions in Equation Q1 through Equation Q7 of Subpart Q. Recordkeeping and reporting hours for Subpart Q are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table Q-1c. Labor Costs – Subpart Q – CEMS Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	0	0	0	0	$0	$0
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.2	0	2	0	0.1	$0	$164
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**1.7**	**0**	**8**	**0**	**1.6**	**$0**	**$778**

Capital and O&M Costs for Subpart Q – CEMS Option

Capital and O&M costs for each of the 16 facilities using the CEMS option to comply with Subpart Q are shown in Table Q-2c. Facilities only incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table Q-2c. Capital and O&M Costs – Subpart Q – CEMS Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart Q

The total industry costs related to Subpart Q are approximately $329,000 per year for a total of $987,000 over the three-year period of the ICR. One hundred twenty-two facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart R – Lead Production

Description of Subpart R

For purposes of the GHGRP, the lead production source category applies to primary and secondary lead smelter sources that produce lead. A primary lead smelter is a facility engaged in the production of lead metal from lead sulfide ore concentrates through the use of pyrometallurgical techniques. A secondary lead smelter is a facility at which lead-bearing scrap materials (including but not limited to, lead-acid batteries) are recycled by smelting into elemental lead or lead alloys. The only primary lead smelter In the U.S. reported to Subpart R from RY2010 to RY2013. It shut down in December 2013 and therefore stopped reporting. The remaining 11 facilities currently reporting to Subpart R are secondary lead smelter sources. The number of facilities reporting to Subpart R facilities has not significantly changed over the past reporting years, with a maximum number of 14 facilities and a minimum number of 11 facilities per reporting year. It is anticipated that no new facilities will report to Subpart R during the three year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below. Facilities currently reporting to Subpart R have up to four smelting furnaces, with most having two smelting furnaces. Cost estimates below are based on a facility with two smelting furnaces.

The emissions reported under Subpart R are a result of natural gas combustion and lead smelter process emissions, resulting in the release of CO_2.

Labor Costs for Subpart R

Table R-1 presents the estimated labor costs for reporting emissions for Subpart R. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "low bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.183, including calculation of combustion and production CO_2 emissions from each smelting furnace.

Table R-1. Labor Costs –Subpart R

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.4	0	4	0	0.2	$0	$440
QA/QC	0	1	0	0.3	0	3	0	0.2	$0	$358
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.5	0	5	0	0.3	$0	$410
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**2**	**0**	**2.7**	**0**	**18**	**0**	**2.1**	**$0**	**$1,823**

Capital and O&M Costs for Subpart R

Capital and O&M costs for Subpart R are shown in Table R-2. Costs associated with O&M are expected for recordkeeping, as discussed in the Cost Appendix Introduction, and the annual cost of sampling to determine the carbon content of their materials. No capital costs are expected for Subpart R.

Table R-2. Capital and O&M Costs – Subpart R

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,000	$0	$1,000
Total	$0		$0	$1,050	$0	$1,050

Total Costs for Subpart R

The total industry costs related to Subpart R are approximately $31,600 per year for a total of $95,000 over the three-year period of the ICR. Total costs are based on 11 facilities in 2019, 2020, and 2021.

Cost Appendix for Subpart S – Lime Manufacturing

Description of Subpart S

For purposes of the GHGRP, the lime manufacturing source category applies to lime manufacturing plants that engage in the manufacture of a lime product by calcination of limestone, dolomite, shells or other calcareous substances.

In RY2017, 75 facilities reported to Subpart S. The number of facilities reporting to Subpart S has not significantly changed over the past reporting years, with a maximum number of 76 facilities and a minimum number of 72 facilities per reporting year. It is anticipated that no new facilities will report to Subpart S during the three-year period covered by this ICR. Initial costs apply only to new facilities; therefore, those costs are zero in the tables below.

The emissions reported under Subpart S are a result of calcination, when limestone—mostly calcium carbonate ($CaCO_3$)—is roasted at high temperatures in a kiln to produce calcium oxide (CaO) and CO_2. The CO_2 emissions are released as a gas to the atmosphere. For facilities that use a CEMS, the CO_2 process emissions and combustion emissions from lime kilns are reported under Subpart S. For facilities that do not use a CEMS, the CO_2 combustion emissions, CH_4 combustion emissions, and N_2O combustion emissions from lime kilns are reported under Subpart C. In RY2017 there were five facilities using a CEMS and 70 facilities not using a CEMS. Lime manufacturing facilities that do not use a CEMS are required to measure and report the CaO and Magnesium oxide (MgO) content of each type of lime and calcined byproduct/waste produced. Facilities using CEMS are not required to measure and report the CaO and MgO content of each type of lime and calcined byproduct/waste produced, as such there are only costs related to recordkeeping and reporting for Subpart S facilities that use a CEMS.

Labor Costs for Subpart S – CEMS Option

Table S-1a below includes the labor hours for each of the five facilities using a CEMS to comply with Subpart S. There is no advantage to installing CEMS for GHGRP purposes; therefore, CEMS were most likely installed as part of another state or Federal regulation. As stated above, facilities using CEMS are not required to measure and report the CaO and MgO content of each type of lime and calcined byproduct/waste produced; therefore, the only labor costs attributed to the GHGRP are those for reporting and recordkeeping. Recordkeeping and reporting hours for Subpart S are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table S-1a. Labor Costs – Subpart S – CEMS Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	0	0	0	0	$0	$0
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0	0	0	0	0	$0	$0
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	**0**	**0**	**0**	**1.5**	**0**	**15**	**0**	**1.5**	**$0**	**$1,257**

Labor Costs for Subpart S – non CEMS Option

Table S-1b below includes the labor hours for each of the 70 facilities that do not use CEMS to comply with Subpart S. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis hours include completion of the measurements and calculations required in §98.193. Calculations include inputting the CaO and MgO contents of each type of lime and calcined byproduct/waste produced into the Subpart S equations to calculate CO_2 emissions.

Table S-1b. Labor Costs – Subpart S – non CEMS Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.4	0	4	0	0.2	$0	$440
QA/QC	0	1	0	0.2	0	2	0	0.1	$0	$276
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1	0	0.1	$0	$82
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**2.2**	**0**	**22**	**0**	**1.9**	**$0**	**$2,056**

Capital and O&M Costs for Subpart S – CEMS and non CEMS Option

As shown in Table S-2, all Subpart S facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. Lime facilities are required by the National Lime Association (NLA) Protocol to determine the CaO and MgO content of each type of lime and calcined byproduct/waste produced, as a result there are no additional capital or O&M costs for CaO and MgO testing attributed to Subpart S of the GHGRP.

Table S-2. Capital and O&M Costs – Subpart S – CEMS and non CEMS Options

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/ year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart S

The total industry costs related to Subpart S (from non-CEMS reporting facilities only) are approximately $154,000 per year for a total of $462,000 over the three-year period of the ICR. Total costs are based on 75 facilities each in 2019, 2020, and 2021; it is anticipated that no new facilities will report to Subpart S during the next three years of this ICR.

Cost Appendix for Subpart T – Magnesium Production

Description of Subpart T

For purposes of the GHGRP, magnesium production refers to facilities that engage in the following types of magnesium production activities:

1. Primary production where magnesium metal is refined from raw material;
2. Secondary production where scrap is recycled to recover magnesium metal; and
3. Casting operations that produce magnesium ingots and/or magnesium and magnesium alloy parts (e.g., automobile parts, camera bodies).

The GHG emissions from magnesium production arise from the release of gases used for fire suppression during the handling and processing of molten magnesium metal. Without the cover gas, the molten magnesium readily vaporizes and burns when exposed to air. The gases used for fire suppression contain a mixture of cover gas (e.g., SF_6, HFC-134a, sulfur dioxide) and carrier gas (e.g., CO_2, nitrogen, dry air) with the cover gas accounting for only a small portion of the total mixture (typically less than 5%). The cover gas molecules form weak bonds with magnesium atoms on the surface of the molten metal, forming a surface layer that prevents oxidation of the molten magnesium. Typically, the cover and carrier gases are stored in a central location within the plant and supplied to each individual unit (e.g., crucible, die casting machine) via a manifold pipe system. Magnesium production facilities track cover and carrier gas consumption as a normal business operations. While some facilities use up to three different types of GHGs, most use only one or two GHGs.[4]

The GHG emissions from Subpart T facilities are based on gas usage records, with the assumption that all gas used is emitted to the atmosphere.

Subpart T facilities are based on gas usage records, with the assumption that all gas used is emitted to the atmosphere. Subpart T allows facilities to calculate emissions using one of the following three methods: (1) GHG usage derived from company records, including GHG deliveries, returns and an annual inventory (Method 1) (see §98.203(a)(1)); (2) direct measurements of GHG usage made using scales to measure the change in weight of each individual gas cylinder (Method 2) (see §98.203(a)(2)); or (3) direct measurement of flow (either mass or volumetric) using flow meters installed on the cover gas distribution pipelines (Method 3) (see §98.203(c)). Most facilities use Method 1 with the remainder using Method 2.[5] Method 3 is not currently used by facilities. It is expected that any new facility would use either Method 1 or 2. Facilities using Methods 1 and 2 may use data provided by their gas supplier in lieu of making their own measurements onsite.

The number of facilities reporting to Subpart T has varied from a low of eight in 2017 to a high of eleven in 2014 and 2015. Although eight facilities reported in RY2017, one of the eight facilities was a new facility that was not subject to Part 98 because their reported CO_2e emissions were below the 25,000 metric tons/year applicability threshold. However, three other magnesium production facilities that had reported in RY2016 failed to submit reports for RY2017. These three facilities were expected to report in RY2017 based on their reporting histories. They do not appear to qualify for the off-ramp provisions in §98.2(i) and have not notified the EPA of any changes in their operations. Although there is uncertainty whether these facilities will continue reporting in future years, we have included them in the count of existing facilities to ensure we do not underestimate the reporting burden for this subpart. We have excluded the one new facility that submitted a report for the first time in RY2017. Since this facility is not

[4] In RY2016, seven facilities used only one GHG, one facility used two different GHGs, and two facilities used three different GHGs. In RY2017, four facilities used only one GHG, one facility used two GHGs, and two facilities used three GHGs. The average for the subpart for RY2016 and RY2017 was 2 GHGs per facility.

[5] In RY2016, seven of the ten Subpart T facilities used Method 1 and three used Method 2 to determine GHG emissions. In RY2017, four of the seven facilities used Method 1 and three used Method 2

currently subject to Part 98, their reporting is voluntary. Hence, we have assumed ten existing facilities consisting of the seven facilities that are subject to Part 98 and submitted RY2017 plus the three facilities that failed to report in RY2017 and are believed to be still subject to Part 98 reporting. We anticipate that one new Subpart T facility will begin reporting during the three-year period of this ICR. This is consistent with prior years, where one new facility began reporting in the period 2011-2013 and a second new facility began reporting in the period from 2014 to 2016. For the purposes of this analysis, we expect the new facility to begin reporting in 2019 and the eleven facilities (*i.e.*, ten existing Subpart T facilities and one new facility) will report in 2019 through 2021.

Labor Costs for Subpart T

Table T-1 below includes the labor hours for Subpart T. Typical activities for each of the labor categories are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "low bin" designation. Calculations include time required to complete measurements and calculations for Method 1 or Method 2, including calculation of emissions, magnesium throughput, and cover gas composition, flow rate and usage rate. Methods 1 and 2 require approximately the same level of effort to complete the measurements, calculations, QA/QC, recordkeeping and reporting.

The costs for legal support and QA/QC, recordkeeping and calculations for any new facility are expected to be the same as for existing facilities since there are no additional requirements for these tasks that apply to new facilities. However, a new facility in their initial year of reporting will require additional time for planning to familiarize themselves with the rule, as discussed in the Cost Appendix Introduction.

Table T-1. Labor Costs – Subpart T

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	1	1	0.4	0.1	4	1	0.2	0.1	$440	$194
QA/QC	0	0	0.2	0.2	2	2	0.2	0.2	$168	$168
Recordkeeping	0	0	0.5	0.5	2	2	0.5	0.5	$205	$205
Sampling and Analysis (Calculations)	0	0	1.0	1.0	3	3	0.5	0.5	$320	$320
Reporting	0	0	1.0	1.0	6	4	1.0	1.0	$552	$410
Total	**1**	**1**	**3.1**	**2.8**	**17**	**12**	**2.4**	**2.3**	**$1,685**	**$1,296**

Capital and O&M Costs for Subpart T

Table T-2 shows the capital and O&M costs for each Subpart T facility. The only O&M costs expected are those associated with recordkeeping, as discussed in the Cost Appendix introduction. Methods 1 and 2 do not require facilities to install any new monitoring equipment. Facilities may either make their own measurements (using weighing scales or load cells) or use GHG measurements provided by their gas supplier. Routine tracking of cover gas composition and flow rates, as well as tracking of gas inventory, is an essential part of the safe operation of magnesium production facilities due to the potential fire hazards. Hence, facilities are expected to have existing monitoring equipment and procedures in place for tracking cover gas usage. If the facility elects to make their own measurements, they may use equipment already available at the plant. Therefore, no capital costs are expected.

Table T-2. Capital and O&M Costs – Subpart T

Activity	Cost Categories				Total Capital and O&M Cost per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$50	$50

Total Costs for Subpart T

The total industry costs related to Subpart T average approximately $14,400 per year for existing sources and approximately $600 per year for new sources, for a total of approximately $15,000 per year and approximately $45,000 over the three-year period of the ICR. Eleven facilities are expected to report in 2019, 2020, and 2021, which accounts for the one new facility reporting in 2019.

Cost Appendix for Subpart U – Miscellaneous Uses of Carbonate

Description of Subpart U

For purposes of the GHGRP, the miscellaneous uses of carbonate source category includes any equipment that uses certain carbonates in manufacturing processes that emit CO_2. The carbonates include limestone, dolomite, ankerite, magnesite, siderite, rhodochrosite, and sodium carbonate. Facilities are considered to emit CO_2 if at least 2,000 tons per year of carbonates are consumed and the carbonates are heated to a temperature sufficient to allow the calcination reaction to occur. This source category does not include equipment that uses carbonates or carbonate containing minerals that are consumed in the production of cement, glass, ferroalloys, iron and steel, lead, lime, phosphoric acid, pulp and paper, soda ash, sodium bicarbonate, sodium hydroxide, or zinc. This source category also does not include carbonates used in sorbent technology used to control emissions from stationary fuel combustion equipment.

For RY2017, seven facilities reported to Subpart U. The number of facilities reporting to Subpart U has not increased over the prior six reporting years; therefore, no new facilities are expected to report over the next three years. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below.

Facilities have two options for calculating CO_2 emissions under Subpart U: (1) use calcination fractions with Equation U-1, according to §98.213(a), or (2) use actual mass of input and output carbonates with Equation U-2 (mass balance), according to §98.213(b).

Labor Costs for Subpart U

Table U-1a and Table U-1b below includes the labor hours for each of the seven facilities reporting to Subpart U. Four facilities used the calcination fraction methodology, and three facilities used the mass balance approach. Recordkeeping and reporting hours are based on the “low bin” designation as discussed in the Cost Appendix Introduction. No sampling costs are expected because all facilities have used the default calcination fraction of 1.0 instead of using x-ray fluorescence to determine the calcination fraction; and no calculation costs are expected because the only calculation required for Subpart U is automatically performed within e-GGRT.

Table U-1a. Labor Costs – Subpart U – Calcination fraction method

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**1.5**	**0**	**6**	**0**	**1.5**	**$0**	**$614**

Table U-1b. Capital and O&M Costs –Subpart U – Mass balance method

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**1.5**	**0**	**6**	**0**	**1.5**	**$0**	**$614**

Capital and O&M Costs for Subpart U

As shown in Table U-2, facilities will only incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction. No additional capital costs are expected because monthly measurement of the amount of each carbonate consumed are determined using the same plant instruments used for regular facility accounting purposes.

Table U-2. Capital and O&M Costs – Subpart U

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart U

The total industry costs related to Subpart U are approximately $4,700 per year for a total of approximately $14,000 over the three-year period of the ICR. Seven facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart V – Nitric Acid Production

Description of Subpart V

For purposes of the GHGRP, nitric acid production involves the production of nitric acid using one or more trains. A nitric acid train produces nitric acid through the catalytic oxidation of ammonia. For RY2017, 32 facilities reported to Subpart V. The number of facilities in Subpart V has varied over the course of the GHGRP. Based on the number of facilities over the most recent period, no new facilities are expected in each of the next 3 reporting years. While this subpart applies to strong nitric acid producers after RY2017, the only producer of strong nitric acid in the United States also produces weak nitric acid and already reports to Subpart V. Initial year costs apply to new facilities, therefore these costs are zero in the tables below.

There are three options for determining GHG emissions under Subpart V. The annual performance test option at §98.224(a)(1) requires an annual performance test to determine the N_2O emission factor, which is then used to calculate N_2O emissions, using the total annual nitric acid production rate, broken into two sets of costs. One set of costs are for facilities that do not have N_2O abatement technologies and the other set of costs are for facilities that have N_2O abatement technologies. The alternative monitoring method option at §98.223(b) allows the facility to use existing monitoring equipment (such as continuous monitoring of N_2O emissions) to determine total N_2O emissions. Of the 32 facilities reporting in RY2017, 29 use the annual performance test option (14 with abatement and 15 without abatement) and three use the alternative monitoring method option. Most facilities in Subpart V have 1 or 2 nitric acid trains per facility, with an average of 1.63 nitric acid trains per facility used for cost calculations.

Labor Costs for Subpart V - Annual Performance Test Option (without Abatement)

Table V-1a below includes the labor hours for each of the 15 facilities using the annual performance test option (without abatement) to determine emissions under Subpart V. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. In addition, labor costs include planning hours related to the required annual performance test: preparing for equipment shutdown prior to testing, contacting the test company, setting up the testing, attending the performance test, etc. Recordkeeping and reporting hours for Subpart V are based on the "low bin" designation, as discussed in the Cost Appendix Introduction. Unlike most subparts, QA/QC hours are not expected because the annual performance test (and related QA/QC) is performed by a contractor; as such both costs are represented as O&M costs (see Table V-2a below) rather than labor costs.

