Subpart L—Fluorinated Gas Production [1]

This redline strikeout document represents the combined changes proposed to the subpart L regulatory text in two proposed actions:

- Greenhouse Gas Reporting Program: Proposed Amendments and Confidentiality Determinations for Fluorinated Gas Production, signed by the EPA Administrator Gina McCarthy on November 7, 2013.
- Revisions to Reporting and Recordkeeping Requirements, and Proposed Confidentiality Determinations under the Greenhouse Gas Reporting Program (Proposed Inputs rule) [78 FR 55994; September 11, 2013]

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§ 98.120 Definition of the source category.

(a) The fluorinated gas production source category consists of processes that produce a fluorinated gas from any raw material or feedstock chemical, except for processes that generate HFC-–23 during the production of HCFC-–22.

(b) To produce a fluorinated gas means to manufacture a fluorinated gas from any raw material or feedstock chemical. Producing a fluorinated gas includes producing a fluorinated GHG as defined at §98.410(b). Producing a fluorinated gas also includes the manufacture of a chlorofluorocarbon (CFC) or hydrochlorofluorocarbon (HCFC) from any raw material or feedstock chemical, including manufacture of a CFC or HCFC as an isolated intermediate for use in a process that will result in the transformation of the CFC or HCFC either at or outside of the production facility. Producing a fluorinated gas does not include the reuse or recycling of a fluorinated gas, the creation of HFC–23 during the production of HCFC–22, the creation of intermediates that are created and transformed in a single process with no storage of the intermediates, or the creation of fluorinated GHGs that are released or destroyed at the production facility before the production measurement in §98.414(a).

§ 98.121 Reporting threshold.

You must report GHG emissions under this subpart if your facility contains a fluorinated gas production process that generates or emits fluorinated GHG and the facility meets the requirements of either §98.2(a)(1) or (a)(2). To calculate GHG emissions for comparison to the 25,000 metric ton CO_2e per year emission threshold in §98.2(a)(2), calculate process emissions from fluorinated gas production using uncontrolled GHG emissions.

§ 98.122 GHGs to report

(a) You must report CO_2, CH_4, and N_2O combustion emissions from each stationary combustion unit. You must calculate and report these emissions under subpart C of this part (General Stationary Fuel Combustion Sources) by following the requirements of subpart C.

(b) You must report under subpart O of this part (HCFC–22 Production and HFC–23 Destruction) the emissions of HFC–23 from HCFC–22 production processes and HFC–23 destruction processes. Do not report the generation and emissions of HFC–23 from HCFC–22 production under this subpart.

(c) *Process level.* You must report ~~the total mass of~~ , for each fluorinated GHG group, the total GWP-weighted mass of all fluorinated GHGs in that group (in metric tons CO2e) emitted from:

(1) Each fluorinated gas production process ~~and all fluorinated gas production processes combined~~.

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[1] Revisions made to subpart L as a result of the proposed *Revisions to Reporting and Recordkeeping Requirements, and Proposed Confidentiality Determinations under the Greenhouse Gas Reporting Program* (Inputs Rule) are included in this file. The Inputs Rule revisions are highlighted in yellow.

(2)~~-~~ Each fluorinated gas transformation process that is not part of a fluorinated gas production process and where no fluorinated GHG reactant is produced at another facility. ~~all such fluorinated gas transformation processes combined, except report separately fluorinated GHG emissions from transformation processes where a fluorinated GHG reactant is produced at another facility.~~

(3) Each fluorinated gas transformation process that is not part of a fluorinated gas production process and where one or more fluorinated GHG reactants are produced at another facility.

(d) *Facility level, multiple products*. If your facility produces more than one fluorinated gas product, you must report the emissions (in metric tons) for the facility as a whole of each fluorinated GHG that is emitted from the facility as a whole in quantities of 1,000 metric tons of CO2e or more. Aggregate and report emissions of all other fluorinated GHGs by fluorinated GHG group for the facility as a whole, in metric tons of CO2e.

(e) *Facility level, one product only*. If your facility produces only one fluorinated gas product, aggregate and report the GWP-weighted emissions of fluorinated GHGs by fluorinated GHG group for the facility as a whole, in metric tons CO2e, with the following exception: Where emissions consist of a major fluorinated GHG constituent of a fluorinated gas product, and the product is sold or transferred to another person, report the total mass of each fluorinated GHG emitted that is a major fluorinated GHG constituent of the product (in metric tons).

(f) You must report the total mass of each fluorinated GHG emitted (in metric tons) from:

(~~3~~1) Each fluorinated gas 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.

(~~4~~2) Venting of residual fluorinated GHGs from containers returned from the field.

§ 98.123 Calculating GHG emissions.

For fluorinated gas production and transformation processes, you must calculate the fluorinated GHG emissions from each process using ~~either the mass balance method specified in paragraph (b) of this section, or~~ the emission factor or emission calculation factor method specified in paragraphs (c), (d), and (e) of this section, as appropriate. For destruction processes that destroy fluorinated GHGs that were previously "produced" as defined at §98.410(b), you must calculate emissions using the procedures in paragraph (f) of this section. For venting of residual gas from containers (e.g., cylinder heels), you must calculate emissions using the procedures in paragraph (g) of this section.

(a) *Default GWP value.* For fluorinated GHGs that do not have GWPs listed in Table A–1 to subpart A of this part, use the default GWP provided for the fluorinated GHG group of which the GHG is a member in Table L-1 of this subpart in your calculations under ~~In~~ paragraph~~s (b)(1) and~~ (c)(1) of this section ~~and~~ , in §98.124~~(b)(8) and~~ (c)(2), and if you used the mass-balance method to calculate emissions from the process for reporting years 2011, 2012, 2013, or 2014, ~~use a GWP of 2,000 for fluorinated GHGs that do not have GWPs listed in Table A–1 to subpart A of this part~~, ~~except as provided in paragraph §98.123(c)(1)(vi)~~. ~~Do not report CO_2e emissions under §98.3(c)(4) for fluorinated GHGs that do not have GWPs listed in Table A–1 to subpart A of this part.~~

(b) *Mass balance method.* The mass balance method was available for reporting years 2011, 2012, 2013, and 2014 only. It may be found at 75 FR 74774, 74832-74837 (December 1, 2010). ~~Before using the mass balance approach to estimate your fluorinated GHG emissions from a process, you must ensure that the process and the equipment and methods used to measure it meet either the error limits described in this paragraph and calculated under paragraph (b)(1) of this section or the requirements specified in paragraph §98.124(b)(8). If you choose to calculate the error limits, you must estimate the absolute and relative errors associated with using the mass balance approach on that process using Equations L–1 through L–4 of this section in conjunction with Equations L–5 through L–10 of this section. You may use the mass-balance approach to estimate emissions from the process if this calculation results in an absolute error of less than or equal to 3,000 metric tons CO_2e per year or a relative error of less than or equal to 30 percent of the estimated CO_2e fluorinated GHG emissions. If you do not meet either of the error limits or the requirements of paragraph §98.124(b)(8), you must use the emission factor approach detailed in paragraphs (c), (d), and (e) of this section to estimate emissions from the process.~~

~~(1) Error calculation. To perform the calculation, you must first calculate the absolute and relative errors associated with the quantities calculated using either Equations L–7 through L–10 of this section or Equation L–17 of this~~

~~section. Alternatively, you may estimate these errors based on the variability of previous process measurements (e.g., the variability of measurements of stream concentrations), provided these measurements are representative of the current process and current measurement devices and techniques. Once errors have been calculated for the quantities in these equations, those errors must be used to calculate the errors in Equations L–6 and L–5 of this section. You may ignore the errors associated with Equations L–11, L–12, and L–13 of this section.~~

~~(i) Where the measured quantity is a mass, the error in the mass must be equated to the accuracy or precision (whichever is larger) of the flowmeter, scale, or combination of volumetric and density measurements at the flow rate or mass measured.~~

~~(ii) Where the measured quantity is a concentration of a stream component, the error of the concentration must be equated to the accuracy or precision (whichever is larger) with which you estimate the mean concentration of that stream component, accounting for the variability of the process, the frequency of the measurements, and the accuracy or precision (whichever is larger) of the analytical technique used to measure the concentration at the concentration measured. If the variability of process measurements is used to estimate the error, this variability shall be assumed to account both for the variability of the process and the precision of the analytical technique. Use standard statistical techniques such as the student's t distribution to estimate the error of the mean of the concentration measurements as a function of process variability and frequency of measurement.~~

~~(iii) Equation L–1 of this section provides the general formula for calculating the absolute errors of sums and differences where the sum, S, is the summation of variables measured, a, b, c, etc. (e.g., S = a + b + c):~~

$$e_{SA} = [(a*e_a)^2 + (b*e_b)^2 + (c*e_c)^2]^{1/2} \quad \text{(Eq. L-1)}$$

~~Where:~~

~~e_{SA}= Absolute error of the sum, expressed as one half of a 95 percent confidence interval.~~

~~e_a= Relative error of a, expressed as one half of a 95 percent confidence interval.~~

~~e_b= Relative error of b, expressed as one half of a 95 percent confidence interval.~~

~~e_c= Relative error of c, expressed as one half of a 95 percent confidence interval.~~

~~(iv) Equation L–2 of this section provides the general formula for calculating the relative errors of sums and differences:~~

$$e_{SR} = \frac{e_{SA}}{(a+b+c)} \quad \text{(Eq. L-2)}$$

~~Where:~~

~~e_{SR}= Relative error of the sum, expressed as one half of a 95 percent confidence interval.~~

~~e_{SA}= Absolute error of the sum, expressed as one half of a 95 percent confidence interval.~~

~~a+b+c = Sum of the variables measured.~~

~~(v) Equation L–3 of this section provides the general formula for calculating the absolute errors of products (e.g., flow rates of GHGs calculated as the product of the flow rate of the stream and the concentration of the GHG in the stream), where the product, P, is the result of multiplying the variables measured, a, b, c, etc. (e.g., P = a*b*c):~~

$$e_{PA} = (a*b*c)(e_a^2 + e_b^2 + e_c^2)^{1/2} \quad \text{(Eq. L-3)}$$

~~Where:~~

~~e_{PA}= Absolute error of the product, expressed as one half of a 95 percent confidence interval.~~

~~e_a= Relative error of a, expressed as one half of a 95 percent confidence interval.~~

~~e_b= Relative error of b, expressed as one half of a 95 percent confidence interval.~~

~~e_c= Relative error of c, expressed as one half of a 95 percent confidence interval.~~

~~(vi) Equation L–4 of this section provides the general formula for calculating the relative errors of products:~~

$$e_{PR} = \frac{e_{PA}}{(a * b * c)} \quad \text{(Eq. L-4)}$$

~~Where:~~

~~e_{PR}= Relative error of the product, expressed as one half of a 95 percent confidence interval.~~

~~e_{PA}= Absolute error of the product, expressed as one half of a 95 percent confidence interval.~~

~~a*b*c = Product of the variables measured.~~

~~(vii) Calculate the absolute error of the emissions estimate in terms of CO_2e by performing a preliminary estimate of the annual CO_2e emissions of the process using the method in paragraph (b)(1)(viii) of this section. Multiply this result by the relative error calculated for the mass of fluorine emitted from the process in Equation L–6 of this section.~~

~~(viii) To estimate the annual CO_2e emissions of the process for use in the error estimate, apply the methods set forth in paragraphs (b)(2) through (b)(7) and (b)(9) through (b)(16) of this section to representative process measurements. If these process measurements represent less than one year of typical process activity, adjust the estimated emissions to account for one year of typical process activity. To estimate the terms FER_d, FEP, and FEB_k for use in the error estimate for Equations L–11, L–12, and L–13 of this section, you must either use emission testing, monitoring of emitted streams, and/or engineering calculations or assessments, or in the alternative assume that all fluorine is emitted in the form of the fluorinated GHG that has the highest GWP among the fluorinated GHGs that occur in more than trace concentrations in the process. To convert the fluorinated GHG emissions to CO_2e, use Equation A–1 of §98.2. For fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part, use a default GWP of 2,000.~~

~~(2) The total mass of each fluorinated GHG emitted annually from each fluorinated gas production and each fluorinated GHG transformation process must be estimated by using Equation L–5 of this section.~~

$$E_{FGHGf} = \sum_{p=1}^{n} (E_{Rp-FGHGf} + E_{Pp-FGHGf} + E_{Bp-FGHGf}) \quad \text{(Eq. L-5)}$$

~~Where:~~

~~E_{FGHGf}= Total mass of each fluorinated GHG f emitted annually from production or transformation process i (metric tons).~~

~~ERp-FGHGf= Total mass of fluorinated GHG reactant f emitted from production process i over the period p (metric tons, calculated in Equation L–11 of this section).~~

~~EPp-FGHGf= Total mass of the fluorinated GHG product f emitted from production process i over the period p (metric tons, calculated in Equation L–12 of this section).~~

~~EBp-FGHGf= Total mass of fluorinated GHG by-product f emitted from production process i over the period p (metric tons, calculated in Equation L–13 of this section).~~

~~n = Number of concentration and flow measurement periods for the year.~~

~~(3) The total mass of fluorine emitted from process i over the period p must be estimated at least monthly by calculating the difference between the total mass of fluorine in the reactant(s) (or inputs, for processes that do not involve a chemical reaction) and the total mass of fluorine in the product (or outputs, for processes that do not involve a chemical reaction), accounting for the total mass of fluorine in any destroyed or recaptured streams that contain reactants, products, or by-products (or inputs or outputs). This calculation must be performed using Equation L–6 of this section. An element other than fluorine may be used in the mass-balance equation, provided the element occurs in all of the fluorinated GHGs fed into or generated by the process. In this case, the mass fractions of the element in the reactants, products, and by-products must be calculated as appropriate for that element.~~

$$E_F = \sum_{1}^{v} (R_d * MFF_{Rd}) - P * MFF_P - F_D \qquad \text{(Eq. L-6)}$$

