

# Fluorinated Gas Production



## Subpart L, Mandatory Reporting of Greenhouse Gases

*Under the Mandatory Reporting Rule for Additional Sources of Fluorinated Greenhouse Gases, owners or operators of facilities that contain fluorinated gas production processes (as defined below) and whose uncontrolled emissions equal or exceed 25,000 metric tons of carbon dioxide equivalent per year from fluorinated gas production, stationary combustion, miscellaneous use of carbonates, and other source categories (see information sheet on General Provisions- subpart A) must report emissions from all source categories located at the facility for which emission calculation methods are defined in the rule. Owners or operators must collect emission data, calculate greenhouse gas (GHG) emissions, and follow the specified procedures for quality assurance, missing data, recordkeeping, and reporting.*

*Producers of fluorinated gases should also review the requirements of 40 CFR part 98, subparts O and OO (HCFC-22 Production and HFC-23 Destruction; Suppliers of Industrial Greenhouse Gases) to determine if they must also report emissions under those subparts.*

### How Is This Source Category Defined?

Under this rule, the fluorinated gas production source category consists of facilities that produce fluorinated gases from any raw material or feedstock chemical. Fluorinated gases include fluorinated GHGs (described further below), chlorofluorocarbons (CFCs), and hydrochlorofluorocarbons (HCFCs). The reuse or recycling of fluorinated gases and the generation of HFC-23 from the production of HCFC-22 are not included in this source category. Emissions of HFC-23 from HCFC-22 production are covered in subpart O (HCFC-22 Production and HFC-23 Destruction).

### What GHGs Must Be Reported?

Fluorinated GHGs include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF<sub>6</sub>), nitrogen trifluoride (NF<sub>3</sub>), hydrofluoroethers (HFEs) and others as defined by the final Mandatory Reporting of GHGs Rule (74 FR 56260; October 30, 2009).

The rule requires fluorinated gas production facilities to report the total mass of each fluorinated-GHG emitted from:

- Each fluorinated gas production process and all fluorinated gas production processes combined.
- Each fluorinated gas transformation process that is not part of a fluorinated gas production process and all such fluorinated gas transformation processes combined (but facilities are required to separately report fluorinated GHG emissions from transformation processes where a fluorinated GHG reactant is produced at another facility).
- Each fluorinated GHG destruction process that is not part of a fluorinated gas production process or a fluorinated gas transformation process and all such fluorinated gas destruction processes combined.
- Venting of residual fluorinated GHGs from containers returned from the field.

Each facility must also report GHG emissions for other source categories for which calculation methods are provided in other subparts of the rule. For example, facilities must report carbon dioxide (CO<sub>2</sub>), nitrous

oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>) emissions from each stationary combustion unit on site by following the requirements of 40 CFR part 98, subpart C (General Stationary Fuel Combustion Sources). If applicable, facilities must also report the emissions of HFC-23 from HCFC-22 production processes and HFC-23 destruction processes as required by 40 CFR part 98, subpart O (HCFC-22 Production and HFC-23 Destruction). Please refer to the relevant information sheet for a summary of the requirements for calculating and reporting emissions from any other source categories at the facility.

## **How Must GHG Emissions Be Calculated?**

Under this rule, fluorinated GHG emissions from fluorinated gas production and transformation must be estimated either using a mass-balance approach or the emission factor or emission calculation factor approach. Emissions must also be calculated for destruction processes, and for venting of residual gas from containers (e.g., cylinder heels).

### **Mass-Balance Approach**

Before using the mass-balance approach for a process, the facility must calculate the absolute and relative errors associated with using that approach on the process. If the absolute error is less than or equal to 3,000 metric tons CO<sub>2</sub>e per year or the relative error is less than or equal to 30 percent of the estimated process emissions, then the mass-balance approach may be used on the process. Otherwise, the facility must use the emission factor or emission calculation factor approach for that process.