Sampling and analysis costs for the annual performance test option (without abatement) include time to calculate the N_2O emission factor (according to Equation V-1) using the information gathered during the performance test and to calculate total N_2O emissions from the nitric acid trains.

Table V-1a. Labor Costs – Subpart V – Annual Performance Test Option (without Abatement)

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	1.0	0.0	2.0	0.0	19.5	0.0	1.0	$0	$1,711
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0.0	0.0	0.0	0.5	0.0	2.0	0.0	0.5	$0	$205
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.3	0.0	3.3	0.0	0.2	$0	$267
Reporting	0.0	0.0	0.0	1.0	0.0	4.0	0.0	1.0	$0	$410
Total	**0.0**	**1.0**	**0.0**	**3.8**	**0.0**	**28.8**	**0.0**	**2.6**	**$0**	**$2,592**

Capital and O&M Costs for Subpart V -Annual Performance Test Option (without Abatement)

Table V-2a below includes the capital and O&M costs for each of the 15 facilities using the annual performance test option (without abatement) to comply with Subpart V. Typical costs related to equipment, recordkeeping, travel, and sampling costs are discussed in the Cost Appendix Introduction.

In addition, each of these facilities will incur $5,437 per year for performance testing per nitric acid train. Each facility has an average of 1.63 trains, for a total of $8,835 per facility. The cost estimate is based on a comment letter from Dow Chemical Company, dated June 9, 2009. Comment letter EPA-HQ-OAR-2008-0508-0533 stated that for Subpart V, the "cost to perform the tests would be $5,000 per test" (page 21 of 37). The costs from 2009 have been scaled up to 2017 dollars.

Table V-2a. Capital and O&M Costs – Subpart V – Annual Performance Test Option (without Abatement)

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	$0		$0	$8,835	$0	$8,835
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$8,835**	**$0**	**$8,885**

Labor Costs for Subpart V–- Annual Performance Test Option (with Abatement)

Table V-1b below includes the labor hours for each of the 14 facilities using the annual performance test option (with abatement) to determine GHG emissions under Subpart V. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. In addition, Subpart V includes planning hours related to the required annual performance test: preparing for equipment shutdown prior to testing, contacting the test company, setting up the testing, attending the performance test, etc. Recordkeeping and reporting hours for Subpart V are based on the "low bin" designation, as explained in the Cost Appendix Introduction. Unlike most subparts, Subpart V is not expected to have QA/QC hours because the annual performance test is performed by a contractor and these costs are represented as O&M costs (see Table V-2b below) rather than labor costs.

For Subpart V, sampling and analysis costs for the annual performance test option (with abatement) include time to calculate the N_2O emission factor (according to Equation V-1) using the information gathered during the performance test, to determine the abatement utilization factor for each abatement device, and to calculate total N_2O emissions from the nitric acid trains. All Subpart V facilities using the annual performance test option (with abatement) have one abatement device.

Table V-1b. Labor Costs – Subpart V – Annual Performance Test Option (with Abatement)

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	1.0	0.0	2.0	0.0	19.5	0.0	1.0	$0	$1,711
QA/QC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	$0	$0
Recordkeeping	0.0	0.0	0.0	0.5	0.0	2.0	0.0	0.5	$0	$205
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.5	0.0	4.9	0.0	0.2	$0	$400
Reporting	0.0	0.0	0.0	1.0	0.0	4.0	0.0	1.0	$0	$410
Total	**0.0**	**1.0**	**0.0**	**3.9**	**0.0**	**30.4**	**0.0**	**2.7**	**$0**	**$2,725**

Capital and O&M Costs for Subpart V – Annual Performance Test Option (with Abatement)

Table V-2b below includes the capital and O&M costs for each of the 14 facilities using the annual performance test option (with abatement) to determine GHG emissions under Subpart V. Typical costs related to equipment, recordkeeping, travel, and sampling costs are discussed in the Cost Appendix Introduction.

In addition, each of these facilities will incur $5,437 per year for performance testing per nitric acid train. Each facility has an average of 1.63 trains, for a total of $8,835 per facility. The cost estimate is based on a comment letter from Dow Chemical Company, dated June 9, 2009. Comment letter EPA-HQ-OAR-2008-0508-0533 stated that for Subpart V, the "cost to perform the tests would be $5,000 per test" (page 21 of 37). The costs from 2009 have been scaled up to 2017 dollars.

Table V-2b. Capital and O&M Costs – Subpart V – Annual Performance Test Option (with Abatement)

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/ year)	O&M Costs (2017$/ year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	$0		$0	$8,835	$0	$8,835
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$8,835**	**$0**	**$8,885**

Labor Costs for Subpart V – Alternative Monitoring Method Option

Table V-1c below includes the labor hours for each of the three facilities using the alternative monitoring method option to determine GHG emissions under Subpart V. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours for Subpart V are based on the "low bin" designation, as explained in the Cost Appendix Introduction. For the alterative monitoring method option, Subpart V is expected to have QA/QC hours related to maintaining the equipment used to comply with the alternative monitoring method option, along with review of all measurements and calculations used to determine emissions. Sampling and analysis costs include time to calculate the total N_2O emissions using the alternative monitoring procedures already in place.

Table V-1c. Labor Costs – Subpart V –Alternative Monitoring Method Option

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	1.0	0.0	0.3	0.0	3.3	0.0	0.2	$0	$379
QA/QC	0.0	0.0	0.0	0.8	0.0	8.1	0.0	0.4	$0	$666
Recordkeeping	0.0	0.0	0.0	0.5	0.0	2.0	0.0	0.5	$0	$205
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.2	0.0	1.6	0.0	0.1	$0	$133
Reporting	0.0	0.0	0.0	1.0	0.0	4.0	0.0	1.0	$0	$410
Total	**0.0**	**1.0**	**0.0**	**2.8**	**0.0**	**19.0**	**0.0**	**2.2**	**$0**	**$1,793**

Capital and O&M Costs for Subpart V – Alternative Monitoring Method Option

Table V-2c below includes the capital and O&M costs for each of the three facilities using the alternative monitoring method option to comply with Subpart V. The costs related to recordkeeping are detailed in the Cost Appendix Introduction. The alternative monitoring method option allows the facility to use existing monitoring equipment to determine total N_2O emissions; therefore, there are no equipment costs attributed to the GHGRP in Table V-2c.

Table V-2c. Capital and O&M Costs – Subpart V – Alternative Monitoring Method Option

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart V

The total industry costs related to Subpart V are approximately $340,000 per year for a total of approximately $1,021,000 over the three-year period of the ICR. 32 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart W – Petroleum and Natural Gas Systems

Description of Subpart W

Appendix E to the Supporting Statement contains the burden and costs for Subpart W, including the detailed labor assumptions used for each activity required for each industry segment in Subpart W. For purposes of the GHGRP, the petroleum and natural gas systems source category consists of the following industry segments (as defined in §98.230):

- **Offshore Petroleum and Natural Gas Production**: Any platform structure, affixed temporarily or permanently to offshore submerged lands, that houses equipment to extract hydrocarbons from the ocean or lake floor and that processes and/or transfers such hydrocarbons to storage, transport vessels, or onshore. Based on RY2017, there are 141 reporters in this industry segment.
- **Onshore Petroleum and Natural Gas Production**: All equipment on a single well-pad or associated with a single well-pad used in the production, extraction, recovery, lifting, stabilization, separation or treating of petroleum and/or natural gas (including condensate). Based on RY2017, there are 497 reporters in this industry segment.
- **Onshore Natural Gas Processing**: Processing of field-quality gas to produce pipeline-quality natural gas, processing plants that fractionate gas liquids, and processing plants that do not fractionate gas liquids but have an annual average throughput of 25 MMscf per day or greater. Based on RY2017, there are 449 reporters in this industry segment.
- **Onshore Natural Gas Transmission Compression**: Compressor stations used to transfer natural gas through transmission pipelines. Based on RY2017, there are 532 reporters in this industry segment.
- **Underground Natural Gas Storage**: Reporters that store natural gas in underground formations. Based on RY2017, there are 48 reporters in this industry segment.
- **Liquefied Natural Gas (LNG) Storage**: Onshore LNG storage vessels located above ground, equipment for liquefying natural gas, compressors to capture and re-liquefy boil-off-gas, re-condensers, and vaporization units for re-gasification of the liquefied natural gas. Based on RY2017, there are 6 reporters in this industry segment.
- **LNG Import/Export**: All onshore or offshore equipment that receives imported LNG via ocean transport, stores LNG, re-gasifies LNG, and delivers re-gasified natural gas to a natural gas transmission or distribution system. Based on RY2017, there are 6 reporters in this industry segment.
- **Natural Gas Distribution**: Distribution systems that deliver natural gas to customers. Based on RY2017, there are 169 reporters in this industry segment.
- **Onshore Petroleum and Natural Gas Gathering and Boosting (new for RY2016)**: Gathering pipelines and other equipment used to collect petroleum/natural gas from onshore production gas or oil wells and used to compress, dehydrate, sweeten, or transport the petroleum/natural gas. Based on RY2017, there are 321 reporters in this industry segment.
- **Onshore Natural Gas Transmission Pipeline (new for RY2016)**: All natural gas transmission pipelines as defined in §98.238 (a rate-regulated interstate or intrastate pipeline, or a pipeline that falls under the "Hinshaw Exemption" of the Natural Gas Act). Based on RY2017, there are 33 reporters in this industry segment.

For all industry segments within Subpart W except for Offshore Petroleum and Natural Gas Production, labor hours related to recordkeeping and reporting are based on the “high bin” designation, as discussed in the Cost Appendix Introduction. Subpart W has higher labor rates than other subparts because oil and

gas companies typically pay higher than average salaries. Those labor categories are represented in all tables in this chapter as Lawyer, Middle Manager, Senior Manager, Engineer, and Technician.

For the Offshore Petroleum and Natural Gas Production industry segment, the same labor rates will be used but it is expected that reporters will use one half of the time allotted for recordkeeping and reporting by the "high bin" designation. Reporters in the Offshore Petroleum and Natural Gas Production industry segment submit information that is already submitted through other programs; therefore, EPA estimates that less time will be needed to report Subpart W data than for Subpart W reporters in other industry segments. While the information is already gathered for other programs, time will be needed by reporters in the Offshore Petroleum and Natural Gas Production industry segment to separate the Subpart W specific data from the data reported to other programs and to aggregate any necessary information specifically for Subpart W reporting.

Subpart W contains specific definitions of "facility" depending on the industry segment. To avoid confusion, the Subpart W chapter of this Cost Appendix refers to each entity with an e-GGRT ID as a "reporter" whereas other chapters of this Cost Appendix use the term "facility."

Many of the industry segments in the oil and gas source category are expected to have a few new reporters in 2019 through 2021. However, it is difficult to develop a realistic estimate of the number of new reporters due to unpredictable market conditions and considerable merger and acquisition activity. Since 2014, the number of new reporters per year has been approximately balanced by the number of reporters exiting the program per the provisions in §98.2(i). Therefore, the total number of reporters has remained relatively stable (excluding the addition of two new industry segments in RY2016) and we expect that the count of reporters in RY2017 provides a reasonable estimate of the number of reporters during the three year period covered by this ICR. Initial year costs apply only to new reporters; therefore, those costs are zero in all tables below.

Labor Costs for Subpart W – Offshore Petroleum and Natural Gas Production

Table W-1a below includes the labor hours for each of the 141 existing reporters in the Offshore Petroleum and Natural Gas Production industry segment to comply with Subpart W according to §98.232(b). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction.

For this industry segment, labor hours are only related to planning activities and recordkeeping and reporting.

Capital and O&M Costs for Subpart W – Offshore Petroleum and Natural Gas Production

Table W-2a below includes the capital and O&M costs for each of the 141 reporters in the Offshore Petroleum and Natural Gas Production industry segment to comply with Subpart W according to §98.232(b). O&M costs related to recordkeeping are discussed in the Cost Appendix Introduction.

Table W-1a. Labor Costs – Subpart W – Offshore Petroleum and Natural Gas Production

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.3	0.0	0.6	0.0	6.0	0.0	0.0	$0	$877
QA/QC	–	–	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	6.5	0.0	1.0	$0	$758
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–	–	–
Reporting	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Total	**0.0**	**2.0**	**0.0**	**0.3**	**0.0**	**2.6**	**0.0**	**25.5**	**0.0**	**2.0**	**$0**	**$2,985**

Table W-2a. Capital and O&M Costs – Subpart W – Offshore Petroleum and Natural Gas Production

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–	–	–	–	–	–
Performance testing	–	–	–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Labor Costs for Subpart W – Onshore Petroleum and Natural Gas Production

Table W-1b below includes the labor hours for each of the 497 existing reporters in the Onshore Petroleum and Natural Gas Production industry segment to comply with Subpart W according to §98.232(c). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(c).

Capital and O&M Costs for Subpart W – Onshore Petroleum and Natural Gas Production

Table W-2b below includes the capital and O&M costs for each of the 497 reporters in the Onshore Petroleum and Natural Gas Production industry segment to comply with Subpart W §98.232(c). Typical costs related to performance testing, recordkeeping, travel, and sampling are discussed in the Cost Appendix Introduction.

Although there are expected to be equipment costs for the purchase of portable flow meters to determine emissions from oil well completions and workovers with hydraulic fracturing, these costs are shown as zero in Table W-2b. As discussed in the Cost Appendix Introduction, new tax law (Tax Cuts and Jobs Act, Pub. L. No. 115–97 (2017)), makes it beneficial for Subpart W reporters to pay off any remaining annualized capital expenditures prior to RY2019. Therefore, those costs are not included in Table W-2b.

Table W-1b. Labor Costs – Subpart W – Onshore Petroleum and Natural Gas Production

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	10.1	0.0	20.2	0.0	0.0	0.0	0.0	$0	$3,571
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	202.4	0.0	9.1	$0	$18,980
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**10.6**	**0.0**	**24.3**	**0.0**	**251.4**	**0.0**	**12.1**	**$0**	**$27,912**

Table W-2b. Capital and O&M Costs – Subpart W - Onshore Petroleum and Natural Gas Production

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$115	$0	$115
Performance testing	–	–	–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	**$0**		**$0**	**$165**	**$0**	**$165**

Labor Costs for Subpart W – Onshore Natural Gas Processing

Table W-1c below includes the labor hours for each of the 449 existing reporters in the Onshore Natural Gas Processing industry segment to comply with Subpart W according to §98.232(d). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(d).

Capital and O&M Costs for Subpart W – Onshore Natural Gas Processing

Table W-2c below includes the capital and O&M costs for each of the 449 reporters in the Onshore Natural Gas Processing industry segment to comply with Subpart W. Typical costs related to performance testing, recordkeeping, and travel are discussed in the Cost Appendix Introduction.

Equipment costs for this industry segment are related to the purchase of simulation software needed to model emissions from acid gas removal units and storage tanks. Due to the low cost of this software license (less than $200 per year), the costs were classified as O&M costs rather than capital costs; reporters are not expected to classify such a small annual cost as a capital expenditure, which would also accrue interest payments over time. Sampling costs for this industry segment are related to the use of EPA Method 21 to conduct equipment leak surveys; the hiring of contractors to conduct leak measurements for reciprocating and centrifugal compressors; and analyzing quarterly gas samples for acid gas removal units.

Table W-1c. Labor Costs – Subpart W – Onshore Natural Gas Processing

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.5	0.0	0.9	0.0	0.0	0.0	0.0	$0	$162
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.2	0.0	0.1	$0	$844
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**1.0**	**0.0**	**4.9**	**0.0**	**58.2**	**0.0**	**3.1**	**$0**	**$6,386**

Table W-2c. Capital and O&M Costs – Subpart W – Onshore Natural Gas Processing

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$113	$0	$113
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$21,228	$0	$21,228
Total	**$0**		**$0**	**$21,391**	**$0**	**$21,391**

Labor Costs for Subpart W – Onshore Natural Gas Transmission Compression

Table W-1d below includes the labor hours for each of the 532 existing reporters in the Onshore Natural Gas Transmission Compression industry segment to comply with Subpart W according to §98.232(e). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(e).

Capital and O&M Costs for Subpart W – Onshore Natural Gas Transmission Compression

Table W-2d below includes the capital and O&M costs for each of the 532 reporters in the Onshore Natural Gas Transmission Compression industry segment to comply with Subpart W. Typical costs related to equipment, performance testing, recordkeeping, and travel are discussed in the Cost Appendix Introduction.

Sampling costs for this industry segment are related to the use of EPA Method 21 to conduct equipment leak surveys; the hiring of contractors to conduct leak measurements for reciprocating and centrifugal compressors; and determining emissions from transmission storage tanks.

Table W-1d. Labor Costs – Subpart W – Onshore Natural Gas Transmission Compression

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.5	0.0	1.0	0.0	0.0	0.0	0.0	$0	$170
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	$0	$879
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**1.0**	**0.0**	**5.0**	**0.0**	**58.6**	**0.0**	**3.0**	**$0**	**$6,411**

Table W-2d. Capital and O&M Costs – Subpart W – Onshore Natural Gas Transmission Compression

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$14,699	$0	$14,699
Total	**$0**		**$0**	**$14,749**	**$0**	**$14,749**

Labor Costs for Subpart W – Underground Natural Gas Storage

Table W-1e below includes the labor hours for each of the 48 existing reporters in the Underground Natural Gas Storage industry segment to comply with Subpart W according to §98.232(f). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(f).

Capital and O&M Costs for Subpart W – Underground Natural Gas Storage

Table W-2e below includes the capital and O&M costs for each of the 48 reporters in the Underground Natural Gas Storage industry segment to comply with Subpart W. Typical costs related to equipment, performance testing, recordkeeping, and travel are discussed in the Cost Appendix Introduction.

Sampling costs for this industry segment are related to the use of EPA Method 21 to conduct equipment leak surveys, and the hiring of contractors to conduct leak measurements for reciprocating and centrifugal compressors.

