November 2010

Economic Impact Analysis for the Mandatory Reporting of Greenhouse Gas Emissions F-Gases: Subparts I, L, DD, QQ, SS

Final Report

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INTRODUCTION AND BACKGROUND

1.1 Background

On December 26, 2007, President Bush signed the FY2008 Consolidated Appropriations Act authorizing funding for EPA to issue a rule requiring the mandatory reporting of greenhouse gas (GHG) emissions (Consolidated Appropriations Act, 2008, Pub. L. No.110-161, 121 Stat 1844, 2128 (2008)). An accompanying joint explanatory statement directed EPA to "use its existing authority under the Clean Air Act" to develop a mandatory GHG reporting rule.

The Final Mandatory Reporting of Greenhouse Gases Rule (Final MRR) (40 CFR part 98) was signed on September 22, 2009 by Administrator Lisa Jackson; and published in the Federal Register on October 30, 2009 (74 FR 56260). The Final MRR, which is effective on December 29, 2009, included reporting of GHGs from the facilities and suppliers that EPA determined appropriately responded to the direction in the 2008 Consolidated Appropriations Act[1]. These source categories capture approximately 85 percent of U.S. GHG emissions through reporting by direct emitters as well as suppliers of fossil fuels and industrial gases.

EPA initially proposed reporting requirements for electronics, fluorinated GHG production, and electrical equipment use on April 12, 2009 (74 FR 16448) as part of the larger rulemaking effort to establish a GHG reporting program for all sectors of the economy. In addition, EPA requested comment on requiring reporting of the quantities of fluorinated GHGs imported and exported inside pre-charged equipment and foams. However, EPA did not include requirements for these source categories in the Final Mandatory GHG Reporting Rule.

EPA deferred action on these requirements because EPA received a number of lengthy, detailed comments regarding the proposed requirements for electronics and fluorinated GHG production (subparts I and L, respectively), several comments regarding the definition of “facility” for electric power system use (Subpart DD), and several comments regarding a reporting requirement for imports and exports of fluorinated GHGs contained inside pre-charged equipment and foams (included in today’s final rule as Subpart QQ). These comments, which are described in more detail in the discussions of the individual source categories in the April 12, 2010 proposed rule, raised concerns about the costs and technical feasibility of implementing subparts I and L as initially proposed, requested clarification of how “facility” should be interpreted under subpart DD, and both favored and opposed a requirement to report imports of

[1] Consolidated Appropriations Act, 2008, Public Law 110–161, 121 Stat. 1844, 2128.

fluorinated GHGs contained in imported and exported pre-charged equipment and closed-cell foams.

EPA recognized the concerns raised by stakeholders, and decided to re-propose significant pieces of these subparts. The revised proposed rule was published in the Federal Register on April 12, 2010. A public hearing on the proposed rule was held on April 20, 2010 in Washington, DC, and the 60-day public comment period ended on June 11, 2010.

For subparts I and L this rule incorporates a number of changes including, but not limited to, the addition of different methodologies that provide improved emissions coverage at a lower cost burden to facilities as compared to the initial April 2009 proposal. Where aspects of the initial proposals for subparts I and L are retained in this rule, such as in the basic mass-balance methodology for subpart L (as an option for some facilities) and in many of the equations for subpart I, today's rule adds more flexibility in how and how frequently the underlying data are gathered. In addition, EPA is requiring facilities to report emissions from manufacture or refurbishment of electrical equipment and to report the quantities of fluorinated GHGs imported and exported inside pre-charged equipment and foams.

EPA believes the monitoring approaches required in this rule, which combine direct measurement and facility-specific calculations, effectively balance accuracy and costs, and that they are warranted even though the rule does not contain any emissions reduction requirements. As we stated in the October 2009 Final MRR, the data collected by the rule are expected to be used in analyzing and developing a range of potential CAA GHG policies and programs. A consistent and accurate data set is crucial to serve this intended purpose.

1.2 Final Rule: Fluorinated Greenhouse Gas Subparts

This rule requires reporting of fluorinated greenhouse gas (F-GHG) emissions from electronics manufacturing, production of fluorinated gases, and use of electric transmission and distribution equipment. EPA is also requiring such reporting from manufacturers of electrical equipment, import and export of pre-charged equipment, and closed cell foams. These F-GHG source categories are covered under Subparts I, L, DD, QQ, and SS of the rule. This section provides a brief introduction to the industries covered by each subpart and identifies which subparts were included in the initial proposal.

1.2.1 Subpart I: Electronics Manufacturing

The electronics manufacturing source category consists of facilities that manufacture semiconductors, liquid crystal displays (LCDs), micro-electro-mechanical systems (MEMS), photovoltaic cells (PV), and light-emitting diodes (LEDs).The rule applies to electronics manufacturing facilities that emit GHGs from electronics manufacturing processes such as plasma etching, chemical vapor deposition, chamber cleaning, and heat transfer fluid use.

Subpart I was included in the initial MRR proposal but omitted from the final rule. EPA received comments from entities within the covered industries regarding the requirements put forth in the initial proposal. EPA took these comments into consideration in the development of this final rule.

1.2.2 Subpart L:Fluorinated Gas Production

The fluorinated gas production source category consists of processes that manufacture a fluorinated gas from any raw material or feedstock chemical, except for processes that generate HFC-23 during the production of HCFC-22[2]. Under the rule, these facilities would be required to report their fluorinated GHG emissions from fluorinated gas production, transformation, and destruction, as well as combustion-related CO_2, CH_4, and nitrous oxide (N_2O) emissions from stationary fuel combustion. Fluorinated gases include fluorinated GHGs (HFCs, PFCs, SF6, NF3, HFEs, etc.), CFCs, and HCFCs. Similarly, emissions of CFCs and HCFCs (considered ozone depleting substances rather than F-GHG) are addressed under the regulations implementing Title VI of the Clean Air Act and are therefore excluded from this subpart.

Like Subpart I, Subpart L was included in the initial MRR proposal but omitted from the final rule. After receiving comments on the proposed regulation, EPA has modified the rule with respect to entities under this subpart.

1.2.3 Subpart DD: Electric Transmission and Distribution Equipment Use

The electric transmission and distribution equipment use source category includes gas-insulated substations, circuit breakers, other switchgear, and gas-insulated lines containing SF_6 or PFCs. Equipment also includes gas containers such as pressurized cylinders, gas carts, new equipment owned but not yet installed, or other containers. Notwithstanding the definition of facility in subpart A, for purposes of this subpart, “facility” means an electric transmission and

[2] Since HFC-23 emissions for HCFC-22 production are addressed under Subpart O, they are omitted from this subpart.

distribution system which is the collection of SF6- and PFC insulated equipment linked through electric power transmission or distribution lines and operated as an integrated unit by one electric power entity or several entities that have a single owner.

Regulation of Subpart DD was proposed under the initial MRR, but was excluded after EPA received several comments regarding the definition of "facility" as it would be covered under the rule. After taking these comments under consideration, EPA has clarified the definition for this final rule.

1.2.4 Subpart QQ: Imports and Exports of Fluorinated GHGs in Pre-Charged Equipment and Closed-Cell Foams

This source category consists of any entity that is importing or exporting pre-charged equipment that contains a fluorinated GHG and also includes any entity that is importing or exporting closed-cell foams that contain a fluorinated GHG.

Today's rule introduces Subpart QQ as a new addition to the MRR. This source category was not proposed in the initial rule.

1.2.5 Subpart SS: Electrical Equipment Manufacture or Refurbishment and Manufacturing of Electrical Components

This source category consists of electrical equipment manufacturers and refurbishers of SF_6 or PFC-insulated closed-pressure equipment and sealed-pressure equipment including gas-insulated substations, circuit breakers and other switchgear, gas-insulated lines, or power transformers containing sulfur-hexafluoride (SF_6) or perfluorocarbons (PFCs).Like Subpart QQ, this source category was not covered under the initial MRR proposal and final rule.

1.3 Economic Impact Analysis for F-Gas Subparts

As part of the regulatory process of developing these rules, EPA is required to conduct an economic impact analysis (EIA). This report documents the EIA methods and results and proceeds as follows: Section 2 describes the current regulatory context into which the new rules will be integrated. Section 3 explains the development process for each of the four subparts, and Section 4 details the individual cost analyses methodology used to evaluate each regulation. Section 5 presents the results of the economic impact analysis. A review of executive orders is provided in Section 6, which is followed by a brief EIA summary and conclusion in Section 7.

SECTION 2
REGULATORY BACKGROUND

The intent of this rule is to collect accurate and timely GHG emissions data that can be used to inform future policies. Although the mandatory GHG rule is unique, EPA carefully considered other federal and state programs during development of the rule. The reporting program will supplement rather than duplicate other U.S. government GHG programs. We outline EPA's overall rulemaking approach, statutory authority, and summarize our review of GHG monitoring protocols below.

2.1 EPA's Overall Rulemaking Approach

The greenhouse gas reporting program will provide comprehensive and accurate data which will inform future climate change policies. Potential future climate policies include research and development initiatives, economic incentives, new or expanded voluntary programs, adaptation strategies, emission standards, a carbon tax, or a cap-and-trade program. Because we do not know at this time the specific policies that will be adopted, the data reported through the greenhouse gas reporting system should be of sufficient quality to support a range of approaches.

To these ends, we identified the following goals of the greenhouse gas reporting system:

- Obtain data that is of sufficient quality that it can be used to support a range of future climate change policies and regulations.
- Balance the rule coverage to maximize the amount of emissions reported while excluding small emitters.
- Create reporting requirements that are consistent with existing GHG reporting programs by using existing GHG emission estimation and reporting methodologies to reduce reporting burden, where feasible.

2.1.1 Stakeholder Outreach to Identify Reporting Issues

Early in the development process, we conducted a proactive communications outreach program to inform the public about the rule development effort. We solicited input and maintained an open door policy for those interested in discussing the rulemaking. Since January 2008, EPA staff has held more than 100 meetings with stakeholders, including the following:

- trade associations and firms in potentially affected industries/sectors;
- state, local, and tribal environmental control agencies and regional air quality planning organizations;
- state and regional organizations already involved in GHG emissions reporting, such as TCR, CARB, and Western Climate Initiative (WCI); and
- environmental groups and other nongovernmental organizations.
- We also met with U.S. Department of Energy (DOE) and U.S. Department of Agriculture (USDA), which have programs relevant to GHG emissions.

During the meetings, we shared information about the statutory requirements and timetable for developing a rule. Stakeholders were encouraged to provide input on key issues. Examples of topics discussed included existing GHG monitoring and reporting programs and lessons learned, thresholds for reporting, schedules for reporting, scope of reporting, handling of confidential data, data verification, and the role of states in administering the program. As needed, the EPA technical workgroups followed up with these stakeholder groups on a variety of methodological, technical, and policy issues. EPA staff also provided information to tribes through conference calls with different Indian tribal working groups and organizations at EPA and through individual calls with tribal board members of TCR.

For a full list of organizations EPA met with when developing this rule please see the memo found at EPA-HQ-OAR-2008-0508-055.

On April 10, 2009 (74 FR 16448), EPA proposed the GHG reporting rule. EPA held two public hearings, and received over 16,000 written public comments. The public comment period ended on June 9, 2009.

In addition to the public hearings, EPA had an open door policy, similar to the outreach conducted during the development of the proposal. As a result, EPA met with over 4,000 people and 135 groups between proposal signature (March 10, 2009) and the close of the comment period (June 9, 2009). Details of these meetings are available in the docket (EPA-HQ-OAR-2008-0508). EPA also visited two fluorinated gas production facilities and conducted multiple meetings and conference calls with fluorinated gas producers in order to better understand the current practices and issues associated with measuring emissions of fluorinated GHGs from fluorinated gas production facilities.

2.1.2 Consideration of Comments Received

In the April 2009 proposed mandatory GHG reporting rule, the electronics, fluorinated GHG production, and use of electrical equipment source categories were included as subparts I, L, and DD. In addition, EPA requested comment on requiring reporting under subpart OO of the quantities of fluorinated GHGs imported and exported inside pre-charged equipment and foams. EPA received a number of lengthy, detailed comments regarding proposed subparts I and L, several comments regarding the definition of "facility" under subpart DD, and several comments regarding a reporting requirement for imports and exports of F-GHGs contained inside pre-charged equipment and foams. These comments, which are described in more detail in the discussions of the individual source categories in the proposed rule, raised concerns about the costs and technical feasibility of implementing subparts I and L as initially proposed, requested clarification of how "facility" should be interpreted under subpart DD, and both favored and opposed a requirement to report imports of F-GHGs contained in imported and exported pre-charged equipment and closed-cell foams. EPA recognized the concerns raised by stakeholders, and decided not to finalize subparts I, L, and DD with the Final MRR, but chose instead to re-propose significant pieces of these subparts in April, 2010.

The re-proposed rule incorporated a number of changes including, but not limited to, different methodologies that provide improved emissions coverage at a lower cost burden to facilities than would have been covered under the initial proposed rule. In addition, EPA proposed requirements to report the quantities of fluorinated GHGs imported and exported inside pre-charged equipment and foams, and to report emissions from manufacture of electrical equipment, which are covered under Subparts QQ and SS. This rule was published in the Federal Register on April 12, 2010. During the 60-day comment period following the public hearing for the rule, EPA received further requests from commenters for clarification and revisions to certain aspects of the each subpart. EPA took these comments into account while developing today's final rules for the F-gas subparts.

2.1.3 Analysis of Emissions by Sector

For each of the source categories considered for this rule, EPA compiled information on current conditions in the category, including information about existing monitoring equipment or reporting frameworks, estimated emissions of GHGs, and estimated productive capacity or throughput. Incremental costs of measuring GHG emissions and conducting reporting activities were estimated under multiples scenarios. The cost estimates and analysis methodologies are detailed in Sections 4 and 5 of this report.

2.2 Statutory Authority

As proposed, EPA is promulgating this rule under its existing CAA authority; specifically, authorities provided in CAA section 114. As discussed in detail in Sections I.C and II.Q of the preamble to the final rule establishing the GHG Reporting Program (74 FR 56260, October 30, 2009), CAA section 114 provides EPA with broad authority to require information mandated by this rule, because such data will inform and are relevant to EPA's carrying out a wide variety of CAA provisions. Under CAA section 114(a)(1), the Administrator may require emissions sources, persons subject to the CAA, or persons whom the Administrator believes may have necessary information to monitor and report emissions and provide such other information as the Administrator requests for the purposes of carrying out the provisions in the CAA (except for a provision of title II with respect to motor vehicles).

As discussed in greater detail in "Mandatory Reporting of Greenhouse Gases, EPA's Response to Public Comment's Section 3- Legal Issues" (EPA-HQ-OAR-2008-0508), the CAA provides EPA with broad authority to require the comprehensive and accurate information mandated in this rule because such data will inform, and are relevant to, EPA's analyses of various CAA provisions. EPA may gather information for a variety of purposes, including for the purpose of assisting in the development of implementation plans or of emissions standards under CAA section 111, determining compliance with implementation plans or such standards, or more broadly for "carrying out any provision" of the CAA. In addition, CAA section 103 authorizes EPA to establish a national research and development program, including non-regulatory approaches and technologies for the prevention and control of air pollution as it relates to GHGs and climate change.

2.3 Existing Reporting Programs

In addition to the greenhouse gas reporting program, a number of voluntary and mandatory GHG programs already exist or are being developed at the State, regional, and Federal levels. These programs have different scopes and purposes. Many focus on GHG emission reduction, whereas others are purely reporting programs. In addition to the GHG programs, other Federal emission reporting programs and emission inventories are relevant to the GHG reporting rule. Several of these programs are summarized in this section.

Since the 1990s, EPA has operated a number of non-CO2 voluntary partnership programs aimed at reducing emissions from GHGs such as methane, SF6, and PFCs. There are two sector-specific partnerships to reduce SF6 emissions: the SF6 Emission Reduction Partnership for Electric Power Systems, with over 80 participating utilities, and the SF6 Emission Reduction

Partnership for the Magnesium Industry. Partners in these programs implement practices to reduce SF6 emissions and prepare corporate-wide annual inventories of SF6 emissions using protocols and reporting tools developed by EPA. There are also two partnerships focused on PFCs: The Voluntary Aluminum Industrial Partnership (VAIP) promotes technically feasible and cost-effective actions to reduce PFC emissions; industry partners track and report PFC emissions reductions. Similarly, the Semiconductor Industry Association and EPA formed a partnership to reduce PFC emissions in which a third party compiles data from participating semiconductor companies and submits an aggregate (not company-specific) annual PFC emissions report.

In developing the rule, we carefully reviewed the existing reporting programs, particularly with respect to emissions sources covered, thresholds, monitoring methods, frequency of reporting and verification. States may have, or intend to develop, reporting programs that are broader in scope or are more aggressive in implementation because those programs are either components of established reduction programs (e.g., cap and trade) or being used to design and inform measures that reduced GHGs indirectly (e.g., energy efficiency). Where possible, we built upon concepts in existing Federal and State programs in developing the mandatory GHG reporting rule. For a full summary of the reporting programs reviewed in the development of the mandatory reporting rule please see the Regulatory Impact Analysis for the Mandatory Reporting of Greenhouse Gas Emissions EPA-HQ-OAR-2008-0508.

SECTION 3
DEVELOPMENT OF SUBPARTS

The F-Gas source categories included in this rule are:

- **Subpart I** -Electronics Manufacturing;
- **Subpart L** - Fluorinated Gas Production;
- **Subpart DD** – Electric Transmission and Distribution Equipment Use
- **Subpart QQ** - Imports and Exports of Fluorinated GHGs in Pre-Charged Equipment and Closed-Cell Foams; and
- **Subpart SS** - Electrical Equipment Manufacture or Refurbishment and Manufacturing of Electrical Components.

This section provides additional details about the development of these subparts (e.g., which were included in the initial proposal and which subparts are new additions to the original MRR). For each subpart, this section also provides a brief description of required monitoring methods and data reporting and recordkeeping requirements.

3.1 Subpart I – Electronics Manufacturing

3.1.1 Definition of Affected Entities

Electronics manufacturing includes, but is not limited to, the manufacture of semiconductors, liquid crystal displays (LCDs), microelectromechanical (MEMS), and photovoltaic cells (PV). The electronics industry uses multiple long-lived F-GHGs such as perfluorocarbons (PFCs), Hydrofluorocarbons (HFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3), as well as nitrous oxide (N_2O). This rule would apply to electronics manufacturing facilities that emit equal to or greater than 25,000 metric tons of CO_2e per year[3] from electronics manufacturing processes such as plasma etching, chemical vapor deposition, chamber cleaning, and heat transfer fluid use.

[3] As discussed further below, EPA is proposing that uncontrolled emissions be used for purposes of determining whether a facility's emissions are equal to or greater than 25,000 mtCO2e.

In this action, EPA is designating methods to estimate emissions from cleaning and etching processes for semiconductor, LCD, MEMS, and PV manufacture and also methods for estimating N_2O emissions from deposition and other manufacturing processes such as chamber cleaning. EPA is also clarifying methods for estimating emissions from heat transfer fluids. EPA is also presenting methods for reporting controlled emissions from abatement systems.

3.1.2 Summary of Major Changes Since Proposal

The April 2010 proposal included the following reporting provisions for electronics manufacturers: (1) a single emissions-based reporting threshold for semiconductor, LCD, MEMS, and PV facilities; (2) modified methods for estimating emissions from cleaning and etching activities for semiconductor facilities and other electronics facilities including those that manufacture LCDs, MEMS, and PV; (3) methods for estimating facility N_2O emissions; (4) clarified methods for estimating emissions from heat transfer fluids; and (5) revised methods for reporting controlled emissions from abatement equipment.

After considering comments in response to the April 2010 proposal, EPA has further revised and clarified the regulations on the electronics manufacturing industry for today's final rule. The changes to the rule include the following:

- EPA has revised the methodology for semiconductor manufacturing facilities to require affected facilities[4] to estimate and report emissions from etching and cleaning using five process categorizations differentiated by two wafer technologies (150/200 mm and 300 mm wafer size).

- EPA has added a requirement for the largest semiconductor facilities (defined as facilities with annual capacities of greater than 10,500 m^2 of silicon) to estimate and report their emissions from the plasma etching process type using directly measured recipe-specific emission factors. (i.e. using an approach consistent with the 2006 IPCC Tier 3 method).

- EPA has modified the procedures by which facilities must develop gas consumption apportioning factors. Facilities are required to apportion gas consumption using facility-specific engineering models based on quantifiable metrics of fluorinated GHG-using activity and to document and verify these models, as specified by EPA, in site GHG Monitoring Plan (as required under 40 CFR 98.3). EPA will permit the use of facility-specific models based on quantifiable metrics, such as wafer pass or wafer starts, provided a facility acceptably documents and verifies the model.