Under the mass-balance approach, fluorinated GHG emissions must be calculated by measuring or calculating the following variables:

- Total mass of each fluorine-containing reactant fed into the process
- Total mass of the fluorine-containing product fed produced by the process
- Total mass of fluorine in destroyed or recaptured streams containing fluorine-containing reactants, products, and byproducts
- Fractions of total fluorine emitted consisting of each fluorine-containing reactant, product, and by-product

In order to calculate these variables, the following inputs must be measured or calculated:

- Mass removed from the process in each stream that is fed into the destruction device and that contains greater than trace concentrations of fluorine-containing reactants, products, or by-products
- Mass removed from the process in each recaptured stream that contains greater than trace concentrations of fluorine-containing reactants, products, or by-products
- Concentrations (mass fractions) of each fluorine-containing reactant, product, and by-product in each stream that is fed into the destruction device
- Concentration (mass fraction) of each fluorine-containing by-product in each recaptured stream.
- Destruction efficiency of the destruction device

### **Process-Vent-Specific Emission Factor and Emission Calculation Factor Approach**

This approach requires a preliminary estimate of emissions by process vent, followed by the development of emission factors for each process vent. For vents with annual controlled emissions of less than 10,000 mtCO<sub>2</sub>e, facilities could use engineering calculations or engineering assessments to establish the emission factor. This approach is referred to as the process-vent-specific emission calculation factor method. For other vents, facilities must use emissions testing to establish the emission factor. This approach is referred to as the process-vent-specific emission factor method. In addition to estimating their emissions from process vents, facilities using the process-vent-specific approach must estimate their emissions from equipment leaks.

A CO<sub>2</sub> equivalent test is used to determine the applicability of the process-vent-specific emission factor or process-vent-specific emission calculation factor. For fluorinated GHGs whose GWPs are not listed in Table A-1 of subpart A of part 98, facilities may use a default GWP of 2000. Alternatively, they may submit a request to EPA to use provisional GWPs for these fluorinated GHGs if

- the fluorinated GHGs are emitted in quantities that, with a default GWP of 2000, result in total calculated annual emissions equal to or greater than 10,000 mtCO<sub>2</sub>e for the vent, and
- the facility submits data and analysis that support GWPs for the fluorinated GHGs that would result in total calculated annual emissions less than 10,000 mtCO<sub>2</sub>e for the vent.

If an individual process vent within an operating scenario has fluorinated GHG emissions of less than 10,000 metric tons CO<sub>2</sub>e per year then use either:

- Process-vent-specific emission factor.
- Process-vent-specific emission calculation factor.

If an individual continuous process vent within an operating scenario has fluorinated GHG emissions of greater than 10,000 metric tons CO<sub>2</sub>e per year then:

- Process-vent-specific emission factor method must be used.

If an individual batch process vent within an operating scenario has fluorinated GHG emissions of greater than 10,000 metric tons CO<sub>2</sub>e per year then use either:

- Process-vent-specific emission factor method.
- Process-vent-specific emission calculation factor.

Under the process-vent-specific emission factor method, fluorinated GHG emissions must be calculated using the following:

- Total process activity.
- Hourly fluorinated GHG emission rate (for continuous processes).
- Process specific emission factor.
- Fluorinated GHG emissions for the process vent. A process-vent-specific emission calculation factor must also be developed for periods when the process vent is not venting to the destruction device.
- Destruction efficiency, only for the portion of the process activity during which the vent is vented to a destruction device.

Under the process-vent-specific emission calculation factor method, fluorinated GHG emissions must be calculated using the following:

- Process specific emission calculation factor.
- Total process activity.
- Destruction efficiency, if the process vent is vented to a destruction device.

For both the process-vent-specific emission factor method and the process-vent-specific emission calculation factor method, information must be collected on the number and type of equipment; service of each piece of equipment; concentration of each fluorinated GHG in the stream; and the time period each piece of equipment was in service. Emissions from equipment leaks must be calculated using any of the following methods:

- Average Emission Factor Approach in EPA Protocol for Equipment Leak Estimates.
- Other Approaches in EPA Protocol for Equipment Leak Estimates in conjunction with EPA Method 21.

- Other Approaches in EPA Protocol for Equipment Leak Estimates in conjunction with site-specific leak detection methods.
- Site-specific leak detection methods.