~~Where:~~

~~E_F= Total mass of fluorine emitted from process i over the period p (metric tons).~~

~~R_d= Total mass of the fluorine-containing reactant d that is fed into process i over the period p (metric tons).~~

~~P = Total mass of the fluorine-containing product produced by process i over the period p (metric tons).~~

~~MFF_{Rd}= Mass fraction of fluorine in reactant d, calculated in Equation L–14 of this section.~~

~~MFF_P= Mass fraction of fluorine in the product, calculated in Equation L–15 of this section.~~

~~F_D= Total mass of fluorine in destroyed or recaptured streams from process i containing fluorine-containing reactants, products, and by-products over the period p, calculated in Equation L–7 of this section.~~

~~v = Number of fluorine-containing reactants fed into process i.~~

~~(4) The mass of total fluorine in destroyed or recaptured streams containing fluorine-containing reactants, products, and by-products must be estimated at least monthly using Equation L–7 of this section unless you use the alternative approach provided in paragraph (b)(15) of this section.~~

$$F_D = \sum_{j=1}^{q} P_j * MFF_P + \sum_{k=1}^{u}\left[\left(\sum_{j=1}^{q} B_{kj} + \sum_{l=1}^{x} B_{kl}\right) * MFF_{Bk}\right] + \sum_{d=1}^{v}\left(\sum_{j=1}^{q} R_{dj} * MFF_{Rd}\right) \qquad \text{(Eq. L-7)}$$

~~Where:~~

~~F_D= Total mass of fluorine in destroyed or recaptured streams from process i containing fluorine-containing reactants, products, and by-products over the period p.~~

~~P_j= Mass of the fluorine-containing product removed from process i in stream j and destroyed over the period p (calculated in Equation L–8 or L–9 of this section).~~

~~B_{kj}= Mass of fluorine-containing by-product k removed from process i in stream j and destroyed over the period p (calculated in Equation L–8 or L–9 of this section).~~

~~B_{kl}= Mass of fluorine-containing by-product k removed from process i in stream l and recaptured over the period p.~~

~~R_{dj}= Mass of fluorine-containing reactant d removed from process i in stream j and destroyed over the period p (calculated in Equation L–8 or L–9 of this section).~~

~~MFF_{Rd}= Mass fraction of fluorine in reactant d, calculated in Equation L–14 of this section.~~

~~MFF$_{P}$= Mass fraction of fluorine in the product, calculated in Equation L–15 of this section.~~

~~MFF$_{Bk}$= Mass fraction of fluorine in by-product k, calculated in Equation L–16 of this section.~~

~~q = Number of streams destroyed in process i.~~

~~x = Number of streams recaptured in process i.~~

~~u = Number of fluorine-containing by-products generated in process i.~~

~~v = Number of fluorine-containing reactants fed into process i.~~

~~(5) The mass of each fluorinated GHG removed from process i in stream j and destroyed over the period p (i.e., P$_{j}$, B$_{kj}$, or R$_{dj}$, as applicable) must be estimated by applying the destruction efficiency (DE) of the device that has been demonstrated for the fluorinated GHG f to fluorinated GHG f using Equation L–8 of this section:~~

$$M_{FGHGfj} = DE_{FGHGf} * c_{FGHGfj} * S_j \quad \text{(Eq. L-8)}$$

~~Where:~~

~~M$_{FGHGfj}$= Mass of fluorinated GHG f removed from process i in stream j and destroyed over the period p. (This may be P$_{j}$, B$_{kj}$, or R$_{dj}$, as applicable.)~~

~~DE$_{FGHGf}$= Destruction efficiency of the device that has been demonstrated for fluorinated GHG f in stream j (fraction).~~

~~C$_{FGHGfj}$= Concentration (mass fraction) of fluorinated GHG f in stream j removed from process i and fed into the destruction device over the period p. If this concentration is only a trace concentration, c$_{F-GHGfj}$is equal to zero.~~

~~S$_{j}$= Mass removed in stream j from process i and fed into the destruction device over the period p (metric tons).~~

~~(6) The mass of each fluorine-containing compound that is not a fluorinated GHG and that is removed from process i in stream j and destroyed over the period p (i.e., P$_{j}$, B$_{kj}$, or R$_{dj}$, as applicable) must be estimated using Equation L–9 of this section.~~

$$M_{FCgj} = c_{FCgj} * S_j \quad \text{(Eq. L-9)}$$

~~Where:~~

~~M$_{FCgj}$= Mass of non-GHG fluorine-containing compound g removed from process i in stream j and destroyed over the period p. (This may be P$_{j}$, B$_{kj}$, or R$_{dj}$, as applicable).~~

~~c$_{FCgj}$= Concentration (mass fraction) of non-GHG fluorine-containing compound g in stream j removed from process i and fed into the destruction device over the period p. If this concentration is only a trace concentration, c$_{FCgj}$is equal to zero.~~

~~S$_{j}$= Mass removed in stream j from process i and fed into the destruction device over the period p (metric tons).~~

~~(7) The mass of fluorine-containing by-product k removed from process i in stream l and recaptured over the period p must be estimated using Equation L–10 of this section:~~

$$B_{kl} = c_{Bkl} * S_l \quad \text{(Eq. L-10)}$$

~~Where:~~

~~B_{kl}= Mass of fluorine-containing by-product k removed from process i in stream l and recaptured over the period p (metric tons).~~

~~c_{Bkl}= Concentration (mass fraction) of fluorine-containing by-product k in stream l removed from process i and recaptured over the period p. If this concentration is only a trace concentration, $c_{Bkl}$is equal to zero.~~

~~S_l= Mass removed in stream l from process i and recaptured over the period p (metric tons).~~

~~(8) To estimate the terms FER$_d$, FEP, and FEB$_k$for Equations L–11, L–12, and L–13 of this section, you must assume that the total mass of fluorine emitted, E_F, estimated in Equation L–6 of this section, occurs in the form of the fluorinated GHG that has the highest GWP among the fluorinated GHGs that occur in more than trace concentrations in the process unless you possess emission characterization measurements showing otherwise. These emission characterization measurements must meet the requirements in paragraph (8)(i), (ii), or (iii) of this section, as appropriate. The sum of the terms must equal 1. You must document the data and calculations that are used to speciate individual compounds and to estimate FER$_d$, FEP, and FEB$_k$. Exclude from your calculations the fluorine included in F_D. For example, exclude fluorine-containing compounds that are not fluorinated GHGs and that result from the destruction of fluorinated GHGs by any destruction devices (e.g., the mass of HF created by combustion of an HFC). However, include emissions of fluorinated GHGs that survive the destruction process.~~

~~(i) If the calculations under paragraph (b)(1)(viii) of this section, or any subsequent measurements and calculations under this subpart, indicate that the process emits 25,000 metric tons CO_2e or more, estimate the emissions from each process vent, considering controls, using the methods in §98.123(c)(1). You must characterize the emissions of any process vent that emits 25,000 metric tons CO_2e or more as specified in §98.124(b)(4).~~

~~(ii) For other vents, including vents from processes that emit less than 25,000 metric tons CO_2e, you must characterize emissions as specified in §98.124(b)(5).~~

~~(iii) For fluorine emissions that are not accounted for by vent estimates, you must characterize emissions as specified in §98.124(b)(6).~~

~~(9) The total mass of fluorine-containing reactant d emitted must be estimated at least monthly based on the total fluorine emitted and the fraction that consists of fluorine-containing reactants using Equation L–11 of this section. If the fluorine-containing reactant d is a non-GHG, you may assume that FER$_d$is zero.~~

$$E_{R\text{-}ip} = \frac{FER_d * E_F}{\left(\sum_{d=1}^{v} FER_d * MFF_{Rd} + FEP * MFF_P + \sum_{k=1}^{n} FEB_k * MFF_{Bk}\right)} \quad \text{(Eq. L-11)}$$

~~Where:~~

~~ER-ip= Total mass of fluorine-containing reactant d that is emitted from process i over the period p (metric tons).~~

~~FER$_d$= The fraction of the mass emitted that consists of the fluorine-containing reactant d.~~

~~E_F= Total mass of fluorine emissions from process i over the period p (metric tons), calculated in Equation L–6 of this section.~~

~~FEP = The fraction of the mass emitted that consists of the fluorine-containing product.~~

~~FEB$_k$= The fraction of the mass emitted that consists of fluorine-containing by-product k.~~

~~MFF$_{Rd}$= Mass fraction of fluorine in reactant d, calculated in Equation L–14 of this section.~~

~~MFF$_P$= Mass fraction of fluorine in the product, calculated in Equation L–15 of this section.~~

~~MFF$_{Bk}$= Mass fraction of fluorine in by-product k, calculation in Equation L–16 of this section.~~

~~u = Number of fluorine-containing by-products generated in process i.~~

~~v = Number of fluorine-containing reactants fed into process i.~~

~~(10) The total mass of fluorine-containing product emitted must be estimated at least monthly based on the total fluorine emitted and the fraction that consists of fluorine-containing products using Equation L–12 of this section. If the fluorine-containing product is a non-GHG, you may assume that FEP is zero.~~

$$E_{P-ip} = \frac{FEP * E_F}{\left(\sum_{d=1}^{v} FER_d * MFF_{Rd} + FEP * MFF_P + \sum_{k=1}^{u} FEB_k * MFF_{Bk}\right)} \quad \text{(Eq. L-12)}$$

~~Where:~~

~~EP-ip= Total mass of fluorine-containing product emitted from process i over the period p (metric tons).~~

~~FEP = The fraction of the mass emitted that consists of the fluorine-containing product.~~

~~E_F= Total mass of fluorine emissions from process i over the period p (metric tons), calculated in Equation L–6 of this section.~~

~~FER_d= The fraction of the mass emitted that consists of fluorine-containing reactant d.~~

~~FEB_k= The fraction of the mass emitted that consists of fluorine-containing by-product k.~~

~~MFF_{Rd}= Mass fraction of fluorine in reactant d, calculated in Equation L–14 of this section.~~

~~MFF_P= Mass fraction of fluorine in the product, calculated in Equation L–15 of this section.~~

~~MFF_{Bk}= Mass fraction of fluorine in by-product k, calculation in Equation L–16 of this section.~~

~~u = Number of fluorine-containing by-products generated in process i.~~

~~v = Number of fluorine-containing reactants fed into process i.~~

~~(11) The total mass of fluorine-containing by-product k emitted must be estimated at least monthly based on the total fluorine emitted and the fraction that consists of fluorine-containing by-products using Equation L–13 of this section. If fluorine-containing by-product k is a non-GHG, you may assume that FEB_k is zero.~~

$$E_{Bk-ip} = \frac{FEB_k * E_F}{\left(\sum_{d=1}^{v} FER_d * MFF_{Rd} + FEP * MFF_P + \sum_{k=1}^{u} FEB_k * MFF_{Bk}\right)} \quad \text{(Eq. L-13)}$$

~~Where:~~

~~EBk-ip= Total mass of fluorine-containing by-product k emitted from process i over the period p (metric tons).~~

~~FEB_k= The fraction of the mass emitted that consists of fluorine-containing by-product k.~~

~~FER_d= The fraction of the mass emitted that consists of fluorine-containing reactant d.~~

~~FEP = The fraction of the mass emitted that consists of the fluorine-containing product.~~

~~E_F= Total mass of fluorine emissions from process i over the period p (metric tons), calculated in Equation L–6 of this section.~~

~~MFF_{Rd}= Mass fraction of fluorine in reactant d, calculated in Equation L–14 of this section.~~

~~MFF_P= Mass fraction of fluorine in the product, calculated in Equation L–15 of this section.~~

~~MFF_{Bk}= Mass fraction of fluorine in by-product k, calculation in Equation L–16 of this section.~~

~~u = Number of fluorine-containing by-products generated in process i.~~

~~v = Number of fluorine-containing reactants fed into process i.~~

~~(12) The mass fraction of fluorine in reactant d must be estimated using Equation L–14 of this section:~~

$$MFF_{Rd} = MF_{Rd} * \frac{AW_F}{MW_{Rd}} \quad \text{(Eq. L-14)}$$

~~Where:~~

~~MFF_{Rd}= Mass fraction of fluorine in reactant d (fraction).~~

~~MF_{Rd}= Moles fluorine per mole of reactant d.~~

~~AW_F= Atomic weight of fluorine.~~

~~MW_{Rd}= Molecular weight of reactant d.~~

~~(13) The mass fraction of fluorine in the product must be estimated using Equation L–15 of this section:~~

$$MFF_P = MF_P * \frac{AW_F}{MW_P} \quad \text{(Eq. L-15)}$$

~~Where:~~

~~MFF_P= Mass fraction of fluorine in the product (fraction).~~

~~MF_P= Moles fluorine per mole of product.~~

~~AW_F= Atomic weight of fluorine.~~

~~MW_P= Molecular weight of the product produced.~~

~~(14) The mass fraction of fluorine in by-product k must be estimated using Equation L–16 of this section:~~

$$MFF_{Bk} = MF_{Bk} * \frac{AW_F}{MW_{Bk}} \quad \text{(Eq. L-16)}$$

~~Where:~~

~~MFF_{Bk}= Mass fraction of fluorine in the product (fraction).~~

~~MF_{Bk}= Moles fluorine per mole of by-product k.~~

~~AW$_F$= Atomic weight of fluorine.~~

~~MW$_{Bk}$= Molecular weight of by-product k.~~

~~(15) Alternative for determining the mass of fluorine destroyed or recaptured. As an alternative to using Equation L–7 of this section as provided in paragraph (b)(4) of this section, you may estimate at least monthly the total mass of fluorine in destroyed or recaptured streams containing fluorine-containing compounds (including all fluorine-containing reactants, products, and byproducts) using Equation L–17 of this section.~~

$$F_D = \sum_{j=1}^{q} DE_{avgj} * c_{TFj} * S_j + \sum_{l=1}^{x} c_{TFl} * S_l \quad \text{(Eq. L-17)}$$