[4] Covers facilities that have emissions equal to or greater than 25,000 $mtCO_2e$

- EPA has revised the requirement to recalculate gas- and facility-specific heel factors by requiring facilities to recalculate these factors if the trigger point for change out used to establish a gas- and facility-specific heel factors differs by more than 5 percent from the previous trigger point.

- EPA has added methods by which to calculate uptime and the DRE for a specific gas/categorization set. EPA has also modified how uptime is calculated by defining an "operational mode" for abatement systems.

- EPA has further defined direct recipe-specific measurements (i.e., an approach based on the 2006 IPCC Tier 3 method) by adding definitions for "individual recipe" and "similar recipes."

- EPA has added provisions for the largest facilities to submit extension requests for only specific monitoring requirements and QA/QC standards demonstrating that it is not reasonable feasible to implement the use of a quantifiable indicator for apportioning gas to all etch processes and obtain directly measured emission factors for all etch processes at the facility. This extension request is in addition to permitting the use of BAMM through March 31, 2011. EPA does not anticipate approving extension requests beyond December 31, 2011 except in extreme circumstances which include safety, a requirement being technically infeasible or counter to other local, State or Federal regulations.

- EPA has added provisions for facilities that manufacture LEDs to estimate and report their emissions using an approach based on two process types, plasma etching and chamber cleaning, and default emission factors (utilization and by-product formation rates).

3.1.3 Selection of Reporting Threshold

Under this rule, facilities that manufacture semiconductors, LCD, MEMS, and PV would be subject to an emissions-based threshold of 25,000 mtCO_2e. Consistent with other sections of the Final MRR, for the purposes of determining whether a facility emits equal to or greater than a 25,000 mtCO_2e, a facility must include emissions from all source categories for which methods are provided in the rule. For purposes of the threshold determination under subpart I, EPA is offering two different methods, depending on whether the facility manufacturers semiconductors, MEMS, LCDs or PVs. It is important to note that these methods are only for determining whether a facility exceeds the threshold; methods required for monitoring and reporting emissions data are presented in sections 3.1.5 and 3.1.6 below.

To determine whether a manufacturer falls above or below the 25,000 metric tons of CO_2e threshold, EPA is requiring that semiconductor, MEMS, and LCD facilities use gas specific emission factors assuming 100% manufacturing capacity to calculate annual metric tons

of emissions in CO_2 equivalents. Because we understand that heat transfer fluids are widely used within semiconductor manufacturing, EPA is requiring that semiconductor manufacturers add 10% of total clean and etch emissions at a facility to their estimate. PV facilities must multiply annual fluorinated GHG purchases or consumption by the gas-appropriate 100-year GWPs, as defined in Table A-1 of Subpart A of Part 98, to calculate annual metric tons of emissions in CO_2 equivalents.

EPA is requiring an emissions estimating method that does not account for destruction by abatement equipment because actual emissions from facilities employing abatement equipment may exceed estimates when based on the manufacturers' rated DREs of the equipment and may therefore exceed the 25,000 metric tons CO_2e threshold without the knowledge of the facility operators. When abatement equipment is used, electronics manufacturers often estimate their emissions using the manufacturer-supplied DRE for the equipment. However, abatement equipment may fail to achieve its rated DRE either because it was not installed properly, is not being properly operated and maintained, or because the DRE value itself was incorrectly measured due to a failure to properly account for the effects of dilution.

EPA is imposing an emissions-based threshold in response to comments received on the initial proposal that stated the proposed capacity-based threshold created ambiguity. EPA believes an emissions-based threshold will simplify the applicability determination and that by applying the method for determining whether the threshold is met, a facility will be able to quickly determine whether they must report under this rule.

3.1.4 Selection of Monitoring Methods

Today's rule specifies methods to monitor and estimate fluorinated GHG and N_2O emissions from semiconductor, LCD, MEMS, and PV manufacture. The methods discussed below include the following:

- estimating emissions from cleaning and etching processes;
- estimating facility N_2O emissions;
- estimating emissions from heat transfer fluids; and
- reporting controlled emissions from abatement systems.

The methods described in this section are for estimating emissions that are required to be reported under this subpart.

3.1.4.1 GHG Emissions Calculations and Monitoring Overview

To calculate fluorinated GHG and N_2O emissions from electronics manufacturing facilities, reporters (i.e. covered facilities) must use the following methods, as appropriate.[5]

Fluorinated GHG emissions from electronics manufacturing production processes

All electronics manufacturing facilities are required to calculate fluorinated GHG emissions from etch and clean processes by estimating emissions of input fluorinated GHGs and of by-product fluorinated GHGs. This is done by applying utilization factors and by-product formation factors (collectively referred to as "emission factors" below) to the consumption of each fluorinated GHG by each process type, process sub-type or recipe, as appropriate. The methods prescribed for use by different types of electronics manufacturing facilities differ in the values of these emission factors, the level of aggregation to which the factors are applied (process type, process sub-type, or recipe), and whether defaults or facility-specific factors are applied.

Gas Consumption

Electronics manufacturing facilities must use the following methods to calculate and apportion gas consumption:

- Gas consumption as calculated using the facility's purchase records, disbursements, gas container inventories, and gas- and facility-specific heel factors.
- Gas consumption apportioning factors developed using facility-specific engineering models based on quantifiable metrics of fluorinated GHG-using activity.

Fluorinated GHG Utilization and By-Product Formation Rates (Emission Factors)

Electronics manufacturing facilities must use the following methods for applying fluorinated GHG emission factors, as appropriate.

[5] Covered facilities are electronics manufacturing facilities that have emissions equal to or greater than 25,000 $mtCO_2e$. For electronics manufacturing, EPA is requiring that uncontrolled emissions be used for purposes of determining whether a facility's emissions are equal to or greater than 25,000 mt CO_2e.

3.1.4.2 F-GHG Emissions Estimation Methods – PV, LCD, MEM, and LED Manufacturing

Facilities that manufacture PV, LCDs, MEMS, and LEDS are required to estimate their emissions using default emissions factors for two process types: plasma etching and chamber cleaning. A facility may use directly measured recipe-specific emission factors in lieu of defaults only if the factors are measured in accordance with the 2006 ISMI Guidelines, International SEMATECH #06124825A-ENG, with limited exceptions.[6] A facility must use only default emission factors or only recipe-specific emission factors; the combined use of emission factor types within the same reporting year is not permitted.

3.1.4.3 F-GHG Emissions Estimation Methods – Semiconductor Manufacturing Facilities that Fabricate Devices on Wafers Measuring 300 mm or less in Diameter

Semiconductor manufacturing facilities that fabricate devices on wafers measuring 300 mm or less in diameter and have an annual manufacturing capacity of less than or equal to 10,500 m^2 silicon must estimate their emissions using default emissions factors for the following five categorizations.

- process type plasma etching;
- process category in-situ plasma chamber cleaning;
- process category remote plasma chamber cleaning;
- process category in-situ thermal chamber cleaning; and
- process type wafer cleaning.

This approach is hereinafter referred to as the "Tier 2c Method." Semiconductor manufacturing facilities that fabricate devices on wafers measuring 300 mm or less in diameter and have an annual manufacturing capacity greater than 10,500 m^2 silicon must estimate their emissions using the five categorizations as defined for the Tier 2c method. However, instead of using default emission factors for the plasma etching process type, facilities must use directly measured recipe-specific emission factors. These facilities must use default emission factors for the following:

- process category in-situ plasma chamber cleaning;

[6] EPA is permitting facilities to use emission factors measured in accordance with the 2001 ISMI Guidelines provided the emissions factors were measured prior to January 1, 2007. Documentation for the measurements is required.

- process category remote plasma chamber cleaning;
- process category in-situ thermal chamber cleaning; and
- process type wafer cleaning.

The following hybrid methodology is hereinafter referred to as the "Tier 2d Method." A facility may use directly measured recipe-specific emission factors in lieu of chamber and wafer cleaning defaults only if the factors are measured in accordance with the 2006 ISMI Guidelines, International SEMATECH #06124825A-ENG, with limited exceptions.[7] A facility must use only default emission factors, or only recipe-specific emission factors for chamber and wafer cleaning; the combined use of emission factor types within the same reporting year is not permitted.

3.1.4.4 F-GHG Estimation Methods—Semiconductor Facilities that Fabricate Devices on Wafers Measuring 300 mm or more in Diameter

Semiconductor manufacturing facilities that fabricate devices on wafers measuring greater than 300 mm in diameter must estimate all of their emissions from plasma etching, chamber cleaning, and wafer cleaning using directly measured recipe-specific emission factors. Emission factors must be measured in accordance with the 2006 ISMI Guidelines, International SEMATECH #06124825A-ENG, with limited exceptions.[8]

3.1.4.5 Method for Estimating N_2O Emissions

Electronics manufacturing facilities must calculate emissions of N_2O using:

- Requirements for calculating and apportioning gas consumption as outlined above for "Fluorinated GHG emissions from electronics manufacturing production processes"
- Manufacturing production process emission factors for chemical vapor deposition and other electronics manufacturing production processes.

3.1.4.6 Method for Estimating Emissions of Heat Transfer Methods

Electronics manufacturing facilities must calculate emissions from heat transfer fluids using a mass balance approach in which disbursements are properly accounted for according to procedures provided in 40 CFR part 98, subpart I.

[7] See footnote 5.

[8] See footnote 5.

3.1.4.7 Method for Reporting Controlled Emissions from Abatement Equipment

Electronics manufacturing facilities that wish to document and report controlled fluorinated GHG and N_2O emissions from abatement systems must certify that that abatement system is installed, operated, and maintained in accordance with the manufacturers' specifications, as well as account for uptime of abatement systems. Facilities must calculate controlled emissions using either:

- Destruction or removal efficiencies based on a default value of 60%. Under this approach, certification that the abatement system is specifically designed for fluorinated GHG and N_2O abatement is required; or
- EPA's Random Sampling Abatement System Testing Program (RSASTP) to measure destruction or removal efficiencies using EPA's Protocol for Measuring Destruction or Removal Efficiency of Fluorinated Greenhouse Gas Abatement Equipment in Electronics Manufacturing, Version 1, EPA 430-R-10-003.

3.1.5 Selection of Data Reporting Requirements

Owners and operators would be required to report fluorinated GHG and N_2O emissions for the facility for all plasma etching, chemical vapor deposition, chamber cleaning, and wafer cleaning processes as well as all heat transfer fluid use. The text of today's rule details the specific data reporting requirements for this sector.

For each abatement system for which a facility is reporting controlled emissions, the following would be required: certification that the abatement device is installed, operated, and maintained according to manufacturers' specifications; the uptime and the calculations to determine uptime for that reporting year; the DRE used (i.e. either the EPA default DRE value or a properly measured DRE); and required documentation to use the EPA default DRE value or a properly measured DRE.

These data form the basis of the calculations and are needed for EPA to understand the reported emissions and verify their reasonableness.

3.1.6 Selection of Recordkeeping Requirements

EPA is requiring that facilities keep records of data used to estimate emissions, records supporting values used to estimate emissions, purchase records, and invoices for gas purchases and sales.

For those facilities that are reporting controlled emissions, EPA requests that the following records be kept: documentation to certify that each abatement device used at the facility is installed, maintained, and operated in accordance with manufacturers' specifications; records of the uptime and the calculations to determine uptime; abatement system calibration and maintenance records; required documentation to use either the EPA default DRE value or a properly measured DRE; and dated certification by the technician who makes the measurement that the destruction or removal efficiency is calculated in accordance with the methods in EPA 430-R-10-003.

These records consist of values that are directly used to calculate the emissions that are reported and are necessary to enable verification that the GHG emissions monitoring and calculations are done correctly.

3.2 Subpart L – Fluorinated GHG Producers

3.2.1 Definition of Affected Entities

An affected entity under subpart L is defined as any facility that produces a fluorinated gas from any raw material or feedstock chemical. Fluorinated gas production includes the production of fluorinated GHGs (including HFCs, PFCs, SF_6, NF3, and HFEs) and chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs). EPA stipulates that production of fluorinated gases does not include the reuse or recycling of fluorinated GHG or the generation of HFC-23 during the production of HCFC-22.

Facilities that produce fluorinated gases will be required to report their fluorinated GHG emissions from fluorinated gas production, transformation, venting, and destruction, as well as combustion-related CO_2, CH_4, and nitrous oxide (N_2O) emissions from stationary fuel combustion. Fluorinated gases include fluorinated GHGs (HFCs, PFCs, SF6, NF3, HFEs, etc.), CFCs, and HCFCs. However, emissions of HFC-23 from HCFC-22 production are addressed under subpart O and are therefore excluded from this subpart. Similarly, emissions of CFCs and HCFCs are addressed under the regulations implementing Title VI of the Clean Air Act and are therefore excluded from this subpart.

3.2.2 Summary of Changes Since the Initial Proposal

The proposal published in the Federal Registry in April of 2010, included revisions to several of the provisions in the initial proposed subpart L (April 2009). The subsequent

comment period provided commenters an opportunity to respond to the new proposal. Today's final rule reflects EPA's consideration of the concerns raised during this comment period.

Today's Subpart L rule incorporates a number of changes since proposal including, but not limited to, the following:

- EPA has clarified when and how the scoping speciation ("scoping test" in the proposed rule) must be performed.
- EPA has added more flexibility to the mass-balance approach in order to: allow use of the mass-balance approach with process that do not produce fluorinated GHGs but may emit them (e.g., process wafers that transform fluorinated GHGs); incorporate process variability into the error calculation; and provide an alternative to the error limits for facilities that do not wish to calculate them
- EPA has added more flexibility to the emission factor approach by:
  - Changing the method for determining whether the emissions of a process fall below the 10,000 mtCO2e cutoff that allows the use of engineering calculations rather than stack testing.
  - Providing an additional two months to develop emission factors and emission calculation factors.
  - Allowing use of engineering calculations or assessments with all batch processes, regardless of emissions.
  - Allowing emissions testing after the control device if the vent is controlled and annual emissions bypassing (i.e., not vented to) the control device are less than 10,000 mtCO2e.
  - Requiring testing of only the largest-emitting operating scenario and any other operating scenario that (1) emits more than 10,000 mtCO2e through the vent, and (2) has an emission calculation factor that differs by 15 percent or more from the emission calculation factor of the tested operating scenario. (In the proposed rule, stack testing would have been required for each operating scenario.)
  - Expanding the set of test methods that can be used for emissions testing to include industry standard sampling and analytical methods that have been validated using EPA Method 301 or other validation methods.
  - Expanding the set of methods that can be used for quantifying emissions from equipment leaks.
  - For purposes of quantifying emissions from equipment leaks, defining "in fluorinated GHG service" as containing or contacting a feedstock, byproduct, or product that contains 5 percent or more total fluorinated GHG by weight.

- EPA is adding a requirement to monitor and report fluorinated GHG emissions from containers when the residual fluorinated GHG (heel) is vented to the atmosphere rather than recaptured and reused or destroyed.

- EPA has also added a one-time requirement to report existing data and analysis regarding the formation of products of incomplete combustion (PICs) that are fluorinated GHGs during the destruction of fluorinated gases.

- EPA has clarified that PICs are excluded from reporting under the rule after the one-time initial reporting requirement.

- EPA is limiting the proposed BAMM provision to allow fluorinated gas production facilities to use BAMM through June 20, 2011 without submitting a request to EPA. In the proposal, facilities would have been allowed to use BAMM only through March 31, 2011 without submitting a request.

3.2.3 Selection of Reporting Threshold

Under the rule, owners and operators of fluorinated gas production facilities would be required to estimate and report GHG emissions if they are equal to or greater than 25,000 $mtCO_2e$ in the absence of control technology (e.g., thermal oxidation).

As is true for the other source categories covered by the Mandatory GHG Reporting Rule, EPA is allowing that fluorinated gas production facilities could cease reporting if their emissions were less than 25,000 $mtCO_2e$ per year for five consecutive years or less than 15,000 $mtCO_2e$ per year for three consecutive years.

A full discussion of the threshold selection analysis is available in the revised Fluorinated Gas Production TSD (EPA-HQ-OAR-2009-0927). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4.

3.2.4 Selection of Monitoring Methods

EPA is allowing facilities to use either a mass-balance approach or a site-specific, process-vent-specific emission factor (PSEF) approach to estimate their fluorinated GHG emissions. The mass-balance approach is similar to that of the April, 2009 proposal, as well as that included in the April, 2010 proposal, but has been modified in some details in response to comments. Facilities using either approach would be required to perform a one-time scoping speciation to identify the F-GHGs in certain emitted streams and to verify the destruction efficiency (DE) of any destruction devices every ten years.

3.2.5 Selection of Data Reporting Requirements

Under the rule, owners and operators of facilities producing fluorinated GHGs would be required to report both their fluorinated GHG emissions and the quantities used to estimate them on a process-specific basis. For the mass-balance approach, this includes the masses of the reactants and products and the masses of the reactants, by-products, and products destroyed or recaptured. For the emission factor and emission calculation factor approach, data to be reported includes the process activity used to calculate emissions (e.g., the tons of product produced or tons of reactant consumed) and the emission factors used to estimate them. Owners and operators must also report the mass of each fluorinated GHG gas emitted, including the mass of each fluorinated GHG emitted from equipment leaks.

Where fluorinated gas production facilities have estimated missing data, the facility would be required to report the reason the data were missing, the length of time the data were missing, the method used to estimate the missing data, and the estimates of those data.

3.2.6 Selection of Recordkeeping Requirements

Maintaining records of the information used to determine the reported GHG emissions is necessary to enable us to verify that the GHG emissions monitoring and calculations were done correctly. Under the rule, owners and operators of facilities producing fluorinated GHGs would be required to retain records documenting the data reported, including records of monthly emission estimation calculations, including all data that went in to the calculations, calibration records for flowmeters, scales, and gas chromatographs, and documentation of emission factor development activities. These records are necessary to verify that the GHG emissions monitoring and calculations were performed correctly.

3.3 Subpart DD--Electric Transmission and Distribution Equipment Use

3.3.1 Definition of Affected Entities

The electric transmission and distribution equipment use source category includes gas-insulated substations, circuit breakers, other switchgear, and gas-insulated lines containing SF6 or PFCs. Equipment also includes gas containers such as pressurized cylinders, gas carts, new equipment owned but not yet installed, or other containers. Notwithstanding the definition of facility in subpart A, for purposes of this subpart, “facility” means an electric transmission and distribution system which is the collection of SF6- and PFC insulated equipment linked through

electric power transmission or distribution lines and operated as an integrated unit by one electric power entity or several entities that have a single owner.

Reporting by the electric transmission and distribution system is comprised of the system-wide collection of gas-insulated equipment located between the point of generation or the point at which electricity is obtained from a different power entity and the point at which the customer or another electric power entity receives the electricity, and must be based on the aggregation of emissions of all servicing inventory and equipment. All individual pieces of equipment that are located within the system are included regardless of ownership.

EPA defines an electric power entity as a company; an electric cooperative; a public electric supply corporation as the Tennessee Valley Authority; a similar Federal department or agency such as the Bonneville Power Administration; the Bureau of Reclamation or the Corps of Engineers; a municipally owned electric department offering service to the public; or an electric public utility district (a ‘‘PUD’’); also a jointly owned electric supply project such as the Keystone.

3.3.2 Summary of Changes Since Proposal

While Subpart DD remains largely unchanged from the initial proposal, EPA has made a few modifications after receiving several comments regarding the source category definition and the rule requirements. In the final rule, EPA is clarifying that “operators” refers to operators of the collection of system assets including SF6 equipment and not operators of Electric Systems, whose responsibility is to monitor and control electricity in that system in real time. EPA is also clarifying that system boundaries are specific to delivery to the customer or another electric power system. EPA is also requiring scale recalibration is accordance with manufacturer specifications or every three years, whichever is sooner, and that the scales are required to be accurate with +/- 2 pounds of the scale’s capacity. Finally, EPA is including costs of reporting requirements ($1,700 in reporting costs for each facility) which had inadvertently been omitted from the proposal RIA.

With the exception of the updates discussed in the previous paragraph, the requirements for entities covered under Subpart DD are identical to those described in the proposed MRR (see docket # EPA-HQ-OAR-2008-0508).

3.4 Subpart QQ – Importing/Exporting of Pre-charged Equipment and Foams

3.4.1 Definition of Affected Entities

This source category consists of any entity that is importing or exporting pre-charged equipment that contains a fluorinated GHG and also consists of any entity that that is importing or exporting closed-cell foams that contain a fluorinated GHG. A variety of products containing fluorinated greenhouse gases (F-GHGs), nitrous oxide (N_2O), and carbon dioxide (CO_2) are imported into and exported from the United States. Pre-charged equipment includes air-conditioning, refrigeration, and electrical equipment. Closed-cell foams that are imported and exported include polyurethane (PU) rigid foam used in insulation in domestic refrigerators and freezers; commercial refrigeration foam,; PU rigid sandwich panel continuous and discontinuous foam; extruded polystryrene (XPS) sheet foam; and XPS boardstock foam.