### **Destruction of Fluorinated GHGs that were Previously “Produced”**

Emissions from the destruction of fluorinated GHGs that were previously “produced” (e.g., shipped to the facility by another facility for destruction or returned to the facility for reclamation but found to be irretrievably contaminated and therefore destroyed) must be calculated using the following:

- Mass of fluorinated GHGs previously “produced” and that are fed into the destruction device.
- Destruction efficiency of the destruction device.

### **Venting of Residual Fluorinated GHGs in Containers**

Emissions from the venting of residual fluorinated GHGs from containers must be calculated using one the following methods:

- Measure the contents of each container before and after venting.
- Develop a heel factor (based on representative samples), and apply this factor to the number of containers vented.

## **When Must Reports be Submitted?**

The submission date for the annual GHG report can vary in the first 3 years of the program.

- Reporting Year 2010. The report was required to be submitted by September 30, 2011.
- Reporting Year 2011. The due date depends on which source categories are included in the report. If the report includes one or more of the source categories listed below, then the report must be submitted by September 28, 2012. This reporting deadline applies to all subparts being reported by the facility. In addition, if the facility contains one or more of these source categories and the facility submitted a GHG annual report for reporting year 2010 under another subpart (e.g., subpart C for general stationary fuel combustion), then by April 2, 2012 you must notify EPA through e-GGRT that you are not required to submit the second annual report until September 28, 2012 (the notification deadline according to 4 CFR 98.3(b) is March 31, 2012, however, because this date falls on a Saturday in 2012, the notification is due on the next business day).
  - Electronics Manufacturing (subpart I)
  - Fluorinated Gas Production (subpart L)
  - Magnesium Production (subpart T)
  - Petroleum and Natural Gas Systems (subpart W)
  - Use of Electric Transmission and Distribution Equipment (subpart DD)
  - Underground Coal Mines (subpart FF)
  - Industrial Wastewater Treatment (subpart II)
  - Geologic Sequestration of Carbon Dioxide (subpart RR)
  - Manufacture of Electric Transmission and Distribution (subpart SS)
  - Industrial Waste Landfills (subpart TT)
  - Injection of Carbon Dioxide (subpart UU)

- Imports and Exports of Equipment Pre-charged with Fluorinated GHGs or Containing Fluorinated GHGs in Closed-cell Foams (subpart QQ)

If the report contains none of the source categories listed above, then the report must be submitted by April 2, 2012 (the deadline is March 31, 2012, however, because this date falls on a Saturday, the annual report is due on the next business day).

- Reporting Year 2012. Starting in 2013 and each year thereafter, the report must be submitted by March 31 of each year, unless the 31st is a Saturday, Sunday, or federal holiday, in which case the reports are due on the next business day.

## What Information Must Be Reported?

In addition to the information required by the General Provisions at 40 CFR 98.3(c), the rule requires the following to be reported by covered facilities:

- The chemical identities of the contents of the process or emissions stream(s) analyzed under the initial scoping test of fluorinated GHG, by process.
- The location and function of the process or emissions stream(s) that were analyzed under the initial scoping test of fluorinated GHG, by process.
- The annual emissions of each fluorinated GHG by process, from equipment leaks (if applicable), and for the facility as a whole.
- The method used to determine the mass of emissions of each F-GHG, for each process and process vent at the facility.
- The chemical formula and total mass produced of the fluorinated gas product in metric tons, by chemical and process.
- Missing data periods, including reporting the reasons for the missing data, the length of time the data were missing, the method used to estimate values for missing data, and the estimates of those data.

Facilities using the mass-balance approach must report the following information:

- The absolute and relative uncertainties calculated under paragraphs §98.123(b)(1) through (b)(4), as well as the data (including quantities and their uncertainties) used in these calculations.
- The balanced chemical equation that describes the reaction used to manufacture the fluorinated GHG product and each fluorinated GHG transformation product.
- The mass and chemical formula of each fluorinated GHG reactant emitted from the process in metric tons.
- The mass and chemical formula of the fluorinated GHG product emitted from the process in metric tons.
- The mass and chemical formula of each fluorinated GHG by-product emitted from the process in metric tons.
- The mass and chemical formula of each fluorine-containing reactant that is fed into the process (metric tons).
- The mass and chemical formula of each fluorine-containing product produced by the process (metric tons).
- The mass and chemical formula of each fluorine-containing product that is removed from the process and destroyed.
- The mass and chemical formula of each fluorine-containing byproduct that is removed from the process and destroyed.