~~Where:~~

~~F$_D$= Total mass of fluorine in destroyed or recaptured streams from process i containing fluorine-containing reactants, products, and by-products over the period p.~~

~~DE$_{avgj}$= Weighted average destruction efficiency of the destruction device for the fluorine-containing compounds identified in destroyed stream j under §98.124(b)(4)(ii) and (5)(ii) (calculated in Equation L–18 of this section)(fraction).~~

~~c$_{TFj}$= Concentration (mass fraction) of total fluorine in stream j removed from process i and fed into the destruction device over the period p. If this concentration is only a trace concentration, c$_{TFj}$is equal to zero.~~

~~S$_j$= Mass removed in stream j from process i and fed into the destruction device over the period p (metric tons).~~

~~c$_{TFl}$= Concentration (mass fraction) of total fluorine in stream l removed from process i and recaptured over the period p. If this concentration is only a trace concentration, c$_{Bkl}$is equal to zero.~~

~~S$_l$= Mass removed in stream l from process i and recaptured over the period p.~~

~~q = Number of streams destroyed in process i.~~

~~x = Number of streams recaptured in process i.~~

~~(16) Weighted average destruction efficiency. For purposes of Equation L–17 of this section, calculate the weighted average destruction efficiency applicable to a destroyed stream using Equation L–18 of this section.~~

$$DE_{avgj} = \frac{\sum_{f=1}^{w} DE_{FGHGf} * c_{FGHGfj} * S_j * MFF_{FGHGf} + \sum_{g=1}^{z} c_{FCg} * S_j * MFF_g}{\sum_{f=1}^{w} c_{FGHGf} * S_j * MFF_{FGHGf} + \sum_{g=1}^{z} c_{FCg} * S_j * MFF_g} \quad \text{(Eq. L-18)}$$

~~Where:~~

~~DE$_{avgj}$= Weighted average destruction efficiency of the destruction device for the fluorine-containing compounds identified in destroyed stream j under 98.124(b)(4)(ii) or (b)(5)(ii), as appropriate.~~

~~DE$_{FGHGf}$= Destruction efficiency of the device that has been demonstrated for fluorinated GHG f in stream j (fraction).~~

~~c$_{FGHGfj}$= Concentration (mass fraction) of fluorinated GHG f in stream j removed from process i and fed into the destruction device over the period p. If this concentration is only a trace concentration, c$_{F-GHGfj}$is equal to zero.~~

~~c_{FCgj}= Concentration (mass fraction) of non-GHG fluorine-containing compound g in stream j removed from process i and fed into the destruction device over the period p. If this concentration is only a trace concentration, $c_{FCgj}$is equal to zero.~~

~~S_j= Mass removed in stream j from process i and fed into the destruction device over the period p (metric tons).~~

~~MFF_{FGHGf}= Mass fraction of fluorine in fluorinated GHG f, calculated in Equation L–14, L–15, or L–16 of this section, as appropriate.~~

~~MFF_{FCg}= Mass fraction of fluorine in non-GHG fluorine-containing compound g, calculated in Equation L–14, L–15, or L–16 of this section, as appropriate.~~

~~w = Number of fluorinated GHGs in destroyed stream j.~~

~~y = Number of non-GHG fluorine-containing compounds in destroyed stream j.~~

(c) *Emission factor and emission calculation factor methods.* To use the method in this paragraph for batch processes, you must comply with either paragraph (c)(3) of this section (Emission Factor approach) or paragraph (c)(4) of this section (Emission Calculation Factor approach). To use the method in this paragraph for continuous processes, you must first make a preliminary estimate of the emissions from each individual continuous process vent under paragraph (c)(1) of this section. If your continuous process operates under different conditions as part of normal operations, you must also define the different operating scenarios and make a preliminary estimate of the emissions from the vent for each operating scenario. Then, compare the preliminary estimate for each continuous process vent (summed across operating scenarios) to the criteria in paragraph (c)(2) of this section to determine whether the process vent meets the criteria for using the emission factor method described in paragraph (c)(3) of this section or whether the process vent meets the criteria for using the emission calculation factor method described in paragraph (c)(4) of this section. For continuous process vents that meet the criteria for using the emission factor method described in paragraph (c)(3) of this section and that have more than one operating scenario, compare the preliminary estimate for each operating scenario to the criteria in (c)(3)(ii) to determine whether an emission factor must be developed for that operating scenario.

(1) *Preliminary estimate of emissions by process vent.* You must estimate the annual CO_2e emissions of fluorinated GHGs for each process vent within each operating scenario of a continuous process using the approaches specified in paragraph (c)(1)(i) or (c)(1)(ii) of this section, accounting for any destruction as specified in paragraph (c)(1)(iii) of this section. You must determine emissions of fluorinated GHGs by process vent by using measurements, by using calculations based on chemical engineering principles and chemical property data, or by conducting an engineering assessment. You may use previous measurements, calculations, and assessments if they represent current process operating conditions or process operating conditions that would result in higher fluorinated GHG emissions than the current operating conditions and if they were performed in accordance with paragraphs (c)(1)(i), (c)(1)(ii), and (c)(1)(iii) of this section, as applicable. You must document all data, assumptions, and procedures used in the calculations or engineering assessment and keep a record of the emissions determination as required by §98.127(a).

(i) *Engineering calculations.* For process vent emission calculations, you may use any of paragraphs (c)(1)(i)(A), (c)(1)(i)(B), or (c)(1)(i)(C) of this section.

(A) U.S. Environmental Protection Agency, Emission Inventory Improvement Program, Volume II: Chapter 16, Methods for Estimating Air Emissions from Chemical Manufacturing Facilities, August 2007, Final (incorporated by reference, see §98.7).

(B) You may determine the fluorinated GHG emissions from any process vent within the process using the procedures specified in §63.1257(d)(2)(i) and (d)(3)(i)(B) of this chapter, except as specified in paragraphs (c)(1)(i)(B)(*1*) through (c)(1)(i)(B)(*4*) of this section. For the purposes of this subpart, use of the term “HAP” in §63.1257(d)(2)(i) and (d)(3)(i)(B) of this chapter means “fluorinated GHG”.

(*1*) To calculate emissions caused by the heating of a vessel without a process condenser to a temperature lower than the boiling point, you must use the procedures in §63.1257(d)(2)(i)(C)(*3*) of this chapter.

(*2*) To calculate emissions from depressurization of a vessel without a process condenser, you must use the procedures in §63.1257(d)(2)(i)(D)(*10*) of this chapter.

(*3*) To calculate emissions from vacuum systems, the terms used in Equation 33 to §63.1257(d)(2)(i)(E) of this chapter are defined as follows:

(*i*) P_{system}= Absolute pressure of the receiving vessel.

(*ii*) P_i= Partial pressure of the fluorinated GHG determined at the exit temperature and exit pressure conditions of the condenser or at the conditions of the dedicated receiver.

(*iii*) P_j= Partial pressure of condensables (including fluorinated GHG) determined at the exit temperature and exit pressure conditions of the condenser or at the conditions of the dedicated receiver.

(*iv*) $MW_{Fluorinated\ GHG}$= Molecular weight of the fluorinated GHG determined at the exit temperature and exit pressure conditions of the condenser or at the conditions of the dedicated receiver.

(*4*) To calculate emissions when a vessel is equipped with a process condenser or a control condenser, you must use the procedures in §63.1257(d)(3)(i)(B) of this chapter, except as follows:

(*i*) You must determine the flowrate of gas (or volume of gas), partial pressures of condensables, temperature (T), and fluorinated GHG molecular weight ($MW_{Fluorinated\ GHG}$) at the exit temperature and exit pressure conditions of the condenser or at the conditions of the dedicated receiver.

(*ii*) You must assume that all of the components contained in the condenser exit vent stream are in equilibrium with the same components in the exit condensate stream (except for noncondensables).

(*iii*) You must perform a material balance for each component, if the condensate receiver composition is not known.

(*iv*) For the emissions from gas evolution, the term for time, t, must be used in Equation 12 to §63.1257(d)(2)(i)(B) of this chapter.

(*v*) Emissions from empty vessel purging must be calculated using Equation 36 to §63.1257(d)(2)(i)(H) of this chapter and the exit temperature and exit pressure conditions of the condenser or the conditions of the dedicated receiver.

(C) Commercial software products that follow chemical engineering principles (e.g., including the calculation methodologies in paragraphs (c)(1)(i)(A) and (c)(1)(i)(B) of this section).

(ii) *Engineering assessments.* For process vent emissions determinations, you may conduct an engineering assessment to calculate uncontrolled emissions. An engineering assessment includes, but is not limited to, the following:

(A) Previous test results, provided the tests are representative of current operating practices of the process.

(B) Bench-scale or pilot-scale test data representative of the process operating conditions.

(C) Maximum flow rate, fluorinated GHG emission rate, concentration, or other relevant parameters specified or implied within a permit limit applicable to the process vent.

(D) Design analysis based on chemical engineering principles, measureable process parameters, or physical or chemical laws or properties.

(iii) *Impact of destruction for the preliminary estimate.* If the process vent is vented to a destruction device, you may reflect the impact of the destruction device on emissions. In your emissions estimate, account for the following:

(A) The destruction efficiencies of the device that have been demonstrated for the fluorinated GHGs in the vent stream for periods when the process vent is vented to the destruction device.

(B) Any periods when the process vent is not vented to the destruction device.

(iv) *Use of typical recent values.* In the calculations in paragraphs (c)(1)(i), (c)(1)(ii), and (c)(1)(iii) of this section, the values used for the expected process activity and for the expected fraction of that activity whose emissions will be vented to the properly functioning destruction device must be based on either typical recent values for the process or values that would overestimate emissions from the process, unless there is a compelling reason to adopt a different value (e.g., installation of a destruction device for a previously uncontrolled process). If there is such a reason, it must be documented in the GHG Monitoring Plan.

(v) *GWPs.* To convert the fluorinated GHG emissions to CO_2e, use Equation A–1 of §98.2. ~~For fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part, use a default GWP of 2,000 unless you submit a request to use other GWPs for those fluorinated GHGs in that process under paragraph (c)(1)(vi) of this section and we approve that request.~~

(vi) [Reserved] ~~*Request to use a GWP other than 2,000 for fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part.* If your process vent emits one or more fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part, that are emitted in quantities that, with a default GWP of 2,000, result in total calculated annual emissions equal to or greater than 10,000 metric tons CO_2e for the vent, and that you believe have GWPs that would result in total calculated annual emissions less than 10,000 metric tons CO_2e for the vent, you may submit a request to use provisional GWPs for these fluorinated GHGs for purposes of the calculations in paragraph (c)(1) of this section. The request must be submitted by February 28, 2011 for a completeness determination and review by EPA.~~

~~(A) *Contents of the request.* You must include the following information in the request for each fluorinated GHG that does not have a GWP listed in Table A–1 to subpart A of this part and that constitutes more than one percent by mass of the stream emitted from the vent:~~

~~(*1*) The identity of the fluorinated GHG, including its chemical formula and, if available, CAS number.~~

~~(*2*) The estimated GWP of the fluorinated GHG.~~

~~(*3*) The data and analysis that supports your estimate of the GWP of the fluorinated GHG, including:~~

~~(*i*) Data and analysis related to the low-pressure gas phase infrared absorption spectrum of the fluorinated GHG.~~

~~(*ii*) Data and analysis related to the estimated atmospheric lifetime of the fluorinated GHG (reaction mechanisms and rates, including e.g., photolysis and reaction with atmospheric components such as OH, O_3,CO, and water).~~

~~(*iii*) The radiative transfer analysis that integrates the lifetime and infrared absorption spectrum data to calculate the GWP.~~

~~(*iv*) Any published or unpublished studies of the GWP of the gas.~~

~~(*4*) The engineering calculations or assessments and underlying data that demonstrate that the process vent is calculated to emit less than 10,000 metric tons CO_2e of this and other fluorinated GHGs only when the proposed provisional GWPs, not the default GWP of 2,000, are used for fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part.~~

~~(B) *Review and completeness determination by EPA.* If EPA makes a preliminary determination that the request is complete, that it substantiates each of the provisional GWPs, and that it demonstrates that the process vent is calculated to emit less than 10,000 metric tons CO_2e of this and other fluorinated GHGs only when the provisional GWPs, not the default GWP of 2,000, are used for fluorinated GHGs whose GWPs are not listed in Table A–1 to~~

~~subpart A of this part, then EPA will publish a notice including the data and analysis submitted under paragraphs (c)(1)(vi)(A)(1) through (c)(1)(vi)(A)(3) of this section. If, after review of public comment on the notice, EPA finalizes its preliminary determination, then EPA will permit the facility to use the provisional GWPs for the calculations in paragraph (c)(1) of this section unless and until EPA determines that one or more of the provisional GWPs is in error and provides reasonable notice to the facility.~~

(2) *Method selection for continuous process vents.*

(i) If the calculations under paragraph (c)(1) of this section, as well as any subsequent measurements and calculations under this subpart, indicate that the continuous process vent has fluorinated GHG emissions of less than 10,000 metric ton CO_2e per year, summed across all operating scenarios, then you may comply with either paragraph (c)(3) of this section (Emission Factor approach) or paragraph (c)(4) of this section (Emission Calculation Factor approach).

(ii) If the continuous process vent does not meet the criteria in paragraph (c)(2)(i) of this section, then you must comply with the emission factor method specified in paragraph (c)(3) (Emission Factor approach) of this section.

(A) You must conduct emission testing for process-vent-specific emission factor development before the destruction device unless the calculations you performed under paragraph (c)(1)(iii) of this section indicate that the uncontrolled fluorinated GHG emissions that occur during periods when the process vent is not vented to the properly functioning destruction device are less than 10,000 metric tons CO_2e per year. In this case, you may conduct emission testing after the destruction device to develop a process-vent-specific emission factor. If you do so, you must develop and apply an emission calculation factor under paragraph (c)(4) to estimate emissions during any periods when the process vent is not vented to the properly functioning destruction device.