Table W-1e. Labor Costs – Subpart W – Underground Natural Gas Storage

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.0	0.0	$0	$104
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.4	$0	$563
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**0.8**	**0.0**	**4.6**	**0.0**	**54.9**	**0.0**	**3.4**	**$0**	**$6,029**

Table W-2e. Capital and O&M Costs –Subpart W – Underground Natural Gas Storage

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$0	$0	$0
Performance testing	$0		$0	$0	$0	$0
Recordkeeping	$0		$0	$50	$0	$50
Travel	$0		$0	$0	$0	$0
Sampling and Analysis Costs	$0		$0	$27,572	$0	$27,572
Total	**$0**		**$0**	**$27,622**	**$0**	**$27,622**

Labor Costs for Subpart W – LNG Storage

Table W-1f below includes the labor hours for each of the 6 existing reporters in the LNG Storage industry segment to comply with Subpart W according to §98.232(g). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(g).

Capital and O&M Costs for Subpart W – LNG Storage

Table W-2f below includes the capital and O&M costs for each of the 6 reporters in the LNG Storage industry segment to comply with Subpart W. Typical costs related to equipment, performance testing, recordkeeping, and travel are discussed in the Cost Appendix Introduction.

Sampling costs for this industry segment are related to the use of EPA Method 21 to conduct equipment leak surveys, and the hiring of contractors to conduct leak measurements for reciprocating and centrifugal compressors.

Table W-1f. Labor Costs – Subpart W –LNG Storage

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	021	0.0	0.4	0.0	0.0	0.0	0.0	$0	$75
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.4	$0	$412
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**0.7**	**0.0**	**4.4**	**0.0**	**53.3**	**0.0**	**3.4**	**$0**	**$5,849**

Table W-2f. Capital and O&M Costs – Subpart W – LNG Storage

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$5,478	$0	$5,478
Total	**$0**		**$0**	**$5,528**	**$0**	**$5,528**

Labor Costs for Subpart W – LNG Import and Export Equipment

Table W-1g below includes the labor hours for each of the 6 existing reporters in the LNG Import and Export Equipment industry segment to comply with Subpart W according to §98.232(h). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(h).

Capital and O&M Costs for Subpart W – LNG Import and Export Equipment

Table W-2g below includes the capital and O&M costs for each of the 6 reporters in the LNG Import and Export industry segment to comply with Subpart W. Typical costs related to equipment, performance testing, recordkeeping, and travel are discussed in the Cost Appendix Introduction.

Sampling costs for this industry segment are related to the use of EPA Method 21 to conduct equipment leak surveys, and the hiring of contractors to conduct leak measurements for reciprocating and centrifugal compressors.

Table W-1g. Labor Costs – Subpart W –LNG Import and Export Equipment

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.4	0.0	0.7	0.0	0.0	0.0	0.0	$0	$124
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.5	$0	$666
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**0.9**	**0.0**	**4.7**	**0.0**	**56.0**	**0.0**	**3.5**	**$0**	**$6,152**

Table W-2g. Capital and O&M Costs – Subpart W –LNG Import and Export Equipment

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$19,525	$0	$19,525
Total	**$0**		**$0**	**$19,575**	**$0**	**$19,575**

Labor Costs for Subpart W–- Natural Gas Distribution

Table W-1h below includes the labor hours for each of the 169 existing reporters in the Natural Gas Distribution industry segment to comply with Subpart W according to §98.232(i). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(i).

Capital and O&M Costs for Subpart W – Natural Gas Distribution

Table W-2h below includes the capital and O&M costs for each of the 169 reporters in the Natural Gas Distribution industry segment to comply with Subpart W. Typical costs related to equipment, performance testing, recordkeeping, and travel are discussed in the Cost Appendix Introduction.

Sampling costs for this industry segment are related to the use of EPA Method 21 to conduct equipment leak surveys.

Table W-1h. Labor Costs – Subpart W – Natural Gas Distribution

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.3	0.0	0.6	0.0	0.0	0.0	0.0	$0	$106
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.4	$0	$573
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**0.8**	**0.0**	**4.6**	**0.0**	**55.0**	**0.0**	**3.4**	**$0**	**$6,041**

Table W-2h. Capital and O&M Costs – Subpart W – Natural Gas Distribution

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$6,365	$0	$6,365
Total	**$0**		**$0**	**$6,415**	**$0**	**$6,415**

Labor Costs for Subpart W – Onshore Petroleum and Natural Gas Gathering and Boosting

Table W-1i below includes the labor hours for each of the 321 existing reporters in the Onshore Petroleum and Natural Gas Gathering and Boosting industry segment to comply with Subpart W according to §98.232(j). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(j).

Capital and O&M Costs for Subpart W – Onshore Petroleum and Natural Gas Gathering and Boosting

Table W-2i below includes the capital and O&M costs for each of the 321 reporters in the Onshore Petroleum and Natural Gas Gathering and Boosting industry segment to comply with Subpart W. Typical costs related to performance testing, recordkeeping, travel, and sampling are discussed in the Cost Appendix Introduction.

Equipment costs for this industry segment are related to the purchase of simulation software needed to model emissions from acid gas removal units and storage tanks. Due to the low cost of this software license (less than $200 per year), the costs were classified as O&M costs rather than capital costs; reporters are not expected to classify such a small annual cost as a capital expenditure, which would also accrue interest payments over time.

Table W-1i. Labor Costs – Subpart W – Onshore Petroleum and Natural Gas Gathering and Boosting

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	1.7	0.0	3.3	0.0	0.0	0.0	0.0	$0	$586
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.2	0.0	1.7	$0	$3,131
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**2.2**	**0.0**	**7.3**	**0.0**	**82.2**	**0.0**	**4.7**	**$0**	**$9,079**

Table W-2i. Capital and O&M Costs – Subpart W – Onshore Petroleum and Natural Gas Gathering and Boosting

Activity	Cost Categories				Total Capital and O&M Cost per Year per Reporter (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$134	$0	$134
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$184**	**$0**	**$184**

Labor Costs for Subpart W – Natural Gas Transmission Pipeline

Table W-1j below includes the labor hours for each of the 33 existing reporters in the Natural Gas Transmission Pipeline industry segment to comply with Subpart W according to §98.232(k). Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emission calculations) are discussed in the Cost Appendix Introduction. Calculations required for this industry segment are detailed in §98.233, based on the emission sources listed in §98.232(k).

Capital and O&M Costs for Subpart W – Natural Gas Transmission Pipeline

Table W-2j below includes the capital and O&M costs for each of the 33 reporters in the Natural Gas Transmission Pipeline industry segment to comply with Subpart W. The O&M costs related to recordkeeping are discussed in the Cost Appendix Introduction.

Table W-1j. Labor Costs – Subpart W – Natural Gas Transmission Pipeline

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.0	$0	$71
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	$0	$364
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**0.7**	**0.0**	**4.4**	**0.0**	**53.0**	**0.0**	**3.0**	**$0**	**$5,797**

Table W-1j. Labor Costs – Subpart W – Natural Gas Transmission Pipeline

Activity	Labor Rates (per hour)										Total Labor Cost per Year per Reporter (2017$)	
	Lawyer		Senior Manager		Middle Manager		Engineer		Technician			
	$112.23		$141.54		$105.68		$91.06		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0.0	2.0	0.0	0.5	0.0	1.0	0.0	10.0	0.0	0.0	$0	$1,312
QA/QC	0.0	0.0	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.0	$0	$71
Recordkeeping	0.0	0.0	0.0	0.0	0.0	1.0	0.0	13.0	0.0	1.0	$0	$1,350
Sampling and Analysis (Calculations)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	$0	$364
Reporting	0.0	0.0	0.0	0.0	0.0	2.0	0.0	26.0	0.0	2.0	$0	$2,700
Total	**0.0**	**2.0**	**0.0**	**0.7**	**0.0**	**4.4**	**0.0**	**53.0**	**0.0**	**3.0**	**$0**	**$5,797**

Total Costs for Subpart W

The total industry costs related to Subpart W average approximately $45,212,000 per year with a total of $135,637,000 over the three-year period of the ICR. Approximately 2,200 reporters are expected to report in 2019, 2020, and 2021. For more details on the annual cost estimates, please see Appendix E to the Supporting Statement.

Cost Appendix for Subpart X – Petrochemical Production

Description of Subpart X

For purposes of the GHGRP, the petrochemical production source category consists of all processes that produce acrylonitrile, carbon black, ethylene, ethylene dichloride, ethylene oxide, or methanol. The source category includes processes that produce the petrochemical as an intermediate in the onsite production of other chemicals, as well as processes that produce the petrochemical as an end product for sale or shipment off site.

For RY2017, 69 facilities included Subpart X in their annual reports. The number of facilities making each type of petrochemical has been relatively stable from 2010 to 2017, except for methanol, which has increased from 2 facilities in 2010 to 7 facilities in 2017 and is expected to continue increasing in the next few years due to the increased production of natural gas, which is the primary feedstock for methanol production. Additionally, several ethylene production facilities have been increasing capacity in recent years, one new production facility started operations in 2017, and company announcements and industry analyses indicate that several other new facilities are expecting to start operations in the next few years. Thus, it is anticipated that 3 new methanol production facilities and 3 new ethylene production facilities will report to Subpart X during the three-year period covered by the ICR (i.e., one new methanol facility and one new ethylene facility each year of the 3 years).

The number of facilities making each type of petrochemical are as follows (note that the sum of these counts per type of petrochemical exceeds the total number of reporting facilities because some facilities make more than one type of petrochemical):

- Acrylonitrile production: 4
- Carbon black production: 16
- Ethylene: 28
- Ethylene dichloride: 13
- Ethylene oxide: 10
- Methanol: 7

Subpart X provides 3 types of calculation methodologies:

- Optional combustion methodology (§98.243(d)) – Most ethylene production facilities (25) used this methodology in RY2017. For these facilities, emissions from combustion units that burn vented off-gases from the ethylene production processes are calculated using Subpart C procedures and are reported under Subpart C rather than Subpart X. The only emissions from these processes that are reported under Subpart X are emissions from flares. Although emissions from stationary combustion units that burn ethylene process off-gas as fuel are reported under Subpart C, the costs for these units are attributed to Subpart X because Subpart X specifies this reporting procedure, and the bulk of the fuel burned in the combustion units is off-gas from the ethylene processes.
- CEMS methodology (§98.243(b)) — 2 ethylene dichloride production facilities and 1 ethylene production facility used this methodology in RY2017.
- Mass balance methodology (§98.243(c)) — A total of 47 facilities used this methodology for at least one type of petrochemical in RY2017.

The costs presented in this appendix are per methodology per facility. Thus, the total costs attributed to Subpart X are equal to the sum of the number of facilities using the optional combustion methodology times the annual cost for the optional combustion methodology plus the number of facilities using the

CEMS methodology times the annual cost for the CEMS methodology plus the number of facilities using the mass balance methodology times the annual cost for the mass balance methodology. Most petrochemical production facilities use only a single methodology, regardless of the number of types of petrochemical products produced. But a few facilities use different methodologies for different petrochemical products. For example, some facilities use the optional combustion methodology for ethylene production and the mass balance methodology for ethylene oxide and/or ethylene dichloride production. The cost for such a facility is equal to the sum of the annual cost for the optional combustion methodology plus the annual cost for the mass balance methodology.

Labor Costs for Subpart X – Optional Combustion Methodology (§98.243(d))

Table X-1a summarizes the expected labor costs using the optional combustion methodology for Subpart X. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "high bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.243, including calculation of emissions, feedstocks and products quantities, and other process data. These sampling and analysis hours also include the labor hours required to collect and prepare the sample shipments at facilities that conduct weekly sampling and analysis of fuel gas (i.e., ethylene process off-gas burned in stationary combustion units) for carbon content determinations. In RY2017, 46 percent of facilities using the optional combustion methodology reported weekly sampling and analysis. The remaining facilities reported using daily or hourly sampling. No labor costs are estimated for hourly or daily sampling because such sampling is expected to be done automatically via continuous, on-line equipment. It is anticipated that 3 new ethylene production facilities will report to Subpart X using the optional combustion methodology during the 3-year period covered by the ICR (one facility per year). New facilities in their initial year of reporting will incur additional planning time to familiarize themselves with the rule and to establish standard operating procedures. Initial year labor costs also include time for setup of compliance activities. Existing facilities are expected to already have required monitoring equipment and will only need to do annual QA/QC.

Table X-1a. Labor Costs – Subpart X – Optional Combustion Methodology (§98.243(d))

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	16	2	1	0	18	6	2	1	$3,226	$701
QA/QC	0	0	3	1	50	17	5	2	$4,004	$1,335
Recordkeeping	0	0	1	1	13	13	1	1	$1,053	$1,053
Sampling and Analysis (Calculations)	0	0	15	5	307	102	31	10	$24,407	$8,136
Reporting	0	0	2	2	26	26	2	2	$2,105	$2,105
Total	**16**	**2**	**22**	**9**	**415**	**164**	**41**	**16**	**$34,795**	**$13,329**

Capital and O&M Costs for Subpart X – Optional Combustion Methodology §98.243(d)(1)

The optional combustion methodology in Subpart X requires use of measurement methods for stationary combustion units and flares that are already in use at the facility and provide simpler, default methods when measurement data are not available (e.g., for flare gas flow). We expect existing facilities will either already have all equipment needed to comply with the rule, or that they will contract for analytical services. Similarly, for new facilities, we expect that either the monitoring equipment needed for process control and other regulatory compliance purposes would meet the requirements for monitoring equipment in Subpart X, or the facility will contract for analytical services. Thus, no additional capital costs will be incurred by either existing or new facilities to comply with this methodology.

Table X-2a summarizes the O&M costs for the optional combustion methodology in §98.243(d)(1). These costs consist of the fee charged by an offsite lab to conduct carbon content analyses, the cost to ship the collected samples to the lab, and costs to store records of the carbon content values and other monitoring data. As discussed for labor costs above, facilities may conduct hourly, daily, or weekly sampling. Carbon content analyses at an offsite lab are required only for the 46 percent of facilities that conduct weekly sampling because no lab analyses are required when hourly and daily sampling is conducted automatically via continuous, on-line equipment. Based on analytical price lists, we estimated that costs of shipping and analyzing a gaseous fuel sample for carbon content would be $195[6]. The average annual cost per facility is estimated by using the $195 per week analytical price times 52 weeks per year times 46 percent (i.e., the percentage of facilities reporting weekly sampling under the §98.243(d)(1) methodology). All facilities using the optional combustion methodology are expected to incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction.

Table X-2a. Capital and O&M Costs – Subpart X – Optional Combustion Methodology §98.243(d)(1)

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$4,660	$4,660	$4,660
Total	**$0**		**$0**	**$4,710**	**$4,710**	**$4,710**

[6] Cost of gas chromatography analysis per sample is estimated to be $155 plus $40 shipping and handling (Wyoming Analytical Laboratories, Inc. Analytical Services Fee Schedule. July 29, 2016).

Labor Costs for Subpart X – CEMS (§98.243(b)) Methodology

Table X-1b summarizes the expected labor costs using the CEMS methodology for Subpart X. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "high bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.243, including emissions, feedstock and product quantities, and other process data. No new facilities are expected to use CEMS to report under Subpart X during the three-year period covered by this ICR. Existing facilities are expected to have required monitoring equipment and will only need to do annual QA/QC. Costs are provided on a per facility basis.

Table X-1b. Labor Costs –Subpart X - CEMS (§98.243(b)) Methodology

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0	0	6	0	1	$0	$701
QA/QC	0	0	0	1	0	13	0	1	$0	$1,057
Recordkeeping	0	0	0	1	0	13	0	1	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	0	0	3	0	0	$0	$262
Reporting	0	0	0	2	0	26	0	2	$0	$2,105
Total	**0**	**2**	**0**	**4**	**0**	**62**	**0**	**5**	**$0**	**$5,178**

Labor Costs for Subpart X – Mass balance (§98.243(c)) Methodology

Table X-1c summarizes the expected labor costs using the mass balance methodology for Subpart X. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "high bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.243, including calculation of emissions, feedstocks and products quantities, and other process data. 3 new methanol facilities are expected to report to Subpart X during the 3-year period covered by the ICR (one facility per year) and each of these is anticipated to use the mass balance methodology. New facilities in their initial year of reporting will incur additional planning time to familiarize themselves with the rule and to establish standard operating procedures. Initial year labor costs also include time for setup of compliance activities. Existing facilities are expected to have required monitoring equipment and will only need to do annual QA/QC. Costs are provided on a per facility basis.

Table X-1c. Labor Costs –Subpart X - Mass balance (§98.243(c)) Methodology

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	16	2	1	0	18	6	2	1	$3,226	$701
QA/QC	0	0	5	2	105	35	10	3	$8,318	$2,773
Recordkeeping	0	0	1	1	13	13	1	1	$1,053	$1,053
Sampling and Analysis (Calculations)	0	0	6	2	120	40	12	4	$9,510	$3,170
Reporting	0	0	2	2	26	26	2	2	$2,105	$2,105
Total	**16**	**2**	**15**	**7**	**281**	**120**	**27**	**11**	**$24,212**	**$9,802**

Capital and O&M Costs for Subpart X – CEMS (§98.243(b)) or Mass Balance (§98.243(c)) Methodologies

The CEMS or Mass Balance calculation methodologies in Subpart X require use of measurement methods or default methods when measurement data are not available. Existing facilities are expected to already have all equipment needed to comply with the rule. For new facilities using the mass balance method, it is expected that the monitoring equipment needed for process control and other regulatory compliance purposes will meet the requirements for monitoring equipment in Subpart X, such that no additional capital costs would be incurred.

Table X-2b is a summary of the anticipated O&M costs for Subpart X facilities that use the CEMS or Mass Balance methodologies. Facilities will incur O&M costs associated with recordkeeping as discussed in the Cost Appendix Introduction. Note that there are no new sources expected to use the CEMS methodology so initial year costs apply only to the one new facility expected to use the Mass Balance methodology.