3.4.2 Summary of Proposal

In the April 2009 proposed rule EPA did not require reporting of the quantities of GHGs imported and exported inside products. EPA was concerned that it would be difficult for importers and exporters to identify and quantify the quantities of GHGs inside some products and that the number of importers and exporters would be high. However, EPA requested comment on the option of requiring reporting of imports and exports of HFCs and SF_6 contained in pre-charged air-conditioning, refrigeration, and electrical equipment and in closed cell foams. EPA noted that for these products, information on the size and chemical identity of the charge or blowing agent is likely to be readily available to importers and exporters (e.g., from nameplates affixed to equipment, servicing manuals, and product information for foams). Moreover, as noted above, the total quantities of imported and exported F-GHGs in pre-charged equipment and foams are significant.

After carefully considering the comments and available information on imports and exports of F-GHGs inside pre-charged equipment and foams, EPA proposed to require reporting of these imports and exports in the revised April 2010 proposal. Importers and exporters of pre-charged equipment and closed-cell foams would be subject to requirements similar to those for importers and exporters of bulk GHGs. In addition, equipment importers would be required to report the types and charge sizes of equipment and the number of pieces of each type of equipment that they imported or exported, while foam importers would be required to report the volume of foam and F-GHG density of the foam that they imported. As is true for importers and

exporters of bulk F-GHGs, importers and exporters of equipment and foam would only be required to report if their total imports or exports exceeded the 25,000 mtCO2e threshold.

3.4.3 Summary of Changes Since the Proposal

Following the comment period on the April 2010 proposal, EPA has modified the regulations on Subpart QQ for today's final rule. The changes to Subpart QQ are as follows:

- EPA has revised the reporting requirements for closed-cell foams such that, in cases where the importer or exporter does not know the identity and amount of fluorinated GHGs inside the closed-cell foam, they can report the amount of fluorinated GHGS imported or exported on a Co_2e basis, based on information from the manufacturer.

- EPA has revised the definition of closed-cell foams to exclude packaging foam.

- EPA has revised the requirements for importers such that the port of entry and country of origin are no longer listed under data reporting requirements. These two data elements are now listed under recordkeeping requirements.

- EPA has revised the requirement for exporters such that the port of exit and countries to which items were exported are no longer listed under data reporting requirements. These are two data elements are now listed under recordkeeping requirements.

- EPA has clarified that importers and exporters must report the number of pieces of pre-charge equipment and closed-cell foam imported with each unique combination of charge size and charge type. Importers and exporters cannot report the average charge size or most common fluorinated GHG used for a particular type of equipment.

3.4.4 Selection of Reporting Threshold

Under the final rule, EPA is requiring that importers and exporters of F-GHGs contained in pre-charged equipment and closed cell foams report their fluorinated GHG emissions if either

their total imports or their total exports, in equipment, foams, and in bulk, exceed 25,000 $mtCO_2e$ per year. This threshold is the same as that for bulk imports and exports.

3.4.5 Selection of Monitoring Methods and QA/QC Requirements

EPA is requiring importers and exporters of equipment and foams to estimate their imports and exports of each F-GHG by multiplying the mass of the F-GHG contained in each type of equipment or foam by the number of pieces of equipment or by the volume of foam, as appropriate. EPA believes that information on F-GHG identity and charge size (or density, for foams) should be readily available to importers and exporters.

3.4.6 Selection of Data Reporting Requirements

Under the rule, EPA will require importers and exporters of pre-charged equipment and closed cell foams to report the following:

(1) The total mass in metric tons of each fluorinated GHG imported or exported in pre-charged equipment or closed-cell foams.

(2) For each type of pre-charged equipment, the identity of the fluorinated GHG used as a refrigerant or electrical insulator, charge size (holding charge[9], if applicable), and number imported or exported.

(3) For closed-cell foams that are imported or exported inside of appliances, the identity of the fluorinated GHG contained in the foam, the quantity of fluorinated GHG contained in the foam in each appliance, and the number of appliances imported for each type of appliance.

(4) For closed cell-foams that are not inside of appliances, the identity of the fluorinated GHG, the density of the fluorinated GHG in the foam (kg F-GHG/cubic foot), and the quantity of foam imported or exported (cubic feet) for each type of closed-cell foam.

(5) Dates on which the pre-charged equipment or closed-cell foams were imported or exported.

(6) Ports of entry through which the pre-charged equipment or closed-cell foams passed.

[9] This refers to any holding charge consisting of a fluorinated GHG. Holding charges consisting of other gases, such as nitrogen, are not included.

(7) Countries from or to which the pre-charged equipment or closed-cell foams were imported or exported.

EPA is collecting this information because it is necessary either to understand the total volume of F-GHGs imported or exported inside of pre-charged equipment and foams (and thereby contributing to the U.S. supply of F-GHGs) or to verify submitted information.

3.4.7 Selection of Recordkeeping Requirements

EPA is requiring importers and exporters of equipment and closed cell foams to retain the following records:

(1) a copy of the bill of lading for the import or export;

(2) the invoice for the import or export; and

(3) for imports, the U.S. Customs entry form.

Persons who transship pre-charged equipment and closed cell foams containing fluorinated GHGs must maintain records that indicate that the pre-charged equipment or foam originated in a foreign country and did not enter into commerce in the United States. This information is necessary to verify submitted information.

3.5 Subpart SS – Electrical Equipment and Components Manufacturing

3.5.1 Definition of Affected Entities

Affected entities under subpart SS are defined as electrical equipment manufacturers of SF_6-insulated closed-pressure system equipment and sealed-pressure system equipment including gas-insulated substations, circuit breakers, other switchgear, gas-insulated lines, or power transformers containing sulfur-hexafluoride (SF_6) or perfluorocarbons (PFCs).

Electrical equipment manufacturers purchase bulk SF_6 gas to (1) install a nominal charge in high-voltage closed-pressure equipment, (2) ship alongside closed-pressure equipment for topping off at installation site, (3) fill sealed-pressure equipment with its intended lifetime supply of SF6, and (4) develop and test equipment. Fugitive emissions of SF_6 from equipment manufacturers typically occur during the manufacturing of equipment but can also occur during the other uses of SF_6 at manufacturing facilities.

While EPA believes that SF_6 represents the majority of emissions from this source category, manufacturers may also use PFCs as dielectrics and heat transfer fluids in power transformers. For example the PFC perfluorohexane (C_6F_{14}) is used for retrofitting CFC-113 cooled transformers.

According to the U.S. Inventory of Greenhouse Gas Emissions and Sinks: 1990-2007 (U.S. Environmental Protection Agency, 2009), total U.S. estimated emissions of SF_6 from electrical equipment manufacturers was estimated to be 0.81 million metric tons CO_2e in 2006. EPA is requiring reporting from electrical equipment manufacture and refurbishment facilities because these operations represent a significant source, approximately 5% of SF_6 emissions. It is estimated that ten equipment manufacturers were responsible for these emissions.

EPA is also including emissions of PFCs emitted during the manufacture or refurbishment of PFC-containing power transformers because the National Inventory has no information on this source and because use of transformers is expected to grow in the future.

This source category comprises electrical equipment manufacturers and refurbishers of SF6 or PFC-insulated closed-pressure system equipment and sealed-pressure system equipment including gas-insulated substations, circuit breakers, other switchgear, gas-insulated lines, or power transformers containing sulfur-hexafluoride (SF_6) or perfluorocarbons (PFCs).

3.5.2 Summary of Changes Since Proposal

The major changes in this rule since the proposal are identified in the following list.

- Scale recalibration is required in accordance with manufacturer specifications or once every three years, whichever is sooner.
- Scales are required to be accurate within +/- 2 pounds of the scale's capacity.
- EPA is allowing use of a statistically representative value for emissions downstream of the flowmeter measuring the mass of SF_6 being transferred from the storage container to the equipment being filled. The statistically representative value must be based on a statistically representative sample size for each combination of hose and valve of a given sized diameter.
- To increase flexibility, EPA is providing an additional option for determining the mass of SF_6 or the PFCs disbursed to customers in new equipment. EPA is allowing the equipment's nameplate capacity or, in cases where equipment is shipped with a partial charge, the equipment's partial shipping charge to be assumed as equal to the disbursement.

- The quantity of gas charged in to delivered equipment and added during installation by the manufacturer must be certified by the manufacturer and expressed in pounds of SF_6 or PFC.

- The electrical equipment manufacturer must estimate the annual SF_6 and PFC emissions from the equipment being installed on the electric power system's premises, only when the title of the equipment has not yet been transferred, using an equipment installation mass balance equation.

3.5.3 Selection of Reporting Threshold

EPA is requiring electrical equipment manufacturers to report their SF_6 and PFC emissions if their total annual purchases of SF_6 and PFCs exceed 23,000 lbs. This consumption-based threshold is equivalent to an emissions-based threshold of 25,000 $mtCO_2e$, assuming an average manufacturer emission rate of 10%.

3.5.4 Selection of Monitoring Methods and QA/QC Requirements

In developing the approach, EPA reviewed the 2006 IPCC Guidelines, the U.S. GHG Inventory, DOE 1605(b), EPA's Climate Leaders Program, and The Climate Registry. In the IPCC Guidelines, Tiers 1 and 2 are based on default and country-specific SF_6 and PFC emission factors, but Tier 3 is based on a mass-balance approach for estimating SF_6 and PFC emissions at each life-cycle stage of the equipment.

The monitoring methods for calculating SF_6 and PFC emissions from electrical equipment manufacturing and refurbishment are similar to the methodologies described in the 2006 IPCC Guidelines Tier 3 methods for emissions from electrical equipment manufacturing.

EPA is requiring that all SF_6 and PFC emissions be reported, including those from equipment testing, manufacturing, decommissioning and disposal, refurbishing, and from storage cylinders, as well as combustion-related CO_2, CH_4, and nitrous oxide (N_2O) emissions from stationary fuel combustion. The Tier 3 approach is being used because it is the most accurate and it is feasible for all equipment manufacturers to conduct the mass balance analysis for SF_6 and PFCs using readily available information.

A comparable mass-balance approach is used for subpart DD *Sulfur Hexafluoride (SF_6) and Perfluorocarbons (PFCs) from Electrical Equipment at an Electric Power System*. The mass-balance approach works by tracking and systematically accounting for all facility uses of SF_6 and PFCs during the reporting year. The quantities of SF_6 and PFCs that cannot be accounted for are assumed to have been emitted to the atmosphere. The emissions of SF_6 and

PFCs must be estimated and reported separately. All quantities required to calculate the mass-balance equations for this subpart must be measured using scales or flow meters that are certified with an accuracy and precision within two pounds of the scale's capacity.

In addition, EPA will require that electrical equipment manufacturers keep records for the QA/QC requirements including check-out sheets and weigh-in procedures for cylinders, residual gas amounts in cylinders sent back to suppliers, invoices for gas and equipment purchases or sales, and documentation of recycling and destruction. The records that are being requested are the minimum needed to reproduce and confirm emission calculations.

3.5.5 Selection of Data Reporting Requirements

EPA is requiring annual reporting for the electrical equipment manufacturing and refurbishing industry. Equipment manufacturers would report all SF_6 and PFC emissions, including those from equipment testing, equipment manufacturing, and bulk SF_6 and PFC handling. However, the emissions would not need to be broken down and reported separately for testing, manufacturing, or bulk SF_6 and PFC handling. Along with their emissions, electrical equipment manufacturers will be required to submit the following supplemental data: SF_6 and PFCs with or inside equipment delivered to customers, SF_6 and PFCs returned by customers with or inside equipment, bulk SF_6 and PFC purchases, SF_6 and PFCs sent off-site for destruction or to be recycled, SF_6 and PFC returned from offsite after recycling, SF_6 and PFCs stored in containers at the beginning and end of the year, and SF_6 and PFCs returned to suppliers. Facilities must also report a description of the engineering methods and calculations used to determine emissions from hoses or other flow lines that connect the container to the equipment that is being filled.

These data must be submitted because they are the minimum data that are needed to understand and reproduce the emission calculations that are the basis of the reported emissions.

3.5.6 Selection of Recordkeeping Requirements

In this action, EPA is requiring that electrical equipment manufacturers be required to keep records documenting (1) their adherence to the QA/QC requirements specified in the rule, and (2) the data that would be included in their emission reports, as specified above. Facilities must also keep check-out and weigh-in sheets and procedures for cylinders, documentation of residual gas amounts in cylinders sent back to suppliers, and invoices for gas purchases and sales.

SECTION 4
ENGINEERING COST ANALYSIS

4.1 Introduction

EPA estimated costs of complying with the rule for process emissions of GHGs in each affected industrial facility. EPA used available industry and EPA data to characterize conditions at affected sources. Incremental monitoring, recordkeeping, and reporting activities were then identified for each type of facility, and the associated costs were estimated.

4.2 Overview of Cost Analysis

The costs of complying with the rule will vary from one facility to another, depending on the types of emissions, the number of affected sources at the facility, existing monitoring, recordkeeping, and reporting activities at the facility, etc. The costs include labor costs for performing the monitoring, recordkeeping, and reporting activities necessary to comply with the rule. For affected facilities, costs include monitoring, recording, and reporting of GHG emissions from production processes and from stationary combustion units. All costs referred to in this section are reported in 2006 dollars.

For each source category, we first provide a general overview of baseline reporting (if data are available); two costs components associated with this information collection; labor costs (i.e., the cost of labor by facility staff to meet the information collection requirements of the rule); and capital and operating and maintenance costs (e.g., the cost of purchasing and installing monitoring equipment or contractor costs associated with providing the required information). Additional details of the data, methods, and assumptions underlying the costs are documented in a separate cost appendix and in accompanying Technical Support Documents (TSDs). The TSDs also include information on the assumptions and methods used to identify representative entities or groups of entities used to develop the cost analysis for each subpart.

4.2.1 Baseline Reporting

When data are available to determine how many companies are currently implementing approaches consistent with the methods at the facility level to meet internal GHG management programs or state or voluntary reporting programs at the domestic or international level, we include a discussion of the baseline reporting practices. When data are not available, EPA is assuming that none of the facilities in these source categories are currently reporting emissions and that many of the requirements will result in “new” or “full” costs to meet reporting requirements. Specifically, EPA is assuming that there will be additional costs for any sampling

and testing in the requirements in methods (i.e., carbon contents of process inputs, such coke, coal, carbonate composition, or actual emissions). EPA is also assuming that additional costs will be incurred for preparing monitoring and QA/QC plans, performing the calculations, reporting the results, and maintaining records.

4.2.2 Reporting Costs

To ensure consistency in the development of cost estimates across all sources, EPA developed a cost spreadsheet template used for each subpart to compile, document, and calculate per unit reporting costs. Detailed instructions were provided along with the cost spreadsheet template that clearly explained the data to be compiled and calculated. The template included three tables; analysis of reporting thresholds, analysis of monitoring and reporting options, and unit costs for monitoring and reporting. Key variables and data fields were clearly defined to ensure that costs developed for each subpart used a standard set of methods and assumptions (e.g., method for annualization of capital costs, interest rate to be applied to capital).

Labor Costs. The costs of complying with and administering this rule include the time of managers, technical, and administrative staff in both the private sector and the public sector. Staff hours are estimated for activities including:

- monitoring (private): staff hours to operate and maintain emissions monitoring systems;
- reporting (private): staff hours to gather and process available data and reporting it to EPA through electronic systems; and
- assuring and releasing data (public): staff hours to quality assure, analyze, and release reports.

Staff activities and associated labor costs may vary over time. Thus, cost estimates are developed for start-up, first-time reporting, and subsequent reporting.

Loaded hourly labor rates (also referred to as "wage rates") were developed for several labor categories to represent *the employer costs to use an hour of employees' time* in each of the manufacturing sector labor categories used in this analysis. The labor categories correspond to the job responsibilities of the personnel that are likely to be involved in GHG emissions monitoring activities at the manufacturing facility level to comply with the rulemaking.

For purposes of this study, EPA adopted the methodology used by Cody Rice (2002) to calculate the wage rates for the EPA's Toxics Release Inventory (TRI) Program. Thus, the *wage rates* calculated for different labor categories included the *employer costs for employee*

compensation (comprising the basic wages and the corresponding benefits) and *the overhead costs to the employer*.[10]

For each labor category, the following formula was used to calculate the wage rates:

Loaded Hourly Labor Rate ($/hr.) = Basic Wages ($/hr.) *
(1 + Benefits Loading Factor + Overhead Loading Factor).

The *benefits loading factor* corresponds to the relative share of benefits compensation in the total employee compensation (comprising basic wages and benefits). Although the benefits factor tends to vary by labor category and by industry (0.37 to 0.50), for purposes of this analysis, we have assumed the benefits loading factor (1.7) to remain the same for each labor category across all industries within the manufacturing sector due to a lack of availability of necessary industry-specific data on benefits paid to employees.

The *overhead loading factor* corresponds to the share of overhead costs to the employer relative to the total employee compensation. For purposes of this analysis, we have also adopted the same overhead loading factor that Cody Rice (2002) used in her wage rate calculations. Thus the overhead loading factor that we used in the wage rate calculations remains the same for all labor categories and across all industry types within the manufacturing sector. The overhead loading factor was assumed to be 0.17.

The loaded labor rates for the four labor categories that are used in the cost analysis for each subpart covered under this rule and are also reported in the appropriate sectors labor cost tables in the following sections.

10For each employee, the employer also incurs overhead costs (comprising the rental costs of the office space, computer hardware and software, telecommunication and other equipments, organizational support, etc.) required for and used by the employee to effectively fulfill his/her job responsibilities. These costs are over and above the employee compensation costs.

Table 4-1. Labor Categories and Hourly Rates

Labor Category	Description	Loaded Hourly Rate ($/hour)
Legal	Oversees legal aspects of company reports and data-reporting forms.	$101.00/hour
Managerial	Oversees work at a high level and is the final authority on all reporting requirements.	$71.03/hour
Technical	Conducts monitoring of emissions sources, checks for accuracy, performs measurements.	$55.20/hour
Clerical	Assists with documentation and recording information	$29.65/hour

Capital and O&M Costs. This includes the cost of purchasing and installing monitoring equipment or contractor costs associated with providing the required information. Selected subparts do not require capital expenditures because the selected monitoring option does not require capital equipment or the reporter already owns the necessary monitoring equipment. Equipment costs include both the initial purchase price of monitoring equipment and any facility/process modification that may be required. For example, the cost estimation method for mobile sources involves upstream measurement by the vehicle manufacturers. This may require an upgrade to their test equipment and facility. Based on expert judgment, the engineering costs analyses annualized capital equipment costs with the appropriate lifetime and interest rate assumptions. Cost recovery periods vary by industry (5 to 15 years) with one-time capital costs are amortized at a rate of 7%.

Other Recordkeeping and Reporting. Additional reporting ($500) costs was added to all subparts.

Cost Analysis by Subpart. The balance of section 4 provides the cost data by subpart. The data are the basis for the economic impact analysis described in detail in Section 5 of this document. This chapter provides these data, as well as background information needed to understand the engineering costs analysis conducted for each source and the reporting option selection.

4.3 Cost Analysis for Subpart I – Electronics Manufacturers

4.3.1 Model Facility Development

This analysis is based on the costs of monitoring fluorinated greenhouse gas (F-GHG) and nitrous oxide (N2O) emissions from electronics manufacturing facilities. Electronics manufacturing facilities were broken into three categories; non-semiconductor electronics (3 facilities), large semiconductor (29 facilities), and non-large semiconductor (62 facilities).[11,12] Non-semiconductor electronics includes facilities that manufacture micro-electromechanical systems (MEMS), liquid crystal displays (LCDs), and photovoltaics (PV).

Through industry comments and the PFC Reduction/Climate Partnership for Semiconductors, the EPA has improved its understanding of semiconductor facilities and their emissions and has assigned a method of compliance to each electronics manufacturing facility category. For cost estimates, non-semiconductor facilities were assigned to use the "Tier 2b Method" based on IPCC's Tier 2b two process categories (chamber cleaning and plasma etching) in order to comply with Subpart I. Non-large semiconductor facilities were assigned to use the "Tier 2c Method" defining the following five process categories and default emission factors: (1) chamber cleaning – in situ plasma; (2) chamber cleaning – remote plasma; (3) chamber cleaning – in-situ thermal; (4) plasma etching; and (5) wafer cleans. The largest semiconductor facilities were assigned to use the "Tier 2d Method" which is identical to the "Tier 2c Method" for all facility process categories except plasma etching, which requires directly measured recipe-specific emission factors similar to the 2006 IPCC Tier 3 methodology.[13] Annual costs differ for each of the three electronics manufacturing categories because they are subject to different requirements, as detailed below under "Monitoring Costs". In addition, MEMS, LCD, and PV manufacturing use fewer types of F-GHGs than semiconductor manufacturing facilities. Therefore, cost estimates for these other types of electronics facilities were developed using cost estimates from EPA's initial proposal for a "small" semiconductor facility and scaling these costs to account for the use of a smaller set of gases.[14]

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11 Number of facilities based on Semiconductor Equipment and Materials Industry (SEMI). July 2007. World Fab Forecast. http://www.semi.org/en/index.htm and does not include LED facilities.