(B) Regardless of the level of uncontrolled emissions, the emission testing for process-vent-specific emission factor development may be conducted on the outlet side of a wet scrubber in place for acid gas reduction, if one is in place, as long as there is no appreciable reduction in the fluorinated GHG.

(3) *Process-vent-specific emission factor method.* For each process vent, conduct an emission test and measure fluorinated GHG emissions from the process and measure the process activity, such as the feed rate, production rate, or other process activity rate, during the test as described in this paragraph (c)(3). Conduct the emission test according to the procedures in §98.124. All emissions test data and procedures used in developing emission factors must be documented according to §98.127. If more than one operating scenario applies to the process that contains the subject process vent, you must comply with either paragraph (3)(i) or paragraph (3)(ii) of this section.

(i) Conduct a separate emissions test for operation under each operating scenario.

(ii) Conduct an emissions test for the operating scenario that is expected to have the largest emissions in terms of CO_2e (considering both activity levels and emission calculation factors) on an annual basis. Also conduct an emissions test for each additional operating scenario that is estimated to emit 10,000 metric tons CO_2e or more annually from the vent and whose emission calculation factor differs by 15 percent or more from the emission calculation factor of the operating scenario that is expected to have the largest emissions (or of another operating scenario for which emission testing is performed), unless the difference between the operating scenarios is solely due to the application of a destruction device to emissions under one of the operating scenarios. For any other operating scenarios, adjust the process-vent specific emission factor developed for the operating scenario that is expected to have the largest emissions (or for another operating scenario for which emission testing is performed) using the approach in paragraph (c)(3)(viii) of this section.

(iii) You must measure the process activity, such as the process feed rate, process production rate, or other process activity rate, as applicable, during the emission test and calculate the rate for the test period, in kg (or another appropriate metric) per hour.

(iv) For continuous processes, you must calculate the hourly emission rate of each fluorinated GHG using Equation L–19 of this section and determine the hourly emission rate of each fluorinated GHG per process vent (and per operating scenario, as applicable) for the test run.

$$E_{ContPV} = \frac{C_{PV}}{10^6} * MW * Q_{PV} * \frac{1}{SV} * \frac{1}{10^3} * \frac{60}{1} \quad \text{(Eq. L-19)}$$

Where:

E_{ContPV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, during the emission test during test run r (kg/hr).

C_{PV}= Concentration of fluorinated GHG f during test run r of the emission test (ppmv).

MW = Molecular weight of fluorinated GHG f (g/g-mole).

Q_{PV}= Flow rate of the process vent stream during test run r of the emission test (m^3 /min).

SV = Standard molar volume of gas (0.0240 m^3 /g-mole at 68 °F and 1 atm).

$1/10^3$ = Conversion factor (1 kilogram/1,000 grams).

60/1 = Conversion factor (60 minutes/1 hour).

(v) You must calculate a site-specific, process-vent-specific emission factor for each fluorinated GHG for each process vent and each operating scenario, in kg of fluorinated GHG per process activity rate (e.g., kg of feed or production), as applicable, using Equation L–20 of this section. For continuous processes, divide the hourly fluorinated GHG emission rate during the test by the hourly process activity rate during the test runs.

$$EF_{PV} = \frac{\sum_{1}^{r}\left(\frac{E_{PV}}{Activity_{EmissionTest}}\right)}{r} \quad \text{(Eq. L-20)}$$

Where:

EF_{PV}= Emission factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j (e.g., kg emitted/kg activity).

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, during the emission test during test run r, for either continuous or batch (kg emitted/hr for continuous, kg emitted/batch for batch).

$Activity_{EmissionTest}$= Process feed, process production, or other process activity rate for process i, operating scenario j, during the emission test during test run r (e.g., kg product/hr).

r = Number of test runs performed during the emission test.

(vi) If you conducted emissions testing after the destruction device, you must calculate the emissions of each fluorinated GHG for the process vent (and operating scenario, as applicable) using Equation L–21 of this section. You must also develop a process-vent-specific emission calculation factor based on paragraph (c)(4) of this section for the periods when the process vent is not venting to the destruction device.

$$E_{PV} = EF_{PV-C} * Activity_{C} + ECF_{PV-U} * Activity_{U} \quad \text{(Eq. L-21)}$$

Where:

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year (kg).

EF_{PV-C}= Emission factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j, based on testing after the destruction device (kg emitted/activity) (e.g., kg emitted/kg product).

$Activity_C$= Total process feed, process production, or other process activity for process i, operating scenario j, during the year for which emissions are vented to the properly functioning destruction device (i.e., controlled).

ECF_{PV-U}= Emission calculation factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j during periods when the process vent is not vented to the properly functioning destruction device (kg emitted/activity) (e.g., kg emitted/kg product).

$Activity_U$= Total process feed, process production, or other process activity during the year for which the process vent is not vented to the properly functioning destruction device (e.g., kg product).

(vii) If you conducted emissions testing before the destruction device, apply the destruction efficiencies of the device that have been demonstrated for the fluorinated GHGs in the vent stream to the fluorinated GHG emissions for the process vent (and operating scenario, as applicable), using Equation L-22 of this section. You may apply the destruction efficiency only to the portion of the process activity during which emissions are vented to the properly functioning destruction device (i.e., controlled).

$$E_{PV} = EF_{PV-U} * \left(Activity_U + Activity_C * (1 - DE)\right) \quad \text{(Eq. L-22)}$$

Where:

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year, considering destruction efficiency (kg).

EF_{PV-U}= Emission factor (uncontrolled) for fluorinated GHG f emitted from process vent v during process i, operating scenario j (kg emitted/kg product).

$Activity_U$= Total process feed, process production, or other process activity for process i, operating scenario j, during the year for which the process vent is not vented to the properly functioning destruction device (e.g., kg product).

$Activity_C$= Total process feed, process production, or other process activity for process i, operating scenario j, during the year for which the process vent is vented to the properly functioning destruction device (e.g., kg product).

DE = Demonstrated destruction efficiency of the destruction device (weight fraction).

(viii) *Adjusted process-vent-specific emission factors for other operating scenarios.* For process vents from processes with multiple operating scenarios, use Equation L-23 of this section to develop an adjusted process-vent-specific emission factor for each operating scenario from which the vent is estimated to emit less than 10,000 metric tons CO_2e annually or whose emission calculation factor differs by less than 15 percent from the emission calculation factor of the operating scenario that is expected to have the largest emissions (or of another operating scenario for which emission testing is performed).

$$EF_{PVadj} = \frac{ECF_{UT}}{ECF_T} * EF_{PV} \quad \text{(Eq. L-23)}$$

Where:

EF_{PVadj}= Adjusted process-vent-specific emission factor for an untested operating scenario.

ECF_{UT}= Emission calculation factor for the untested operating scenario developed under paragraph (c)(4) of this section.

ECF_{T}= Emission calculation for the tested operating scenario developed under paragraph (c)(4) of this section.

EF_{PV}= Process vent specific emission factor for the tested operating scenario.

(ix) Sum the emissions of each fluorinated GHG from all process vents in each operating scenario and all operating scenarios in the process for the year to estimate the total process vent emissions of each fluorinated GHG from the process, using Equation L-24 of this section.

$$E_{Pfi} = \sum_{1}^{o} \sum_{1}^{v} E_{PV} \quad \text{(Eq. L-24)}$$

Where:

E_{Pfi}= Mass of fluorinated GHG f emitted from process vents for process i for the year (kg).

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year, considering destruction efficiency (kg).

v = Number of process vents in process i, operating scenario j.

o = Number of operating scenarios for process i.

(4) *Process-vent-specific emission calculation factor method.* For each process vent within an operating scenario, determine fluorinated GHG emissions by calculations and determine the process activity rate, such as the feed rate, production rate, or other process activity rate, associated with the emission rate.

(i) You must calculate uncontrolled emissions of fluorinated GHG by individual process vent, E_{PV}, by using measurements, by using calculations based on chemical engineering principles and chemical property data, or by conducting an engineering assessment. Use the procedures in paragraphs (c)(1)(i) or (ii) of this section, except paragraph (c)(1)(ii)(C) of this section. The procedures in paragraphs (c)(1)(i) and (ii) of this section may be applied either to batch process vents or to continuous process vents. The uncontrolled emissions must be based on a typical batch or production rate under a defined operating scenario. The process activity rate associated with the uncontrolled emissions must be determined. The methods, data, and assumptions used to estimate emissions for each operating scenario must be selected to yield a best estimate (expected value) of emissions rather than an over- or underestimate of emissions for that operating scenario. All data, assumptions, and procedures used in the calculations or engineering assessment must be documented according to §98.127.

(ii) You must calculate a site-specific, process-vent-specific emission calculation factor for each process vent, each operating scenario, and each fluorinated GHG, in kg of fluorinated GHG per activity rate (e.g., kg of feed or production) as applicable, using Equation L-25 of this section.

$$ECF_{PV} = \frac{E_{PV}}{Activity_{Representative}} \quad \text{(Eq. L-25)}$$

Where:

ECF_{PV}= Emission calculation factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j, (e.g., kg emitted/kg product).

E_{PV}= Average mass of fluorinated GHG f emitted, based on calculations, from process vent v from process i, operating scenario j, during the period or batch for which emissions were calculated, for either continuous or batch (kg emitted/hr for continuous, kg emitted/batch for batch).

$\text{Activity}_{\text{Representative}}$= Process feed, process production, or other process activity rate corresponding to average mass of emissions based on calculations (e.g., kg product/hr for continuous, kg product/batch for batch).

(iii) You must calculate emissions of each fluorinated GHG for the process vent (and operating scenario, as applicable) for the year by multiplying the process-vent-specific emission calculation factor by the total process activity, as applicable, for the year, using Equation L-26 of this section.

$$E_{PV} = ECF_{PV} * Activity \quad \text{(Eq. L-26)}$$

Where:

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year (kg).

ECF_{PV}= Emission calculation factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j, (kg emitted/activity) (e.g., kg emitted/kg product).

Activity = Process feed, process production, or other process activity for process i, operating scenario j, during the year.

(iv) If the process vent is vented to a destruction device, apply the demonstrated destruction efficiency of the device to the fluorinated GHG emissions for the process vent (and operating scenario, as applicable), using Equation L-27 of this section. Apply the destruction efficiency only to the portion of the process activity that is vented to the properly functioning destruction device (i.e., controlled).

$$E_{PV} = ECF_{PV} * \left(Activity_U + Activity_C * (1 - DE)\right) \quad \text{(Eq. L-27)}$$

Where:

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year considering destruction efficiency (kg).

ECF_{PV}= Emission calculation factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j, (e.g., kg emitted/kg product).

Activity_U= Total process feed, process production, or other process activity for process i, operating scenario j, during the year for which the process vent is not vented to the properly functioning destruction device (e.g., kg product).

Activity_C= Total process feed, process production, or other process activity for process i, operating scenario j, during the year for which the process vent is vented to the properly functioning destruction device (e.g., kg product).

DE = Demonstrated destruction efficiency of the destruction device (weight fraction).

(v) Sum the emissions of each fluorinated GHG from all process vents in each operating scenario and all operating scenarios in the process for the year to estimate the total process vent emissions of each fluorinated GHG from the process, using Equation L-28 of this section.

$$E_{Pfi} = \sum_{1}^{o} \sum_{1}^{v} E_{PV} \quad \text{(Eq. L-28)}$$

Where:

E_{Pfi}= Mass of fluorinated GHG f emitted from process vents for process i for the year (kg).

E_{PV}= Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year, considering destruction efficiency (kg).

v = Number of process vents in process i, operating scenario j.

o = Number of operating scenarios in process i.

(d) *Calculate fluorinated GHG emissions for equipment leaks (EL).* If you comply with paragraph (c) of this section, you must calculate the fluorinated GHG emissions from pieces of equipment associated with processes covered under this subpart and in fluorinated GHG service. If you conduct monitoring of equipment in fluorinated GHG service, monitoring must be conducted for those in light liquid and in gas and vapor service. If you conduct monitoring of equipment in fluorinated GHG service, you may exclude from monitoring each piece of equipment that is difficult-to-monitor, that is unsafe-to-monitor, that is insulated, or that is in heavy liquid service; you may exclude from monitoring each pump with dual mechanical seals, agitator with dual mechanical seals, pump with no external shaft, agitator with no external shaft; you may exclude from monitoring each pressure relief device in gas and vapor service with upstream rupture disk, each sampling connection system with closed-loop or closed-purge systems, and any pieces of equipment where leaks are routed through a closed vent system to a destruction device. You must estimate emissions using another approach for those pieces of equipment excluded from monitoring. Equipment that is in fluorinated GHG service for less than 300 hr/yr; equipment that is in vacuum service; pressure relief devices that are in light liquid service; and instrumentation systems are exempted from these requirements.

(1) The emissions from equipment leaks must be calculated using any of the procedures in paragraphs (d)(1)(i), (d)(1)(ii), (d)(1)(iii), or (d)(1)(iv) of this section.

(i) *Use of Average Emission Factor Approach in EPA Protocol for Equipment Leak Emission Estimates.* The emissions from equipment leaks may be calculated using the default Average Emission Factor Approach in EPA–453/R–95–017 (incorporated by reference, see §98.7).