Table X-2b. Capital and O&M Costs—Subpart X – CEMS (§98.243(b)) or Mass Balance (§98.243(c)) Methodologies

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$50**	**$50**

Total Costs for Subpart X

The total industry costs related to Subpart X average approximately $958,000 per year for existing sources and approximately $64,000 per year for new sources, for a total of approximately $1,021,000 per year and a total of approximately $3,064,000 over the three-year period of the ICR. Total costs are based on 3 facilities using the CEMS methodology (§98.243(b)), 48 facilities using the mass balance methodology (§98.243(c)), and 26 facilities using the optional combustion methodology (§98.243(d)) in 2019; 3 CEMS facilities, 49 mass balance facilities, and 27 optional combustion facilities in 2020; and 3 CEMS facilities, 50 mass balance facilities, and 28 optional combustion facilities in 2021. These totals include 2 new facilities per year (1 methanol production facility using the mass balance methodology and 1 ethylene production facility using the optional combustion methodology).

Cost Appendix for Subpart Y – Petroleum Refineries

Description of Subpart Y

For purposes of the GHGRP, the petroleum refineries source category includes facilities that produce gasoline, gasoline blending stocks, naphtha, kerosene, distillate fuel oils, residual fuel oils, lubricants, or asphalt (bitumen) by the distillation of petroleum or the redistillation, cracking, or reforming of unfinished petroleum derivatives. Facilities that distill only pipeline transmix (off-spec material created when different specification products mix during pipeline transportation) are not petroleum refineries, regardless of the products produced.

Petroleum refineries are energy intensive facilities and rank among the top GHG emitters, both in terms of industry sector totals and in terms of emissions per facility. Stationary fuel combustion is the largest source of GHG emissions at petroleum refineries. These emissions are reported under Subpart C, but Subpart Y includes specific methodology requirements when refinery fuel gas is used. Petroleum refining sources emit GHGs from venting, flares, and fugitive leaks from process equipment components (e.g., valves, flanges, pumps). The primary sources of venting that emit GHG emissions, when present at the refinery, are fluid catalytic cracking units (FCCU), fluid coking units (FCU), catalytic reforming units, sulfur recovery units, delayed coking units, coke calcining units, and asphalt blowing units. Other sources of GHG emissions at refineries include storage tanks, loading operations and blowdown systems.

The number of facilities reporting to Subpart Y has been consistent over the past 5 years, with slight variations from one year to the next but with no specific trend. The number of petroleum refineries reporting emissions for RY2017 was 144. No new facilities are expected to report to Subpart Y during the three-year period covered by this ICR. Initial year costs apply only to new facilities; therefore, those costs are zero in the tables below.

Subpart Y generally requires the use of continuous monitoring systems for key emission sources if they are present. If they are not present, then an alternative methodology or, in the case of FCCU/FCU and flares, a series of methodologies are provided:

For FCCU, there are four potential calculation options: measured using CEMS; calculated using regenerator exhaust CO_2 and carbon monoxide (CO) monitoring with continuous flow monitoring (Equation Y-6 + direct flow); calculated using regenerator exhaust CO_2 and carbon monoxide (CO) and calculated flow rate (Equation Y-6/Y-7a/Y-7b); or, for FCCU with capacities of 10,000 barrels per stream day or less, calculated using annual throughput (Equation Y-8).

Similarly, there are 4 alternative calculation options for flares: gas composition monitoring method (Equations Y-1a or Y-1b); heat content monitoring method (Y-2); or engineering estimate method (Equation Y-3). The gas composition monitoring method and heat content monitoring method are typically used for primary facility flares, while the engineering calculation method is typically used for an emergency only flare.

Other sources, including blowdown emissions, asphalt blowing, and sulfur recovery units have two emissions calculation alternatives; these generally allow for the use of either default emission factor/equation or measurement of the vented emissions (referred to as the “process vent method” using Equation Y-19). Recent amendments to Subpart Y for delayed coking units (DCUs), which are effective starting in RY2018, changed the calculation methodology from a simple gas expansion model to a steam generation model. As explained in the preamble to the final amendments, the use of the steam generation model more accurately reflects the emissions from DCU and provides consistency between the GHGRP’s

Subpart Y requirements and other federal rule requirements for refineries (e.g., 40 CFR part 63 Subpart CC).[7]

Model Plants for Subpart Y

Labor costs for Subpart Y were developed based on model plants. There are three general types of refineries: 1) topping refineries, which typically only have atmospheric and/or vacuum distillation units, but also include asphalt refineries; 2) hydroskimming refineries, which have sulfur removal and catalytic reforming to produce final gasoline products, but no upgrading equipment; and 3) upgrading or "complex" refineries, which have cracking and/or coking units. Topping and hydroskimming units are typically small, with crude capacities under 30,000 barrels per day (bbls/d) capacity, although a few have capacities as high as 85,000 bbls/day. Most refineries in the U.S. are upgrading refineries. These plants are generally larger than topping and hydroskimming refineries, with less than 8 percent of refineries with capacities under 30,000 bbls/d and the largest complex refineries pushing 600,000 bbls/d capacity. A count of facilities by model plant type and size was developed based on the processes and capacities reported in the 2016 Refinery Capacity Report (EIA, 2016)[8]. An appropriate number of sources was then assigned to each model plant and assigned a calculation method for those sources, if applicable, so that the aggregate total counts of sources per calculation methodology matched the counts observed in the RY2017 Subpart Y reports. It should be noted that some model plants have a fractional count of sources, as not all sources are present at every refinery assigned to each model plant. For example, only half of the refineries assigned to the "medium upgrading refinery" model plant category have a DCU, resulting in a unit count of 0.5 DCU per refinery for this model plant.

There are some activities and emission calculations that every refinery will have to complete. For example, all petroleum refineries will have to estimate emissions from storage tanks and fugitive leaks from process equipment components. These calculations are expected to require the same effort regardless of the facility size. Other emission sources may exist only at select refineries. Table Y-1 below shows the name of each model plant, the number of petroleum refinery facilities represented by the model plant, and a matrix of the unique mix of sources at the model plant. Note that the size reference is relative to refineries of that type; a small upgrading refinery may have a capacity similar to that of a "larger" topping refinery.

[7] 2015 Revisions and Confidentiality Determinations for Data Elements Under the Greenhouse Gas Reporting Rule. Federal Register Volume 81 No. 237, p. 89214-89220 (December 9, 2016).
[8] Available at: https://www.eia.gov/petroleum/refinerycapacity/archive/2016/refcap2016.php

Table Y-1. Model Plants – Subpart Y

Model Plant	Labor Hours and Cost Table	No. of Facilities	Flares				SRU			FCCU				Process Vent	Asphalt Blowing Units	DCU	Loading	Coke Calciners		CRU	Other (e.g., Equipment leaks, blowdowns)
			Eqn Y-1a	Eqn Y-1b	Eqn Y-2	Eqn Y-3	Eqn Y-12	Eqn Y-19	CEMS	Eqn Y-8	Eqn Y-6/Y-7a/Y-7b	Eqn Y-6 + Direct Flow	CEMS	Eqn Y-19				Eqn Y-13	CEMS		
Small Topping Refinery	Table Y-2a	11				1															1
Asphalt Refinery	Table Y-2b	9				2									1						1
Larger Topping Refinery	Table Y- 2c	5				3															1
Small Hydroskimming Refinery	Table Y-2d	2				1	1													1	1
Larger Hydroskimming Refinery	Table Y-2e	8				3	1													1	1
Very Small Upgrading Refinery	Table Y-2f	2				1		0.5	0.5	1										1	1
Small Upgrading Refinery	Table Y-2g	40			1	1	1				1			1						1	1
Medium Upgrading Refinery	Table Y-2h	20	2			1	1				1			1		0.5				1	1
Medium Upgrading Refinery with Loading	Table Y-2i	10		1		1	1				1			2		1	27			1.3	1
Large Upgrading Refinery with CEMS	Table Y-2j	26	3			3	3						1	2		1				1	1
Large Upgrading Refinery with Coke Calcining	Table Y-2k	4	3			4	3				1			7.5		4		0.75	0.5	3	1
Very Large Upgrading Refinery	TableY- 2l	7	6			4	5					1		7		2				3	1

Labor Costs for Subpart Y

Tables Y-2a through Y-2l provide the labor hour estimates and labor costs for each model plant.

It is assumed that the existing facilities already have required monitoring equipment and will only need to do annual QA/QC on that monitoring equipment. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations of GHG emissions as required in Section §98.253.

Table Y-2a. Labor Costs – Subpart Y – Small Topping Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.2	0	2	0	0.2	$0	$392
QA/QC	0	0	0	0.4	0	4	0	0.4	$0	$335
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.3	0	3	0	0.3	$0	$251
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**2.4**	**0**	**24**	**0**	**2.4**	**$0**	**$2,236**

Table Y-2b. Labor Costs – Subpart Y – Asphalt Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.2	0	2	0	0.2	$0	$392
QA/QC	0	0	0	0.4	0	4	0	0.4	$0	$335
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.6	0	5.5	0	0.6	$0	$461
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**2.7**	**0**	**26.5**	**0**	**2.7**	**$0**	**$2,446**

Table Y-2c. Labor Costs – Subpart Y – Larger Topping Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.2	0	2	0	0.2	$0	$392
QA/QC	0	0	0	0.4	0	4	0	0.4	$0	$335
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.7	0	7	0	0.7	$0	$587
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**2.8**	**0**	**28**	**0**	**2.8**	**$0**	**$2,572**

Table Y-2d. Labor Costs – Subpart Y – Small Hydroskimming Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.4	0	4	0	0.4	$0	$560
QA/QC	0	0	0	0.4	0	4	0	0.4	$0	$335
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.4	0	4.3	0	0.4	$0	$356
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**2.7**	**0**	**27.3**	**0**	**2.7**	**$0**	**$2,509**

Table Y-2e. Labor Costs – Subpart Y – Larger Hydroskimming Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.4	0	4	0	0.4	$0	$560
QA/QC	0	0	0	0.4	0	4	0	0.4	$0	$335
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.8	0	8.3	0	0.8	$0	$692
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**3.1**	**0**	**31.3**	**0**	**3.1**	**$0**	**$2,844**

Table Y-2f. Labor Costs – Subpart Y – Very Small Upgrading Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.4	0	4	0	0.4	$0	$560
QA/QC	0	0	0	0.8	0	8	0	0.8	$0	$671
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.5	0	5.3	0	0.5	$0	$440
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**3.2**	**0**	**32.3**	**0**	**3.2**	**$0**	**$2,928**

Table Y-2g. Labor Costs – Subpart Y – Small Upgrading Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.6	0	6	0	0.6	$0	$727
QA/QC	0	0	0	0.6	0	6	0	0.6	$0	$503
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.7	0	6.8	0	0.7	$0	$566
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**3.4**	**0**	**33.8**	**0**	**3.4**	**$0**	**$3,053**

Table Y-2h. Labor Costs – Subpart Y – Medium Upgrading Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.8	0	8	0	0.8	$0	$895
QA/QC	0	0	0	1.2	0	12	0	1.2	$0	$1,006
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.8	0	8.3	0	0.8	$0	$692
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**4.3**	**0**	**43.3**	**0**	**4.3**	**$0**	**$3,850**

Table Y-2i. Labor Costs – Subpart Y – Medium Upgrading Refinery with Loading

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.8	0	8	0	0.8	$0	$895
QA/QC	0	0	0	0.9	0	9.2	0	0.9	$0	$771
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	1.8	0	17.6	0	1.8	$0	$1,475
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**5.0**	**0**	**49.8**	**0**	**5.0**	**$0**	**$4,399**

Table Y-2j. Labor Costs – Subpart Y – Large Upgrading Refinery with CEMS

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.2	0	12	0	1.2	$0	$1,230
QA/QC	0	0	0	2.5	0	24.8	0	2.5	$0	$2,079
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	1.8	0	18.0	0	1.8	$0	$1,505
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**7.0**	**0**	**70.0**	**0**	**7.0**	**$0**	**$6,071**

Table Y-2k. Labor Costs – Subpart Y – Large Upgrading Refinery with Coke Calciner

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.2	0	12	0	1.2	$0	$1,230
QA/QC	0	0	0	2.0	0	20	0	2.0	$0	$1,676
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	2.4	0	23.9	0	2.4	$0	$2,001
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**7.1**	**0**	**70.9**	**0**	**7.1**	**$0**	**$6,165**

Table Y-2l. Labor Costs – Subpart Y – Very Large Upgrading Refinery

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.6	0	16	0	1.6	$0	$1,566
QA/QC	0	0	0	3.4	0	33.6	0	3.4	$0	$2,816
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	3.0	0	30.2	0	3.0	$0	$2,527
Reporting	0	0	0	1	0	10	0	1	$0	$838
Total	**0**	**2**	**0**	**9.5**	**0**	**94.8**	**0**	**9.5**	**$0**	**$8,167**

Capital and O&M Costs for Subpart Y

Most calculation methodologies in Subpart Y require use of measurement methods when they are already in use at the facility, but provide simpler, default methods when measurement data are not available. There are no mandatory testing requirements or sampling requirements for Subpart Y (except for sampling of refinery fuel gas, the burden for which is included in Subpart C). Table Y-3 is a summary of the anticipated operating and maintenance (O&M) costs for each Subpart Y facility. The O&M costs associated with recordkeeping are discussed in the Cost Appendix Introduction. No capital costs are expected to be incurred due to Subpart Y.

Table Y-3. Capital and O&M Costs – Subpart Y – All Refineries

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart Y

The total industry costs related to Subpart Y are approximately $583,000 per year for a total of $1,749,000 over the three-year period of the ICR. 144 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart Z – Phosphoric Acid Production

Description of Subpart Z

For purposes of the GHGRP, the phosphoric acid production source category consists of facilities that produce phosphoric acid using a wet-process phosphoric acid process line in which phosphate rock is reacted with acid. In RY2017 11 phosphoric acid production facilities reported their GHG emissions under Subpart Z. The number of facilities has decreased since 2010, and no new facilities to Subpart Z are expected over the three-year period covered by this ICR. Initial costs apply to new facilities; therefore, those costs are zero in the tables below.

Facilities reporting to Subpart Z estimate emissions using one of the following three approaches:

- CO_2 emissions are measured using a CEMS
- Process CO_2 emissions are calculated using the monthly mass of phosphate rock consumed by each process line and one of the following;
  - Monthly inorganic carbon content of each grab sample of phosphate rock, or
  - Monthly CO_2 content of each grab sample of phosphate rock.

No Subpart Z facilities use CEMS for estimating CO_2 emissions; therefore, separate cost tables have not been included for that option.

Labor Costs for Subpart Z

Labor costs for Subpart Z are shown in Table Z-1. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Facilities are tracking and collecting the data required for estimating emissions such as phosphate rock feed rates and sampling and testing phosphate rock for its inorganic carbon or CO_2 contents as part of normal business operations. Therefore, no costs are attributed to Subpart Z for obtaining the necessary data and performing the necessary QA/QC on the data required for estimating process-related CO_2 emissions on a routine basis. The calculation of CO_2 emissions for Subpart Z are automatically generated by e-GGRT, when each facility enters the required data into their GHGRP report. Therefore, those costs are not attributed to Subpart Z calculation costs but are included as part of reporting costs. Recordkeeping and reporting labor costs are based on the "low bin" designation as discussed in the Cost Appendix Introduction.

Table Z-1. Labor Costs – Subpart Z

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0	0	0	0	0	$0	$112
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0	0	0	0	0	$0	$0
Reporting	0	0	0	1	0	4	0	1	$0	$410
Total	**0**	**1**	**0**	**1.5**	**0**	**6.0**	**0**	**1.5**	**$0**	**$727**

Capital and O&M Costs for Subpart Z

Capital and O&M costs are shown in Table Z-2. Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table Z-2. Capital and O&M Costs – Subpart Z

Activity	Cost Categories				Total Capital and O&M Costs per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart Z

The total industry costs related to Subpart Z average approximately $8,500 per year for a total of $25,600 over the three-year period covered by this ICR. Eleven facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart AA – Pulp and Paper Manufacturing

Description of Subpart AA

For purposes of the GHGRP, pulp and paper manufacturing refers to facilities that produce market pulp (stand-alone pulp facilities), manufacture pulp and paper (integrated pulp and paper mills), produce paper products from purchased pulp, produce secondary fiber from recycled paper, convert paper into paperboard products (e.g. containers), or operate coating and laminating processes. Facilities reporting to Subpart AA must report GHG emissions from chemical recovery furnaces at kraft and soda mills, chemical recovery combustion units at sulfite mills, chemical recovery combustion units at stand-alone semi-chemical facilities, pulp lime kilns at kraft and soda facilities, and systems for adding makeup chemicals in the chemical recovery areas of chemical pulp mills.

In RY2017, 107 facilities reported to Subpart AA. It is estimated that there will be no new facilities reporting to Subpart AA, as no new facilities have reported to Subpart AA since 2012. Initial costs apply only to new facilities; therefore, those costs are zero in the tables below.

Labor Costs for Subpart AA

Table AA-1 below includes the labor hours for Subpart AA. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in (§98.276), including calculation of emissions, steam purchases, unbleached pulp production, makeup chemical use, and heat input percentages for each fossil fuel type entering a lime kiln, where applicable.

Table AA-1. Labor Costs – Subpart AA

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0.5	0	0.1	0	1.0	0	1.0	$0	$140
QA/QC	0	0	0	1.0	0	2.3	0	0	$0	$252
Recordkeeping	0	0	0	0.5	0	5.0	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	1	0	4.4	0	0	$0	$402
Reporting	0	0	0	1	0	10.0	0	1.0	$0	$838
Total	**0**	**0.5**	**0**	**3.6**	**0**	**22.7**	**0**	**1.6**	**$0**	**$2,051**

Capital and O&M Costs for Subpart AA

Table AA-2 summarizes the capital and O&M costs for Subpart AA. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction. The largest cost for Subpart AA is for facilities to characterize their spent pulping liquor by sending a sample to an offsite lab for a carbon analysis. The average cost of this analysis is $192. No capital costs are expected.