12 The distinction between large and small semiconductor facilities is based on the facility's manufacturing capacity and the wafer size the facility manufactures.

13 Plasma etching emission factors must be measured in accordance with the 2006 ISMI Guidelines, International SEMATECH #06124825A-ENG, with limited exemptions.

14 In its initial 2009 proposal for electronics manufacture, EPA defined "small" semiconductor facilities as those facilities with annual capacities less than 10,500 m2 silicon (147 facilities out of 175 total facilities). In the initial proposal, those facilities were required to estimate their emissions using an approach based on the IPCC Tier 2b method.

4.3.2 Determination of Cost Elements

The total costs associated with complying with the proposed rulemaking were broken into four elements, which are described below.

Monitoring costs. The following types of monitoring costs were identified:

Collection of activity data for estimating F-GHG and N2O emissions.

As previously mentioned costs for collecting activity data differ depending on the facility category (large semiconductor, non-large semiconductor, or other electronics manufacturing).

Using the "Tier 2b Method" non-semiconductor facilities are required to estimate emissions using (1) gas consumption as calculated using the facility's purchase records, inventory, and gas-and facility-specific heel factors, (2) facility specific methods for apportioning gas usage by IPCC's Tier 2b two process categories (clean and etch), (3) updated Tier 2b default emissions factors, and (4) either EPA published default DRE value or properly measured DRE where appropriate.

Non-large semiconductor facilities assigned to the "Tier 2c Method" would be required to use an approach for estimating emissions which includes the following components: (1) gas consumption as calculated using the facility's purchase records, inventory, and gas-and facility-specific heel factors, (2) facility specific methods for apportioning gas usage by five process categories, (3) default emission factors (including factors for by-products) based on five process categories, and (4) either EPA published default destruction or removal efficiency (DRE) value or properly measured DRE where appropriate. Facilities could either use emission factors provided by EPA or develop/acquire facility-specific emissions factors from process equipment manufacturers. In addition, facilities that have monitoring infrastructure or the necessary data to estimate emissions obtained through recipe-specific measurements would be permitted to do so. The costs presented in this analysis reflect the use of default emission factors and EPA published DRE values.

Under the "Tier 2d Method" the largest semiconductor facilities were assigned to use an approach for estimating emissions which includes (1) gas consumption as calculated using the facility's purchase records, inventory, and gas-and facility-specific heel factors, (2) facility specific methods for apportioning gas usage by five process categories (3) default emission factors (including factors for by-products) based on four process categories and directly measured emission factors for the etching process, and (4) either EPA published default destruction or removal efficiency (DRE) value or properly measured DRE. Similar to the "Tier

2c Method", facilities can use either default emission factors or developed emission factors for the four non-etch processes, however the facility must measure and develop recipe-specific emission factors for all etch processes. The cost analysis reflects using default factors for the non-etch processes and the cost to measure and develop emission factors for etch processes. Due to the complex nature of apportioning gas in a large semiconductor facility, EPA has added software costs to account for the challenge of apportioning gases to etch processes.

Annual costs to report controlled emissions from abatement systems.

Under the final rule, any facility that wishes to reflect abatement of F-GHGs in its emissions estimates would be required to certify that the abatement system is installed, operated, and maintained in accordance with manufacturers' specifications and either use EPA published DRE default value or properly measured DRE. Facility costs incurred for assuring abatement systems are properly installed, operated, maintained, and reported, and accounting for uptime have been included for large facility categories in this cost analysis.[15] However, because DRE measurements are optional, the EPA's estimated costs for performing DRE testing was not included for any facility category in this cost analysis.

Collection of data for estimating heat transfer fluid (HTF) emissions.

In the proposed rule, electronics manufacturing facilities that use heat transfer fluids were required to account for emissions from use of heat transfer fluids using a mass-balance approach. EPA understands heat transfer fluids are widely used within semiconductor manufacturing; however, EPA is uncertain about heat transfer fluid use in other electronics manufacturing facilities. For this reason, costs associated with emissions from heat transfer fluids were conservatively included in all electronics manufacturing categories. The mass-balance approach uses company-specific data and accounts for differences among facilities' HTFs (which vary in their global warming potentials), leak rates, and service practices.

Reporting costs. The following types of reporting costs were identified:

Reporting F-GHG emission estimate.

Electronics manufacturing facilities will be required to complete and submit company-specific annual reports. Costs associated with reporting activity data were included for all categories. Facilities that employ abatement systems and wish to reflect the emission reductions

[15] Facility costs incurred for assuring abatement systems are properly installed, operated, maintained, and reported, and accounting for uptime are based on 32 technical labor hours. This cost is only included for large semiconductor facilities based on SIA's comments that 29 facilities would incur abatement compliance costs.

due to these systems in their emissions estimates will need to provide certification that the system is installed, operated, and maintained in accordance with manufacturers' specifications in their annual reports.[5] This certification process also includes an annual assessment of the equipment uptime. It is assumed there are no other costs associated with using default DRE values.

Facilities that choose to reflect emissions reductions through direct measurement of DRE at the facility, performance confirmed through direct DRE measurement (i.e., consistent with EPA's DRE Protocol) would be required. As previously stated, direct DRE measurements are optional, therefore reporting costs for DRE testing were not included in the cost analysis for any of the electronics manufacturing categories.

Reporting heat transfer fluid emissions estimate.

Electronics manufacturing facilities are required to complete and submit data-reporting forms. EPA has included costs for reporting heat transfer fluid emissions from all facilities because EPA is uncertain about whether LCD, PV, and MEMS manufacturing facilities use heat transfer fluids.

4.3.3 Proportion of Facilities in the Different Model Facility Levels

Semiconductor, MEMS, PV, and LCD facilities would determine whether they exceed the emissions-based threshold using IPCC Tier 1 emission factors and assuming no abatement. For PV facilities, annual emissions would be estimated by multiplying annual F-GHG consumption by the appropriate GWP factor. For semiconductor facilities, 91 out of 175 entities exceed the 25,000 $mtCO_2e$ threshold which includes 96 percent of total semiconductor emissions. For MEMS facilities, the 25,000 $mtCO_2e$ threshold includes two out of 12 entities and includes 66 percent of total MEMS emissions. For LCD facilities, no entities exceed the 25,000 $mtCO_2e$ threshold. Only one PV facility is included in the 25,000 $mtCO_2e$ threshold which includes 47 percent of total PV emissions. The number of each type of facility that EPA estimates will meet the 25,000 $mtCO_2e$ threshold and required to report is identified in Table 4-2.

Table 4-2. Number of Representative Affected Entities Used in the Cost Analysis

Threshold	Number of Representative Entities			
	Semiconductors (All)	MEMS	Liquid Crystal Display	Photovoltaics
1,000	134	10	5	16
10,000	108	4	1	1
25,000	91	2	0	1
100,000	55	0	0	0

4.3.4 Assigning Costs to Cost Elements

Assigning costs to each of the cost elements was completed using the four labor categories (legal, managerial, technical and clerical) and associated labor rates presented in Table 4-3. EPA assigns responsibilities to each labor category to estimate labor hours. Finally, EPA estimates the annualized capital costs and operation & maintenance (O&M) costs for each of the cost elements.

Determining Labor Categories.

To evaluate labor costs, it was not only necessary to determine the amount of time required for all of the tasks associated with monitoring, but also to determine who will perform each task.

Table 4-3. Labor Categories and Hourly Rates

Labor Category	Description	Loaded Hourly Rate ($/hour)
Legal	Oversees legal aspects of company reports and data-reporting forms.	$101.00/hour
Managerial	Oversees work at a high level and is the final authority on all reporting requirements.	$71.03/hour
Technical	Conducts monitoring of emissions sources, checks for accuracy, performs measurements.	$55.20/hour
Clerical	Assists with documentation and recording information	$29.65/hour

Allocate Responsibilities and Estimate Labor Hours.

Labor hours for all categories (large and non-large semiconductor and other electronics facilities) were estimated using IPCC's Tier 2b method from the initial proposed method for small semiconductor facilities and industry comments. EPA, drawing on its experience with semiconductor facilities voluntarily reporting emission via its sector Partnership, estimated the labor hours borne by non-large semiconductor facilities using IPCC's Tier 2b method and scaling the hours to represent 5 process categories. Large semiconductor facility burden hours were also based on scaling IPCC's Tier 2b method to four process categories (which account for 70 percent of all facility processes) and adding IPCC's Tier 3 method for the etching process (30 percent of all facility processes). The burden hours and costs borne by other electronics manufacturers were estimated using cost estimates from EPA's initial proposal for a small semiconductor facility and scaling these costs down to account for the use of a smaller set of gases, as these facilities use fewer types of PFCs than the semiconductor manufacturing facilities. In addition, information received from industry on burden hour estimates for technical staff to measure gas- and facility-specific heel factors were included. Table 4-4 presents the burden hours allocated to each labor category across all affected facility types covered under subpart I. The hours and costs for estimating emissions of heat transfer fluids were based on the ICR for EPA's SF6 Emission Reduction Partnership for Electric Power Systems. Under the SF6 Partnership, electric power systems report emissions using a mass-balance method that is essentially identical to that proposed for heat transfer fluids in semiconductor facilities.

Table 4-4. Responsibilities for Regulation Compliance by Labor Category Per Facility Category

Cost Element	Responsibilities and Hours by Labor Category							
	Legal		Managerial		Technical		Clerical	
	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours
Large Semiconductors—Tier 2d Method								
Monitoring								
Collection of activity data for F-GHG emission estimate			Provide quality assurance of analyses and authorize completeness of the checks.	15.7	Collect data on gas consumption, gas utilization, and by-product formation. Perform calculation for four process categories using default factors provided by EPA (Costs for EF Tier 3 EF Development for etch is under capital costs).	228	Assist in recording and maintaining data collected on gas consumption, gas utilization and by-product formation	3.6
Collect data for mass-balance calculation of Heat Transfer Fluids			Provide quality assurance of analyses and authorize completeness of the checks.	2.4	Collect activity data related to HTF emissions	10	Assist in recording and maintaining data on collected activity data related to HTF emissions	6.7
Reporting								
Complete and submit company-specific annual report	Oversee legal aspects of annual report submission	0.26	Provide quality assurance of annual report.	10.8	Complete and submit company-specific annual report	25.3	Assist with completing and submitting the company-specific annual report	8.4
Complete and submit data reporting forms for mass-balance calculation of Heat Transfer Fluids			Review and submit data reporting form.	3.5	Review instructions and complete the form for data reporting	3.5	Maintain data reporting records.	1.9
Abatement/DRE data gathering					Abatement system quality assurance audit and reporting	32		
Recordkeeping								
Collect and store necessary records for compliance			Review and submit appropriate records	2.4	Assure that appropriate records are kept	24.7	Assist with recordkeeping and filing	5.7

Cost Element	Responsibilities and Hours by Labor Category							
	Legal		Managerial		Technical		Clerical	
	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours
Non-Large Semiconductor Facilities—Tier 2c Method								
Monitoring								
Collection of activity data for F-GHG emission estimate			Provide quality assurance of analyses and authorize completeness of the checks.	3.6	Collect data on gas consumption. Perform calculations using IPCC Tier 2b default emission factors.	257.3	Assist in recording and maintaining data collected on gas consumption, gas utilization and by-product formation	
Collect data for mass-balance calculation of Heat Transfer Fluids			Provide quality assurance of analyses and authorize completeness of the checks.	2.2	Collect activity data related to HTF emissions	9.4	Assist in recording and maintaining data on collected activity data related to HTF emissions	6.11
Reporting								
Completion of company-specific annual report	Oversee legal aspects of annual report submission	0.26	Provide quality assurance of annual report.	10.8	Complete and submit company-specific annual report	25.3	Assist with completing and submitting the company-specific annual report	8.4
Complete and submit data reporting forms for mass-balance calculation of Heat Transfer Fluids			Review and submit data reporting form.	3.5	Review instructions and complete the form for data reporting	3.5	Maintain data reporting records.	1.7
Recordkeeping								
Collect and store necessary records for compliance			Review and submit appropriate records	2.39	Assure that appropriate records are kept	24.7	Assist with recordkeeping and filing	5.7

Cost Element	Responsibilities and Hours by Labor Category							
	Legal		Managerial		Technical		Clerical	
	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours
Non-Semiconductors—Tier 2b Method								
Monitoring								
Collection of activity data for F-GHG emission estimate			Provide quality assurance of analyses and authorize completeness of the checks.	7.2	Collect data on gas consumption, gas utilization, and by-product formation. Perform calculation for five process categories using default factors provided by EPA.	169.5	Assist in recording and maintaining data collected on gas consumption, gas utilization and by-product formation	
Collect data for mass-balance calculation of Heat Transfer Fluids			Provide quality assurance of analyses and authorize completeness of the checks.	4	Collect activity data related to HTF emissions	17	Assist in recording and maintaining data on collected activity data related to HTF emissions	11
Reporting								
Completion of company-specific annual report	Oversee legal aspects of annual report submission	0.26	Provide quality assurance of annual report.	10.8	Complete and submit company-specific annual report	25.3	Assist with completing and submitting the company-specific annual report	8.4
Complete and submit data reporting forms for mass-balance calculation of Heat Transfer Fluids			Review and submit data reporting form.	3.5	Review instructions and complete the form for data reporting	3.5	Maintain data reporting records.	1.7
Recordkeeping								
Collect and store necessary records for compliance			Review and submit appropriate records	2.4	Assure that appropriate records are kept	24.7	Assist with recordkeeping and filing	5.7

Capital and O&M Costs

Non-Large Semiconductor, LCD, PV and MEMS Facilities: The EPA estimated that non-large semiconductor facilities and non-semiconductor facilities using the "Tier 2b" or "Tier 2c" method would incur no capital or O&M costs.

Large Semiconductor Facilities: For the largest semiconductor facilities using the "Tier 2d Method", the EPA has estimated capital and O&M costs associated with developing both apportioning software and emission factors for the etch processes. Facilities were assumed to share software development resources if they are owned by the same company; EPA estimated 11 companies own the 29 large semiconductor facilities. Industry apportioning software capital costs were based on the assumption that each of the 11 companies would pay the full software development cost (based on 2,000 labor hours required to develop the software at a technical engineer labor rate) for one of their facilities and each subsequent facility the company owned would pay 50 percent of the software development cost (i.e., 11 facilities pay full cost and 18 facilities pay 50 percent). Facility software capital cost was then calculated by dividing total industry software capital cost by 29 facilities. Apportioning software O&M costs were based on a 10 year software lifetime.[16] Industry capital costs for emission factor development (etch processes only) was assumed to be incurred per company and based on labor costs associated with three technical engineers (2,000 hours each) needed to develop emission factors. The EPA assumed that facilities will already have the necessary equipment to develop emission factors and therefore did not include capital cost estimates for equipment. In order to obtain facility capital cost for emission factor development, the total industry cost was divided by 29 facilities. O&M costs for emission factor development represents the cost for updating/revising emission factors as needed based on changes to a facility's processes, recipes, or equipment (estimated to be every 7 years)[17]. All capital costs (for both software and emission factor development) were annualized with an interest rate of 7.0 percent.

Other Costs

The EPA estimated that the per-facility optional cost of directly measuring DREs in accordance with EPA's DRE Protocol is $71,766. This cost was not included in this economic analysis since direct measurements of DREs are optional. The cost estimate was based on the assumption that a large semiconductor facility would have approximately 50 etch tools, all of

[16] O&M cost for software is based on 500 labor hours at an industrial engineer labor rate.

[17] O&M costs were not factored into first year costs to a facility.

which have PFC abatement systems. The EPA estimates that 20 percent of these fifty systems would be required to be tested annually and that it would take two weeks to test these ten systems per year. The cost for two weeks worth of testing was based on industry estimates and EPA's experience conducting DRE testing. While 90 percent of this cost is related to labor and 10 percent is related to freight shipments and measurement study supplies, it was assumed that the facilities outsource the DRE measurement and thus this cost was not considered a labor cost for the facility.

4.3.5 Estimation of Facility Costs for Each Threshold Level

Once the labor hours were calculated, by category, for each of the cost elements, they were multiplied by the associated labor rates to estimate labor costs per facility for each facility category (large semiconductor facilities, non-large semiconductor facilities, and non-semiconductor facilities). Finally, the unit cost per facility was multiplied by the number of facilities that exceed the reporting threshold for each type of facility, resulting in the total national costs per year for this sector.

4.4 Cost Analysis for Subpart L—Fluorinated Gas Production

4.4.1 Model Facility Development

For the Fluorinated Gas Production subpart, model facilities were developed based on the number of products at a single facility using known data for Fluorinated Gas Production facilities. Facilities were then categorized as producing one, three or six products using either continuous or batch processes. Facilities that were assumed to use continuous processes to produce their products were assumed to employ two processes per product and two vents per process. Facilities that were assumed to use batch processes to produce their products were assumed to employ five processes per product and five vents per process.

Option 1, the Mass Balance Approach, requires that a monthly fluorine or carbon balance of all inputs and outputs be performed using measurements of the masses of the inputs and outputs and of the fluorine or carbon content of the inputs and outputs. Greenhouse gas (GHG) emissions are calculated from the difference of fluorine- or carbon-in minus fluorine- or carbon-out. For this evaluation, the average facility using either Mass Balance Approach was assumed to have four processes on site.

Option 2, the Process Vent Method, requires the development of emission factors for each process vent. For vents whose GHG emissions exceed 10,000 mt CO2e/year, facilities

must use emissions testing to establish the emission factor. For other vents, facilities may use engineering calculations to establish the emission calculation factor. For the purpose of this evaluation it was assumed that one quarter of the process vents had GHG emissions over 10,000 mtCO2e per year. Thus, for the "average" facility, it was assumed that 25 percent of vents would be measured by emission testing and the other three quarters would be evaluated using engineering calculations. Under the proposed rule, facilities are required to develop emission factors and emission calculation factors in the first year and to update them every ten years thereafter.

When calculating the cost impact for the Process Vent Method, it was apparent that a single "outlier" facility was distorting the average cost per facility. This "outlier" is comprised of many more processes than the average facility, and also consists of processes that are very complicated and require many steps. Thus, the cost for this particular outlier is not at all representative of the cost that the "average" facility will see. Thus, the cost for this particular outlier is not at all representative of the cost that the "average" facility will see. Thus, the outlier was excluded for purposes of summarizing the typical cost to a facility. However, the outlier cost was still included for the nationwide impact analysis.

Under the Process Vent Method, Option 2, facilities would be required to estimate their emissions from equipment leaks every year. Under both Option 1 and Option 2, facilities would also be required to measure the destruction efficiency of their destruction device (e.g., thermal oxidizer) initially and every ten years thereafter.

4.4.2 Cost Analysis for Mass Balance Approach - Option 1

This section identifies the costs associated with complying with the rulemaking using Option 1, the Mass Balance approach. Compliance costs for this option include both labor and non-labor (capital and O&M) costs and both startup and recurring costs. The "average" plant that utilized the mass balance approach was estimated to have a total of 4.67 processes. The total first year cost for the mass balance method is $127,440 in labor costs and $12,061 in capital costs. Tables 4-5 and 4-6 summarize the labor and non-labor costs respectively.

Initial planning costs were estimated for the time needed to review the rule and prepare required initial notifications and records. These planning hours include resolving questions, reviewing drawings, conducting source inspections, defining constraints, writing the engineering report and onetime costs for equipment leak measurement, such as walk-down and field verification, populating software and initial monitoring setup costs.

For the mass balance approach, the first year planning hours include 6.4 management hours, 12.5 administrative hours and 124.9 hours for the industrial engineer/technician. Quality assurance/quality control costs for planning, meetings, sample analysis certification and annual review total 4.6 hours for the industrial manager, 92.9 industrial engineer/technician hours and 37.1 administrative hours. No planning costs are incurred in subsequent years, and QA/QC hours drop from 135 in the first year to a total of 34 in subsequent years.

Sampling, analysis, monitoring and calculation costs were estimated on a per-continuous-process basis. Existing facilities have indicated that the mass balance method is not practical for batch processes, due to higher cost and the nature of the batch processes, so costs for batch processes have not been calculated.

For the mass balance approach, first year stream sampling and analysis costs include 1798 hours for the industrial engineer/technician, 179.8 administrative hours and 89.9 management hours. This includes 165 engineer/technician hours, 8.25 management hours and 16.5 administrative hours to perform the mass balance measurements and calculations for each of the 4.67 processes. It also includes 330 engineer/technician hours, 16.5 management hours and 33 administrative hours to complete the scoping study on each of the 3.1 processes above the one-ton threshold. These costs apply only to the first year.