- The mass and chemical formula of each fluorine-containing reactant that is removed from the process and destroyed.
- The mass and chemical formula of each fluorine-containing byproduct that is removed from the process and recaptured.
- The demonstrated destruction efficiency of the destruction device for the fluorinated GHG (fraction).
- The fraction of the mass emitted that consists of each fluorine-containing reactant (FERd).
- The fraction of the mass emitted that consists of the fluorine-containing product (FEP).
- The fraction of the mass emitted that consists of each fluorine-containing by-product (FEBk).

Facilities using the Emission Factor and Emission Calculation Factor Approach must report the following information:

- The process activity used to estimate emissions.
- The site-specific, process-vent-specific emission factor(s) or emission calculation factor for each process vent.
- The mass of each fluorinated GHG emitted, including the mass of each fluorinated GHG emitted from equipment leaks.

Fluorinated gas production facilities that destroy fluorinated GHGs must submit:

- Excess emissions that result from malfunctions of the destruction device, and these excess emissions must be reflected in the fluorinated GHG estimates in §98.123(b) and (c). Such excess emissions would occur if the destruction efficiency was reduced due to the malfunction.
- Emissions testing report containing the following information:
  - Destruction efficiency (DE) of each destruction unit for each fluorinated GHG, in accordance with §98.124(g)(1)(i) through (iv).
  - Test methods or analytical methods used to determine the destruction efficiency.
  - Methods used to record the mass of fluorinated GHG destroyed.
  - Chemical identity of the fluorinated GHG(s) used in the performance test conducted to determine DE, including surrogates, and information on why the surrogate is sufficient to demonstrate DE for each fluorinated GHG, consistent with requirements in §98.124(g)(1), vented to the destruction unit.
  - Name of all applicable federal or state regulations that may apply to the destruction process.
  - If any process changes affect unit destruction efficiency or the methods used to record mass of fluorinated GHG destroyed, then a revised report must be submitted to reflect the changes. The revised report must be submitted to EPA within 60 days of the testing.
- For each previously produced fluorinated GHG destroyed:
  - The mass of the fluorinated GHG fed into the destruction device.
  - The mass of the fluorinated GHG emitted from the destruction device.
- A one-time report by June 30, 2011, that describes any measurements, research, or analysis that it has performed or obtained that relate to the formation of products of incomplete combustion (PICs) that are fluorinated GHGs during the destruction of fluorinated gases. The report should include:
  - The methods and results of any measurement or modeling studies, including the PICs for which the exhaust stream was analyzed
  - Copies of relevant scientific papers, if available, or citations of the papers, if they are not.

Fluorinated gas production facilities that vent residual fluorinated GHGs from containers must report the following for each fluorinated GHG vented:

- The mass of the residual fluorinated GHG vented from containers annually (tons).
- If applicable, the heel factor calculated for each container size and type.

EPA has temporarily deferred the requirement to report data elements in the above list that are used as inputs to emission equations (76 FR 53057, August 25, 2011). For the current status of reporting requirements, including the list of data elements that are considered to be inputs to emissions equations, consult the following link: <http://www.epa.gov/climatechange/emissions/CBI.html>

## **For More Information**

This document is provided solely for informational purposes. It does not provide legal advice, have legally binding effect, or expressly or implicitly create, expand, or limit any legal rights, obligations, responsibilities, expectations, or benefits in regard to any person. The series of information sheets is intended to assist reporting facilities/owners in understanding key provisions of the rule. They are not intended to be a substitute for the rule.

Visit EPA's Web site ([www.epa.gov/climatechange/emissions/ghgrulemaking.html](http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)) for more information and additional information sheets, or go to [www.regulations.gov](http://www.regulations.gov) to access the rulemaking docket EPA-HQ-OAR-2009-0927.