(ii) *Use of Other Approaches in EPA Protocol for Equipment Leak Emission Estimates in conjunction with EPA Method 21 at 40 CFR part 60, appendix A–7.* The emissions from equipment leaks may be calculated using one of the following methods in EPA–453/R–95–017 (incorporated by reference, see §98.7): The Screening Ranges Approach; the EPA Correlation Approach; or the Unit-Specific Correlation Approach. If you determine that EPA Method 21 at 40 CFR part 60, appendix A–7 is appropriate for monitoring a fluorinated GHG, and if you calibrate your instrument with a compound different from one or more of the fluorinated GHGs or surrogates to be measured, you must develop response factors for each fluorinated GHG or for each surrogate to be measured using EPA Method 21 at 40 CFR part 60, appendix A–7. For each fluorinated GHG or surrogate measured, the response factor must be less than 10. The response factor is the ratio of the known concentration of a fluorinated GHG or surrogate to the observed meter reading when measured using an instrument calibrated with the reference compound.

(iii) *Use of Other Approaches in EPA Protocol for Equipment Leak Emission Estimates in conjunction with site-specific leak monitoring methods.* The emissions from equipment leaks may be calculated using one of the following methods in EPA–453/R–95–017 (incorporated by reference, see §98.7): The Screening Ranges Approach; the EPA Correlation Approach; or the Unit-Specific Correlation Approach. You may develop a site-specific leak monitoring method appropriate for monitoring fluorinated GHGs or surrogates to use along with these three approaches. The site-specific leak monitoring method must meet the requirements in §98.124(f)(1).

(iv) *Use of site-specific leak monitoring methods.* The emissions from equipment leaks may be calculated using a site-specific leak monitoring method. The site-specific leak monitoring method must meet the requirements in §98.124(f)(1).

(2) You must collect information on the number of each type of equipment; the service of each piece of equipment (gas, light liquid, heavy liquid); the concentration of each fluorinated GHG in the stream; and the time period each piece of equipment was in service. Depending on which approach you follow, you may be required to collect information for equipment on the associated screening data concentrations for greater than or equal to 10,000 ppmv and associated screening data concentrations for less than 10,000 ppmv; associated actual screening data concentrations; or associated screening data and leak rate data (i.e., bagging) used to develop a unit-specific correlation.

(3) Calculate and sum the emissions of each fluorinated GHG in metric tons per year for equipment pieces for each process, E_{ELf}, annually. You must include and estimate emissions for types of equipment that are excluded from monitoring, including difficult-to-monitor, unsafe-to-monitor and insulated pieces of equipment, pieces of equipment in heavy liquid service, pumps with dual mechanical seals, agitators with dual mechanical seals, pumps with no external shaft, agitators with no external shaft, pressure relief devices in gas and vapor service with upstream rupture disk, sampling connection systems with closed-loop or closed purge systems, and pieces of equipment where leaks are routed through a closed vent system to a destruction device.

(e) *Calculate total fluorinated GHG emissions for each process and for production or transformation processes at the facility.*

(1~~i~~) Estimate annually the total mass of each fluorinated GHG emitted from each process, including emissions from process vents in paragraphs (c)(3) and (c)(4) of this section, as appropriate, and from equipment leaks in paragraph (d), using Equation L-29 of this section.

$$E_i = E_{Pfi} + E_{ELfi} \quad \text{(Eq. L-29)}$$

Where:

E_i= Total mass of each fluorinated GHG f emitted from process i, annual basis (kg/year).

E_{Pfi}= Mass of fluorinated GHG f emitted from all process vents and all operating scenarios in process i, annually (kg/year, calculated in Equation L-24 or L-28 of this section, as appropriate).

E_{ELfi}= Mass of fluorinated GHG f emitted from equipment leaks for pieces of equipment for process i, annually (kg/year, calculated in paragraph (d)(3) of this section).

(2~~ii~~) Estimate annually the total mass of each fluorinated GHG emitted from each type of production or transformation process at the facility using Equation L-30 of this section. Develop separate totals for fluorinated gas production processes, transformation processes that transform fluorinated gases produced at the facility, and transformation processes that transform fluorinated gases produced at another facility.

$$E = \sum_{i=1}^{z} E_i * 0.001 \quad \text{(Eq. L-30)}$$

Where:

E = Total mass of each fluorinated GHG f emitted from all fluorinated gas production processes, all transformation processes that transform fluorinated gases produced at the facility, or all transformation processes that transform fluorinated gases produced at another facility, as appropriate (metric tons).

E_i= Total mass of each fluorinated GHG f emitted from each production or transformation process, annual basis (kg/year, calculated in Equation L-29 of this section).

0.001 = Conversion factor from kg to metric tons.

z = Total number of fluorinated gas production processes, fluorinated gas transformation processes that transform fluorinated gases produced at the facility, or transformation processes that transform fluorinated gases produced at another facility, as appropriate.

(f) *Calculate fluorinated GHG emissions from destruction of fluorinated GHGs that were previously "produced".* Estimate annually the total mass of fluorinated GHGs emitted from destruction of fluorinated GHGs that were previously "produced" as defined at §98.410(b) using Equation L-31 of this section:

$$E_D = RE_D * (1 - DE) \quad \text{(Eq. L-31)}$$

Where:

E_D= The mass of fluorinated GHGs emitted annually from destruction of fluorinated GHGs that were previously “produced” as defined at §98.410(b) (metric tons).

RE_D= The mass of fluorinated GHGs that were previously “produced” as defined at §98.410(b) and that are fed annually into the destruction device (metric tons).

DE = Destruction efficiency of the destruction device (fraction).

(g) *Emissions from venting of residual fluorinated GHGs in containers.* If you vent residual fluorinated GHGs from containers, you must either measure the residual fluorinated GHGs vented from each container or develop a heel factor for each combination of fluorinated GHG, container size, and container type that you vent. You do not need to estimate de minimis emissions associated with good-faith attempts to recycle or recover residual fluorinated GHGs in or from containers.

(1) *Measuring contents of each container.* If you weigh or otherwise measure the contents of each container before venting the residual fluorinated GHGs, use Equation L-32 of this section to calculate annual emissions of each fluorinated GHG from venting of residual fluorinated GHG from containers. Convert pressures to masses as directed in paragraph (g)(2)(ii) of this section.

$$E_{Cf} = \sum_{1}^{n} H_{Bfj} - \sum_{1}^{n} H_{Efj} \quad \text{(Eq. L-32)}$$

Where:

E_{Cf}= Total mass of each fluorinated GHG f emitted from the facility through venting of residual fluorinated GHG from containers, annual basis (~~kg~~metric tons/year).

H_{Bfj}= Mass of residual fluorinated GHG f in container j when received by facility (metric tons).

H_{Efj}= Mass of residual fluorinated GHG f in container j after evacuation by facility (metric tons). (Facility may equate to zero.)

n = Number of vented containers for each fluorinated GHG f.

(2) *Developing and applying heel factors.* If you use heel factors to estimate emissions of residual fluorinated GHGs vented from containers, you must annually develop these factors based on representative samples of the containers received by your facility from fluorinated GHG users.

(i) *Sample size.* For each combination of fluorinated GHG, container size, and container type that you vent, select a representative sample of containers that reflects the full range of quantities of residual gas returned in that container size and type. This sample must reflect the full range of the industries and a broad range of the customers that use and return the fluorinated GHG, container size, and container type. The minimum sample size for each combination of fluorinated GHG, container size, and container type must be 30, unless this is greater than the number of containers returned within that combination annually, in which case the contents of every container returned must be measured.

(ii) *Measurement of residual gas.* The residual weight or pressure you use for paragraph (g)(1) of this section must be determined by monitoring the mass or the pressure of your cylinders/containers according to §98.124(k). If you monitor the pressure, convert the pressure to mass using a form of the ideal gas law, as displayed in Equation L-33 of this section, with an appropriately selected Z value.

$$m_R=(p\times V\times MW\ )/(Z\times R\times T\times 〖10〗^6)\quad \text{(Eq. L-33)}$$

$$pV=ZnRT \quad \text{(Eq. L-33)}$$

~~where~~

Where:

m_R = Mass of residual gas in the container (metric ton)

p = Absolute pressure of the gas (Pa)

V = Volume of the gas (m^3~~-~~)

MW = Molecular weight of the fluorinated GHG f (g/gmole)

Z = Compressibility factor

~~n = Amount of substance of the gas (moles)~~

R = Gas constant (8.314 ~~Joule~~Pa m^3/Kelvin mole)

T = Absolute temperature (K)

10^6 = Conversion factor (10^6 g/metric ton)

(iii) *Heel factor calculation.* To determine the heel factor h_{fj} for each combination of fluorinated GHG, container size, and container type, use paragraph (g)(1) of this section to calculate the total heel emissions for each sample selected under paragraph (g)(2)(i) of this section. Divide this total by the number of containers in the sample. Divide the result by the full capacity (the mass of the contents of a full container) of that combination of fluorinated GHG, container size, and container type. The heel factor is expressed as a fraction of the full capacity.

(iv) Calculate annual emissions of each fluorinated GHG from venting of residual fluorinated GHG from containers using Equation L-34 of this section.

$$E_{Cf} = \sum_{j=1}^{n} h_{fj} * N_{fj} * F_{fj} \quad \text{(Eq. L-34)}$$

Where:

E_{Cf}= Total mass of each fluorinated GHG f emitted from the facility through venting of residual fluorinated GHG from containers, annual basis (~~kg~~metric tons/year).

h_{fj}= Facility-wide gas-specific heel factor for fluorinated GHG f (fraction) and container size and type j, as determined in paragraph (g)(2)(iii) of this section.

N_{fj}= Number of containers of size and type j returned to the fluorinated gas production facility.

F_{fj}= Full capacity of containers of size and type j containing fluorinated GHG f (~~kg~~metric tons).

n = Number of combinations of container sizes and types for fluorinated GHG f.

(h) *Effective destruction efficiency for each process.* If you used the emission factor or emission calculation factor method to calculate emissions from the process, use Equation L-35 to calculate the effective destruction efficiency for the process, including each process vent:

$$DE_{Effective} = 1 - \frac{\sum_{1}^{w}\left(\sum_{1}^{o}\ \sum_{1}^{v} E_{PVf}\right)\times GWP_f}{\sum_{1}^{w}\left(\sum_{1}^{o}\ \sum_{1}^{v} ECF_{PV-Uf}\times\left(Activity_U + Activity_C\right)\right)\times GWP_f + \sum_{1}^{w}\left(\sum_{1}^{o}\ \sum_{1}^{v} EF_{PV-Uf}\times\left(Activity_U + Activity_C\right)\right)\times GWP_f}$$

(Eq. L-35)

Where:

$DE_{Effective}$ = Effective destruction efficiency for process i (fraction).

E_{PVf} = Mass of fluorinated GHG f emitted from process vent v from process i, operating scenario j, for the year, calculated in Equation L-21, L-22, L-26, or L-27of this section (kg).

GWP_f = Global warming potential for each greenhouse gas from Table A-1 to subpart A of this part or Table L-1 of this subpart. If the GHG has a GWP listed in Table A-1, use that GWP. Otherwise, use the default GWP provided in Table L-1 for the fluorinated GHG group of which the GHG is a member.

ECF_{PV-Uf} = Emission calculation factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j during periods when the process vent is not vented to the properly functioning destruction device, as used in Equation L-21; or Emission calculation factor for fluorinated GHG f emitted from process vent v during process i, operating scenario j, as used in Equation L-26 or L-27 (kg emitted/activity) (e.g., kg emitted/kg product), denoted as "ECF_{PV}" in those equations.

EF_{PV-Uf} = Emission factor (uncontrolled) for fluorinated GHG f emitted from process vent v during process i, operating scenario j, as used in Equation L-22 (kg emitted/activity) (e.g., kg emitted/kg product).

$Activity_U$= Total process feed, process production, or other process activity during the year for which the process vent is not vented to the properly functioning destruction device (e.g., kg product).

$Activity_C$= Total process feed, process production, or other process activity for process i, operating scenario j, during the year for which emissions are vented to the properly functioning destruction device (i.e., controlled).

o = Number of operating scenarios for process i.

v = Number of process vents in process i, operating scenario j.

w-= Number of fluorinated GHG emitted from the process.

§ 98.124 Monitoring and QA/QC requirements.

(a) *Initial scoping speciation to identify fluorinated GHGs.* You must conduct an initial scoping speciation to identify all fluorinated GHGs that may be generated from processes that are subject to this subpart and that have at least one process vent with uncontrolled emissions of 1.0 metric ton or more of fluorinated GHGs per year based on the preliminary estimate of emissions in §98.123(c)(1). You are not required to quantify emissions under this initial scoping speciation. Only fluorinated GHG products and by-products that occur in greater than trace concentrations in at least one stream must be identified under this paragraph.

(1) *Procedure.* To conduct the scoping speciation, select the stream(s) (including process streams or destroyed streams) or process vent(s) that would be expected to individually or collectively contain all of the fluorinated GHG by-products of the process at their maximum concentrations and sample and analyze the contents of these selected streams or process vents. For example, if fluorinated GHG by-products are separated into one low-boiling-point and one high-boiling-point stream, sample and analyze both of these streams. Alternatively, you may sample and analyze streams where fluorinated GHG by-products occur at less than their maximum concentrations, but you must ensure that the sensitivity of the analysis is sufficient to compensate for the expected difference in concentration. For

example, if you sample and analyze streams where fluorinated GHG by-products are expected to occur at one half their maximum concentrations elsewhere in the process, you must ensure that the sensitivity of the analysis is sufficient to detect fluorinated GHG by-products that occur at concentrations of 0.05 percent or higher. You do not have to sample and analyze every stream or process vent, i.e., you do not have to sample and analyze a stream or process vent that contains only fluorinated GHGs that are contained in other streams or process vents that are being sampled and analyzed. Sampling and analysis must be conducted according to the procedures in paragraph (e) of this section.

(2) *Previous measurements.* If you have conducted testing of streams (including process streams or destroyed streams) or process vents less than 10 years before December 31, 2010, and the testing meets the requirements in paragraph (a)(1) of this section, you may use the previous testing to satisfy this requirement.