First year recordkeeping and reporting costs were estimated to include 24.7 industrial engineer/technician hours, 5.7 management hours and 2.4 administrative hours to compile and store data annually. Labor requirements for preparing the annual report include 7.3 industrial engineer/technician hours, 0.7 management hours, and 1.7 administrative hours to prepare the annual report. These costs remain unchanged in subsequent years.

Capital costs included include $12,061 to hire a consultant to perform Destruction Efficiency Testing.

Table 4-5. Subpart L – F-Gas Mass Balance Approach: Labor Costs (2006$)

Activity	Labor Rates (per hour)								Labor Cost per Year per Reporting Unit/Facility	
	Legal		Managerial		Technical		Clerical			
	$101.00		$71.03		$55.20		$29.65			
	First Year	Subseq. Year	First Year	Subseq. Year	First Year	Subseq. Year	First Year	Subseq. Year	First Year	Subseq. Year
Planning			6.4	0.0	124.9	0.0	12.5	0.0	$7,719	$0
QA/QC			4.6	1.2	92.9	23.2	37.1	9.3	$6,555	$1,638
Recordkeeping			2.4	2.4	24.7	24.7	5.7	5.7	$1,702	$1,702
Sampling and analysis (calculations)			89.9	0	1,798.0	0	179.8	0	$110,960	$0
Reporting			0.7	0.7	7.3	7.3	1.7	1.7	$503	$503
Total	**0**	**0**	**103.99**	**4.24**	**2,047.80**	**55.20**	**236.80**	**16.70**	**$127,440**	**$3,844**

Note: All costs are in constant 2006$s.

Table 4-6. Subpart L – F-Gas Mass Balance Method: Capital and O&M Costs (2006$)

Activity	Cost Categories				Total Reporting Cost per Unit/Facility	
	Capital Cost	Equipment Lifetime (years)	Annualized Capital Cost (per year)	O&M Costs (per year)	First Year	Subseq. Year
Equipment (selection, purchase, installation)						
Performance testing	$12,061	10	$845		$845	$845
Recordkeeping and Reporting						
Travel						
Sampling costs						
Total	**$12,061**		**$845**	**$0**	**$845**	**$845**

Note: All costs are in constant 2006$s. Annualization uses 7% interest rate.

4.4.3 Cost Analysis for Option 2- Process Vent Testing

This section presents costs associated with complying with the rulemaking using Option 2, Process Vent Testing. These include both labor and non-labor (capital and O&M) costs and both startup and recurring costs. The "average" plant that utilized the process vent approach was

assumed to have a total of 5 processes. An average of 2.5 process vents were assumed to be evaluated by testing. The remaining vents, accounting for 75% of the total vents at a facility, were assumed to be evaluated using the engineering calculation approach. In effect, this was assumed to require engineering calculations for each of the 5 processes at the average facility complying with the Process Vent approach.

In each of the following paragraphs, the costs are broken out between the process vent emissions estimates and the equipment leak assessment. For the average facility, the total first year labor cost (Table 4-7) for the process vent method is $124,768. A capital cost of $17,521 per average facility is also estimated, as shown in Table 4-8.

Initial planning costs were estimated for the time needed to review the rule and prepare required initial notifications and records. These planning hours include resolving questions, reviewing drawings, conducting source inspections, defining constraints, writing the engineering report and onetime costs for equipment leak measurement, such as walk-down and field verification, populating software and initial monitoring setup costs.

For Option 2, the planning labor includes 1.8 hours for the industrial manager, 55.1 hours for the industrial engineer/technician, and 44 administrative hours, totaling $4,474. There are no planning costs estimated in subsequent years. Quality assurance/quality control requires an estimated 105.2 hours during the first year ($4,992), and 26.35 hours in subsequent years ($1,251).

Sampling, analysis, monitoring and calculation costs were on a per-vent basis for the process vent testing and a per-process basis for process vent calculations and for equipment leaks.

Sampling and analysis is estimated to require 2,067.33 hours, costing $111,568, during the first year; and 70.75 hours, costing $3,917, in subsequent years.

Recordkeeping costs were estimated on an annual basis, requiring 32.8 industrial engineer/technician hours, 2.4 management hours and 16.3 administrative hours to compile and store data, and costing $2,466. Labor requirements for preparing the annual report included 15.4 industrial engineer/technician hours, 0.7 management hours, and 12.3 administrative hours to prepare the annual report, at a cost of $1,267.

Capital costs included equipment for leak detection such as the monitoring device and data collection system. It was assumed that half of the facilities already possess monitoring and

data collections systems, and that half of the facilities would be required to complete Destruction Efficiency Testing.

Capital costs for the average facility totaled $17,521 (annualized to $1,227) in equipment purchases, and an annual rental cost, in subsequent years, of $1,280 for sampling equipment.

Table 4-7. Subpart L – F-Gas Process Vent (Avg. per plant basis): Labor Costs (2006$)

Activity	Labor Rates (per hour)								Labor Cost per Year per Reporting Unit/Facility	
	Legal		Managerial		Technical		Clerical			
	$101.00		$71.03		$55.20		$29.65			
	First Year	Subseq. Year	First Year	Subseq. Year	First Year	Subseq. Year	First Year	Subseq. Year	First Year	Subseq. Year
Planning			1.8	0	55.1	0	44.0	0	$4,474	$0
QA/QC			3.4	0.9	67.8	17.0	34.0	8.5	$4,992	$1,251
Recordkeeping			2.4	2.4	32.8	32.8	16.3	16.3	$2,466	$2,466
Sampling and analysis (calculations)			73.2	0.75	1,849.3	70.0	144.8	0	$111,568	$3,919
Reporting			0.7	0.7	15.4	15.4	12.3	12.3	$1,267	$1,267
Total	**0**	**0**	**81.48**	**4.71**	**2,020.48**	**135.29**	**251.48**	**37.15**	**$124,768**	**$8,904**

Note: All costs are in constant 2006$s.

Table 4-8. Subpart L – F-Gas Process Vent Method: Capital and O&M Costs (2006$)

Activity	Cost Categories				Total Reporting Cost per Unit/Facility	
	Capital Cost	Equipment Lifetime (years)	Annualized Capital Cost (per year)	O&M Costs (per year)	First Year	Subseq. Year
Equipment (selection, purchase, installation)	$5,460	10	$382		$382	$382
Performance testing	$11,200	10	$845		$845	$845
Recordkeeping and Reporting						
Travel						
Sampling costs					$0	$1,280
Total	**$17,521**		**$1,227**		**$1,227**	**$2,507**

4.5 Cost Analysis for Subpart DD—Electric Power Systems

4.5.1 Model Facility Development

The model facility for electric power systems is an electric utility that operates an average amount (nameplate capacity) of SF_6-containing transmission equipment. Costs are not expected to vary widely among utilities because all utilities would track the same set of quantities (SF_6 stored, acquired, and disbursed; equipment installed and retired), and the costs of tracking and reporting these quantities are relatively modest.

The model facility is assumed to already have the capital and technical capability to monitor and report emissions of SF_6 using a mass-balance formula. To use the formula, facilities must track their SF_6 inventory in cylinders, SF_6 acquisitions, and SF_6 disbursements, as well as their equipment commissioning and decommissioning. These data are already tracked by utilities, but not necessarily as closely and comprehensively as required to develop all utility level mass-balance inputs. Thus, as discussed below, the model facility is assumed to incur some costs for tracking and reporting SF_6 emissions.

4.5.2 Determine Cost Elements

The total costs associated with the proposed rulemaking for electric power systems were estimated using labor hours from an Information Collection Request (ICR) performed for EPA's SF6 Emission Reduction Partnership.[18] The labor hours were multiplied by current labor costs to calculate the reporting costs under the proposed reporting rule.

All labor costs are considered on an annual basis and are divided into the following four categories:

Regulation Compliance Determination Costs. Recurring costs consist of reviewing the instructions of the mass-balance reporting form and associated materials to ensure the proper procedures are in place to obtain technically accurate inputs.

*Monitoring Costs***.** Recurring costs consist of gathering information for the mass-balance reporting form and associated materials. The information gathered represents the movement of SF_6 throughout the system. Since SF_6 is often handled and stored at the substation level,

[18] EPA. (2000). Supporting statement for EPA Information Collection Request number 1933.01 "Information collection activities associated with EPA's SF_6 Emission Reduction Partnership for Electric Power Systems."

collecting information is usually a bottom-up process that is the most labor-intensive activity in the reporting process.

*Reporting Costs***.** Recurring costs consist of completing and reviewing the information requested by the mass-balance reporting form and associated materials as well as submitting all materials.

*Recordkeeping Costs***.** Recurring costs consist of maintaining a record of the emissions inventory and documentation.

4.5.3 Proportion of Facilities in Different Model Facility Levels

There is only one model facility for electric power systems.

4.5.4 Assigning Costs to Cost Elements

Determine Labor Categories

To evaluate labor costs, it was not only necessary to determine the amount of time required for all of the tasks associated with the compliance, monitoring, reporting, and recordkeeping activities, but also to determine who will perform each task. For this analysis, three labor categories were used as shown in Table 4-9.

Table 4-9. Labor Categories and Hourly Rates

Labor Category	Description	Loaded Hourly Rate ($/hour)
Managerial	Oversees work at a high level and is the final authority on all reporting requirements. Reviews reporting forms to ensure accuracy and consistency	$71.03/hour
Technical	Compiles data to develop mass-balance inputs. Performs emission calculations on reporting form	$55.20/hour
Clerical	Assists with documentation and recording information	$29.65/hour

Allocate Responsibilities and Estimate Labor Hours

Labor hours for all cost elements were estimated based on consultation between EPA and SF_6 Emission Reduction Partners conducted for the 2000 Partnership ICR. Table 4-10 summarizes the allocation of hours and responsibilities by labor category.

Table 4-10. Responsibilities for Regulation Compliance by Labor Category

Cost Element	Responsibilities and Hours by Labor Category						
	Managerial		Technical		Clerical		Per Facility/ Per Company
	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours	
Regulation Compliance Determination Costs							
Review the instructions, SF_6 mass-balance reporting form, and associated materials	Review the instructions to the level required to perform oversight responsibilities	1	Review the instructions to the level required to compile data and perform necessary calculations	1.5			Per Facility
Monitoring Costs							
Gather information for the SF_6 mass-balance reporting form and associated materials	Institute and oversee proper data collection procedures that account for all SF_6 within the system	4	Compile SF_6 data and sort data into appropriate input categories for the mass-balance formula	17	Perform measurements and collect documentation that track SF_6 gas movements	11	Per Facility
Reporting Costs							
Complete and review the information requested by the SF_6 mass-balance reporting form and associated materials	Review reporting forms to ensure accuracy and consistency	3.5	Calculate inputs for the mass-balance reporting form. Perform facility-wide SF_6 emission calculations	3.5	Provide data and supporting documentation to technical and managerial staff	1.5	Per Facility
Submit the SF_6 mass-balance reporting form and associated materials		0		0	Combine the mass-balance reporting form with all necessary materials and submit	0.2	Per Facility
Recordkeeping Costs							
Maintain a record of the emissions inventory and documentation		0		0	File the mass-balance reporting form and associated materials into the recordkeeping	0.2	Per Facility

Cost Element	Responsibilities and Hours by Labor Category						
	Managerial		Technical		Clerical		Per Facility/ Per Company
	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours	
					system		

Other Costs

Other costs consist of postage costs—for submitting materials in a one ounce package, and photocopying costs—for maintaining records of the reporting form and associated materials. These costs were gathered by EPA in the SF_6 Emission Reduction Partnership ICR.

Table 4-11. Other Costs Associated with Reporting and Recordkeeping

Element	Description	Costs ($)
Postage Costs	Postage costs for submitting the reporting form and associated materials	$0.38
Photocopying Costs	Photocopying costs for maintaining a record of the emissions inventory and associated materials	$11.66

4.5.5 Estimate per Facility Costs for Each Threshold Level

Once the labor hours were calculated, by category, for each of the cost elements, they were multiplied by the associated labor rates to estimate labor costs per facility. Other costs, consisting of postage and photocopying, were then added to the labor costs to calculate the total cost per facility. For calculating national costs, the total cost per facility was multiplied by 141, which is the number of facilities that exceed the reporting threshold.

4.6 Cost Analysis for Subpart QQ—Imports and Exports of Fluorinated GHGs

4.6.1 Model Facility Development

Importers and exporters of products containing fluorinated GHGs include manufacturers, distributors, and retailers of these products. Such products include several types of refrigeration and air-conditioning equipment and foams containing HFCs and electrical equipment containing SF_6. This analysis does not consider the costs of CO_2 and N_2O contained in imported and exported products. Although EPA does not have data on the amount of CO_2 or N_2O imported and exported in products (e.g., carbonated sodas and cans of whipped cream), the relatively small quantities of CO2 or N2O contained in each unit and the relatively low GWPs of these gases

(compared to those of the fluorinated GHGs) imply that the CO_2-equivalent quantities imported are likely to be small both nationally and per importer.

There is one model entity that represents importers/exporters of products containing fluorinated GHGs and the specific reporting activities and costs.

- *Importers/Exporters of fluorinated GHG--containing products:* An entity that imports or exports products or foam containing fluorinated GHGs or equipment containing SF_6. This entity is assumed to import or export 15 equipment types (with distinct charge sizes and possibly chemicals) in 20 shipments each year.

The proposed monitoring method for fluorinated GHGs-containing products and equipment requires the identification of the total amount of each fluorinated GHG imported/exported inside the products and/or the quantity of products imported/exported (e.g., number of pieces of equipment) along with information on the identity and quantity of the fluorinated GHG in each unit or piece. Persons importing equipment that contain both a fluorinated GHG refrigerant and a foam blown with a fluorinated GHG (e.g., household refrigerators) would separately report these GHGs (which are generally different). Similarly, total exports of chemical actually contained in exported equipment, foams, or other products would be reported by exporters, by chemical in metric tons or metric tCO2e. Trans-shipments (i.e., products containing GHGs that originate in a foreign country and enter the United States en route to an ultimate destination in another foreign country) would be exempt from reporting. Importers/exports of products containing fluorinated GHGs would report their imports/exports on the corporate level.

Table 4-12 presents the number of affected entities that would be subject to the rule based on alternative emission thresholds.

Table 4-12. Number of Representative Affected Entities Used in the Cost Analysis

Threshold	Number of Representative Entities[a]					
	All HFC Equipment		All Foam Products		All SF_6 Equipment	
	Importers	Exporters	Importers	Exporters	Importers	Exporters
1,000	50	25	50	25	8	10
10,000	50	25	50	25	8	5
25,000	50	25	50	25	8	0
100,000	50	25	50	25	8	0

[a]While listed separately in the table above to illustrate the number of importers and number of exporters, importers and exporters are the same entities for SF_6 equipment, and in some cases, the same entities for HFC equipment and foam products. As such, the per-facilities costs will increase—to reflect activities associated with both importing and exporting, and the overall number of respondents will decrease given the overlap.

4.6.2 Determine Cost Elements

The total costs associated with complying with the proposed rulemaking can be broken into 4 elements, each of which is described below.

Monitoring Costs. Costs for tracking quantities of products imported and the quantity of fluorinated GHGs in these products include first-year costs to establish a system such as a spreadsheet or database to track charge sizes for different types of equipment and the numbers of pieces of that type of equipment that are imported. Subsequent year costs include maintaining this system.

Reporting Costs. The reporting costs associated with complying include annual labor hours for reporting the quantities of products or foam imported and/or exported; and the name and quantity of fluorinated GHG within each product or foam imported and/or exported.

Record Keeping Costs. Additional and reporting ($500) costs were also added to each facility.

4.6.3 Analyze Proportion of Facilities in the Different Model Facility Categories

To classify facilities into different groups, the activities undertaken at each model facility type were evaluated. The activities conducted by each model facility are listed in the model facility development section for this subpart. Table 4-13 indicates the number of facilities that fall into each model facility category.

Table 4-13. Allocation of Facilities to Model Types

Segment	Number of Facilities
Importer of HFC-containing equipment	
	50
Exporters of HFC-containing equipment	
	25
Importer of HFC-containing foams	
	50
Exporter of HFC-containing foams	
	25
Importers of SF_6-containing equipment	
	8
Exporters of SF_6-containing equipment	
	10

4.6.4 Assigning Costs to Cost Elements

Determining Labor Categories

To evaluate labor costs, it was not only necessary to determine the amount of time required for all of the tasks associated with monitoring, but also to determine who will perform each task. For this analysis, two labor categories were used as shown in Table 4-14.

Table 4-14. Labor Categories and Hourly Rates

Labor Category	Description	Loaded Hourly Rate (2006$/hour)
Managerial	Oversees work at a high level and is the final authority on all reporting requirements.	$71.03/hour
Technical	Conducts monitoring of emissions sources, checks for accuracy, performs measurements.	$55.20/hour

Allocating Responsibilities and Estimate Labor Hours

Assigning labor hours for all cost elements was based on the following approach.

To determine hours for the first year, the time to assemble relevant paperwork for the first year was taken into account, as well as the time to develop a listing of equipment types and foam products, and the time to enter in the data for all equipment types across all shipments.

To determine hours for subsequent years, the time to maintain the ongoing, relevant paperwork was taken into account as well as the time to enter in the data for all equipment types across all shipments. Management time in both the first and subsequent years was assumed to represent 10 percent of total time for both the first and subsequent years.Table 4-15 summarizes the allocation of hours and responsibilities by labor category. The reporting labor hours shown in this table represent the time estimated to complete the cost element for all activities applicable to the entity (i.e., import, export).

Table 4-15. Responsibilities for Regulation Compliance by Labor Category

Cost Element	Responsibilities and Hours by Labor Category				
	Managerial		Technical		Per Facility/ Per Company*
	Responsibilities	**Hours**	**Responsibilities**	**Hours**	
Importer/Exporter of Fluorinated GHG-containing Product (including foams and SF6-containing equipment)					
Registration Compliance Data					
None Estimated					
Monitoring					
First Year: Tracking System	To oversee the design of a database or spreadsheet to track imports/exports	4	To establish a database or spreadsheet to track imports/exports	40	Per Company
Subsequent Years: *Tracking System*	To review maintained tracking system	3	To update and maintain tracking system	31	Per Company
Reporting					
Report Data	To review the data	1	To collect data records already measured by an instrument	3	Per Company
Record Keeping					
None Estimated					

Once the labor hours were calculated, by category, for each of the cost elements, they were multiplied by the associated labor rates to estimate labor costs per facility. No additional costs are assumed.

Capital Cost Annualization and O&M Costs

There are no assumed capital costs related to monitoring emissions and archiving of information, and therefore there are no associated O&M costs.

4.6.5 Estimate per Facility Costs for Each Threshold Level

Once the labor hours were calculated, by category, for each of the cost elements (as shown in Table 4-15, they were multiplied by the associated labor rates (as shown in Table 4-14) to estimate labor costs per facility. The unit cost per entity was multiplied by the number of facilities that exceed the reporting threshold (as shown in Table 4-13), to determine the total national costs per year for this sector.

4.7 Subpart SS—Electrical Equipment Manufacturing

4.7.1 Model Facility Development

The model facility for electrical equipment manufacture or refurbishment and manufacturing of electrical components is a manufacturer that produces an average amount (nameplate capacity) of SF_6-containing transmission and distribution equipment. Costs are not expected to vary widely among electrical equipment manufacturers because all manufacturers would track the same set of quantities (SF_6 stored, acquired, and disbursed), and the costs of tracking and reporting these quantities are relatively modest.

The model facility is assumed to already have the capital and technical capability to monitor and report emissions of SF_6 using a mass-balance formula. To use the formula, facilities must track their SF_6 inventory in cylinders, SF_6 acquisitions, and SF_6 disbursements. These data are already tracked by electrical equipment manufacturers, but not necessarily as closely and comprehensively as required to develop all manufacturer-level mass-balance inputs. Thus, as discussed below, the model facility is assumed to incur some costs for tracking and reporting SF_6 emissions.

Table 4-16 presents the number of affected entities that would be subject to the rule based on alternative emission thresholds under subpart SS.

Table 4-16. Number of Representative Affected Entities Used in the Cost Analysis

Threshold	Number of Representative Entities
1,000	10
10,000	10
25,000	10
100,000	5

4.7.2 Determine Cost Elements

The total costs associated with the proposed rulemaking for electrical equipment manufacturers were estimated using labor hours from an Information Collection Request (ICR) performed for EPA's SF_6 Emission Reduction Partnership.[19,20] The labor hours were multiplied by current labor costs to calculate the reporting costs under the proposed reporting rule. All labor costs are considered on an annual basis and are divided into the following four categories:

Regulation Compliance Determination Costs. Recurring costs consist of reviewing the instructions of the mass-balance reporting form and associated materials to ensure the proper procedures are in place to obtain technically accurate inputs.

Monitoring Costs. Recurring costs consist of gathering information for the mass-balance reporting form and associated materials. The information gathered represents the movement of SF_6 throughout the system.