Table AA-2. Capital and O&M Costs – Subpart AA

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$192	$0	$192
Total	$0		$0	$242	$0	$242

Total Costs for Subpart AA

The total industry costs related to Subpart AA are approximately $245,000 per year for a total of $736,000 over the three-year period covered by this ICR. Approximately 107 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart BB – Silicon Carbide Production

Description of Subpart BB

For the purposes of the GHGRP, silicon carbide production involves the production of industrial abrasives from silica sand or quartz and petroleum coke. For RY2017, one silicon carbide production facility reported to Subpart BB. The number of silicon carbide production facilities has not changed since the inception of the program. Based on the available information, no new facilities are expected to begin operation during the three-year period covered by this ICR. Initial year hours and costs apply to new facilities; therefore, these costs are zero in the tables below.

Labor Costs for Subpart BB

Table BB-1 below includes the labor hours for Subpart BB. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.283.

Table BB-1. Labor Costs – Subpart BB

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq Year Hours	Initial Year Hours	Subseq Year Hours	Initial Year Hours	Subseq Year Hours	Initial Year Hours	Subseq Year Hours	Initial Year	Subseq. Year
Planning	0	0.25	0	0.5	0	1	0	1.0	$0	$180
QA/QC	0	0	0	0.5	0	1	0	1.0	$0	$151
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0	0	1	0	0	$0	$71
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0.25**	**0**	**2.5**	**0**	**9**	**0**	**3.5**	**$0**	**$1,017**

Capital and O&M Costs for Subpart BB

Because CEMS are not used by the silicon carbide production facility reporting to subpart BB, estimates of CO_2 emissions are based on the consumption of petroleum coke and the carbon content of the petroleum coke. Under the GHGRP, Subpart BB requires the reporting of carbon content of the petroleum coke consumed (§98.284), which is provided by the supplier. Petroleum coke consumption is monitored by the facility as part of their routine accounting procedures or purchase records, therefore, costs for this monitoring are not attributed to the GHGRP. The facility must conduct an annual QA of the supplier data for carbon content of petroleum coke using ASTM methods (§98.284). The estimated annual cost of the laboratory analysis of the carbon content for QA purposes is $179 in 2017 dollars.[9] Annual production of silicon carbide and the annual production capacity must also be reported (§98.286). These data are collected by the facility as a normal business operations and are not attributed to the GHGRP.

Capital and O&M costs are shown in Table BB-2. Facilities will also incur O&M costs associated with recordkeeping, which are discussed in the Cost Appendix Introduction. No capital costs are expected.

Table BB-2. Capital and O&M Costs – Subpart BB

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$179	$0	$179
Total	**$0**		**$0**	**$229**	**$0**	**$229**

Total Costs for Subpart BB

The total industry costs related to Subpart BB are approximately $1,200 per year for a total of $3,700 over the three-year period of the ICR. One facility is expected to report in 2019, 2020, and 2021.

[9] Wyoming Analytical Laboratories, Inc, Analytical Services Fee Schedule, July 29, 2016. UPL address accessed on 6/16/2018: http://wal-lab.com/wp-content/uploads/2016/08/Current-Price-List.pdf

Cost Appendix for Subpart CC – Soda Ash Manufacturing

Description of Subpart CC

For purposes of the GHGRP, soda ash manufacturing refers to facilities with a manufacturing line that produces soda ash by one of the following methods: calcining trona, calcining sodium sesquicarbonate, or using a liquid alkaline feedstock process that directly produces CO_2. In RY2017, four soda ash manufacturing facilities reported to Subpart CC. The number of facilities has decreased since 2010, and no new facilities in Subpart CC are expected over the three-year period covered by this ICR. Initial year costs apply only to new facilities; therefore, these costs are zero in the tables below.

Subpart CC facilities determine emissions using one of the following four approaches:

- CEMS – CO_2 emissions are measured using a CEMS
- Trona input method – CO_2 emissions are calculated using the following measurements:
  - Monthly mass of trona input.
  - The monthly inorganic carbon in the trona based on weekly composite analysis.
- Soda ash output method – CO_2 emissions are calculated using the following measurements:
  - Monthly mass of soda ash produced.
  - The monthly inorganic carbon in the soda ash.
- Site-specific emission factor method – Can only be used to calculate CO_2 emissions from the liquid alkaline feedstock process through an annual performance test using:
  - Direct measurements of hourly CO_2 concentration at process vents.
  - Hourly stack gas volumetric flow rate from mine water stripper/evaporate.

No Subpart CC facilities use the CEMS option for estimating CO_2 emissions; therefore, a separate cost table for that option has not been included. Of the four facilities currently reporting to Subpart CC in RY2017, a total of eight process lines are reported. Five of the process lines utilize the trona input method, two of the process lines utilize the soda ash output method, and one of the process lines utilizes the site-specific emission factor method. Three facilities use only the trona input method, whereas one facility utilizes both the soda ash output method and the site-specific emission factor method for different process lines. For the facility with multiple methods, it is anticipated that the labor costs associated with both methods would be incurred.

Labor Costs for Subpart CC—Trona Input Method and Soda Ash Output Method

Labor costs for Subpart CC are shown in Table CC-1a and Table CC-1b. Facilities using the trona input method or the soda ash output method will already be obtaining the necessary data and performing the necessary QA/QC on the data required for estimating process-related CO_2 emissions as part of routine operations. Therefore, no planning costs or QA/QC costs are attributed to Subpart CC for facilities that use those methods. Also for the trona input method and soda ash output method, the calculation of CO_2 emissions from Subpart CC facilities are automatically generated by e-GGRT, when each facility enters the required data. Therefore, those costs are not attributed to Subpart CC sampling and analysis (calculation) costs but instead are included as part of reporting costs. Recordkeeping and reporting costs are based on the “low bin” designation as discussed in the Cost Appendix Introduction.

Table CC-1a. Labor Costs – Subpart CC – Trona input method

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	–	–	–	–	–	–	–	–	–	–
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**1.5**	**0**	**6**	**0**	**1.5**	**$0**	**$614**

Table CC-1b. Labor Costs – Subpart CC – Soda ash output method

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	0	0	0	0	$0	$0
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0	0	0	0	0	$0	$0
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**1.5**	**0**	**6**	**0**	**1.5**	**$0**	**$614**

Capital and O&M Costs for Subpart CC—Trona Input Method and Soda Ash Output Method

Capital and O&M costs are shown in Table CC-2a and Table CC-2b. There are no variations in capital and O&M costs among these two methods used by facilities. Facilities will incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. Three facilities use the trona input method and one facility uses the soda ash output method.

Table CC-2a. Capital and O&M Costs – Subpart CC – Trona input method

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Table CC-2b. Capital and O&M costs – Subpart CC – Soda ash output method

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Labor Costs for Subpart CC – Site-Specific Emission Factor Method

Facilities using the site-specific emission factor methodology must manually perform the CO_2 calculations specified in §98.293(b)(3); therefore, some labor costs are expected for performing and reviewing the calculation, as shown in Table CC-1c. Because one facility is using both the soda ash output method and the site-specific emission factor method, the recordkeeping and reporting labor costs for this one facility are already included in Table CC-1b. Therefore, the recordkeeping and reporting labor costs are zero in Table CC-1c to avoid double counting.

Table CC-1c. Labor Costs – Subpart CC – Site-specific emission factor method

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0	0	0	0	0	0	0	$0	$0
QA/QC	0	0	0	0	0	0	0	0	$0	$0
Recordkeeping	0	0	0	0	0	0	0	0	$0	$0
Sampling and Analysis (Calculations)	0	0	0	0.5	0	0.1	0	0	$0	$51
Reporting	0	0	0	0	0	0	0	0	$0	$0
Total	**0**	**0**	**0**	**0.5**	**0**	**0.1**	**0**	**0**	**$0**	**$51**

Capital and O&M Costs for Subpart CC—Site-Specific Emission Factor Method

Capital and O&M costs are shown in Table CC-2c for the site-specific emission factor method. Facilities using this option must perform an annual performance test comprised of three 1-hour tests. Performance test costs of $1,600 (in 2006$) were taken from the *Regulatory Impact Analysis for the Mandatory Reporting of Greenhouse Gas Emissions Final Rule (GHG Reporting): Final Report* (September 2009)[10] and were scaled to $1,817 (in 2017$). Only one of the Subpart CC facilities utilize the site-specific emission factor. Because one facility is using both the soda ash output method and the site-specific emission factor method, the recordkeeping capital cost for this one facility are already included in Table CC-2b. Therefore, the recordkeeping costs are zero in Table CC-2c to avoid double counting. No capital costs are expected.

Table CC-2c. Capital and O&M Costs – Subpart CC – Site-specific emission factor method

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	$0		$0	$1,817	$0	$1,817
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$1,817**	**$0**	**$1,817**

Total Costs for Subpart CC

The total industry costs related to Subpart CC are approximately $4,500 per year for a total of $13,600 over the three-year period of the ICR. Four facilities are expected to report in 2019, 2020, and 2021.

[10] See document EPA-HQ-OAR-2008-0508-2229 at https://www.regulations.gov/document?D=EPA-HQ-OAR-2008-0508-2229.

Cost Appendix for Subpart DD – Electrical Transmission and Distribution Equipment Use

Description of Subpart DD

For purposes of the GHGRP, the Electrical Transmission and Distribution Equipment Use source category consists of all electric transmission and distribution equipment and servicing inventory insulated with or containing sulfur hexafluoride (SF_6) or perfluorocarbons (PFCs) used within an electric power system. Electric transmission and distribution equipment and servicing inventory includes, but is not limited to, gas-insulated substations, circuit breakers, switchgear, including closed-pressure and hermetically sealed-pressure switchgear and gas-insulated lines containing SF_6 or PFCs, gas containers such as pressurized cylinders, gas carts, electric power transformers and other containers of SF_6 or PFCs. In RY2017, 83 facilities reported to Subpart DD. Based on the number of facilities consistently decreasing for Subpart DD, zero new facilities are expected during the three-year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below.

Facilities reporting under Subpart DD calculate their emissions using the mass balance approach in §98.303(a) and (b).

Labor Costs for Subpart DD

Table DD-1 below includes the labor hours for each of the 83 facilities to determine emissions under Subpart DD. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis are discussed in the Cost Appendix Introduction. Specific labor costs related to sampling and analysis activities for Subpart DD include overseeing a contractor who weighs the gas cylinders and performing emission calculations. Recordkeeping and reporting hours are based on the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table DD-1. Labor Costs – Subpart DD

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	1.0	0	2	0	0.0	$0	$343
QA/QC	0	0	0	0	0	2	0	0.0	$0	$143
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	2.0	0	12	0	4.0	$0	$1,177
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	0	1	0	4.5	0	31	**0**	5.5	$0	$2,920

Capital and O&M Costs for Subpart DD

As shown in Table DD-2, existing facilities will incur an O&M cost of $50 per year for recordkeeping and a $1,200 cost per year for sampling. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction. Sampling O&M costs for Subpart DD are for an independent contractor to weigh gas cylinders for facilities that have a high quantity of cylinders. No capital costs are expected.

Table DD-2. Capital and O&M Costs – Subpart DD

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,200	0	$1,200
Total	$0		$0	$1,250	0	$1,250

Total Costs for Subpart DD

The total industry costs related to Subpart DD are approximately $346,000 per year for a total of $1,038,000 over the three-year period of the ICR. Eighty-three facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart EE – Titanium Dioxide Production

Description of Subpart EE

For purposes of the GHGRP, the titanium dioxide production source category consists of facilities that use the chloride process to produce titanium dioxide. Titanium dioxide is a metal oxide commonly used as a white pigment in paint, paper, plastics and other applications. For RY2017, six titanium dioxide production facilities reported to Subpart EE. Based on the available information, no new facilities are expected to begin operation during the three-year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below.

There are two options for determining GHG emissions under Subpart EE. The one option at §98.313(a) allows the use of CEMS to comply with Subpart EE. The second option in §98.313(b) allows the use of monitoring and calculations to estimate process-related emissions under Subpart EE. None of the titanium dioxide production facilities use CEMS to measure CO_2 emissions; therefore, no costs have been estimated related to CEMS use.

Labor Costs for Subpart EE

Table EE-1 below includes the labor hours for determining GHG emissions under Subpart EE. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.313.

Table EE-1. Labor Costs – Subpart EE

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	0.3	0	0.5	0	1	0	1.0	$0	$180
QA/QC	0	0	0	0.5	0	1	0	1.0	$0	$151
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0	0	1	0	0.0	$0	$71
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0.3**	**0**	**2.5**	**0**	**9**	**0**	**3.5**	**$0**	**$1,017**

Capital and O&M Costs for Subpart EE

All facilities determine their GHG emissions based on the consumption of calcined petroleum coke and the carbon content of the petroleum coke (§98.313). They must also report the quantity of carbon-containing waste produced monthly and its carbon content (§98.314). Petroleum coke consumption and production of carbon-containing waste is monitored by the facility as part of their routine accounting records or purchase records, therefore no costs for these steps are attributed to Subpart EE. The carbon content of the calcined petroleum coke and carbon-containing waste is typically provided by the supplier. But on an annual basis, the facility must conduct an annual QA of the supplier data of carbon content of petroleum coke and carbon-containing waste using ASTM methods (§98.314). The cost of the two annual tests is $358.[11] Titanium dioxide production and production capacity data must be reported and are collected as part of routine operations (§98.316); therefore, the costs of collecting these data are not attributed to Subpart EE.

Table EE-2 summarizes capital and O&M costs for Subpart EE. The O&M costs associated with recordkeeping are discussed in the Cost Appendix Introduction. No capital costs are expected.

Table EE-2. Capital and O&M Costs – Subpart EE

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$358	$0	$358
Total	**$0**		**$0**	**$408**	**$0**	**$408**

Total Costs for Subpart EE

The total industry costs related to Subpart EE are approximately $8,600 per year for a total of $25,700 over the three-year period of the ICR. Six facilities are expected to report in 2019, 2020, and 2021.

[11] Wyoming Analytical Laboratories, Inc, Analytical Services Fee Schedule, July 29, 2016. UPL address accessed on 6/16/2018: http://wal-lab.com/wp-content/uploads/2016/08/Current-Price-List.pdf

Cost Appendix for Subpart FF – Underground Coal Mines

Description of Subpart FF

For purposes of the GHGRP, the underground coal mines source category includes active underground coal mines that liberate at least 36,500,000 cubic feet of CH_4 per year. Owners and operators must report methane liberation from ventilation shafts, methane liberation from degasification systems (if applicable), and any methane destroyed or transported offsite.

For RY2017, 78 facilities reported emissions to Subpart FF. Of those 78 facilities, all reported methane liberation from ventilation shafts, 18 facilities reported methane liberation from degasification systems (6 facilities report methane liberation from degasification systems that do not destroy or transport methane offsite; and 12 facilities report methane liberation from degasification systems that destroy or transport methane offsite). The total number of facilities reporting to Subpart FF is expected to remain constant, including the number of facilities that report emissions from degasification systems and the number of facilities that destroy methane or transport methane offsite. Initial year costs apply only to new facilities; therefore, those costs are zero in the tables below.

For methane liberation from ventilation shafts, facilities can choose to calculate emissions using Subpart FF equations and data collected from the Mine Safety and Health Administration (MSHA), or use CEMS. No Subpart FF facilities have reported emissions using CEMS; therefore, the costs for using CEMS are not estimated. There is only one methodology for methane liberation from degasification systems, but the costs are different depending on whether or not methane is destroyed or transported offsite.

Labor Costs for Subpart FF – Methane Liberation from Ventilation Shafts

Table FF-1a below summarizes the labor hours associated with each of the 78 facilities reporting ventilation emissions using MSHA data. Recordkeeping and reporting hours for Subpart FF are based on the "high bin" designation, as discussed in the Cost Appendix Introduction. Sampling and analysis activities include performing calculations to determine methane liberation using ventilation flow and methane concentration from each monitoring point.

Table FF-1a. Labor Costs – Subpart FF – Methane Liberation from Ventilation Shafts

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	1	0	13	0	1	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	1	0	3	0	0	$0	$302
Reporting	0	0	0	2	0	26	0	2	$0	$2,105
Total	**0**	**0**	**0**	**4**	**0**	**42**	**0**	**3**	**$0**	**$3,460**

Capital and O&M Costs for Subpart FF– Methane Liberation from Ventilation Shafts

Table FF-2a summarizes the capital and O&M costs associated with reporting ventilation emissions. Typical costs related to recordkeeping are discussed in the Cost Appendix Introduction.

There are no capital costs expected for Subpart FF. Sampling is being conducted by MSHA; therefore, no equipment must be purchased.

Table FF-2a. Capital and O&M Costs – Subpart FF – Methane Liberation from Ventilation Shafts

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Labor Costs for Subpart FF – Methane Liberation from Degasification Systems that Do Not Destroy Methane or Transport Methane Offsite

Table FF-1b summarizes labor hours associated with calculating degasification emissions for each of the 6 facilities with degasification systems that do not destroy or send any methane offsite. These six facilities have an average of five monitoring points each and are expected to conduct weekly sampling for volumetric flow and methane concentration, as required in §98.324(c)(2). The analysis for CH_4 concentration requires sampling, and either laboratory analyses or the use of a methanometer. Purchase and use of a methanometer to monitor the methane concentration is more economical than sending samples to a laboratory, therefore, it is assumed that all 6 facilities use a methanometer. Only facilities that report degasification emissions that do not also report emissions from methane destroyed or sent offsite have to conduct sample tests for degasification emissions since that monitoring is not expected to already be performed under the facility's normal business operations. Table FF-1b does not include reporting or recordkeeping costs, as these are already accounted for in Table FF-1a for all Subpart FF facilities.

Table FF-1b. Labor Costs – Subpart FF – Methane Liberation from Degasification Systems that Do Not Destroy Methane or Transport Methane Offsite

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	–	–	–	–	–	–	–	–	–	–
Sampling and Analysis (Calculations)	0	0	0	0	0	130	0	0	$0	$9,289
Reporting	–	–	–	–	–	–	–	–	–	–
Total	**0**	**0**	**0**	**0**	**0**	**130**	**0**	**0**	**$0**	**$9,289**

Capital and O&M Costs for Subpart FF– Methane Liberation from Degasification Systems that Do Not Destroy Methane or Transport Methane Offsite

Table FF-2b summarizes the capital and O&M costs associated with reporting degasification emissions. Calibration of the methanometer[12] and the orifice differential flow meter is included under costs for performance testing. The costs related to recordkeeping are discussed in the Cost Appendix Introduction and are taken into account in Table FF-2a.