(b) *Mass balance monitoring.* Mass balance monitoring was available for reporting years 2011, 2012, 2013, and 2014 only. The mass balance monitoring provisions may be found at 75 FR 74774, 74843-74845 (December 1, 2010). ~~If you determine fluorinated GHG emissions from any process using the mass balance method under §98.123(b), you must estimate the total mass of each fluorinated GHG emitted from that process at least monthly. Only streams that contain greater than trace concentrations of fluorine-containing reactants, products, or by-products must be monitored under this paragraph. If you use an element other than fluorine in the mass-balance equation pursuant to §98.123(b)(3), substitute that element for fluorine in the monitoring requirements of this paragraph.~~

~~(1) *Mass measurements.* Measure the following masses on a monthly or more frequent basis using flowmeters, weigh scales, or a combination of volumetric and density measurements with accuracies and precisions that allow the facility to meet the error criteria in §98.123(b)(1):~~

~~(i) Total mass of each fluorine-containing product produced. Account for any used fluorine-containing product added into the production process upstream of the output measurement as directed at §98.413(b) and §98.414(b). For each product, the mass produced used for the mass-balance calculation must be the same as the mass produced that is reported under subpart OO of this part, where applicable.~~

~~(ii) Total mass of each fluorine-containing reactant fed into the process.~~

~~(iii) The mass removed from the process in each stream fed into the destruction device.~~

~~(iv) The mass removed from the process in each recaptured stream.~~

~~(2) *Concentration measurements for use with §98.123(b)(4).* If you use §98.123(b)(4) to estimate the mass of fluorine in destroyed or recaptured streams, measure the following concentrations at least once each calendar month during which the process is operating, on a schedule to ensure that the measurements are representative of the full range of process conditions (e.g., catalyst age). Measure more frequently if this is necessary to meet the error criteria in §98.123(b)(1). Use equipment and methods (e.g., gas chromatography) that comply with paragraph (e) of this section and that have an accuracy and precision that allow the facility to meet the error criteria in §98.123(b)(1). Only fluorine-containing reactants, products, and by-products that occur in a stream in greater than trace concentrations must be monitored under this paragraph.~~

~~(i) The concentration (mass fraction) of the fluorine-containing product in each stream that is fed into the destruction device.~~

~~(ii) The concentration (mass fraction) of each fluorine-containing by-product in each stream that is fed into the destruction device.~~

~~(iii) The concentration (mass fraction) of each fluorine-containing reactant in each stream that is fed into the destruction device.~~

~~(iv) The concentration (mass fraction) of each fluorine-containing by-product in each stream that is recaptured (c_{Bkl}).~~

~~(3) *Concentration measurements for use with §98.123(b)(15).* If you use §98.123(b)(15) to estimate the mass of fluorine in destroyed or recaptured streams, measure the concentrations listed in paragraphs (3)(i) and (ii) of this section at least once each calendar month during which the process is operating, on a schedule to ensure that the~~

~~measurements are representative of the full range of process conditions (e.g., catalyst age). Measure more frequently if this is necessary to meet the error criteria in §98.123(b)(1). Use equipment and methods (e.g., gas chromatography) that comply with paragraph (e) of this section and that have an accuracy and precision that allow the facility to meet the error criteria in §98.123(b)(1). Only fluorine-containing reactants, products, and by-products that occur in a stream in greater than trace concentrations must be monitored under this paragraph.~~

~~(i) The concentration (mass fraction) of total fluorine in each stream that is fed into the destruction device.~~

~~(ii) The concentration (mass fraction) of total fluorine in each stream that is recaptured.~~

~~(4) *Emissions characterization: process vents emitting 25,000 metric tons CO 2 e or more.* To characterize emissions from any process vent emitting 25,000 metric tons CO_2e or more, comply with paragraphs (b)(4)(i) through (b)(4)(v) of this section, as appropriate. Only fluorine-containing reactants, products, and by-products that occur in a stream in greater than trace concentrations must be monitored under this paragraph.~~

~~(i) *Uncontrolled emissions.* If emissions from the process vent are not routed through a destruction device, sample and analyze emissions at the process vent or stack or sample and analyze emitted streams before the process vent. If the process has more than one operating scenario, you must either perform the emission characterization for each operating scenario or perform the emission characterization for the operating scenario that is expected to have the largest emissions and adjust the emission characterization for other scenarios using engineering calculations and assessments as specified in §98.123(c)(4). To perform the characterization, take three samples under conditions that are representative for the operating scenario. Measure the concentration of each fluorine-containing compound in each sample. Use equipment and methods that comply with paragraph (e) of this section. Calculate the average concentration of each fluorine-containing compound across all three samples.~~

~~(ii) *Controlled emissions using §98.123(b)(15).* If you use §98.123(b)(15) to estimate the total mass of fluorine in destroyed or recaptured streams, and if the emissions from the process vent are routed through a destruction device, characterize emissions as specified in paragraph (b)(4)(i) of this section before the destruction device. Apply the destruction efficiency demonstrated for each fluorinated GHG in the destroyed stream to that fluorinated GHG. Exclude from the characterization fluorine-containing compounds that are not fluorinated GHGs.~~

~~(iii) *Controlled emissions using §98.123(b)(4).* If you use §98.123(b)(4) to estimate the mass of fluorine in destroyed or recaptured streams, and if the emissions from the process vent are routed through a destruction device, characterize the process vent's emissions monthly (or more frequently) using the monthly (or more frequent) measurements under paragraphs (b)(1)(iii) and (b)(2)(i) through (b)(2)(iii) of this section. Apply the destruction efficiency demonstrated for each fluorinated GHG in the destroyed stream to that fluorinated GHG. Exclude from the characterization fluorine-containing compounds that are not fluorinated GHGs.~~

~~(iv) *Emissions characterization frequency.* You must repeat emission characterizations performed under paragraph (b)(4)(i) and (b)(4)(ii) of this section under paragraph (b)(4)(iv)(A) or (b)(4)(iv)(B) of this section, whichever occurs first:~~

~~(A) *10-year revision.* Repeat the emission characterization every 10 years. In the calculations under §98.123, apply the revised emission characterization to the process activity that occurs after the revision.~~

~~(B) *Operating scenario change that affects the emission characterization.* For planned operating scenario changes, you must estimate and compare the emission calculation factors for the changed operating scenario and for the original operating scenario whose process vent specific emission factor was measured. Use the engineering calculations and assessments specified in §98.123(c)(4). If the share of total fluorine-containing compound emissions represented by any fluorinated GHG changes under the changed operating scenario by 15 percent or more of the total, relative to the previous operating scenario (this includes the cumulative change in the emission calculation factor since the last emissions test), you must repeat the emission characterization. Perform the emission characterization before February 28 of the year that immediately follows the change. In the calculations under §98.123, apply the revised emission characterization to the process activity that occurs after the operating scenario change.~~

~~(v) *Subsequent measurements.* If a process vent with fluorinated GHG emissions less than 25,000 metric tons CO_2e, per §98.123(c)(2), is later found to have fluorinated GHG emissions of 25,000 metric tons CO_2e or greater, you must perform an emission characterization under this paragraph during the following year.~~

~~(5) *Emissions characterization: process vents emitting less than 25,000 metric tons* CO_2*e.* To characterize emissions from any process vent emitting less than 25,000 metric tons CO_2e, comply with paragraphs (b)(5)(i) through (b)(5)(iii) of this section, as appropriate. Only fluorine-containing reactants, products, and by-products that occur in a stream in greater than trace concentrations must be monitored under this paragraph.~~

~~(i) *Uncontrolled emissions.* If emissions from the process vent are not routed through a destruction device, emission measurements must consist of sampling and analysis of emissions at the process vent or stack, sampling and analysis of emitted streams before the process vent, previous test results, provided the tests are representative of current operating conditions of the process, or bench-scale or pilot-scale test data representative of the process operating conditions.~~

~~(ii) *Controlled emissions using §98.123(b)(15).* If you use §98.123(b)(15) to estimate the total mass of fluorine in destroyed or recaptured streams, and if the emissions from the process vent are routed through a destruction device, characterize emissions as specified in paragraph (b)(5)(i) of this section before the destruction device. Apply the destruction efficiency demonstrated for each fluorinated GHG in the destroyed stream to that fluorinated GHG. Exclude from the characterization fluorine-containing compounds that are not fluorinated GHGs.~~

~~(iii) *Controlled emissions using §98.123(b)(4).* If you use §98.123(b)(4) to estimate the mass of fluorine in destroyed or recaptured streams, and if the emissions from the process vent are routed through a destruction device, characterize the process vent's emissions monthly (or more frequently) using the monthly (or more frequent) measurements under paragraphs (b)(1)(iii) and (b)(2)(i) through (b)(2)(iii) of this section. Apply the destruction efficiency demonstrated for each fluorinated GHG in the destroyed stream to that fluorinated GHG. Exclude from the characterization fluorine-containing compounds that are not fluorinated GHGs.~~

~~(6) *Emissions characterization: emissions not accounted for by process vent estimates.* Calculate the weighted average emission characterization across the process vents before any destruction devices. Apply the weighted average emission characterization for all the process vents to any fluorine emissions that are not accounted for by process vent estimates.~~

~~(7) *Impurities in reactants.* If any fluorine-containing impurity is fed into a process along with a reactant (or other input) in greater than trace concentrations, this impurity shall be monitored under this section and included in the calculations under §98.123 in the same manner as reactants fed into the process, fed into the destruction device, recaptured, or emitted, except the concentration of the impurity in the mass fed into the process shall be measured, and the mass of the impurity fed into the process shall be calculated as the product of the concentration of the impurity and the mass fed into the process. The mass of the reactant fed into the process may be reduced to account for the mass of the impurity.~~

~~(8) *Alternative to error calculation.* As an alternative to calculating the relative and absolute errors associated with the estimate of emissions under §98.123(b), you may comply with the precision, accuracy, measurement and calculation frequency, and fluorinated GHG throughput requirements of paragraph (b)(8)(i) through (b)(8)(iv) of this section.~~

~~(i) *Mass measurements.* Measure the masses specified in paragraph (b)(1) of this section using flowmeters, weigh scales, or a combination of volumetric and density measurements with accuracies and precisions of ±0.2 percent of full scale or better.~~

~~(ii) *Concentration measurements.* Measure the concentrations specified in paragraph (b)(2) or paragraph (b)(3) of this section, as applicable, using analytical methods with accuracies and precisions of ±10 percent or better.~~

~~(iii) *Measurement and calculation frequency.* Perform the mass measurements specified in paragraph (b)(1) of this section and the concentration measurements specified in paragraph (b)(2) or paragraph (b)(3) of this section, as applicable, at least weekly, and calculate emissions at least weekly.~~

~~(iv) *Fluorinated-GHG throughput limit.* You may use the alternative to the error calculation specified in paragraph (b)(8) of this section only if the total annual CO_2-equivalent fluorinated GHG throughput of the process is 500,000 mtCO_2e or less. The total throughput is the sum of the masses of the fluorinated GHG reactants, products, and by-products fed into and generated by the process. To convert these masses to CO_2e, use Equation A–1 of §98.2. For fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part, use a default GWP of 2,000.~~

(c) *Emission factor testing.* If you determine fluorinated GHG emissions using the site-specific process-vent-specific emission factor, you must meet the requirements in paragraphs (c)(1) through (c)(8) of this section.

(1) *Process vent testing.* Conduct an emissions test that is based on representative performance of the process or operating scenario(s) of the process, as applicable. Include in the emission test any fluorinated greenhouse gas that was identified in the initial scoping speciation or is otherwise known to occur in the vent stream.~~occurs in more than trace concentrations in the vent stream or, where a destruction device is used, in the inlet to the destruction device~~. You may include startup and shutdown events if the testing is sufficiently long or comprehensive to ensure that such events are not overrepresented in the emission factor. Malfunction events must not be included in the testing. ~~If you conduct your emission testing after a destruction device, and if the outlet concentration of a fluorinated GHG that is fed into the device is below the detection limit of the method, you may use a concentration of one-half the detection limit to estimate the emission factor.~~ If you do not detect a fluorinated GHG that was identified in the scoping speciation or is otherwise known to occur in the vent stream, assume that fluorinated GHG was emitted at one half of the detection limit.

(2) *Number of runs.* For continuous processes, sample the process vent for a minimum of 3 runs of 1 hour each. If the relative standard deviation (RSD) of the emission factor calculated based on the first 3 runs is greater than or equal to 0.15 for the emission factor, continue to sample the process vent for an additional 3 runs of 1 hour each. If more than one fluorinated GHG is measured, the RSD must be expressed in terms of total CO$_2$ e~~quivalents~~. For fluorinated GHGs whose GWPs are not listed in Table A–1 to subpart A of this part, use the default GWP provided for the fluorinated GHG group of which the GHG is a member ~~a default GWP of 2,000~~ in Table L-1 of this subpart in the RSD calculation.

(3) *Process activity measurements.* Determine the mass rate of process feed, process production, or other process activity as applicable during the test using flow meters, weigh scales, or other measurement devices or instruments with an accuracy and precision of ±1 percent of full scale or better. These devices may be the same plant instruments or procedures that are used for accounting purposes (such as weigh hoppers, belt weigh feeders, combination of volume measurements and bulk density, etc.) if these devices or procedures meet the requirement. For monitoring ongoing process activity, use flow meters, weigh scales, or other measurement devices or instruments with an accuracy and precision of ±1 percent of full scale or better.

(4) *Sample each process.* If process vents from separate processes are manifolded together to a common vent or to a common destruction device, you must follow paragraph (c)(4)(i), (c)(4)(ii), or (c)(4)(iii) of this section.

(i) You may sample emissions from each process in the ducts before the emissions are combined.

(ii) You may sample in the common duct or at the outlet of the destruction device when only one process is operating.

(iii) You may sample the combined emissions and use engineering calculations and assessments as specified in §98.123(c)(4) to allocate the emissions to each manifolded process vent, provided the sum of the calculated fluorinated GHG emissions across the individual process vents is within 20 percent of the total fluorinated GHG emissions measured during the manifolded testing.