Reporting Costs. Recurring costs consist of completing and reviewing the information requested by the mass-balance reporting form and associated materials as well as submitting all materials.

Recordkeeping Costs. Recurring costs consist of maintaining a record of the emissions inventory and documentation.

[19] EPA. (2000). Supporting statement for EPA Information Collection Request number 1933.01 "Information collection activities associated with EPA's SF_6 Emission Reduction Partnership for Electric Power Systems"

[20] Although the ICR was focused on the costs of reporting SF_6 emissions from electric utilities rather than electrical equipment manufacturers, the inputs required to calculate emissions and the activities involved with reporting are similar for both sectors. Therefore, the costs incurred for electrical equipment manufacturers are assumed to be the same as the costs incurred for electric power systems.

4.7.3 Analyze Proportion of Facilities in the Different Model Facility Categories

There is only one model facility for electrical equipment manufacture or refurbishment and manufacturing of electrical components.

4.7.4 Assigning Costs to Cost Elements

Determining Labor Categories

To evaluate labor costs, it was not only necessary to determine the amount of time required for all of the tasks associated with monitoring, but also to determine who will perform each task. For this analysis, two labor categories were used as shown in Table 4-17.

Table 4-17. Labor Categories and Hourly Rates

Labor Category	Description	Loaded Hourly Rate ($/hour)
Managerial	Oversees work at a high level and is the final authority on all reporting requirements. Reviews reporting forms to ensure accuracy and consistency	$71.03/hour
Technical	Compiles data to develop mass-balance inputs. Performs emission calculations on reporting form	$55.20/hour
Clerical	Assists with documentation and recording information	$29.65/hour

Allocating Responsibilities

Labor hours for all cost elements were estimated based on consultation between EPA and SF_6 Emission Reduction Partners conducted for the 2000 Partnership ICR. Table 4-18 summarizes the allocation of hours and responsibilities by labor category.

Table 4-18. Responsibilities for Regulation Compliance by Labor Category Per Facility

Cost Element	Responsibilities and Hours by Labor Category					
	Managerial		Technical		Clerical	
	Responsibilities	Hours	Responsibilities	Hours	Responsibilities	Hours
Regulation Compliance Determination Costs						
Review the instructions, SF_6 mass-balance reporting form, and associated materials	Review the instructions to the level required to perform oversight responsibilities	1	Review the instructions to the level required to compile data and perform necessary calculations	1.5		0
Monitoring Costs						
Gather information for the SF_6 mass-balance reporting form and associated materials	Institute and oversee proper data collection procedures that account for all SF_6 within the system	4	Compile SF_6 data and sort data into appropriate input categories for the mass-balance formula	17	Perform measurements and collect documentation that track SF_6 gas movements	11
Reporting Costs						
Complete and review the information requested by the SF_6 mass-balance reporting form and associated materials	Review reporting forms to ensure accuracy and consistency	3.5	Calculate inputs for the mass-balance reporting form. Perform facility-wide SF_6 emission calculations	3.5	Provide data and supporting documentation to technical and managerial staff	1.5
Submit the SF_6 mass-balance reporting form and associated materials		0		0	Combine the mass-balance reporting form with all necessary materials and submit	0.2
Recordkeeping Costs						
Maintain a record of the emissions inventory and documentation		0		0	File the mass-balance reporting form and associated materials into the recordkeeping system	0.2

4.7.5 Other Costs

Other costs consist of postage costs—for submitting materials in a one ounce package, and photocopying costs—for maintaining records of the reporting form and associated materials. These costs were gathered by EPA in the SF_6 Emission Reduction Partnership ICR and are presented in Table 4-19.

Table 4-19. Other Costs Associated with Reporting and Recordkeeping

Element	Description	Costs ($)
Postage Costs	Postage costs for submitting the reporting form and associated materials	$0.38
Photocopying Costs	Photocopying costs for maintaining a record of the emissions inventory and associated materials	$11.66

4.7.6 Estimate per Facility Costs for Each Threshold Level

Once the labor hours were calculated, by category, for each of the cost elements, they were multiplied by the associated labor rates to estimate labor costs per facility. Other costs, consisting of postage and photocopying, were then added to the labor costs to calculate the total cost per facility. For calculating national costs, the total cost per facility was multiplied by 10, which is the number of facilities that exceed the reporting threshold.

4.8 Public Sector Burden

EPA estimates the public sector burden to be $383,582 per year; $72,000 per year is for verification activities, and remaining costs are for program implementation and developing and maintaining the data collection system. Program implementation activities include, but are not limited to, developing guidance and training materials to assist the regulated community, responding to inquires from affected facilities on monitoring and applicability requirements, and developing tools to assist in determining applicability.

SECTION 5
ECONOMIC IMPACT ANALYSIS

EPA has prepared an EIA to provide decision makers with a measure of the social costs of using resources to comply with the proposed GHG reporting requirements. As noted in EPA's (2000) *Guidelines for Preparing Economic Analyses*, several tools are available to estimate social costs and range from simple direct compliance cost methods to the development of a more complex market analysis that estimates market changes (e.g., price and consumption) and economic welfare changes (e.g., changes in consumer and producer surplus). Given data limitations and the size scope of the proposed rule, EPA has used the direct compliance cost method as a measure of social costs.

5.1 Selection of Reporting Thresholds

5.1.1 Subpart I- Electronics Manufacturing

This analysis is based on the costs of monitoring fluorinated greenhouse gas and N_2O emissions from electronics manufacturing facilities. Electronics manufacturing facilities were broken into three categories; non-semiconductor electronics (3 facilities), largest semiconductor (29 facilities), and non-largest semiconductor (62 facilities). Non- semiconductor electronics facilities include facilities that manufacture micro-electro-mechanical systems (MEMS), liquid crystal displays (LCDs), and photovoltaics (PV).

In the initial proposal, EPA proposed capacity-based thresholds equivalent to 25,000 metric tons of CO_2e for manufacture of semiconductors, LCDs, and MEMS, and an emissions-based threshold of 25,000 metric tons of CO_2e for manufacture of PV. As stated in the initial proposal, EPA proposed to use a capacity-based threshold based on the published capacities of facilities, as opposed to an emissions-based threshold, where possible, because EPA believed that it simplified the applicability determination. In comments received in response to the initial proposed rule, several comments indicated that the proposed capacity-based threshold created ambiguity. In response to the comments received on the initial proposed capacity-based threshold, EPA is now proposing an emissions-based threshold of 25,000 mtCO_2e for manufacture of semiconductors, LCD, MEMS, and PV.

In the analysis, EPA considered emission thresholds of 1,000 metric tons CO_2e, 10,000 metric tons CO_2e, 25,000 metric tons CO_2e, and 100,000 metric tons CO_2e per year. This analysis used IPCC Tier 1 emission factors and assumed no abatement. Table 5-1 presents the emissions and facilities that would be captured by the respective emissions thresholds.

Table 5-1. Threshold Analysis for Subpart I – Electronics Manufacturing Industry

Emission Threshold Level (metric tons CO_2e/yr)	Total National Emissions (metric tons CO_2e/yr)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO_2e/yr	Percent	Facilities	Percent
1,000	5,984,463	216	5,962,091	99.6%	165	76%
10,000	5,984,463	216	5,813,200	97%	114	53%
25,000	5,984,463	216	5,622,570	94%	94	44%
100,000	5,984,463	216	4,737,622	79%	55	26%

EPA selected the 25,000 metric tons CO_2e per year threshold because this threshold maximizes emissions reporting, while excluding small facilities that do not contribute significantly to the overall GHG emissions.

The proposed emissions-based thresholds are estimated to include approximately 76 percent of semiconductor facilities and 7 percent of the non-semiconductor facilities (see Table 5-2). At the same time, the thresholds are expected to cover nearly 96 percent of fluorinated GHG emissions from semiconductor facilities, and 54 percent of fluorinated GHG emissions from non-semiconductor facilities.

Table 5-2. Summary of Rule Applicability under the Proposed Emission-Based Thresholds for Subpart I – Electronics Manufacturing Industry

Emission Threshold Level (metric tons CO_2e/yr)	Total National Emissions (metric tons CO_2e/yr)	Total Number of Facilities	Total Emissions of Source (metric tons CO_2e)	Emissions Covered		Facilities Covered	
				metric tons CO_2e/yr	Percent	Facilities	Percent
Semiconductors	25,000	175	5,741,676	5,492,066	96%	91	52%
Non-Semiconductors	25,000	41	242,786	130,504	54%	3	7%

Combined these emissions are estimated to account for close to 94 percent of fluorinated GHG emissions from the electronics industry as a whole. To determine whether a manufacturer falls above or below the proposed 25,000 metric tons of CO_2e, EPA is proposing that semiconductor, and non-semiconductor MEMS facilities use gas specific 2006 IPCC Tier 1 emission factors assuming 100% manufacturing capacity to calculate annual metric tons of emissions in CO_2 equivalents. For non-semiconductor PV facilities, EPA is proposing that they facilities multiply annual fluorinated GHG purchases or consumption by the gas-appropriate 100-year GWPs, as defined in Table A-1 to Subpart A of Part 98, to calculate annual metric tons of emissions in CO_2 equivalents. None of these calculations shall account for emission abatement technologies.

For additional background information on the threshold analysis, refer to the Electronics Manufacturing TSD (EPA-HQ-OAR-2009-0927). For specific information on costs, including unamortized first year capital expenditures, please refer to section 4.3.

5.1.2 Subpart L- Fluorinated Gas Production

Under the proposed rule, owners and operators of fluorinated gas production facilities would be required to estimate and report GHG emissions if those emissions, including both combustion and fluorinated GHG emissions, would exceed 25,000 mtCO2e in the absence of control technology (e.g., thermal oxidation).[21]

[21] Following the precedents set by other Clean Air Act regulations, EPA is using the term "uncontrolled" to describe such emissions. Specifically, EPA is proposing to define "uncontrolled fluorinated GHG emissions" as a gas stream containing fluorinated GHG which has exited the process (or process condenser, where applicable), but

In developing the threshold, we considered multiple controlled and uncontrolled emissions thresholds, including 1,000, 10,000, 25,000, and 100,000 metric tons CO_2e. For fluorinated GHG production processes (including fluorinated anesthetics production processes), uncontrolled (pre-control) emissions were estimated by multiplying a factor of 3 percent by the estimated production at each facility. For CFC and HCFC production processes (except for HCFC-22 production processes), uncontrolled emissions were estimated by multiplying a factor of 2 percent by the estimated production at each facility. Uncontrolled emissions are strongly influenced by by-product generation rates, which are known to vary between zero and several percent for fluorinated gas production processes; thus, these estimates are uncertain. Controlled emissions were assumed to be half of uncontrolled emissions at each facility. Because EPA has little information on combustion-related emissions at fluorinated gas production facilities, these emissions were not included in the analysis. The results of the analysis for production of HFCs, PFCs, SF_6, NF_3, CFCs, and HCFCs are shown in Tables 5-3 and 5-4.

Table 5-3. Threshold Analysis for Fluorinated GHG Emissions from Production of HFCs, PFCs, SF6, NF3, CFCs, and HCFCs (Uncontrolled Emissions)

Threshold Level (metric tons CO_2e/r)	Total National Emissions (metric tons CO_2e)	Number of Facilities	Emissions Covered		Facilities Covered	
			Metric tons CO2e	Percent	Number	Percent
1,000	10,600,000	14	10,600,000	100%	14	100%
10,000	10,600,000	14	10,600,000	100%	14	100%
25,000	10,600,000	14	10,600,000	100%	14	100%
100,000	10,600,000	14	10,600,000	100%	13	93%

which has not yet been introduced into an air pollution control device to reduce the mass of fluorinated GHGs in the stream. The term does not imply that the emissions are never controlled, but is synonymous with "pre-control emissions."

Table 5-4. Threshold Analysis for Fluorinated GHG Emissions from Production of HFCs, PFCs, SF6, NF3, CFCs, and HCFCs (Controlled Emissions)

Threshold Level (metric tons CO_2e/r)	Total National Emissions (metric tons CO_2e)	Number of Facilities	Emissions Covered		Facilities Covered	
			Metric tons CO2e	Percent	Number	Percent
1,000	10,600,000	14	10,600,000	100%	14	100%
10,000	10,600,000	14	10,600,000	100%	14	100%
25,000	10,600,000	14	10,600,000	100%	14	100%
100,000	10,600,000	14	10,300,000	97%	10	71%

As can be seen from the tables, most HFC, PFC, SF_6, NF_3, CFC, and HCFC production facilities would be covered by all the thresholds considered. Although we do not have facility-specific production information for producers of fluorinated anesthetics, we believe that few or none of these facilities are likely to have uncontrolled emissions above the proposed threshold. However, it is possible that EPA has underestimated total pre-control emissions from anesthetics. In its threshold analysis for fluorinated GHG production, EPA has assumed that emissions have GWPs similar to those of the product produced. However, fluorinated anesthetics are hydrofluoroethers, and other HFE production processes of which EPA is aware generate by-products with higher GWPs than the product. A full discussion of the threshold selection analysis is available in the revised Fluorinated GHG Production TSD (EPA-HQ-OAR-2009-0927-012).

5.1.3 Subpart DD- Sulfur Hexafluoride from Electric Power Systems

The model facility for electric power systems is an electric utility that operates an average amount (nameplate capacity) of Sulfur Hexafloride (SF6)-containing transmission equipment. Costs are not expected to vary widely among utilities because all utilities would track the same set of quantities (SF6 stored, acquired, and disbursed; equipment installed and retired), and the costs of tracking and reporting these quantities are relatively modest.

In the analysis, EPA considered emission thresholds of 1,000 metric tons CO_2e, 10,000 metric tons CO_2e, 25,000 metric tons CO_2e, and 100,000 metric tons CO_2e per year. This analysis used IPCC Tier 1 emission factors and assumed no abatement. Table 5-5 presents the emissions and facilities that would be captured by the respective emissions thresholds.

Table 5-5. Threshold Analysis for Subpart DD – Electric Power Systems

Emission Threshold Level (metric tons CO_2e/yr)	Total National Emissions (metric tons CO_2e/yr)	Total Number of Facilities	Emissions Covered		Facilities Covered	
			metric tons CO_2e/yr	Percent	Facilities	Percent
1,000	12,400,000	1,364	12,190,000	98.31%	578	42.38%
10,000	12,400,000	1,364	10,960,000	88.39%	183	13.42%
25,000	12,400,000	1,364	10,320,000	83.23%	141	10.34%
100,000	12,400,000	1,364	5,950,000	47.98%	35	2.57%

EPA selected the 25,000 metric tons CO_2e per year threshold because this threshold maximizes emissions reporting, while excluding small facilities that do not contribute significantly to the overall GHG emissions.

The proposed emissions-based thresholds are estimated to include approximately 10 percent of electrical power systems transmission equipment (see Table 5-5). At the same time, the thresholds are expected to cover nearly 83 percent of SF_6 emissions.

5.1.4 Subpart QQ- Imports and Exports of Fluorinated GHGs in Pre-Charged Equipment and Closed-Cell Foams

Under the current proposal, EPA is proposing to require that importers and exporters of F-GHGs contained in pre-charged equipment and closed cell foams report their imports and exports if either their total imports or their total exports, in equipment, foams, and in bulk, exceed 25,000 $mtCO_2e$ per year. This threshold is the same as that for bulk imports and exports.

Table 5-6. Threshold Analysis for Subpart QQ–Imports of Fluorinated GHGs in Pre-Charged Equipment and Closed-Cell Foams

	HFC Refrigeration/AC Equipment		SF_6 Electrical Equipment		Closed-cell Foams	
Threshold Level	Imports Covered	Importers Covered	Imports Covered	Importers Covered	Imports Covered	Importers Covered
1,000	16,992,965	50	1,888,932	8	3,025,285	50
10,000	16,992,965	50	1,888,932	8	3,025,285	50
25,000	16,992,965	50	1,888,932	8	3,025,285	50
100,000	16,992,965	50	1,888,932	8	0	0

Table 5-7. Threshold Analysis for Subpart QQ–Exports of Fluorinated GHGs in Pre-Charged Equipment and Closed-Cell Foams

Threshold Level	HFC Refrigeration/AC Equipment		SF_6 Electrical Equipment		Closed-cell Foams	
	Exports Covered	Exporters Covered	Exports Covered	Exporters Covered	Exports Covered	Exporters Covered
1,000	3,061,830	25	153,323	10	1,089,177	25
10,000	3,061,830	25	107,326	5	1,089,177	25
25,000	3,061,830	25	0	0	1,089,177	25
100,000	3,061,830	25	0	0	0	0

5.1.5 Subpart SS- Electrical Equipment Manufacture or Refurbishment and Manufacturing of Electrical Components

EPA is proposing to require electrical equipment manufacturers to report their SF_6 and PFC emissions if their total annual purchases of SF_6 or PFCs exceed 23,061 lbs. This consumption-based threshold is equivalent to an emissions-based threshold of 25,000 $mtCO_2e$, assuming an average manufacturer emission rate of 10%. EPA chose the consumption-based threshold, as it is believed to allow equipment manufacturers to quickly determine if they are subject to reporting requirements by referencing their SF_6 purchase records.

Table 5-8. Threshold Analysis for Subpart SS– Electrical Equipment Manufacture or Refurbishment and Manufacturing of Electrical Components

Emission Threshold (Mt CO_2 Eq)	1,000	10,000	25,000	100,000
Consumption Threshold (lbs. of SF_6)	922	9,220	23,061	92,244
Number of Facilities Above	10	10	10	5
Percent of Facilities Above	100%	100%	100%	50%
Total Emissions of Facilities Above (Mt CO_2 Eq)	814,128	814,128	814,128	569,890
Percent of Emissions Above	100%	100%	100%	70%

5.1.6 National Emissions Covered Under Selected Thresholds

The total national emissions covered under the selected options are 53.4 $MtCO_2e$ (Table 5-9). The majority of these covered emissions are from the importers and exporters of fluorinated GHGs covered by Subpart QQ (26.1$MtCO_2e$). Although the majority of cost and emissions information reported in this economic and small entity analysis is organized by subpart, EPA

also mapped each subpart to an industry included in the North American Industry Classification System (NAICS); the mapping allows the cost data to be used in conjunction with other economic census data.

Table 5-9. Estimates of Emissions ($MtCO_2e$) Reported in 2008 Under the Selected Option

Subpart	Emissions Coverage ($MtCO_2e$)
Subpart I - Electronics Industry	5.6
Subpart L - Fluorinated Gas Production	10.6
Subpart DD – Sulfur Hexalfuoride (SF_6) from Electric Power Systems	10.3
Subpart QQ - Imports and Exports of Fluorinated GHGs	26.1
Subpart SS - Electrical Equipment Manufacture or Refurbishment and Manufacturing of Electrical Components	0.8
Total	**53.4**

5.2 National Cost Estimates

As shown in Table 5-10, the total national costs for the selected option are estimated to be $7.6 million in the first year and $7.24million in subsequent years ($2006). This includes a public sector burden estimate of $384,000 for program implementation and verification activities. Subparts bearing the greatest share of the ongoing private costs of the rule in the first year are the electronics industry (38%) and fluorinated gas producers (40%).

In addition to total national costs by subpart under the selected option, we also report average cost per ton to support additional analysis of the greenhouse reporting programs. The average ongoing (subsequent year) private cost per metric ton varies by subpart; measures range from less than $0.01 per ton (Subpart SS) to $0.36 per ton (Subpart I).

Table 5-10. National Cost Estimates by Subpart: Selected Option

Subpart	2007 NAICS	First Year			Subsequent Years		
		Millions 2006$	$/ton	Share	Millions 2006$	$/ton	Share
Subpart I - Electronics Industry	334413, 334119	$2.9	$0.52	38%	$5.4	$0.96	76%
Subpart L - Fluorinated Gas Production[a]	325120	$3.0	$0.28	40%	$0.2	$0.02	2%
Subpart DD – Electric Transmission and Distribution Equipment Use	221121	$0.6	$0.05	7%	$0.6	$0.05	8%
Subpart QQ - Imports and Exports of Fluorinated GHGs	326140, 326150, 333415, 335313, 336391, 423610, 423620, 423720, 421730, 421740, 443111, 443112, 422610	$0.7	$0.03	9%	$0.6	$0.02	9%
Subpart SS - Electrical Equipment Manufacture and Refurbishment and Manufacturing of Electrical Components	33361, 33531	$0.02	$0.03	0.3%	$0.02	$0.03	0%
Private Sector, Total		$7.2		95%	$6.8		95%
Public Sector, Total		$0.4		5%	$0.4		5%
Total		$7.6		100%	$7.2		100%

[a]Subpart L costs include costs for outlier facility. Columns may not sum to totals due to rounding. .

5.3 Economic Impact Analysis

EPA assessed how the regulatory program may influence the profitability of companies by comparing the monitoring program costs to total sales (i.e., a "sales" test). The techniques and data we use are identical to the MRR rule and focus on small entities. We provide additional details of the analysis below.