Table FF-2b. Capital and O&M Costs – Subpart FF– Methane Liberation from Degasification Systems that Do Not Destroy Methane or Transport Methane Offsite

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	$0		$0	$3,000	$0	$3,000
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$3,000**	**$0**	**$3,000**

Labor Costs for Subpart FF – Methane Liberation from Degasification Systems that Destroy Methane or Transport Methane Offsite

For Subpart FF, the remaining 12 from the 18 total facilities that report degasification emissions are expected to report methane destroyed or sent offsite. All labor costs related to monitoring of methane destroyed or sent offsite are expected to be performed under the facility's normal business operations because the mine already has flowmeters in place to complete these measurements, and will closely monitor the amount of gas destroyed for commercial reasons; therefore, there are no labor costs attributed to the GHGRP for determining emissions from methane destroyed or sent offsite.

Capital and O&M Costs for Subpart FF– Methane Liberation from Degasification Systems that Destroy Methane or Transport Methane Offsite

All capital and O&M costs related to monitoring of methane destroyed or sent offsite are expected to be already covered under the facility's normal business operations; therefore, there are no costs attributed to the GHGRP for determining emissions from methane destroyed or sent offsite.

Total Costs for Subpart FF

The total industry costs related to Subpart FF are approximately $347,000 per year, with a total of $1,042,000 over the three-year period of the ICR. Seventy-eight facilities are expected to report in 2019, 2020, and 2021.

[12] https://www.thesafetyequipmentstore.com/GFG-7745-030.html

Cost Appendix for Subpart GG – Zinc Production

Description of Subpart GG

For purposes of the GHGRP, the zinc production source category includes zinc smelters and secondary zinc recycling facilities. The emissions reported in Subpart GG are process emissions from Waelz kilns and electrothermic furnaces used for zinc production, resulting in the release of CO_2.

For RY2017, five facilities reported to Subpart GG. The number of Subpart GG facilities has not significantly changed over the past reporting years, with a maximum number of six facilities and a minimum number of five facilities per reporting year. Based on available information, the number of facilities reporting to Subpart GG is expected to stay consistent for the three-year period covered by this ICR with no new facilities reporting. Initial year costs apply to new facilities; therefore, these costs are zero in the tables below.

Facilities have two options for calculating CO_2 emissions under Subpart GG: use a CEMS following the procedures of Tier IV of Subpart C, or use the carbon mass balance approach described in §98.333(b). Currently no facilities use CEMS for Subpart GG; therefore, costs for use of CEMS is not estimated.

Labor Costs for Subpart GG

Table GG-1 below includes the labor hours for Subpart GG. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "low bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.333, including calculating CO_2 emissions using the carbon mass balance approach.

Table GG-1. Labor Costs – Subpart GG

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	0.5	0	5	0	0.25	$0	$522
QA/QC	0	1	0	0.3	0	3	0	0.15	$0	$358
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	1	0	10	0	0.5	$0	$820
Reporting	0	0	0	1	0	4	0	1	$0	$410
Total	**0**	**2**	**0**	**3.3**	**0**	**24**	**0**	**2.4**	**$0**	**$2,315**

Capital and O&M Costs for Subpart GG

Table GG-2 summarizes the capital and O&M costs expected for Subpart GG. The costs related to recordkeeping are discussed in the Cost Appendix Introduction. The only additional costs associated with O&M are the annual cost of sampling for facilities that calculate their CO_2 emissions using the carbon mass balance approach. No capital costs are expected.

Table GG-2. Capital and O&M Costs – Subpart GG

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,350	$0	$1,350
Total	**$0**		**$0**	**$1,400**	**$0**	**$1,400**

Total Costs for Subpart GG

The total industry costs related to Subpart GG are approximately $18,600 per year for a total of $56,000 over the three-year period of the ICR. Five facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart HH – Municipal Solid Waste Landfills

Description of Subpart HH

For purposes of the GHGRP, municipal solid waste landfills consist of landfills, landfill gas collection systems, and landfill gas destruction devices at municipal solid waste facilities which generate methane in amounts equivalent to 25,000 metric tons or CO_2e or more per year. This subpart does not include Resource Conservation and Recovery Act (RCRA) Subtitle C or Toxic Substances Control Act (TSCA) hazardous waste landfills, construction and demolition landfills, or industrial landfills that do not receive household waste.

Facilities reporting to Subpart HH fall into one of two major categories: landfills with gas collection and landfills without gas collection. Regardless of gas collection, each landfill reporting to Subpart HH must collect and report data on their yearly waste disposal amounts and waste composition; calculate their methane generation using a model; and then adjust that amount for the estimated amount of methane that is oxidized through the soil cover. Landfills with gas collection must also monitor and report the landfill gas flow and methane concentration, as well as account for the amount of methane sent to destruction devices whether the gas is flared, used beneficially on site (e.g., to generate power via an engine or turbine) and/or piped off site.

There were 1,134 facilities that reported to Subpart HH in RY2017. Of these, 843 had a gas collection system and 291 did not. From 2011 to 2014, about 15 new facilities reported to Subpart HH each year. In 2015, the number of new facilities declined to only 4 facilities, but then began trending upward again in 2016 and 2017. It is estimated that there will be a total of 6 new facilities reporting to Subpart HH in RY2019 (4 with a gas collection system), 4 new facilities reporting in RY2020 (3 with a gas collection system), and 3 new facilities reporting in RY2021, all with gas collection systems (Table HH-1). On average a facility reporting to Subpart HH with a gas collection system has 3 destruction devices associated with its landfill gas collection system operations.

Table HH-1. Subpart HH Facility Counts Per Year

Facility Type	RY2019		RY2020		RY2021	
	New Facilities	Existing Facilities	New Facilities	Existing Facilities	New Facilities	Existing Facilities
Gas Collection System	4	850	3	854	3	857
No Gas Collection System	2	297	1	299	0	300
Total	**6**	**1,147**	**4**	**1,153**	**3**	**1,157**

Labor Costs for Subpart HH – Landfills with Gas Collection Systems

Table HH-2a below includes the labor hours related to Subpart HH landfills with gas collection systems. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "high bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in (§98.346), including calculation of methane generation and emissions, estimating historical waste quantities, and determining annual waste compositions, and the composition, flow, and destruction of landfill gas through the gas collection system. Initial year costs apply to new facilities expected to begin reporting to Subpart HH during the three-year period covered by this ICR. New facilities in their initial year of reporting will incur additional planning hours to familiarize themselves with the rule and hours for setup of compliance activities including sampling and QA/QC.

Table HH-2a. Labor Costs – Subpart HH – Facilities with Gas Collection Systems

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	2	1	1	1	21	1	2	1	$1,885	$307
QA/QC	0	0	1	1	13	6	1	1	$1,053	$552
Recordkeeping	0	0	1	1	13	13	1	1	$1,053	$1,053
Sampling and Analysis (Calculations)	0	0	1	0	16	8	2	1	$1,303	$608
Reporting	0	0	2	2	26	26	2	2	$2,105	$2,105
Total	**2**	**1**	**6**	**5**	**89**	**54**	**8**	**6**	**$7,398**	**$4,625**

Labor Costs for Subpart HH – Landfills without Gas Collection

Table HH-2b below includes the labor hours related to Subpart HH landfills without gas collection systems. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "high bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in (§98.346), including calculation of methane generation and emissions, estimating historical waste quantities, and determining annual waste compositions. Initial year costs apply to new facilities expected to begin reporting to Subpart HH during the three-year period covered by this ICR. New facilities in their initial year of reporting will incur additional planning hours to familiarize themselves with the rule and hours for setup of compliance activities including sampling and QA/QC.

Table HH-2a. Labor Costs – Subpart HH – Facilities with Gas Collection Systems

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	2	1	1	1	21	1	2	1	$1,885	$307
QA/QC	0	0	1	1	13	6	1	1	$1,053	$552
Recordkeeping	0	0	1	1	13	13	1	1	$1,053	$1,053
Sampling and Analysis (Calculations)	0	0	1	0	16	8	2	1	$1,303	$608
Reporting	0	0	2	2	26	26	2	2	$2,105	$2,105
Total	**2**	**1**	**6**	**5**	**89**	**54**	**8**	**6**	**$7,398**	**$4,625**

Capital and O&M Costs for Subpart HH

Tables HH-3a and HH-3b summarize the capital and O&M costs for Subpart HH. Costs outlined in Table HH-3a are for facilities with gas collection systems. Costs in Table HH-3b are for facilities without gas collection systems. Facilities without gas collection systems are only expected to incur O&M costs related to recordkeeping, as discussed in the Cost Appendix Introduction, and are not expected to incur any capital costs.

The largest O&M cost component for facilities with gas collection systems is the need to sample the landfill gas for its methane content, and to monitor the flow of the landfill gas from the landfill to the destruction devices reported by the facility. O&M costs will also be incurred for recordkeeping and for calibration of the sampling equipment and flow meters. No costs are associated with the purchasing of equipment, as any facility, new or existing, reporting to Subpart HH that has a gas collection system is expected to have already installed a flow meter and equipment to measure methane concentration in the landfill gas. This equipment is inherently necessary to quantify the amount and quality of gas being collected to gauge if the gas is adequate for use on site and/or off site and if there is too much being collected such that some needs to be flared. In addition, any new facility reporting to Subpart HH is expected to have scales already on site to measure waste quantities entering the landfill.

Table HH-3a. Capital and O&M Costs – Subpart HH – Facilities with Gas Collection Systems

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$2,099	$2,099	$2,099
Total	$0		$0	$2,149	$2,149	$2,149

Table HH-3b. Capital and O&M Costs – Subpart HH – Facilities without Gas Collection Systems

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$50	$50

Total Costs for Subpart HH

The total industry costs related to Subpart HH average approximately $7,030,000 per year for existing sources and approximately $38,000 per year for new sources, for a total of approximately $7,068,000 per year and $21,204,000 over the three-year period of the ICR. Total costs are based on 1,153 facilities in 2019, 1,157 in 2020, and 1,160 in 2021, which accounts for 6 new reporters in 2019, 4 new reporters in 2020, and 3 new reporters in 2021.

Cost Appendix for Subpart II – Industrial Wastewater Treatment

Description of Subpart II

For purposes of the GHGRP, industrial wastewater treatment consists of anaerobic processes used to treat industrial wastewater and industrial wastewater treatment sludge at facilities that perform one of the following operations: pulp and paper manufacturing, food processing, ethanol production, or petroleum refining. In 2017, 137 facilities reported to Subpart II. It is estimated that there will be one new facility to Subpart II in each of the next three years covered by this ICR. Costs incurred by new facilities are reflected in the Initial Year costs in the tables below.

Subpart II requires the reporting of methane generated, emitted, and recovered from anaerobic lagoons and reactors as well as methane emitted and recovered from anaerobic sludge digesters. If biogas is collected and/or destroyed at the facility, methane emissions and destruction from these devices must also be reported. In 2017, 93 facilities reporting to Subpart II collected and destroyed biogas.

Labor Costs for Subpart II

Table II-1 below includes the labor hours for Subpart II. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "medium bin" designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.356, including calculation of any methane generation, emissions, and biogas collection and recovery amounts and gas characterization if applicable. The per facility labor hours in Table II-1 account for what is expected for both facilities with and without biogas collection and destruction. In their initial year of reporting, new facilities will incur planning costs to familiarize themselves with the rule requirement, and will incur QA/QC costs.

Table II-1. Labor Costs – Subpart II

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	2	1	0.2	0.1	2	1	0.2	0.1	$392	$196
QA/QC	0	0	0.2	0.1	2	1	0.2	0.1	$168	$84
Recordkeeping	0	0	0.5	0.5	5	5	0.5	0.5	$419	$419
Sampling and Analysis (Calculations)	0	0	2.0	2.0	8	8	0	0	$747	$747
Reporting	0	0	1.0	1.0	10	10	1.0	1.0	$838	$838
Total	**2**	**1**	**3.9**	**3.7**	**27**	**25**	**1.9**	**1.7**	**$2,564**	**$2,284**

Capital and O&M Costs for Subpart II

Table II-2 summarizes the capital and operational and maintenance costs for Subpart II. The largest cost component for Subpart II is for O&M to complete the requirement for facilities to calibrate their wastewater flow meters every 3 years. Costs for the calibration of the flow meter at a Subpart II facility were determined by using an average flow meter diameter between 6 and 16 inches and using a flow meter with 2 taps. The O&M cost of $3,550 only occurs once every three years under Subpart II. Therefore, each facility (both new facilities and existing facilities) will be expected to incur a cost of $1,183 each year over the three-year period covered by this ICR.

It is expected that new facilities will not need to purchase any additional equipment (*i.e.*, gas flow meters, gas concentration monitoring equipment, etc.) to comply with the rule because the equipment is expected to already be in place at their facility; therefore, there are no capital costs associated with new facilities. O&M costs for recordkeeping are discussed in the Cost Appendix Introduction.

Table II-2. Capital and O&M Costs – Subpart II

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	$0		$0	$1,183	$1,183	$1,183
Total	$0		$0	$1,233	$1,233	$1,233

Total Costs for Subpart II

The total industry costs related to Subpart II average approximately $489,000 per year for existing sources and approximately $3,800 per year for new sources, for a total of approximately $493,000 per year and $1,478,000 over the three-year period covered by this ICR. Total costs are based on 139 facilities in 2019, 140 in 2020, and 141 in 2021, which accounts for the 1 new facility per year.

Cost Appendix for Subpart LL – Suppliers of Coal-based Liquid Fuels

Description of Subpart LL

For purposes of the GHGRP, suppliers of coal-based liquid fuels include producers, importers and exporters. A producer is the owner or operator of a facility engaged in converting coal into liquid products using a process involving conversion of coal into gas and then into liquids (e.g., Fischer-Tropsch) or conversion of coal directly into liquids (e.g., direct liquefaction). Importers are facilities that bring coal-based petroleum products or natural gas liquids (NGLs) listed in the subpart into the United States from a foreign country in a quantity equivalent to 25,000 metric tons CO_2e or more. Exporters are facilities that transfer coal-based petroleum products or NGLs listed in the subpart from the United States to a foreign country in a quantity equivalent to 25,000 metric tons CO_2e or more.

In RY2017, two facilities reported to Subpart LL. No new sources are expected during the three- year period covered by this ICR. Initial costs apply to new facilities; therefore, those costs are zero in the tables below.

Suppliers must calculate the annual CO_2 emissions (metric tons) that would result from the complete combustion or oxidation of all coal-to-liquid products leaving the facility, minus emissions that would result from the complete combustion or oxidation of 1) coal-to-liquid products entering the facility to be further processed or otherwise used on site, and 2) any biomass co-processed with fossil fuel-based feedstock. To calculate these emissions, facilities multiply the measured annual quantity of each coal-to-liquid product (metric tons or barrels) by a product-specific CO_2 emission factor (metric tons CO_2 emitted per barrel or per metric ton of product). The product-specific CO_2 emission factor is calculated using one of two methods. The first method allows facilities to use a published default factor from table MM-1. The second method allows facilities to develop an emission factor using direct measurement of density and carbon share. Because the rule does not require facilities to use direct measurement (a more expensive alternative which no facilities currently employ), we have estimated costs based on the use of published default factors.

Labor Costs for Subpart LL

Table LL-1 includes the labor hours for Subpart LL, for producers, importers and exporters Typical activities for each of the labor categories are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the “low bin” designation. Calculations include time required to collect throughput data and perform the emission calculation per coal-to-liquid product . The average number of coal-to-liquid products reported by Subpart LL facilities is 1.5.

Table LL-1. Labor Costs – Subpart LL

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2.0	0	0.2	0	4.0	0	0.4	$0	$542
QA/QC	0	0	0	0.2	0	4.0	0	0.4	$0	$318
Recordkeeping	0	0	0	0.5	0	2.0	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	0.1	0	1.3	0	0.1	$0	$100
Reporting	0	0	0	1.0	0	4.0	0	1.0	$0	$410
Total	**0**	**2.0**	**0**	**2.0**	**0**	**15.3**	**0**	**2.4**	**$0**	**$1,575**

Capital and O&M Costs for Subpart LL

Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected for Subpart LL.

Table LL-2. Capital and O&M Costs – Subpart LL

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart LL

The total industry costs related to Subpart LL are approximately $3,300 per year for a total of $9,800 over the three-year period covered by this ICR. Two facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart MM – Suppliers of Petroleum Products

Description of Subpart MM

For purposes of the GHGRP, suppliers of petroleum products include refiners, importers and exporters. Refiners are considered owners and operators of petroleum refineries (i.e., facilities engaged in producing petroleum products listed in the subpart through the distillation of crude oil). Importers are considered facilities who bring petroleum products or natural gas liquids (NGLs) listed in the subpart into the United States from a foreign country, including any blender or refiner of refined or semi-refined petroleum products if the quantity of petroleum products imported is equivalent to 25,000 metric tons CO_2e or more. Exporters are considered facilities who transfer petroleum products or NGLs listed in the subpart from the United States to a foreign country, including any blender or refiner of refined or semi-refined petroleum products if the quantity of petroleum products exported is equivalent to 25,000 metric tons CO_2e or more.

For RY2017, 241 facilities reported to Subpart MM, 137 were petroleum refineries and 104 were import/export facilities. The number of reporting facilities has been consistent over the past 5 years, with slight variations from one year to the next with no specific trend. Therefore, no new facilities are expected over the three year period covered by this ICR. Initial costs apply to new facilities; therefore, those costs are zero in the tables below.