(5) *Emission test results.* The results of an emission test must include the analysis of samples, number of test runs, the results of the RSD analysis, the analytical method used, determination of emissions, the process activity, and raw data and must identify the process, the operating scenario, the process vents tested, and the fluorinated GHGs that were included in the test. ~~(i.e., the fluorinated GHGs that occur in more than trace concentrations in the vent stream or, where a destruction device is used, in the inlet to the destruction device, and any other fluorinated GHGs included in the test).~~ The emissions test report must contain all information and data used to derive the process-vent-specific emission factor, as well as key process conditions during the test. Key process conditions include those that are normally monitored for process control purposes and may include but are not limited to yields, pressures, temperatures, etc. (e.g., of reactor vessels, distillation columns).

(6~~7~~) *Emissions testing frequency.* You must conduct emissions testing to develop the process-vent-specific emission factor under paragraph (c)(7)(i) or (c)(7)(ii) of this section, whichever occurs first:

(i) *10-year revision.* Conduct an emissions test every 10 years. In the calculations under §98.123, apply the revised process-vent-specific emission factor to the process activity that occurs after the revision.

(ii) *Operating scenario change that affects the emission factor.* For planned operating scenario changes, you must estimate and compare the emission calculation factors for the changed operating scenario and for the original operating scenario whose process vent specific emission factor was measured. Use the calculation methods in §98.123(c)(4). If the emission calculation factor for the changed operating scenario is 15 percent or more different from the emission calculation factor for the previous operating scenario (this includes the cumulative change in the emission calculation factor since the last emissions test), you must conduct an emissions test to update the process-vent-specific emission factor, unless the difference between the operating scenarios is solely due to the application of a destruction device to emissions under the changed operating scenario. Conduct the test before February 28 of the year that immediately follows the change. In the calculations under §98.123, apply the revised process-vent-specific emission factor to the process activity that occurs after the operating scenario change.

(7~~8~~) *Subsequent measurements.* If a continuous process vent with fluorinated GHG emissions less than 10,000 metric tons CO_2e, per §98.123(c)(2), is later found to have fluorinated GHG emissions of 10,000 metric tons CO_2e or greater, you must conduct the emissions testing for the process vent during the following year and develop the process-vent-specific emission factor from the emissions testing.

(8~~9~~) *Previous measurements.* If you have conducted an emissions test less than 10 years before December 31, 2010, and the emissions testing meets the requirements in paragraphs (c)(1) through (c)(8) of this section, you may use the previous emissions testing to develop process-vent-specific emission factors. For purposes of paragraph (c)(7)(i) of this section, the date of the previous emissions test rather than December 31, 2010 shall constitute the beginning of the 10-year re-measurement cycle.

(d) *Emission calculation factor monitoring.* If you determine fluorinated GHG emissions using the site-specific process-vent-specific emission calculation factor, you must meet the requirements in paragraphs (d)(1) through (d)(4) of this section.

(1) *Operating scenario.* Perform the emissions calculation for the process vent based on representative performance of the operating scenario of the process. If more than one operating scenario applies to the process that contains the subject process vent, you must conduct a separate emissions calculation for operation under each operating scenario. For each continuous process vent that contains more than trace concentrations of any fluorinated GHG and for each batch process vent that contains more than trace concentrations of any fluorinated GHG, develop the process-vent-specific emission calculation factor for each operating scenario. For continuous process vents, determine the emissions based on the process activity for the representative performance of the operating scenario. For batch process vents, determine emissions based on the process activity for each typical batch operating scenario.

(2) *Process activity measurements.* Use flow meters, weigh scales, or other measurement devices or instruments with an accuracy and precision of ±1 percent of full scale or better for monitoring ongoing process activity.

(3) *Emission calculation results.* The emission calculation must be documented by identifying the process, the operating scenario, and the process vents. The documentation must contain the information and data used to calculate the process-vent-specific emission calculation factor.

(4) *Operating scenario change that affects the emission calculation factor.* For planned operating scenario changes that are expected to change the process-vent-specific emission calculation factor, you must conduct an emissions calculation to update the process-vent-specific emission calculation factor. In the calculations under §98.123, apply the revised emission calculation factor to the process activity that occurs after the operating scenario change.

(5) *Previous calculations*. If you have performed an emissions calculation for the process vent and operating scenario less than 10 years before December 31, 2010, and the emissions calculation meets the requirements in paragraphs (d)(1) through (d)(4) of this section and in §98.123(c)(4)(i) and (c)(4)(ii), you may use the previous calculation to develop the site-specific process-vent-specific emission calculation factor.

(e) *Emission and stream testing, including analytical methods.* Select and document testing and analytical methods as follows:

(1) *Sampling and mass measurement for emission testing.* For emission testing in process vents or at the stack, use methods for sampling, measuring volumetric flow rates, non-fluorinated-GHG gas analysis, and measuring stack gas moisture that have been validated using a scientifically sound validation protocol.

(i) Sample and velocity traverses. Acceptable methods include but are not limited to EPA Method 1 or 1A in Appendix A–1 of 40 CFR part 60.

(ii) Velocity and volumetric flow rates. Acceptable methods include but are not limited to EPA Method 2, 2A, 2B, 2C, 2D, 2F, or 2G in Appendix A–1 of 40 CFR part 60. Alternatives that may be used for determining flow rates include OTM–24 (incorporated by reference, see §98.7) and ALT–012 (incorporated by reference, see §98.7).

(iii) Non-fluorinated-GHG gas analysis. Acceptable methods include but are not limited to EPA Method 3, 3A, or 3B in Appendix A–1 of 40 CFR part 60.

(iv) Stack gas moisture. Acceptable methods include but are not limited to EPA Method 4 in Appendix A–1 of 40 CFR part 60.

(2) *Analytical methods.* Use a quality-assured analytical measurement technology capable of detecting the analyte of interest at the concentration of interest and use a sampling and analytical procedure validated with the analyte of interest at the concentration of interest. Where calibration standards for the analyte are not available, a chemically similar surrogate may be used. Acceptable analytical measurement technologies include but are not limited to gas chromatography (GC) with an appropriate detector, infrared (IR), fourier transform infrared (FTIR), and nuclear magnetic resonance (NMR). Acceptable methods for determining fluorinated GHGs include EPA Method 18 in appendix A–1 of 40 CFR part 60, EPA Method 320 in appendix A of 40 CFR part 63, EPA 430–R–10–003 (incorporated by reference, see §98.7), ASTM D6348–03 (incorporated by reference, see §98.7), or other analytical methods validated using EPA Method 301 at 40 CFR part 63, appendix A or some other scientifically sound validation protocol. Acceptable methods for determining total fluorine concentrations for fluorine-containing compounds in streams under paragraph (b)(3) of this section include ASTM D7359–08 (incorporated by reference, see §98.7), or other analytical methods validated using EPA Method 301 at 40 CFR part 63, appendix A or some other scientifically sound validation protocol. The validation protocol may include analytical technology manufacturer specifications or recommendations.

(3) *Documentation in GHG Monitoring Plan.* Describe the sampling, measurement, and analytical method(s) used under paragraphs (e)(1) and (e)(2) of this section in the GHG Monitoring Plan as required under §98.3(g)(5). Identify the methods used to obtain the samples and measurements listed under paragraphs (e)(1)(i) through (e)(1)(iv) of this section. At a minimum, include in the description of the analytical method a description of the analytical measurement equipment and procedures, quantitative estimates of the method's accuracy and precision for the analytes of interest at the concentrations of interest, as well as a description of how these accuracies and precisions were estimated, including the validation protocol used.

(f) *Emission monitoring for pieces of equipment.* If you conduct a site-specific leak detection method or monitoring approach for pieces of equipment, follow paragraph (f)(1) or (f)(2) of this section and follow paragraph (f)(3) of this section.

(1) *Site-specific leak monitoring approach.* You may develop a site-specific leak monitoring approach. You must validate the leak monitoring method and describe the method and the validation in the GHG Monitoring Plan. To validate the site-specific method, you may, for example, release a known rate of the fluorinated GHGs or surrogates of interest, or you may compare the results of the site-specific method to those of a method that has been validated for the fluorinated GHGs or surrogates of interest. In the description of the leak detection method and its validation, include a detailed description of the method, including the procedures and equipment used and any sampling strategies. Also include the rationale behind the method, including why the method is expected to result in an unbiased estimate of emissions from equipment leaks. If the method is based on methods that are used to detect or quantify leaks or other emissions in other regulations, standards, or guidelines, identify and describe the regulations, standards, or guidelines and why their methods are applicable to emissions of fluorinated GHGs or surrogates from leaks. Account for possible sources of error in the method, e.g., instrument detection limits, measurement biases, and sampling biases. Describe validation efforts, including but not limited to any comparisons against standard leaks or concentrations, any comparisons against other methods, and their results. If you use the Screening Ranges Approach, the EPA Correlation Approach, or the Unit-Specific Correlation Approach with a monitoring instrument that does not meet all of the specifications in EPA Method 21 at 40 CFR part 60, appendix A–7, then explain how and why the monitoring instrument, as used at your facility, would nevertheless be expected to accurately detect and quantify emissions of fluorinated GHGs or surrogates from process equipment, and describe how you verified its accuracy. For all methods, provide a quantitative estimate of the accuracy and precision of the method.

(2) *EPA Method 21 monitoring.* If you determine that EPA Method 21 at 40 CFR part 60, appendix A–7 is appropriate for monitoring a fluorinated GHG, conduct the screening value concentration measurements using EPA Method 21 at 40 CFR part 60, appendix A–7 to determine the screening range data or the actual screening value data for the Screening Ranges Approach, EPA Correlation Approach, or the Unit-Specific Correlation Approach. For the one-time testing to develop the Unit-Specific Correlation equations in EPA–453/R–95–017 (incorporated by reference, see §98.7), conduct the screening value concentration measurements using EPA Method 21 at 40 CFR part 60, appendix A–7 and the bagging procedures to measure mass emissions. Concentration measurements of bagged samples must be conducted using gas chromatography following EPA Method 18 analytical procedures or other method according to §98.124(e). Use methane or other appropriate compound as the calibration gas.

(3) *Frequency of measurement and sampling.* If you estimate emissions based on monitoring of equipment, conduct monitoring at least annually. Sample at least one-third of equipment annually (except for equipment that is unsafe-to-monitor, difficult-to-monitor, insulated, or in heavy liquid service, pumps with dual mechanical seals, agitators with dual mechanical seals, pumps with no external shaft, agitators with no external shaft, pressure relief devices in gas and vapor service with an upstream rupture disk, sampling connection systems with closed-loop or closed purge systems, and pieces of equipment whose leaks are routed through a closed vent system to a destruction device), changing the sample each year such that at the end of three years, all equipment in the process has been monitored. If you estimate emissions based on a sample of the equipment in the process, ensure that the sample is representative of the equipment in the process. If you have multiple processes that have similar types of equipment in similar service, and that produce or transform similar fluorinated GHGs (in terms of chemical composition, molecular weight, and vapor pressure) at similar pressures and concentrations, then you may annually sample all of the equipment in one third of these processes rather than one third of the equipment in each process.

(g) *Destruction device performance testing.* If you vent or otherwise feed fluorinated GHGs into a destruction device and apply the destruction efficiency of the device to one or more fluorinated GHGs in §98.123, you must conduct emissions testing to determine the destruction efficiency for each fluorinated GHG to which you apply the destruction efficiency. You must either determine the destruction efficiency for the most-difficult-to-destroy fluorinated GHG fed into the device (or a surrogate that is still more difficult to destroy) and apply that destruction efficiency to all the fluorinated GHGs fed into the device or alternatively determine different destruction efficiencies for different groups of fluorinated GHGs using the most-difficult-to-destroy fluorinated GHG of each group (or a surrogate that is still more difficult to destroy).

(1) *Destruction efficiency testing.* You must sample the inlet and outlet of the destruction device for a minimum of three runs of 1 hour each to determine the destruction efficiency. You must conduct the emissions testing using the methods in paragraph (e) of this section. To determine the destruction efficiency, emission testing must be conducted when operating at high loads reasonably expected to occur (i.e., representative of high total fluorinated GHG load that will be sent to the device) and when destroying the most-difficult-to-destroy fluorinated GHG (or a surrogate that is still more difficult to destroy) that is fed into the device from the processes subject to this subpart or that belongs to the group of fluorinated GHGs for which you wish to establish a DE. If the outlet concentration of a fluorinated GHG that is fed into the device is below the detection limit of the method, you may use a concentration of one-half the detection limit to estimate the destruction efficiency.

(i) If perfluoromethane (CF_4) is vented to the destruction device in any stream in more than trace concentrations, you must test and determine the destruction efficiency achieved specifically for $CF_4$to take credit for the CF_4emissions reduction.

(ii) If sulfur hexafluoride (SF_6) is vented to the destruction device in any stream in more than trace concentrations, you must test and determine the destruction efficiency achieved specifically for SF_6, or alternatively for CF_4as a surrogate, to take credit for the SF_6emissions reduction.

(iii) If saturated perfluorocarbons other than $CF_4$are vented to the destruction device in any stream in more than trace concentrations, you must test and determine the destruction efficiency achieved for the lowest molecular weight saturated perfluorocarbon vented to the destruction device, or alternatively for a lower molecular weight saturated PFC or SF_6as a surrogate, to take credit for the PFC emission reduction.