5.3.1 Overall Method of Assessing Economic Impacts

To assess the possible economic impacts associated with the rule, EPA compared per-facility program costs to facility sales for facilities of various sizes. Data on sales revenues for facilities of various sizes was obtained from the Census Bureau's Statistics of U.S. Businesses (SUSB) database for 2002. SUSB provides establishment-level information on revenues enterprise size; EPA is assuming that "enterprise" corresponds to firm or company, and "establishment" corresponds to facility. Facility-level costs of complying with the rule are compared to sales revenues for typical facilities, and for facilities owned by companies of

various sizes in the tables below. As noted above, the focus of our analysis is impacts to small entities.

5.3.2 Assessing Economic Impacts on Small Entities

The first step in this assessment was to determine whether the rule will have a significant impact on a substantial number of small entities (SISNOSE). To make this determination, EPA used a screening analysis that allows us to indicate whether EPA can certify the rule as not having a SISNOSE. The elements of this analysis included

- identifying affected subparts and entities,
- selecting and describing the measures and economic impact thresholds used in the analysis, and
- determining SISNOSE certification category.

5.3.2.1 Identify Affected Subparts and Entities

The industry subparts covered by the rule were identified during the development of the cost analysis for the reporting rule. The SUSB data provide national information on the distribution of economic variables by industry and size. These data were developed in cooperation with, and partially funded by, the Office of Advocacy of the Small Business Administration (SBA) (SBA, 2008a). The data include the number of establishments (Table 5-11), and receipts (Table 5-12) and present information on *all* entities in an industry covered by the rule; however, many of these entities would not be expected to report under the preferred option because they would fall below the 25,000 hybrid threshold. SUSB also provides this data by enterprise employment size. The census definitions in this data set are as follows:

- **establishment**: An establishment is a single physical location where business is conducted or where services or industrial operations are performed.
- **employment**: Paid employment consists of full- and part-time employees, including salaried officers and executives of corporations, who were on the payroll in the pay period including March 12, 2002. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.
- **receipts**: Receipts (net of taxes) are defined as the revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Receipts exclude all revenue collected for local, state, and federal taxes.

- **enterprise**: An enterprise is a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Because the SBA's business size definitions (SBA, 2009c) apply to an establishment's "ultimate parent company," we assume in this analysis that the "enterprise" definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses and the terms are used interchangeably. We also report the SBA size standard(s) for each industry group in order to facilitate comparisons and different thresholds.

Table 5-11. Number of Establishments by Affected Industry and Enterprise[a] Size: 2002

2007 NAICS	NAICS Description	Subpart	SBA Size Standard (effective August 22, 2008)	Total Establishments	Owned by Enterprises with:					
					1 to 20 Employees	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
334413	Semiconductor and Related Device Manufacturing	I	500	1,098	458	220	138	19	19	16
334119	Other Computer Peripheral Equipment Manufacturing	I	1,000	815	411	169	85	17	7	11
325120	Industrial Gas Manufacturing	L	1,000	551	45	20	20	NA	30	55
221121	Electrical Power Systems	DD	< 4 Million MWh	217	39	20	29	1	NA	NA
326140	Polystyrene Foam Product Manufacturing	QQ	500	551	176	123	85	16	1	20
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	QQ	500	610	192	133	73	19	8	3
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	QQ	750	840	303	187	87	10	25	20
335313	Switchgear and Switchboard Apparatus Manufacturing	QQ	750	563	273	105	46	6	NA	10
336391	Motor Vehicle Air-Conditioning Manufacturing	QQ	750	72	34	17	8	NA	1	1
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	QQ	100	14,337	7,458	1,679	1,016	248	113	87
423620	Electrical and Electronic Appliance, Television, and Radio Set Merchant Wholesalers	QQ	100	3,510	2,156	554	189	19	39	72

2007 NAICS	NAICS Description	Subpart	SBA Size Standard (effective August 22, 2008)	Total Establishments	Owned by Enterprises with:					
					1 to 20 Employees	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	QQ	100	5,144	2,871	720	455	134	21	16
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	QQ	100	5,598	2,394	929	654	213	52	355
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	QQ	100	1,482	724	271	193	4	28	29
443111	Household Appliance Stores	QQ	$9 M	10,002	7,628	806	312	NA	73	1
443112	Radio, Television and Other Electronics Stores	QQ	$9 M	24,226	11,181	1,760	1,230	38	75	328
422610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers	QQ	100	3,717	2,238	518	281	26	20	58
33361	Engine, Turbine, and Power Transmission Equipment Manufacturing	SS	500 - 1,000	922	375	208	94	14	11	12
33531	Electrical Equipment Manufacturing	SS	750 - 1,000	2,651	1,311	522	246	41	23	19

[a] The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (http://www.sba.gov/size) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses.

[b] The 2002 SUSB data uses 1997 NAICS codes. For this industry, the relevant code is NAICS 422610.

Table 5-12. Receipts by Affected Industry and Enterprise[a] Size ($2002 Million)

NAICS	NAICS Description	Subpart	SBA Size Standard (effective August 22, 2009)	Total Establishments	Owned by Enterprises with:					
					1 to 20 Employees	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
334413	Semiconductor and Related Device Manufacturing	I	500	63,779	701	1,755	3,711	775	2,593	1,434
334119	Other Computer Peripheral Equipment Manufacturing	I	500	18,135	642	1,680	2,712	1,405	247	1,372
325120	Industrial Gas Manufacturing	L	1,000	5,780	22	292	71	NA	NA	NA
221121	Electrical Power Systems	DD	< 4 Million MWh	13,831	74	353	406	NA	NA	NA
326140	Polystyrene Foam Product Manufacturing	QQ	500	6,330	209	623	689	NA	NA	539
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	QQ	500	7,170	307	772	1,063	288	NA	NA
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	QQ	750	24,699	409	1,460	1,813	348	980	803
335313	Switchgear and Switchboard Apparatus Manufacturing	QQ	750	8,593	347	641	826	NA	NA	NA
336391	Motor Vehicle Air-Conditioning Manufacturing	QQ	750	3,396	31	72	NA	NA	NA	NA
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	QQ	100	93,524	21,850	16,229	9,690	1,648	1,339	766
423620	Electrical and Electronic Appliance, Television, and Radio Set Merchant Wholesalers	QQ	100	68,255	9,640	10,388	10,577	2,418	1,805	4,291

NAICS	NAICS Description	Subpart	SBA Size Standard (effective August 22, 2009)	Total Establishments	Owned by Enterprises with:					
					1 to 20 Employees	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	QQ	100	31,668	8,304	12,322	4,156	686	247	51
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	QQ	100	25,599	5,426	5,075	3,551	613	526	NA
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	QQ	100	5,014	1,333	1,791	581	14	187	NA
443111	Household Appliance Stores	QQ	$9 M	12,619	5,432	2,801	1,354	NA	NA	NA
443112	Radio, Television and Other Electronics Stores	QQ	$9 M	53,557	6,325	3,510	1,612	NA	NA	NA
422610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers	QQ	100	32,648	7,345	5,785	4,091	614	687	338
33361	Engine, Turbine, and Power Transmission Equipment Manufacturing	SS	500 - 1,000	37,701	429	1,326	2,067	309	333	304
33531	Electrical Equipment Manufacturing	SS	750 - 1,000	33,211	1,330	2,912	4,096	979	1,089	406

[a] The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (http://www.sba.gov/size) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses.

[b] The 2002 SUSB data uses 1997 NAICS codes. For this industry, the relevant code is NAICS 422610.

5.3.2.2 Develop Small Entity Economic Impact Measures

Because the rule covers a large number of subparts and primarily covers businesses, the analysis generated a set of sales tests (represented as cost-to-receipt ratios)[22] for NAICS codes associated with the affected subparts. Although the appropriate SBA size definition should be applied at the parent company (enterprise) level, data limitations allowed us only to compute and compare ratios for a *model establishment* for six *enterprise size* ranges (i.e., all categories, enterprises with 1 to 20 employees, 20 to 99 employees, 100 to 499 employees, 500 to 999 employees, and 1,000 to 1,499 employees. This approach allows us to account for differences in establishment receipts between large and small enterprises and differences in small business definitions across affected industries. It is also a conservative approach, because an establishment's parent company (the "enterprise") may have other economic resources that could be used to cover the costs of the reporting program.

These sales tests examine the average establishment's total annualized mandatory reporting costs to the average establishment receipts for enterprises within several employment categories[23] (first year costs: Table 5-13; subsequent year costs: Table 5-14). The average entity costs used to compute the sales test are the same across all of these enterprise size categories. As a result, the sales-test will overstate the cost-to-receipt ratio for establishments owned by small businesses, because the reporting costs are likely lower than average entity estimates provided by the engineering cost analysis.

[22]The following metrics for other small entity economic impact measures (if applicable) would potentially include
- Small governments (if applicable): "Revenue" test; annualized compliance cost as a percentage of annual government revenues
- Small non-profits (if applicable): "Expenditure" test; annualized compliance cost as a percentage of annual operating expenses

[23]For the one to 20 employee category, we exclude SUSB data for enterprises with zero employees. These enterprises did not operate the entire year.

Table 5-13. Establishment Sales Tests by Industry and Enterprise[a] Size: First Year Costs

2007 NAICS	NAICS Description	Sub-part	SBA Size Standard (effective August 22, 2008)	Average Cost Per Entity ($/entity)	All Enter-prises	Owned by Enterprises with:					
						1 to 20 Employees	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
334413	Semiconductor and Related Device Manufacturing	I (Semis)	500	$19,980	0.03%	1.16%	0.22%	0.07%	0.04%	0.01%	0.02%
334413	Semiconductor and Related Device Manufacturing	I (Non-Semis)	500	$16,046	0.02%	0.94%	0.18%	0.05%	0.04%	0.01%	0.02%
334119	Other Computer Peripheral Equipment Manufacturing	I (Non-Semis)	500	$16,046	0.06%	0.92%	0.14%	0.04%	0.02%	0.04%	0.01%
325120	Industrial Gas Manufacturing	L	1,000	$126,523[c]	1.08%	23.19%	0.77%	3.19%	NA	NA	NA
221121	Electrical Power Systems	DD	< 4 Million MWh	$2,213	0.00%	0.10%	0.01%	0.01%	NA	NA	NA
326140	Polystyrene Foam Product Manufacturing	QQ	500	$3,364	0.03%	0.25%	0.06%	0.04%	NA	NA	0.01%
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	QQ	500	$3,364	0.03%	0.19%	0.05%	0.02%	0.02%	NA	NA
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	QQ	750	$3,364	0.01%	0.22%	0.04%	0.01%	0.01%	0.01%	0.01%
335313	Switchgear and Switchboard Apparatus Manufacturing	QQ	750	$3,364	0.02%	0.24%	0.05%	0.02%	NA	NA	NA
336391	Motor Vehicle Air-Conditioning Manufacturing	QQ	750	$3,364	0.01%	0.33%	0.07%	NA	NA	NA	NA
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	QQ	100	$3,364	0.05%	0.10%	0.03%	0.03%	0.05%	0.03%	0.03%
423620	Electrical and Electronic Appliance, Television, and Radio Set Merchant Wholesalers	QQ	100	$3,364	0.02%	0.07%	0.02%	0.01%	0.00%	0.01%	0.01%
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	QQ	100	$3,364	0.05%	0.10%	0.02%	0.03%	0.06%	0.03%	0.09%
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	QQ	100	$3,364	0.07%	0.13%	0.05%	0.06%	0.10%	0.03%	NA
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	QQ	100	$3,364	0.09%	0.16%	0.05%	0.10%	0.08%	0.04%	NA
443111	Household Appliance Stores	QQ	$9 M	$3,364	0.24%	0.42%	0.09%	0.07%	NA	NA	NA
443112	Radio, Television and Other Electronics Stores	QQ	$9 M	$3,364	0.14%	0.53%	0.15%	0.23%	NA	NA	NA
422610	Plastics Materials and Basic Forms and Shapes	QQ	100	$3,364	0.03%	0.09%	0.03%	0.02%	0.01%	0.01%	0.05%

2007 NAICS	NAICS Description	Sub-part	SBA Size Standard (effective August 22, 2008)	Average Cost Per Entity ($/entity)	All Enter-prises	Owned by Enterprises with:					
						1 to 20 Employees	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
	Merchant Wholesalers										
33361	Engine, Turbine, and Power Transmission Equipment Manufacturing	SS	500 - 1,000	$2,213	0.00%	0.17%	0.03%	0.01%	0.01%	0.01%	0.01%
33531	Electrical Equipment Manufacturing	SS	750 - 1,000	$2,213	0.02%	0.19%	0.04%	0.01%	0.01%	0.00%	0.01%

[a] The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (http://www.sba.gov/size) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses.

Note: Receipt data in Table 5-7 has been adjusted to 2006$ using the latest GDP implicit price deflator reported by the U.S. Bureau of Economic Analysis (103.257/92.118=1.121) http://www.bea.gov/national/nipaweb/Index.asp (accessed December 21, 2009).

[b] The 2002 SUSB data uses 1997 NAICS codes. For this industry, the relevant code is NAICS 422610.

[c] Total Annualized Costs for Subpart L are computed as a weighted average of costs for Mass Balance and costs for Process Vent, excluding the outlier facility.

Table 5-14. Establishment Sales Tests by Industry and Enterprise[a] Size: Subsequent Years Costs

2007 NAICS	NAICS Description	Sub-part	SBA Size Standard (effective August 22, 2008)	Average Cost Per Entity ($/entity)	All Enter-prises	Owned by Enterprises with:					
						1 to 20 Employees[b]	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
334413	Semiconductor and Related Device Manufacturing	I (Semis)	500	$19,980	0.03%	1.16%	0.22%	0.07%	0.04%	0.01%	0.02%
334413	Semiconductor and Related Device Manufacturing	I (Non-Semis)	500	$16,046	0.02%	0.94%	0.18%	0.05%	0.04%	0.01%	0.02%
334119	Other Computer Peripheral Equipment Manufacturing	I (Non-Semis)	500	$16,046	0.06%	0.92%	0.14%	0.04%	0.02%	0.04%	0.01%
325120	Industrial Gas Manufacturing	L	1,000	$9,859[c]	0.08%	1.81%	0.06%	0.25%	NA	NA	NA
221121	Electrical Power Systems	DD	< 4 Million MWh	$2,213	0.00%	0.10%	0.01%	0.01%	NA	NA	NA
326140	Polystyrene Foam Product Manufacturing	QQ	500	$2,933	0.02%	0.22%	0.05%	0.03%	NA	NA	0.01%
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	QQ	500	$2,933	0.02%	0.16%	0.05%	0.02%	0.02%	NA	NA
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	QQ	750	$2,933	0.01%	0.19%	0.03%	0.01%	0.01%	0.01%	0.01%
335313	Switchgear and Switchboard Apparatus Manufacturing	QQ	750	$2,933	0.02%	0.21%	0.04%	0.01%	NA	NA	NA
336391	Motor Vehicle Air-Conditioning Manufacturing	QQ	750	$2,933	0.01%	0.29%	0.06%	NA	NA	NA	NA
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	QQ	100	$2,933	0.04%	0.09%	0.03%	0.03%	0.04%	0.02%	0.03%
423620	Electrical and Electronic Appliance, Television, and Radio Set Merchant Wholesalers	QQ	100	$2,933	0.01%	0.06%	0.01%	0.00%	0.00%	0.01%	0.00%
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	QQ	100	$2,933	0.04%	0.09%	0.02%	0.03%	0.05%	0.02%	0.08%
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	QQ	100	$2,933	0.06%	0.12%	0.05%	0.05%	0.09%	0.03%	NA
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	QQ	100	$2,933	0.08%	0.14%	0.04%	0.09%	0.07%	0.04%	NA

2007 NAICS	NAICS Description	Sub-part	SBA Size Standard (effective August 22, 2008)	Average Cost Per Entity ($/entity)	All Enter-prises	Owned by Enterprises with:					
						1 to 20 Employees[b]	20 to 99 Employees	100 to 499 Employees	500 to 749 Employees	750 to 999 Employees	1,000 to 1,499 Employees
443111	Household Appliance Stores	QQ	$9 M	$2,933	0.21%	0.37%	0.08%	0.06%	NA	NA	NA
443112	Radio, Television and Other Electronics Stores	QQ	$9 M	$2,933	0.12%	0.46%	0.13%	0.20%	NA	NA	NA
422610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers	QQ	100	$2,933	0.03%	0.08%	0.02%	0.02%	0.01%	0.01%	0.04%
33361	Engine, Turbine, and Power Transmission Equipment Manufacturing	SS	500 - 1,000	$2,213	0.00%	0.17%	0.03%	0.01%	0.01%	0.01%	0.01%
33531	Electrical Equipment Manufacturing	SS	750 - 1,000	$2,213	0.02%	0.19%	0.04%	0.01%	0.01%	0.00%	0.01%

[a] The Census Bureau defines an enterprise as a business organization consisting of one or more domestic establishments that were specified under common ownership or control. The enterprise and the establishment are the same for single-establishment firms. Each multi-establishment company forms one enterprise—the enterprise employment and annual payroll are summed from the associated establishments. Enterprise size designations are determined by the summed employment of all associated establishments.

Since the SBA's business size definitions (http://www.sba.gov/size) apply to an establishment's ultimate parent company, we assume in this analysis that the enterprise definition above is consistent with the concept of ultimate parent company that is typically used for Small Business Regulatory Enforcement Fairness Act (SBREFA) screening analyses.

Note: Receipt data in Table 5-7 has been adjusted to 2006$ using the latest GDP implicit price deflator reported by the U.S. Bureau of Economic Analysis (103.257/92.118=1.121) http://www.bea.gov/national/nipaweb/Index.asp (accessed December 21, 2009).

[b] The 2002 SUSB data uses 1997 NAICS codes. For this industry, the relevant code is NAICS 422610.

[c] Total Annualized Costs for Subpart L are computed as a weighted average of costs for Mass Balance and costs for Process Vent, excluding the outlier facility.

5.3.2.3 Results of Screening Analysis

The Regulatory Flexibility Act generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute, unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small governmental jurisdictions, and small not-for-profit enterprises.

For the purposes of assessing the impacts of the rule on small entities, we defined a small entity as (1) a small business, as defined by SBA's regulations at 13 CFR Part 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district, or special district with a population of less than 50,000; or (3) a small organization that is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

After considering the economic impact of the rule on small entities, EPA has concluded that this action will not have a significant economic impact on a substantial number of small entities. As shown in Tables 5-13 and 5-14, the average ratio of annualized reporting program costs to receipts of establishments owned by model small enterprises was less than 1% for industries presumed likely to have small businesses covered by the reporting program.

We acknowledge that several enterprise categories have ratios that exceed this threshold (e.g., enterprise with one to 20 employees). The Industrial Gas Manufacturing industry (NAICS 325120) has sales test results over 1% for all enterprises. The following enterprise categories have sales test results over 1% and for entities with less than 20 employees: Industrial Gas Manufacturing (325120) and Semiconductor and Related Device Manufacturing (334413).

Below we take a more detailed look at the categories noted above as having sales test ratios above 1%. EPA collected information on the entities likely to be covered by the rule as part of the expert sub-group process.

5.3.2.4 Threshold-based Analysis of Categories Having Sales Test Ratios Above 1%

Industrial Gas Manufacturing (325120)

Subpart L covers facilities included in NAICS codes for Industrial Gas Manufacturing (NAICS 325120). Within this subpart, EPA identified 13 ultimate parent company names covered by the proposed rule. Using publicly available sources (e.g., Hoovers.com), we collected parent company sales and employment data and found that only one company could be classified

as a small entity. Using the cost data for a representative entity (see Section 4), EPA determined the small entity's cost-to-sales ratio is below one percent.

Electronic Computer Manufacturing (334111) and Semiconductor and Related Device Manufacturing (334413)

Data on the number of electronics facilities comes from the World Fab Watch and the Flat Panel Display Fabs on Disk datasets. The census data categories cover more establishments than just those facilities covered in the rule. Subpart I covers facilities included in NAICS codes for Semiconductor and Related Device Manufacturing (334413) and Other Computer Peripheral Equipment Manufacturing (334119). The World Fab Watch dataset includes 216 facilities (94 of which exceed the 25,000 ton threshold), while the sum of the two NAICS codes include 1,903 establishments. Covered facilities with emissions greater than 25,000 MtCO2e per year are unlikely to be included in the 1 to 20 employees size category. Emissions are roughly proportional to production, and establishments with 1 to 20 employees total only 1.6% of total receipts, while the proposed threshold excludes 6% of industry emissions from the least-emitting facilities.