Suppliers of petroleum products must calculate the annual CO_2 emissions that would result from the complete combustion or oxidation of all petroleum products and NGLs listed in the subpart that leave the facility, minus emissions that would result from the complete combustion or oxidation of: 1) petroleum products and NGLs that enter the refinery to be further refined or otherwise used on site and 2) any biomass co-processed with a petroleum feedstock. To calculate these emissions, facilities multiply the measured annual quantity of each product (metric tons or barrels) by a product-specific CO_2 emission factor (metric tons CO_2 emitted per barrel or per metric ton of product). The product-specific CO_2 emission factor may be determined by one of two methods. The first method allows facilities to use a published default provided in the rule, table MM-1. The second method allows facilities to develop an emission factor using direct measurement of density and carbon share. Because the rule does not require facilities to use direct measurement (a more expensive alternative), we have estimated costs based on the use of published default factors.

It should be noted that for facilities reporting emissions from a mixture of importing and exporting, if the export emissions exceed the import emissions then subpart level reported emissions are negative. The emissions from Subpart MM are quite variable year-to-year as the emissions are directly affected by supply and demand of petroleum products from all sectors of the economy.

Labor Costs for Subpart MM

Table MM-1 includes the labor hours for Subpart MM for producers, importers and exporters. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the “medium bin” designation, as discussed in the Cost Appendix Introduction. Calculations include time required to collect throughput data and perform the emission calculation for each petroleum product (regardless of the product-specific CO_2 emission factor calculation method selected from §98.393). There were more than 3,600 petroleum products reported in RY2017, with an average of 15 petroleum products per facility.

Table MM-1. Labor Costs – Subpart MM

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	0.2	0	4.0	0	0.4	$0	$542
QA/QC	0	0	0	0.2	0	4.0	0	0.4	$0	$318
Recordkeeping	0	0	0	0.5	0	5.0	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	0.4	0	8.2	0	0.8	$0	$649
Reporting	0	0	0	1.0	0	10.0	0	1.0	$0	$839
Total	**0**	**2**	**0**	**2.3**	**0**	**31.2**	**0**	**3.1**	**$0**	**$2,767**

Capital and O&M Costs for Subpart MM

Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected for facilities reporting to Subpart MM.

Table MM-2. Capital and O&M Costs – Subpart MM

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–	–	–	–	–	–
Performance testing	–	–	–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart MM

The total industry costs related to Subpart MM are approximately $679,000 per year for a total of approximately $2,037,000 over the three-year period covered by this ICR. 241 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart NN – Suppliers of Natural Gas and Natural Gas Liquids

Description of Subpart NN

For purposes of the GHGRP, suppliers of natural gas and natural gas liquids includes reporting requirements for two types of suppliers:

1. **LDCs** – installations that receive natural gas from a transmission pipeline company and deliver the gas to end users.
2. **NGL fractionators** – plants that receive natural gas or natural gas liquids from producers and fractionate these raw inputs into individual products (ethane, propane, normal butane, isobutane, and pentanes plus) and supply those products into the economy.

Suppliers of natural gas and natural gas liquids must calculate the annual CO2 emissions that would result from the complete combustion or oxidation of the natural gas or natural gas liquid by the customers who receive the products

Natural Gas Local Distribution Companies (LDCs)

Subpart NN applies to LDCs that own or operate distribution pipelines that physically deliver 460,000 Mscf natural gas to end users within a single state. They may be regulated as separate operating companies by State public utility commissions or operate as independent municipally-owned distribution systems. For RY2016 and RY2017, the total number of LDCs reporting Subpart NN data has remained steady at 378. Although there were no new facilities in 2017, there were three new facilities in 2015 and one new facility in 2016. It is expected that two new LDCs will begin reporting to Subpart NN in each of the next three years covered by this ICR.

Natural gas liquids (NGL) fractionators

Fractionators report quantities of each of the five NGL products supplied and the quantity of CO_2 that would result from the combustion of each product by downstream customers. The five NGL products reported are: ethane, propane, butane, isobutane and pentanes plus. Although most fractionators supply all five NGL products, some fractionators separate only one or two products and then supply the remaining unfractionated bulk downstream. In 2017, 123 fractionators reported Subpart NN data. Three of these facilities were new facilities. There were also two new facilities in 2015 and five new facilities in 2016. It is expected that three new NGL fractionators will begin reporting in each of the three years covered by this ICR.

Labor Costs for Subpart NN – Local Distribution Companies (LDCs)

Tables NN-1a provides the annual labor hours for each of the 378 LDC facilities. Typical activities for each of the labor categories are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "low bin" designation. Calculations include time required to retrieve the necessary records, complete calculations and QA/QC the results. LDCs may use the default HHV and/or emission factors provided in the rule or use their own facility-specific factors. Subpart NN requires facilities to use facility-specific HHV and emission factors in their calculations only if the facility already has these factors available (for example, to report to EIA or a state or local government). Hence, the same level of effort is required to complete the measurements, calculations, QA/QC, recordkeeping and reporting for facilities using facility-specific HHV and/or emission factors as for those facilities using the default factors.

The costs for legal support and QA/QC, recordkeeping and calculations are expected to be the same for new facilities as for existing facilities since there are no additional requirements for these tasks that apply to new facilities. However, a new facility in their initial year of reporting will require additional planning

time to familiarize themselves with the rule. As stated above, it is expected that two new LDCs will begin reporting in each of the next three reporting years.

Table NN-1a. Labor Costs – Subpart NN – Local Distribution Companies (LDCs)

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	1	1	0.6	0.1	6	1	0.3	0.1	$604	$194
QA/QC	0	0	0.2	0.2	2	2	0.2	0.2	$168	$168
Recordkeeping	0	0	0.5	0.5	2	2	0.5	0.5	$205	$205
Sampling and Analysis (Calculations)	0	0	1	1	2	2	0.1	0.1	$234	$234
Reporting	0	0	1	1	4	4	1	1	$410	$410
Total	**1**	**1**	**3.3**	**2.8**	**16**	**11**	**2.1**	**1.9**	**$1,621**	**$1,211**

Labor Costs for Subpart NN – NGL Fractionators

Table NN-1b provides the annual labor hours for each of the NGL fractionator facilities. Typical activities for each of the labor categories are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "low bin" designation. Calculations include time required to retrieve the necessary records, complete calculations and QA/QC the results. NGL fractionators may use the default HHV and/or emission factors provided in the rule or use their own facility-specific factors. Subpart NN requires facilities to use facility-specific HHV and emission factors in their calculations only if the facility already has these factors available (for example, to report to EIA or a state or local government). Hence, the same level of effort is required to complete the measurements, calculations, QA/QC, recordkeeping and reporting for facilities using facility-specific HHV and/or emission factors as for those facilities using the default factors.

The costs for legal support and QA/QC, recordkeeping and calculations are expected to be the same for new facilities as for existing facilities since there are no additional requirements for these tasks that apply to new facilities. However, a new facility in their initial year of reporting will require additional planning time to familiarize themselves with the rule. As stated above, it is expected that three new NGL fractionators will begin reporting in each of the next three reporting years.

Table NN-1b. Labor Costs – Subpart NN – NGL Fractionators

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	1	1	0.6	0.1	6	1	0.3	0.1	$604	$194
QA/QC	0	0	0.2	0.2	2	2	0.2	0.2	$168	$168
Recordkeeping	0	0	0.5	0.5	2	2	0.5	0.5	$205	$205
Sampling and Analysis (Calculations)	0	0	1	1	2.7	2.7	0.1	0.1	$285	$285
Reporting	0	0	1	1	4	4	1	1	$410	$410
Total	**1**	**1**	**3.3**	**2.8**	**16.7**	**11.7**	**2.1**	**1.9**	**$1,671**	**$1,261**

Capital and O&M Costs for Subpart NN

Table NN-2 shows the capital and O&M costs for each Subpart NN facility. The only O&M costs facilities are expected to incur are those associated with recordkeeping, as discussed in the Cost Appendix introduction.

No additional capital costs are attributed to the GHGRP because no new monitoring equipment is required for LDCs and NGL fractionators to comply. Facilities use their existing meters to complete the reporting requirements. LDCs routinely measure and record the volumes of gas received, stored, removed from storage and delivered to customers and third parties. The data are essential for LDC operation and for billing purposes. LDCs that own storage facilities monitor natural gas entering and leaving their storage facility to ensure enough natural gas is available during peaks in demand and disruptions in gas received from inter- and intrastate transmission pipelines or local production plants. LDCs also compile and report much of the data reported under Subpart NN to the Department of Energy's Energy Information Administration (EIA) and state and local governments. The data LDCs collect by reading meters on a set schedule for different areas of the system is compiled for the calendar year and used to reconcile transmission pipeline receipts with customer sales and deliveries. Hence, for reporting under Subpart NN, LDCs use the records they already collect from existing meters to compile the data necessary for Subpart NN reporting. If the LDC does not have meters located at the city gate, then they may use invoices provided by the companies that supply natural gas to the LDC.

Similarly, NGL fractionators routinely measure and record the volumes of natural gas and NGL (bulk and fractionated) received, volumes of NGL products supplied, volume of bulk NGL delivered downstream and the volume of odorized propane supplied. This information is essential for supplier and customer billing purposes. NGL fractionators compile this information for reporting to EIA and some state governments. For example, fractionators are required to submit EIA form 816 with information on production and shipment of products and receipts of natural gas and other products used to produce NGLs. NGL fractionators in some states (e.g., Texas) are also required to submit detailed reports to their state government. Under Subpart NN, NGL fractionators are required to measure NGL and natural gas volumes using "methods in common use in the industry for billing purposes as audited under existing Sarbanes Oxley regulation" (see §98.404(a)). Hence, NGL fractionators use data collected from existing

meters for internal purposes (plant operation and customer/supplier billing) and for reporting to EIA and state governments to compile the data reported under Subpart NN.

There are also no additional costs for testing, sampling or calibration included in the cost estimate because there are no mandatory requirements for these activities in Subpart NN. Although LDCs and fractionators may use their own HHV and CO_2 emission factors to calculate CO_2 for the products they supply, they are only required to do so if they already routinely collect that data . LDCs may use data provided by the company that supplies natural gas to their LDC. The rule does not require that any specific methods be used to measure HHV or carbon composition. For HHV values, the only requirement is that measurements be made in accordance with established business practices (see §98.404(b)). For the CO_2 emission factors, carbon composition must be determined using an appropriate standard method published by a consensus-based standards organization. If the methods used to measure HHV or gas composition do not meet these requirements, then facilities use the default values provided in the rule.

Table NN-2. Capital and O&M Costs – Subpart NN - Local Distribution Companies (LDCs) and NGL Fractionators

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$50	$50

Total Costs for Subpart NN

The total industry costs related to Subpart NN average approximately $644,100 per year for existing sources and approximately $8,500 per year for new sources, for a total of approximately $653,000 per year and $1,958,000 over the three-year period covered by this ICR. Total costs are based on 506 facilities in 2019, 511 in 2020, and 516 in 2021, which accounts for the five new facilities per year (i.e., two LDCs and three NGL fractionators).

Cost Appendix for Subpart OO – Suppliers of Industrial Greenhouse Gases

Description of Subpart OO

For purposes of the GHGRP, the suppliers of industrial greenhouse gases source category applies to any facility that produces a fluorinated GHG, fluorinated heat transfer fluid (HTF), or nitrous oxide; any bulk importer or exporter of fluorinated GHGs, fluorinated HTFs, or nitrous oxide; and any destroyer of fluorinated GHGs or fluorinated HTFs. The number of facilities that report to Subpart OO has ranged between 47 and 78 over recent years. In RY2017 there were 78 facilities that reported under Subpart OO; 22 of these facilities were producers, 54 were importers, and 24 were exporters of fluorinated GHGs or nitrous oxide. Some facilities fall under more than one of these categories. Facilities that fall under multiple categories will incur the costs of each of those categories. Revisions to Subpart OO became effective in 2018 to include fluorinated HTFs and those facilities that only destroy fluorinated GHG or fluorinated HTFs in reporting for Subpart OO. No additional reporting facilities are expected to result from the addition of fluorinated HTFs. It is expected that 8 facilities that only destroy fluorinated GHGs or fluorinated HTFs (but do not also produce, import, or export) will begin reporting to Subpart OO beginning in RY2018 as discussed below.

Producers that report to Subpart OO must use Equation OO-1 and Equation OO-2 (§98.413(a) and (b)) to calculate the total mass of fluorinated GHGs, fluorinated HTFs, and nitrous oxide produced. Producers may also transform these gases and use Equation OO-3 (§98.413(c)) to calculate the total mass transformed. Facilities that destroy these gases must use Equation OO-4 (§98.413(d)) to calculate the total mass destroyed.

Labor Costs for Subpart OO – Producers

The labor costs for each of the 22 producers to report under Subpart OO are provided in Table OO-1a. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Additional activities expected to require sampling and analysis labor hours include updating the one-time report required under §98.416(e) if any destruction process changes are made. No new producers are expected to report under Subpart OO during the three year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below. Recordkeeping and reporting labor costs are based on the "high bin" designation.

Table OO-1a. Labor Costs – Subpart OO – Producers

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1	0	1	0	0	$0	$383
QA/QC	0	0	0	5	0	0	0	0	$0	$437
Recordkeeping	0	0	0	1	0	13	0	1	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	2.4	0	48	0	4.8	$0	$3,814
Reporting	0	0	0	2	0	26	0	2	$0	$2,105
Total	**0**	**2**	**0**	**11.4**	**0**	**88**	**0**	**7.8**	**$0**	**$7,792**

Labor Costs for Subpart OO – Importers

The labor costs for each of the 54 importers to report under Subpart OO are provided in Table OO-1b. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Importers also provide an annual report that summarizes imports at the corporate level (see §98.416(c)). No new importers are expected to report under Subpart OO during the three year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below. Recordkeeping and reporting labor costs are based on the "high bin" designation.

Table OO-1b. Labor Costs – Subpart OO – Importers

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1	0	1	0	0	$0	$383
QA/QC	0	0	0	5	0	0	0	0	$0	$437
Recordkeeping	0	0	0	1	0	13	0	1	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	0.9	0	18	0	1.8	$0	$1,430
Reporting	0	0	0	2	0	26	0	2	$0	$2,105
Total	**0**	**2**	**0**	**9.9**	**0**	**58**	**0**	**4.8**	**$0**	**$5,408**

Labor Costs for Subpart OO – Exporters

The labor costs for each of the 24 exporters to report under Subpart OO are provided in Table OO-1c. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Exporters also provide an annual report that summarizes exports at the corporate level (see § 98.416(d)). No new exporters are expected to report under Subpart OO during the three year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below. Recordkeeping and reporting labor costs are based on the "high bin" designation.

Table OO-1c. Labor Costs – Subpart OO – Exporters

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1	0	1	0	0	$0	$383
QA/QC	0	0	0	5	0	0	0	0	$0	$437
Recordkeeping	0	0	0	1	0	13	0	1	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	0.9	0	18	0	1.8	$0	$1,430
Reporting	0	0	0	2	0	26	0	2	$0	$2,105
Total	**0**	**2**	**0**	**9.9**	**0**	**58**	**0**	**4.8**	**$0**	**$5,408**

Labor Costs for Subpart OO – Destroyers, that do not also produce, import, or export

Beginning in RY2018, facilities destroying fluorinated GHGs or fluorinated HTFs (and that also do not produce, import, or export these gases) must begin reporting under Subpart OO. Eight new destruction facilities are expected to begin reporting for RY2018, and no additional destruction facilities are expected after that year. The labor costs for each of the estimated 8 facilities that destroy fluorinated GHG or fluorinated HTFs (and that also do not produce, import, or export these gases) to report under Subpart OO are provided in Table OO-1d. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Additional activities expected to require sampling and analysis labor hours include updating the one-time report, as required under §98.416(b), if any destruction process changes are made. Recordkeeping and reporting labor costs are based on the "high bin" designation.

Table OO-1d. Labor Costs – Subpart OO – Destroyers, that do not also produce, import, or export

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	2	0	1.0	0	1.0	0	0	$0	$383
QA/QC	0	0	0	5.0	0	0	0	0	$0	$437
Recordkeeping	0	0	0	1.0	0	13.0	0	1.0	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	0.6	0	12.8	0	1.3	$0	$1,017
Reporting	0	0	0	2.0	0	26.0	0	2.0	$0	$2,105
Total	**0**	**2**	**0**	**9.6**	**0**	**52.8**	**0**	**4.3**	**$0**	**$4,995**

Capital and O&M Costs for Subpart OO

As shown in Table OO-2, each of the 86 facilities will incur an O&M cost of $50 per year for recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table OO-2. Capital and O&M Costs – Subpart OO

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–	–	–	–	–	–
Performance testing	–	–	–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart OO

The total industry costs related to Subpart OO are approximately $638,000 per year, for a total of $1,913,000 over the three-year period covered by this ICR. 86 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart PP – Suppliers of Carbon Dioxide

Description of Subpart PP

For purposes of the GHGRP, Subpart PP requires reporting of GHG from facilities that capture CO_2 from industrial sources or extract it from natural CO_2-bearing formations for supply into the economy. In RY2017, most of the CO_2 captured from industrial processes, and nearly all CO_2 produced from natural sources, was used for enhanced oil and gas recovery. Food and beverage manufacturing was the second most common end use, followed by other end uses such as pulp and paper manufacturing, fire-fighting equipment, and metal fabrication.

In RY2017, 131 facilities reported under Subpart PP, four fewer facilities than reported in 2016. No new facilities are expected to report during the three-year period covered by this ICR. No new facilities are expected because no new suppliers of CO_2 are anticipated, and the number of facilities has minimally declined. Initial costs apply to new facilities; therefore, these costs are zero in the tables below.

Labor Costs for Subpart PP

Table PP-1 below includes the labor hours for Subpart PP. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. No labor hours for planning or QA/QC are expected. Recordkeeping and Reporting hours are based on the "low bin" designation, as discussed in the Cost Appendix Introduction. Sampling and Analysis (Calculations) hours include completion of the measurements and calculations in Subpart PP, including calculation of CO_2 supply volumes.

Table PP-1. Labor Costs – Subpart PP

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	1.0	0	3	0	0	$0	$302
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$410
Total	**0**	**0**	**0**	**2.5**	**0**	**9**	**0**	**1.5**	**$0**	**$917**

Capital and O&M Costs for Subpart PP

Table PP-2 below summarizes the capital and O&M costs for Subpart PP. Facilities will only incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table PP-2. Capital and O&M Costs – Subpart PP

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart PP

The total industry costs related to Subpart PP average approximately $127,000 per year for a total of $380,000 over the three-year period of the ICR. 131 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart QQ – Importers and Exporters of Fluorinated Greenhouse Gases Contained in Pre-Charged Equipment or Closed-Cell Foams

Description of Subpart QQ

For purposes of the GHGRP, this subpart refers to any entity that imports or exports pre-charged equipment that contains a fluorinated GHG, and any entity that imports or exports closed-cell foams that contain a fluorinated GHG. In RY2017, 41 facilities reported to Subpart QQ, all of which use the calculation procedures in §98.433 to comply with the rule requirements. The total number of facilities reporting to Subpart QQ is expected to remain constant during the three-year period covered by this ICR. Initial year costs apply only to new facilities; therefore, those costs are zero in the tables below.

Labor Costs for Subpart QQ

Table QQ-1 below includes the labor hours for each Subpart QQ facility. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the "high bin" designation. Sampling and analysis (calculations) hours include completion of the calculations in §§98.433(a) and (b).

Table QQ-1. Labor Costs – Subpart QQ

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	1.0	0	2	0	1.0	$0	$379
QA/QC	0	0	0	1.0	0	2	0	0	$0	$230
Recordkeeping	0	0	0	1.0	0	13	0	1.0	$0	$1,053
Sampling and Analysis (Calculations)	0	0	0	1.5	0	8	0	1.5	$0	$757
Reporting	0	0	0	2.0	0	26	0	2.0	$0	$2,105
Total	**0**	**1**	**0**	**6.5**	**0**	**51**	**0**	**5.5**	**$0**	**$4,524**

Capital and O&M Costs for Subpart QQ

As shown in Table QQ-2, Subpart QQ facilities will only incur an O&M cost of $50 per year for recordkeeping as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table QQ-2. Capital and O&M Costs – Subpart QQ

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart QQ

The total industry costs related to Subpart QQ average approximately $188,000 per year with a total of $562,600 over the three-year period covered by this ICR. 41 facilities are expected to report in 2019, 2020, and 2021.

Cost Appendix for Subpart RR – Geologic Sequestration of Carbon Dioxide

Description of Subpart RR

For purposes of the GHGRP, geologic sequestration of carbon dioxide (CO_2) refers to any well or group of wells that inject a CO_2 stream for long-term containment in subsurface geologic formations. Subpart RR provides a mechanism for facilities to monitor and report to EPA the amounts of CO_2 sequestered on an annual basis. Subpart RR monitoring and reporting costs are estimated based on two types of facilities:

- Projects permitted under Class II of EPA's Underground Injection Control (UIC) program (primarily for CO_2 enhanced oil recovery ("CO_2-EOR") wells).
- Projects permitted under Class VI of EPA's UIC Program (expected to be injecting CO_2 into deep saline formations).

The geologic and project characteristics of the "representative" facility for both the CO_2-EOR and the deep saline formation case are based on a typical CO_2-EOR project in the Permian Basin of West Texas, where the majority of ongoing CO_2-EOR operations in the U.S. exist. This "representative" facility is comparable to that used in previous EPA Subpart RR analyses.

This update takes into consideration activities and events occurring since the last estimate in 2016. Specifically, monitoring, reporting, and verification (MRV) plans for CO_2-EOR and deep saline CO_2 storage projects that have been approved by EPA.

In RY2017, two facilities with CO_2-EOR projects and one facility injecting CO_2 into a deep saline formation reported to Subpart RR. For purposes of this analysis, it is expected that one deep saline formation CO_2 storage project would report under Subpart RR in year 1 (2019), year 2 (2020), and year 3 (2021). It is also expected that four CO_2-EOR projects would report under Subpart RR in year 1, seven in year 2, and ten in year 3. Subpart RR has higher labor rates than other subparts because oil and gas companies typically pay higher than average salaries. Those labor categories are represented in all tables in this chapter as Lawyer, Senior Manager, Middle Manager, and Technician.

Labor Costs for Subpart RR

Table RR-1a summarizes the labor costs associated with Subpart RR for those activities associated with developing and implementing an MRV plan for a Class VI/deep saline formation project, and with annual reporting pursuant to that MRV plan. These activities are incremental to those that may be associated with a Class VI permit. These activities include those associated with developing and, as necessary, updating MRV Plans and models upon which plans are based; installing, operating, and maintaining surface and near-subsurface monitoring equipment; and purchasing, operating, and maintaining equipment associated with continuous monitoring of subsurface pressures, temperatures, production and injection rates, along with periodic monitoring of injection gas composition and potential corrosion.

Table RR-1b summarizes the labor costs associated with Subpart RR for those activities associated with developing and implementing an MRV plan for a Class II/CO_2-EOR project, and with annual reporting pursuant to that plan. These activities are incremental to those that may be associated with traditional Class II/CO_2-EOR activities. CO_2-EOR projects that have submitted MRV plans to EPA operate with rigorous monitoring already in place, to ensure efficient and economically viable operations. Incremental costs are associated with the development of an MRV plan and reporting and recordkeeping costs to meet Subpart RR requirements (e.g., submission of annual reports). It is expected that reservoir simulators used to predict the movement of the injected CO_2 plume are updated every other year during the injection phase, based on new data collected as part of monitoring operations, to determine if changes to the Active Monitoring Area (AMA) may be warranted. No facilities are expected to be in the post-injection phase during the three-year period covered by this ICR.

Table RR-1a. Labor Costs – Subpart RR – Class VI/Deep Saline Formation Storage

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Senior Manager		Middle Manager		Technician			
	$112.23		$141.54		$105.68		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	25	0	67.3	0	171.3	0	68.0	$0	$34,563
QA/QC	0	25	0	64.3	0	132.3	0	0.0	$0	$25,888
Recordkeeping	0	0	0	1.0	0	13	0	1.0	$0	$1,576
Sampling and Analysis (Calculations)	0	0	0	67.3	0	342.5	0	0.0	$0	$45,726
Reporting	0	0	0	2.0	0	26	0	2.0	$0	$3,152
Total	**0**	**50**	**0**	**202.0**	**0**	**685.1**	**0**	**71.0**	**$0**	**$110,905**

Table RR-1b. Labor Costs –Subpart RR – Class II/CO_2-EOR Project Storage

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Senior Manager		Middle Manager		Technician			
	$112.23		$141.54		$105.68		$60.72			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	8.5	8.5	22.3	22.3	57.3	57.3	21	21	$11,440	$11,440
QA/QC	8.5	8.5	19.3	19.3	18.3	18.3	0	0	$5,619	$5,619
Recordkeeping	0.0	0.0	1.0	1.0	13.0	13.0	1	1	$1,576	$1,576
Sampling and Analysis (Calculations)	0.0	0.0	67.3	67.3	114.5	114.5	0	0	$15,261	$15,261
Reporting	0.0	0.0	2.0	2.0	26.0	26.0	2	2	$3,152	$3,152
Total	**17**	**17**	**67.0**	**67.0**	**229.0**	**229.0**	**24**	**24**	**$37,049**	**$37,049**

Capital and O&M Costs for Subpart RR

Table RR-2 summarizes the capital and O&M costs associated with developing and implementing an MRV plan for a Class VI/deep saline formation project, and with annual reporting according to that plan. These activities are incremental to those that may be associated with a Class VI permit. These costs are associated with purchasing and periodically replacing equipment associated with continuous monitoring of surface pressures, temperatures, and production and injection rates, along with periodic monitoring of injection gas composition and potential corrosion. Continuous monitoring equipment is not expected to be in place as part of baseline Class VI reporting requirements. In addition, recordkeeping costs are incurred as part of Class VI requirements; therefore, no incremental costs for recordkeeping are expected to be incurred as a result of the Subpart RR requirements.

No incremental capital or O&M costs are expected for a Class II/CO_2-EOR project because these facilities are expected to have vigorous monitoring and recordkeeping systems already in place.

Table RR-2. Capital and O&M Costs – Subpart RR – Class VI/Deep Saline Formation Storage

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	$0		$0	$16,000	$0	$16,000
Performance testing	–		–	–	–	–
Recordkeeping	–		–	–	–	–
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$16,000	$0	$16,000

Total Costs for Subpart RR

The total industry costs related to Subpart RR average approximately $386,000 per year for existing sources and approximately $111,000 per year for new sources, for a total of approximately $497,000 per year and $1,492,000 over the three-year period of the ICR. Total costs are based on 5 facilities in 2019, 8 in 2020, and 11 in 2021, which accounts for the 3 new facilities per year.

Cost Appendix for Subpart SS – Electrical Equipment Manufacture or Refurbishment

Description of Subpart SS

For purposes of the GHGRP, electrical equipment manufacturing or refurbishment consists of processes that manufacture or refurbish gas-insulated substations, circuit breakers, other switchgear, gas-insulated lines, or power transformers (including gas-containing components of such equipment) containing sulfur hexafluoride (SF_6) or perfluorocarbons (PFCs). The processes include equipment testing, installation, manufacturing, decommissioning and disposal, refurbishing, and storage in gas cylinders and other containers. Facilities reporting to Subpart SS calculate their emissions using the equations in §98.453(a) - (i). In RY2017, 8 facilities reported to Subpart SS. No new facilities are expected to report during the three-year period covered by this ICR. Initial costs apply only to new facilities therefore those costs are zero in the tables below.

Labor Costs for Subpart SS

Table SS-1 below includes the labor hours for Subpart SS. Typical activities related to planning, QA/QC, recordkeeping and reporting, and sampling and analysis (which includes emissions calculations) are discussed in the Cost Appendix Introduction. Recordkeeping and Reporting hours correspond to the "medium bin" designation, as discussed in the Cost Appendix Introduction.

Table SS-1. Labor Costs – Subpart SS

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	0	1	0	1.0	0	2	0	0.5	$0	$361
QA/QC	0	0	0	1.0	0	12	0	0.5	$0	$963
Recordkeeping	0	0	0	0.5	0	5	0	0.5	$0	$419
Sampling and Analysis (Calculations)	0	0	0	1.5	0	8	0	1.5	$0	$757
Reporting	0	0	0	1.0	0	10	0	1.0	$0	$838
Total	**0**	**1**	**0**	**5.0**	**0**	**37**	**0**	**4.0**	**$0**	**$3,338**

Capital and O&M Costs for Subpart SS

As shown in Table SS-2, facilities will only incur an O&M cost associated with recordkeeping as discussed in the Cost Appendix Introduction. No additional capital costs are expected.

Table SS-2. Capital and O&M Costs – Subpart SS

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–		–	–	–	–
Performance testing	–		–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–		–	–	–	–
Sampling and Analysis Costs	–		–	–	–	–
Total	$0		$0	$50	$0	$50

Total Costs for Subpart SS

The total industry costs related to Subpart SS are approximately $27,100 per year for a total of $81,000 over the three-year period of the ICR. Eight facilities are expected to report in 2019, 2020 and 2021.

Cost Appendix for Subpart TT – Industrial Waste Landfills

Description of Subpart TT

For purposes of the GHGRP, the industrial waste landfills source category applies to industrial waste landfills that accepted waste on or after January 1, 1980 and that are located at a facility whose total landfill design capacity is greater than or equal to 300,000 metric tons. Subpart TT defines an industrial waste landfill as a landfill other than a municipal solid waste landfill, a RCRA Subtitle C hazardous waste landfill, or a TSCA hazardous waste landfill, in which industrial solid waste (RCRA Subtitle D wastes, non-hazardous as defined in §257.2), commercial solid wastes, or conditionally exempt small quantity generate wastes, is placed. In 2017, 171 facilities reported to Subpart TT, with little deviation from this number in previous reporting years. Subpart TT facilities represent more than 12 different industries; however, the most common industries are paper manufacturing, metal manufacturing, and chemical manufacturing. Because of the large variety of industries represented by the subpart, facilities reporting to Subpart TT differ widely in the amount of waste streams coming in to their facility. On average, a Subpart TT facility has 4 unique waste streams. Approximately three new facilities are expected to begin reporting to Subpart TT during the three-year period covered by this ICR, at a rate of 1 facility per year.

Facilities reporting to Subpart TT are required to report methane generation and emissions from the industrial landfill. They are also required to report methane emissions from landfill gas collection and destruction devices, if applicable. Historically, only two Subpart TT facilities have reported a gas collection system at their facility, and in 2016 this total was reduced to a single facility. Industrial landfills reporting to Subpart TT are generally not expected to have gas collection systems, as the waste disposed of in these landfills is, on average, not very high in degradable organic carbon. Therefore, costs associated with data collection and reporting from gas collection systems at industrial landfills are not accounted for in this ICR.

Labor Costs for Subpart TT

Table TT-1 below includes the labor hours for Subpart TT. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. Recordkeeping and reporting hours are based on the “medium bin” designation. Sampling and analysis (calculations) hours include completion of the measurements and calculations in (§98.276), including calculation of emissions, and volatile solids testing for the initial year of reporting, where applicable. New facilities in their initial year of reporting will incur additional planning time to familiarize themselves with the rule. Initial year labor costs also include time for setup of compliance activities.

Table TT-1. Labor Costs – Subpart TT

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	3	1	3	1	3	1	3	1	$922	$307
QA/QC	0	0	2	1	1	1	2	1	$319	$195
Recordkeeping	0	0	1	1	13	13	1	1	$1,053	$1,053
Sampling and Analysis (Calculations)	0	0	2	1	2	1	0	0	$318	$159
Reporting	0	0	2	2	26	26	2	2	$2,105	$2,105
Total	**3**	**1**	**10**	**6**	**45**	**42**	**8**	**5**	**$4,717**	**$3,819**

Capital and O&M Costs for Subpart TT

Table TT-2 summarizes the capital and O&M costs for Subpart TT. Typical O&M costs related to recordkeeping are discussed in the Cost Appendix Introduction. The largest cost component for Subpart TT is for some facilities to conduct a volatile solids test in order to properly report their waste stream degradable organic carbon (DOC) values. This O&M sampling cost of $95 is only applicable to the initial year of reporting for those facilities, as Subpart TT facilities are only required to perform a volatile solids/DOC test once during their tenure reporting to the program. No capital costs are expected.

Table TT-2. Capital and O&M Costs – Subpart TT

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/year)	O&M Costs (2017$/year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–	–	–	–	–	–
Performance testing	–	–	–	–	–	–
Recordkeeping	$0		$0	$50	$50	$50
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	$0		$0	$145	$145	$50

Total Costs for Subpart TT

The total industry costs related to Subpart TT average approximately $669,000 per year for existing sources and approximately $4,900 per year for new sources, for a total of $674,000 per year and $2,023,000 over the three-year period of the ICR. Total costs are based on 173 facilities in 2019, 174 in 2020, and 175 in 2021, which accounts for 1 new facility per year.

Cost Appendix for Subpart UU – Injection of Carbon Dioxide

Description of Subpart UU

For purposes of the GHGRP, injection of carbon dioxide (CO_2) refers to any well or group of wells that inject a CO_2 stream into the subsurface. Subpart UU requires reporting of GHG from facilities that inject CO_2 underground for the purposes of enhanced oil and gas recovery or any purpose other than geologic sequestration. Injection purposes other than enhanced oil and gas recovery include acid gas injection/disposal and carbon storage research and development. In RY2017, most of the CO_2 injected underground was received for enhanced oil and gas recovery. Acid gas injection/disposal was the second most common end use.

In RY2017, 95 facilities reported for Subpart UU. No new facilities are expected to report during the three-year period covered by this ICR. Initial year costs apply to new facilities; therefore, those costs are zero in the tables below.

Labor Costs for Subpart UU

Table UU-1 below includes the labor hours for Subpart UU. Typical activities for each of the labor activities are discussed in the Cost Appendix Introduction. No planning or QA/QC labor hours are expected . Recordkeeping and reporting hours are based on the "low bin" designation as discussed in the Cost Appendix Introduction. Sampling and analysis (calculations) hours include completion of the measurements and calculations in §98.473 and §98.474, including calculation of CO_2 injection volumes.

Table UU-1. Labor Costs – Subpart UU

Activity	Labor Rates (per hour)								Total Labor Cost per Year per Facility (2017$)	
	Lawyer		Industrial Manager		Industrial Engineer/ Technician		Administrative Support			
	$112.23		$87.45		$71.45		$36.28			
	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year Hours	Subseq. Year Hours	Initial Year	Subseq. Year
Planning	–	–	–	–	–	–	–	–	–	–
QA/QC	–	–	–	–	–	–	–	–	–	–
Recordkeeping	0	0	0	0.5	0	2	0	0.5	$0	$205
Sampling and Analysis (Calculations)	0	0	0	1.0	0	3	0	0	$0	$302
Reporting	0	0	0	1.0	0	4	0	1.0	$0	$409
Total	**0**	**0**	**0**	**2.5**	**0**	**9**	**0**	**1.5**	**$0**	**$916**

Capital and O&M Costs for Subpart UU

Table UU-2 shows the capital and O&M costs expected for Subpart UU. Facilities are only expected to incur O&M costs associated with recordkeeping, as discussed in the Cost Appendix Introduction. No capital costs are expected.

Table UU-2. Capital and O&M Costs – Subpart UU

Activity	Cost Categories				Total Capital and O&M Cost per Year per Facility (2017$)	
	Capital Cost (2017$)	Equipment Lifetime	Annualized Capital Cost (2017$/ year)	O&M Costs (2017$/ year)	Initial Year	Subseq. Years
Equipment (selection, purchase, installation)	–	–	–	–	–	–
Performance testing	–	–	–	–	–	–
Recordkeeping	$0		$0	$50	$0	$50
Travel	–	–	–	–	–	–
Sampling and Analysis Costs	–	–	–	–	–	–
Total	**$0**		**$0**	**$50**	**$0**	**$50**

Total Costs for Subpart UU

The total industry costs related to Subpart UU are approximately $92,000 per year for a total of $275,000 over the three-year period of the ICR. 95 facilities are expected to report in 2019, 2020, and 2021.