Although this rule would not have a significant economic impact on a substantial number of small entities, the Agency nonetheless tried to reduce the impact of this rule on small entities, including seeking input from a wide range of private- and public-sector stakeholders. When developing the rule, the Agency took special steps to ensure that the burdens imposed on small entities were minimal. The Agency conducted several meetings with industry trade associations to discuss regulatory options and the corresponding burden on industry, such as recordkeeping and reporting. The Agency investigated alternative thresholds and analyzed the marginal costs associated with requiring smaller entities with lower emissions to report. The Agency also selected a hybrid method for reporting, which provides flexibility to entities and helps minimize reporting costs.

SECTION 6
STATUTORY AND EXECUTIVE ORDER REVIEWS

This section describes EPA's compliance with several applicable executive orders and statutes during the development of the F-GHG reporting rule, under subparts I, L, DD, QQ, and SS of the Mandatory Reporting Rule.

6.1 Executive Order 12866: Regulatory Planning and Review

Under Executive Order (EO) 12866 (58 FR 51735, October 4, 1993), this action is a "significant regulatory action" because it may raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the EO. Accordingly, EPA submitted this action to the Office of Management and Budget (OMB) for review under EO 12866 and any changes made in response to OMB recommendations have been documented in the docket for this action.

In addition, EPA prepared this EIA, including an analysis of the potential costs associated with this action. In this report, EPA has identified the regulatory options considered, their costs, the emissions that would likely be reported under each option, and explained the selection of the option chosen for the rule. The costs of the rule are reported in Section 4, and the economic impacts and qualitative benefits assessment are reported in Section 5. EPA's cost analysis estimates that for the minimum reporting under the recommended regulatory option, the total annualized cost of the rule will be approximately $7.6 million (in $2006) during the first year of the program and $7.32 million in subsequent years (including $0.4 million of programmatic costs to the Agency). Overall, EPA has concluded that the costs of the F-GHG Reporting Rule are outweighed by the potential benefits of more comprehensive information about GHG emissions.

6.2 Paperwork Reduction Act

The information collection requirements in this final rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq*. The Information Collection Request (ICR) document prepared by EPA has been assigned EPA ICR number [XXXX.XX].

EPA has identified the following goals of the mandatory GHG reporting system:

- Obtain data that is of sufficient quality that it can be used to analyze and inform the development of a range of future climate change policies and potential regulations.

- Balance the rule's coverage to maximize the amount of emissions reported while excluding small emitters.

- Create reporting requirements that are, to the extent possible and appropriate, consistent with existing GHG reporting programs in order to reduce reporting burden for all parties involved.

The information from F-GHG facilities will allow EPA to make well-informed decisions about whether and how to use the CAA to regulate these facilities and encourage voluntary reductions. Because EPA does not yet know the specific policies that will be adopted, the data reported through the mandatory reporting system should be of sufficient quality to inform policy and program development. Also, consistent with the Appropriations Act, the reporting rule covers a broad range of sectors of the economy.

This information collection is mandatory and will be carried out under CAA Sections 114. Information identified and marked as Confidential Business Information (CBI) will not be disclosed except in accordance with procedures set forth in 40 CFR Part 2. However, emissions information collected under CAA Sections 114 generally cannot be claimed as CBI and will be made public.[24]

The projected cost and hour respondent burden in the ICR, averaged over the first three years after promulgation, is $6.9 million and 76,701 hours per year. The estimated average burden per response is 183.9 hours; the frequency of response is annual for all respondents that must comply with the rule's reporting requirements; and the estimated average number of likely respondents per year is 417. The cost burden to respondents resulting from the collection of information includes the total capital and start-up cost annualized over the equipment's expected useful life (averaging $2.70 million per year) a total operation and maintenance component (averaging $9.5 thousand per year), and a labor cost component (averaging $4.15 million per year). Burden is defined at 5 CFR Part 1320.3(b).

These cost numbers differ from those shown elsewhere in the EIA because ICR costs represent the average cost over the first three years of the rule, but costs are reported elsewhere in the EIA for the first year of the rule. Also, the total cost estimate of the rule in the EIA includes the cost to the Agency to administer the program. The ICR differentiates between respondent burden and cost to the Agency, estimated to be $384,000.An agency may not conduct

[24] Although CBI determinations are usually made on a case-by-case basis, EPA has issued guidance in an earlier Federal Register notice on what constitutes emission data that cannot be considered CBI (956 FR 7042 – 7043, February 21, 1991). As discussed in Section II.B of the preamble to the rule, EPA will be initiating a separate notice and comment process to make CBI determinations for the data collected under this rule.

or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations in 40 CFR are listed in 40 CFR Part 9. When this ICR is approved by OMB, the Agency will publish a technical amendment to 40 CFR Part 9 in the Federal Register to display the OMB control number for the approved information collection requirements contained in the final rule.

6.3 Regulatory Flexibility Act

The Regulatory Flexibility Act generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute, unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small governmental jurisdictions, and small not-for-profit enterprises.

The first step in this assessment was to determine whether the rule will have a significant impact on a substantial number of small entities (SISNOSE). To make this determination, EPA used a screening analysis that allows us to indicate whether EPA can certify the rule as not having a SISNOSE. The elements of this analysis included

- identifying affected sectors and entities,
- selecting and describing the measures and economic impact thresholds used in the analysis, and
- determining SISNOSE certification category.

6.3.1 Identify Affected Sectors and Entities

For the purposes of assessing the impacts of the rule on small entities, we defined a small entity as (1) a small business, as defined by SBA's regulations at 13 CFR Part 121.201; (2) a small governmental jurisdiction that is a government of a city, county, town, school district, or special district with a population of less than 50,000; or (3) a small organization that is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

For the F-GHG Reporting Rule, small entity is defined as a small business as defined by the Small Business Administration's regulations at 13 CFR 121.201; according to these size standards, criteria for determining if ultimate parent companies owning affected facilities are categorized as small vary by NAICS. Small entity criteria range from total number of employees at the firm fewer than 100 to number of employees fewer than 1000; one affected NAICS,

44311, defines small entities as those with sales below $9 million. Tables 5-11 through 5-14 present small business criteria and enterprise size distribution data for affected NAICS.

6.3.2 Develop Small Entity Economic Impact Measures

The ratio of total annualized compliance costs to firm sales (or sales test) is the selected impact measure. Details are provided in section 5.3, and results are presented in Table 5-3 for first-year costs and in Table 5-4 for subsequent year costs. These sales tests examine the average establishment's total annualized mandatory reporting costs to the average establishment receipts for enterprises within several employment categories[25]. The average entity costs used to compute the sales test are the same across all of these enterprise size categories. As a result, the sales-test will overstate the cost-to-receipt ratio for establishments owned by small businesses, because the reporting costs are likely lower than average entity estimates provided by the engineering cost analysis

6.3.3 Results of Screening Analysis

After considering the economic impact of the rule on small entities, EPA has concluded that this action will not have a significant economic impact on a substantial number of small entities. The average ratio of annualized reporting program costs to revenues for F-GHG firms owned by model small enterprises and likely to be affected by the final rule was generally less than 1%. For two NAICS, however, some size categories (especially those with 1-20 employees) show costs exceeding 1% of sales. These sectors are Industrial Gas Manufacturing (NAICS 325120) and Semiconductor and Related Device Manufacturing (NAICS 334413). A more careful examination of impacts on small firms in these NAICS codes was conducted.

Analysis of firms in NAICS 334413 shows that firms with fewer than 20 employees produce less than 2% of output; firms below the 25,000 Mt CO_2e threshold release approximately 6% of emissions. Because emissions and production levels are highly correlated, firms fewer than 20 employees are generally not expected to be affected by the final rule; if they are, their costs are likely to be lower than the overall average costs used in the screening analysis. Thus, EPA does not expect the final rule to impose significant costs to a substantial number of small entities in NAICS 334413.

[25]For the one to 20 employee category, we exclude SUSB data for enterprises with zero employees. These enterprises did not operate the entire year.

Subpart L covers facilities included in NAICS codes for Industrial Gas Manufacturing (NAICS 325120). Within this subpart, EPA identified 13 ultimate parent company names covered by the final rule. Using publicly available sources (e.g., Hoovers.com), we collected parent company sales and employment data and found that only one company could be classified as a small entity. Using the cost data for a representative entity (see Section 4 of the EA), EPA determined the small entity's cost-to-sales ratio is below one percent.

Although this rule would not have a significant economic impact on a substantial number of small entities, the Agency nonetheless tried to reduce the impact of this rule on small entities, including seeking input from a wide range of private- and public-sector stakeholders. When developing the rule, the Agency took special steps to ensure that the burdens imposed on small entities were minimal. The Agency conducted several meetings with industry trade associations to discuss regulatory options and the corresponding burden on industry, such as recordkeeping and reporting. The Agency investigated alternative thresholds and analyzed the marginal costs associated with requiring smaller entities with lower emissions to report.

Through comprehensive outreach activities after proposal of the rule, EPA held meetings and/or conference calls with representatives of the primary audience groups. After proposal, EPA posted a general fact sheet for the rule, information sheets for every source category, and an FAQ document. We continued to meet with stakeholders and entered documentation of all meetings into the docket. One public hearing was held on April 12, 2010, which included three speakers from industry and one non-governmental environmental group. In addition, 20 outreach meetings were held. We considered public comments in developing the final rule.

During rule implementation, EPA will maintain an “open door” policy for stakeholders to ask questions about rule or provide suggestions to EPA about the types of compliance assistance that would be useful to small businesses. EPA intends to develop a range of compliance assistance tools and materials and conduct extensive outreach for the final rule.

6.4 Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.L. 104-4, establishes requirements for federal agencies to assess the effects of their regulatory actions on state, local, and tribal governments and the private sector. Under Section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for final rules with “federal mandates” that may result in expenditures to state, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year.

This final rule does not contain a Federal mandate that may result in expenditures of $100 million or more for State, local, and tribal governments, in the aggregate, or the private sector in any one year. Overall, EPA estimates that the total annualized costs of this final rule are approximately $7.6 million for the first year, and $7.2 million for subsequent years ($2006). Thus, this final rule is not subject to the requirements of sections 202 or 205 of UMRA.

This final rule is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments. Facilities subject to the final rule include manufacturers, wholesalers, and retailers. None of the facilities currently known to undertake these activities are owned by small governments.

6.5 Executive Order 13132: Federalism

Executive Order 13132, entitled "Federalism" (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure "meaningful and timely input by state and local officials in the development of regulatory policies that have federalism implications." "Policies that have federalism implications" is defined in the executive order to include regulations that have "substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government."

This final rule does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132.

This regulation applies to manufacturers, wholesalers, and retailers. Few government facilities would be affected. This regulation also does not limit the power of states or localities to collect GHG data and/or regulate GHG emissions. Thus, Executive Order 13132 does not apply to this final rule.

In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed action from State and local officials.

6.6 Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

Executive Order 13175, entitled "Consultation and Coordination with Indian Tribal Governments" (59 FR 22951, November 6, 2000), requires EPA to develop an accountable process to ensure "meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications."

This final rule is not expected to have tribal implications, as specified in Executive Order 13175. This regulation applies to facilities that directly emit GHGs. We do not expect facilities owned by tribal governments to be affected by this rule. Thus, Executive Order 13175 does not apply to this final rule.

Although Executive Order 13175 does not apply to this final rule, EPA sought opportunities to provide information to tribal governments and representatives during development of the MRR rule. In consultation with EPA's American Indian Environment Office, EPA's outreach plan for the MRR included tribes. For a complete list of tribal contacts, see the "Summary of EPA Outreach Activities for Developing the Greenhouse Gas Reporting Rule," in the Docket for this final rulemaking (EPA-HQ-OAR-2008-0508-055). In addition to the consultation activities supporting the MRR, EPA continues to provide information to tribal governments and representatives during development of the Track II rules such as this final rulemaking. EPA specifically solicits additional comment on this proposed action from tribal officials.

6.7 Executive Order 13045: Protection of Children from Environmental Health and Safety Risks

EPA interprets Executive Order 13045 (62 F.R. 19885, April 23, 1997) as applying only to those regulatory actions that concern health or safety risks, such that the analysis required under Section 5-501 of the executive order has the potential to influence the regulation. This action is not subject to Executive Order 13045 because it does not establish an environmental standard intended to mitigate health or safety risks.

6.8 Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This final rule is not a "significant energy action" as defined in Executive Order 13211 (66 FR 28355, May 22, 2001) because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Further, we have concluded that this final rule is not likely to have any adverse energy effects.

This proposal relates to monitoring, reporting, and recordkeeping at facilities that manufacture, sell, import, or export F-GHG related products; it does not adversely affect energy supply, distribution or use. Therefore, we conclude that this final rule is not likely to have any adverse effects on energy supply, distribution, or use.

6.9 National Technology Transfer Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law No. 104-113 (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This rule involves technical standards. EPA will use voluntary consensus standards from at least four three different voluntary consensus standards bodies, including the following: ASTM, ASME, and International SEMATECH Manufacturing Initiative, and EPA . These voluntary consensus standards will help facilities monitor, report, and keep records of GHG emissions. No new test methods were developed for this rule. Instead, from existing rules for source categories and voluntary greenhouse gas programs, EPA identified existing means of monitoring, reporting, and keeping records of greenhouse gas emissions. The existing methods (voluntary consensus standards) include a broad range of measurement techniques, such as methods to measure gas or liquid flow and methods to identify the contents of vented or exhausted streams. The existing methods (voluntary consensus standards) include a broad range of measurement techniques, such as methods to measure gas or liquid flow; and methods to gauge and measure petroleum and petroleum products . The test methods are incorporated by reference into the rule and are available as specified in 40 CFR 98.7.

6.10 Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629, February 16, 1994) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

EPA has determined that this final rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it does not affect the level of protection provided to human health or the environment. This final rule does not affect the level of protection provided to human health or the environment because it is a rule addressing information collection and reporting procedures.

SECTION 7
CONCLUSIONS

The supplemental proposal requires reporting of fluorinated greenhouse gas (F-GHG) emissions from electronics manufacturing, production of fluorinated gases, and use of electrical equipment. EPA is also proposing to require such reporting from manufacturers of electrical equipment, import and export of pre-charged equipment, and closed cell foams. These F-GHG source categories are covered under Subparts I, L, DD, QQ, and SS of the rule.

7.1 Summary of Sectors Covered

7.1.1 Subpart I – Electronics Manufacturing

Electronics manufacturing includes, but is not limited to, the manufacture of semiconductors, liquid crystal displays (LCDs), microelectricomechanical (MEMS), and photovoltaic cells (PV). The electronics industry uses multiple long-lived F-GHGs such as perfluorocarbons (PFCs), Hydrofluorocarbons (HFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3), as well as nitrous oxide (N_2O). This proposed rule would apply to electronics manufacturing facilities that emit equal to or greater than 25,000 metric tons of CO_2e per year[26] from electronics manufacturing processes such as plasma etching, thin film deposition, chamber cleaning, and heat transfer fluid use. EPA is also proposing methods to estimate emissions from cleaning and etch processes for semiconductor, LCD, MEMS, and PV manufacture and also methods for estimating N_2O emissions from deposition and other manufacturing processes such as chamber cleaning. EPA is also clarifying methods for estimating emissions from heat transfer fluids. Finally, EPA is proposing methods for verifying destruction or removal efficiency (DRE) from abatement equipment.

7.1.2 Subpart L – Fluorinated GHG Producers

Affected entities under subpart L are defined as any facility that produces a fluorinated gas from any raw material or feedstock chemical. Fluorinated gas production includes the production of fluorinated GHG, CFC, or HCFC. EPA stipulates that production of fluorinated gases does not include the reuse or recycling of fluorinated GHG or the generation of HFC-23 during the production of HCFC-22.

[26] As discussed further below, EPA is proposing that uncontrolled emissions be used for purposes of determining whether a facility's emissions are equal to or greater than 25,000 mtCO2e.

Facilities that produce fluorinated gases will be required to report their fluorinated GHG emissions from fluorinated gas production, transformation, and destruction, as well as combustion-related CO_2, CH_4, and nitrous oxide (N_2O) emissions from stationary fuel combustion. Fluorinated gases include fluorinated GHGs (HFCs, PFCs, SF6, NF3, HFEs, etc.), CFCs, and HCFCs. However, emissions of HFC-23 from HCFC-22 production are addressed under subpart O and are therefore excluded from this subpart. Similarly, emissions of CFCs and HCFCs are addressed under the regulations implementing Title VI of the Clean Air Act and are therefore excluded from this subpart.

7.1.3 Subpart DD: Electric Transmission and Distribution Equipment Use

The electric transmission and distribution equipment use source category includes gas-insulated substations, circuit breakers, other switchgear, and gas-insulated lines containing SF_6 or PFCs. Equipment also includes gas containers such as pressurized cylinders, gas carts, new equipment owned but not yet installed, or other containers. Notwithstanding the definition of facility in subpart A, for purposes of this subpart, "facility" means an electric transmission and distribution system which is the collection of SF6- and PFC insulated equipment linked through electric power transmission or distribution lines and operated as an integrated unit by one electric power entity or several entities that have a single owner.

Regulation of Subpart DD was proposed under the initial MRR, but was excluded after EPA received several comments regarding the definition of "facility" as it would be covered under the rule. After taking these comments under consideration, EPA has clarified the definition for this final rule.

7.1.4 Subpart QQ – Importing/Exporting of Pre-charged Equipment and Foams

Affected entities under subpart QQ are defined as any entity that is an importer and/or exporter of pre-charged equipment or closed-cell foams that contain fluorinated GHGs. A variety of products containing fluorinated greenhouse gases (F-GHGs), nitrous oxide (N_2O), and carbon dioxide (CO_2) are imported into and exported from the United States. Pre-charged equipment includes air-conditioning, refrigeration, and electrical equipment. Closed-cell foams that are imported and exported include polyurethane (PU) rigid foam used in insulation in domestic refrigerators and freezers,; commercial refrigeration foam,; PU rigid sandwich panel continuous and discontinuous foam; extruded polystryrene (XPS) sheet foam; and XPS boardstock foam.

EPA is proposing to require reporting of these imports and exports. Importers and exporters of pre-charged equipment and closed-cell foams would be subject to requirements similar to those for importers and exporters of bulk GHGs. In addition, equipment importers would be required to report the types and charge sizes of equipment and the number of pieces of each type of equipment that they imported or exported, while foam importers would be required to report the volume of foam and F-GHG density of the foam that they imported. As is true for importers and exporters of bulk F-GHGs, importers and exporters of equipment and foam would only be required to report if their total imports or exports exceeded the 25,000 mtCO2e threshold.

7.1.5 Subpart SS – Electrical Equipment and Components Manufacturing

Affected entities under subpart SS are defined as electrical equipment manufacturers and refurbishers of SF_6-insulated closed-pressure system equipment and sealed-pressure system equipment including gas-insulated substations, circuit breakers, other switchgear, gas-insulated lines, or power transformers containing sulfur-hexafluoride (SF_6) or perfluorocarbons (PFCs). EPA is proposing to require reporting of SF6 and PFC emission from electrical equipment manufacturing and refurbishing using a mass-balance monitoring method comparable to the approach specified for subpart DD, *Sulfur Hexafluoride (SF6) and Perfluorocarbons (PFCs) from Electrical Equipment at an Electric Power System.*

Facilities covered under subpart SS would be required report annual emission report all SF_6 and PFC emissions, including those from equipment testing, equipment manufacturing, and bulk SF_6 and PFC handling. In addition, electrical equipment manufacturers would be required to submit supplemental data that includes: SF_6 and PFCs with or inside equipment delivered to customers, SF_6 and PFCs returned by customers with or inside equipment, bulk SF_6 and PFC purchases, SF_6 and PFCs sent off-site for destruction or to be recycled, SF_6 and PFC returned from offsite after recycling, SF_6 and PFCs stored in containers at the beginning and end of the year, SF_6 and PFCs returned to suppliers. If applicable, facilities would also be required to report combustion-related CO_2, CH_4, and nitrous oxide (N_2O) emissions from stationary fuel combustion. EPA would only require emission reporting a facility's total annual purchases of SF_6 and PFCs are greater than 23,000 lbs. This reporting threshold is equivalent an emissions-based threshold of 25,000 $MtCO_2e$, assuming an average manufacturer emission rate of 10%.

7.2 Estimated Costs and Impacts of the GHG Reporting Program

The total national costs for the selected option are estimated to be $7.6 million in the first year and $7.2 million in subsequent years ($2006). This includes a public sector burden estimate

of $384,000 for program implementation and verification activities. Subparts bearing the greatest share of the ongoing private costs of the rule are the electronics industry (76%) and imports and exports of fluorinated GHGs (9%). The average ongoing (subsequent year) private cost per metric ton varies by subpart; measures range from approximately than $0.02 per ton (Subpart SS) to $0.96 per ton (Subpart I). The national costs are distributed to several economic sectors and represent less than 0.01% of 2008 gross domestic product; overall, EPA does not believe the rule will have a significant macroeconomic impact on the national economy or on small entities within those sectors.

SECTION 8
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