(iv) For all other fluorinated GHGs that are vented to the destruction device in any stream in more than trace concentrations, you must test and determine the destruction efficiency achieved for the most-difficult-to-destroy fluorinated GHG or surrogate vented to the destruction device. Examples of acceptable surrogates include the Class 1 compounds (ranked 1 through 34) in Appendix D, Table D–1 of “Guidance on Setting Permit Conditions and Reporting Trial Burn Results; Volume II of the Hazardous Waste Incineration Guidance Series,” January 1989, EPA

Publication EPA 625/6–89/019. You can obtain a copy of this publication by contacting the Environmental Protection Agency, 1200 Pennsylvania Avenue, NW., Washington, DC 20460, (202) 272–0167, *http://www.epa.gov.*

(2) *Destruction efficiency testing frequency* . You must conduct emissions testing to determine the destruction efficiency as provided in paragraphs (g)(2)(i) or (ii) of this section, whichever occurs first:

(i) Conduct an emissions test every 10 years. In the calculations under §98.123, apply the updated destruction efficiency to the destruction that occurs after the test.

(ii) *Destruction device changes that affect the destruction efficiency* . If you make a change to the destruction device that would be expected to affect the destruction efficiency, you must conduct an emissions test to update the destruction efficiency. Conduct the test before the February 28 of the year that immediately follows the change. In the calculations under §98.123, apply the updated destruction efficiency to the destruction that occurs after the change to the device.

(3) *Previous testing* .If you have conducted an emissions test within the 10 years prior to December 31, 2010, and the emissions testing meets the requirements in paragraph (g)(1) of this section, you may use the destruction efficiency determined during this previous emissions testing. For purposes of paragraph (g)(2)(i) of this section, the date of the previous emissions test rather than December 31, 2010 shall constitute the beginning of the 10-year re-measurement cycle.

(4) *Hazardous Waste Combustor testing* . If a destruction device used to destroy fluorinated GHG is subject to subpart EEE of part 63 of this chapter or any portion of parts 260–270 of this chapter, you may apply the destruction efficiency specifically determined for CF_4, SF_6, PFCs other than CF_4, and all other fluorinated GHGs under that test if the testing meets the criteria in paragraph (g)(1)(i) through (g)(1)(iv) of this section. If the testing of the destruction efficiency under subpart EEE of part 63 of this chapter was conducted more than 10 years ago, you may use the most recent destruction efficiency test provided that the design, operation, or maintenance of the destruction device has not changed since the last destruction efficiency test in a manner that could affect the ability to achieve the destruction efficiency, and the hazardous waste is fed into the normal flame zone.

(h) *Mass of previously produced fluorinated GHGs fed into destruction device* . You must measure the mass of each fluorinated GHG that is fed into the destruction device in more than trace concentrations and that was previously produced as defined at §98.410(b). Such fluorinated GHGs include but are not limited to quantities that are shipped to the facility by another facility for destruction and quantities that are returned to the facility for reclamation but are found to be irretrievably contaminated and are therefore destroyed. You must use flowmeters, weigh scales, or a combination of volumetric and density measurements with an accuracy and precision of ±1 percent of full scale or better. If the measured mass includes more than trace concentrations of materials other than the fluorinated GHG being destroyed, you must measure the concentration of the fluorinated GHG being destroyed. You must multiply this concentration (mass fraction) by the mass measurement to obtain the mass of the fluorinated GHG fed into the destruction device.

(i) *Emissions due to malfunctions of destruction device* . In their estimates of the mass of fluorinated GHG destroyed, fluorinated gas production facilities that destroy fluorinated GHGs must account for any temporary reductions in the destruction efficiency that result from any malfunctions of the destruction device, including periods of operation outside of the operating conditions defined in operating permit requirements and/or destruction device manufacturer specifications.

(j) *Emissions due to process startup, shutdown, or malfunctions* . Fluorinated GHG production facilities must account for fluorinated GHG emissions that occur as a result of startups, shutdowns, and malfunctions, either recording fluorinated GHG emissions during these events, or documenting that these events do not result in significant fluorinated GHG emissions. Facilities may use the calculation methods in §98.123(c)(1) to estimate emissions during startups, shutdowns, and malfunctions.

(k) *Monitoring for venting residual fluorinated GHG in containers* . Measure the residual fluorinated GHG in containers received by the facility either using scales or using pressure and temperature measurements. You may use pressure and temperature measurements only in cases where no liquid fluorinated GHG is present in the container. Scales must have an accuracy and precision of ±1 percent or better of the filled weight (gas plus tare) of the containers of fluorinated GHGs that are typically weighed on the scale. For example, for scales that are generally used to weigh cylinders that contain 115 pounds of gas when full and that have a tare weight of 115 pounds, this equates to ±1 percent of 230 pounds, or ±2.3 pounds. Pressure gauges and thermometers used to measure quantities that are monitored under this paragraph must have an accuracy and precision of ±1 percent of full scale or better.

(l) Initial scoping speciations, emissions testing, emission factor development, emission calculation factor development, emission characterization development, and destruction efficiency determinations must be completed by February 29, 2012 for processes and operating scenarios that operate between December 31, 2010 and December 31, 2011. For other processes and operating scenarios, initial scoping speciations, emissions testing, emission factor development, emission calculation factor development, emission characterization development, and destruction efficiency determinations must be complete by February 28 of the year following the year in which the process or operating scenario commences or recommences.

(m) Calibrate all flow meters, weigh scales, and combinations of volumetric and density measures using monitoring instruments traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST) or other recognized national measurement institute. Recalibrate all flow meters, weigh scales, and combinations of volumetric and density measures at the minimum frequency specified by the manufacturer. Use any of the following applicable flow meter test methods or the calibration procedures specified by the flow meter, weigh-scale, or other volumetric or density measure manufacturer.

(1) ASME MFC–3M–2004 Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi (incorporated by reference, see §98.7).

(2) ASME MFC–4M–1986 (Reaffirmed 1997) Measurement of Gas Flow by Turbine Meters (incorporated by reference, see §98.7).

(3) ASME–MFC–5M–1985, (Reaffirmed 1994) Measurement of Liquid Flow in Closed Conduits Using Transit-Time Ultrasonic Flowmeters (incorporated by reference, see §98.7).

(4) ASME MFC–6M–1998 Measurement of Fluid Flow in Pipes Using Vortex Flowmeters (incorporated by reference, see §98.7).

(5) ASME MFC–7M–1987 (Reaffirmed 1992) Measurement of Gas Flow by Means of Critical Flow Venturi Nozzles (incorporated by reference, see §98.7).

(6) ASME MFC–9M–1988 (Reaffirmed 2001) Measurement of Liquid Flow in Closed Conduits by Weighing Method (incorporated by reference, see §98.7).

(7) ASME MFC–11M–2006 Measurement of Fluid Flow by Means of Coriolis Mass Flowmeters (incorporated by reference, see §98.7).

(8) ASME MFC–14M–2003 Measurement of Fluid Flow Using Small Bore Precision Orifice Meters (incorporated by reference, see §98.7).

(n) All analytical equipment used to determine the concentration of fluorinated GHGs, including but not limited to gas chromatographs and associated detectors, infrared (IR), fourier transform infrared (FTIR), and nuclear magnetic resonance (NMR) devices, must be calibrated at a frequency needed to support the type of analysis specified in the GHG Monitoring Plan as required under §98.124(e)(3) and 93.3(g)(5). Quality assurance samples at the concentrations of concern must be used for the calibration. Such quality assurance samples must consist of or be prepared from certified standards of the analytes of concern where available; if not available, calibration must be performed by a method specified in the GHG Monitoring Plan.

(o) Special provisions for estimating 2011 and subsequent year emissions.

(1) *Best available monitoring methods.* To estimate emissions that occur from January 1, 2011 through June 30, 2011, owners or operators may use best available monitoring methods for any parameter that cannot reasonably be measured according to the monitoring and QA/QC requirements of this subpart. The owner or operator must use the calculation methodologies and equations in §98.123, but may use the best available monitoring method for any parameter for which it is not reasonably feasible to acquire, install, or operate a required piece of monitoring equipment, to procure measurement services from necessary providers, or to gain physical access to make required

measurements in a facility by January 1, 2011. Starting no later than July 1, 2011, the owner or operator must discontinue using best available methods and begin following all applicable monitoring and QA/QC requirements of this part, except as provided in paragraphs (o)(2) through (o)(4) of this section. Best available monitoring methods means any of the following methods specified in this paragraph:

(i) Monitoring methods currently used by the facility that do not meet the specifications of this subpart.

(ii) Supplier data.

(iii) Engineering calculations or assessments.

(iv) Other company records.

(2) *Requests for extension of the use of best available monitoring methods to estimate 2011 emissions: parameters other than scoping speciations, emission factors, and emission characterizations.* The owner or operator may submit a request to the Administrator to use one or more best available monitoring methods for parameters other than scoping speciations, emission factors, or emission characterizations to estimate emissions that occur between July 1, 2011 and December 31, 2011.

(i) *Timing of request.* The extension request must be submitted to EPA no later than February 28, 2011.

(ii) *Content of request.* Requests must contain the following information:

(A) A list of specific items of monitoring equipment and measurement services for which the request is being made and the locations (e.g., processes and vents) where each piece of monitoring equipment will be installed and where each measurement service will be provided.

(B) Identification of the specific rule requirements for which the monitoring equipment or measurement service is needed.

(C) A description of the reasons why the needed equipment could not be obtained, installed, or operated or why the needed measurement service could not be provided before July 1, 2011. The owner or operator must consider all of the data collection and emission calculation options outlined in the rule for a specific emissions source before claiming that a specific safety, technical, logistical, or legal barrier exists.

(D) If the reason for the extension is that the equipment cannot be purchased, delivered, or installed before July 1, 2011, include supporting documentation such as the date the monitoring equipment was ordered, investigation of alternative suppliers, the dates by which alternative vendors promised delivery or installation, backorder notices or unexpected delays, descriptions of actions taken to expedite delivery or installation, and the current expected date of delivery or installation.

(E) If the reason for the extension is that service providers were unable to provide necessary measurement services, include supporting documentation demonstrating that these services could not be acquired before July 1, 2011. This documentation must include written correspondence to and from at least two service providers stating that they will not be able to provide the necessary services before July 1, 2011.

(F) If the reason for the extension is that the process is operating continuously without process shutdown, include supporting documentation showing that it is not practicable to isolate the process equipment or unit and install the measurement device without a full shutdown or a hot tap, and that there is no opportunity before July 1, 2011 to install the device. Include the date of the three most recent shutdowns for each relevant process equipment or unit, the frequency of shutdowns for each relevant process equipment or unit, and the date of the next planned process equipment or unit shutdown.

(G) If the reason for the extension is that access to process streams, emissions streams, or destroyed streams, as applicable, could not be gained before July 1, 2011 for reasons other than the continuous operation of the process without shutdown, include illustrative documentation such as photographs and engineering diagrams demonstrating that access could not be gained.

(H) A description of the best available monitoring methods that will be used and how their results will be applied (i.e., which calculation method will be used) to develop the emission estimate. Where the proposed best available monitoring method is the use of current monitoring data in the mass-balance approach, include the estimated relative and absolute errors of the mass-balance approach using the current monitoring data.

(I) A description of the specific actions the owner or operator will take to comply with monitoring requirements by January 1, 2012.

(3) *Requests for extension of the use of best available monitoring methods to estimate 2011 emissions: scoping speciations, emission factors, and emission characterizations.* The owner or operator may submit a request to the Administrator to use one or more best available monitoring methods for scoping speciations, emission factors, and emission characterizations to estimate emissions that occur between July 1, 2011 and December 31, 2011.

(i) *Timing of request.* The extension request must be submitted to EPA no later than June 30, 2011.

(ii) *Content of request.* Requests must contain the information outlined in paragraph (o)(2)(ii) of this section, substituting March 1, 2012 for July 1, 2011 and substituting March 1, 2013 for January 1, 2012.

(iii) *Reporting of 2011 emissions using scoping speciations, emission factors, and emission characterizations developed after February 29, 2012.* Facilities that are approved to use best available monitoring methods in 2011 for scoping speciations, emission factors, or emission characterizations for certain processes must submit, by March 31, 2013, revised 2011 emission estimates that reflect the scoping speciations, emission factors, and emission characterizations that are measured for those processes after February 29, 2012. If the operating scenario for 2011 is different from all of the operating scenarios for which emission factors are developed after February 29, 2012, use Equation L-23 at §98.123(c)(3)(viii) to adjust the emission factor(s) or emission characterizations measured for the post-February 29, 2012 operating scenario(s) to account for the differences.

(4) *Requests for extension of the use of best available monitoring methods to estimate emissions that occur after 2011.* EPA does not anticipate approving the use of best available monitoring methods to estimate emissions that occur beyond December 31, 2011; however, EPA reserves the right to review requests for unique and extreme circumstances which include safety, technical infeasibility, or inconsistency with other local, State or Federal regulations.

(i) *Timing of request.* The extension request must be submitted to EPA no later than June 30, 2011.

(ii) *Content of request.* Requests must contain the following information:

(A) The information outlined in paragraph (o)(2)(ii) of this section. For scoping speciations, emission factors, and emission characterizations, substitute March 1, 2013 for July 1, 2011 and substitute March 1, 2014 for January 1, 2012. For other parameters, substitute January 1, 2012 for July 1, 2011 and substitute January 1, 2013 for January 1, 2012.

(B) A detailed outline of the unique circumstances necessitating an extension, including specific data collection issues that do not meet safety regulations, technical infeasibility or specific laws or regulations that conflict with data collection. The owner or operator must consider all the data collection and emission calculation options outlined in the rule for a specific emissions source before claiming that a specific safety, technical or legal barrier exists.

(C) A detailed explanation and supporting documentation of how and when the owner or operator will receive the required data and/or services to comply with the reporting requirements of this subpart in the future.

(E) The Administrator reserves the right to require that the owner or operator provide additional documentation.

(iii) *Reporting of 2011 and subsequent year emissions using scoping speciations, emission factors, and emission characterizations developed after approval to use best available monitoring methods expires.* Facilities that are approved to use best available monitoring methods in 2011 and subsequent years for scoping speciations, emission factors, or emission characterizations for certain processes must submit, by March 31 of the year that begins one year after their approval to use best available monitoring method(s) expires, revised emission estimates for 2011 and subsequent years that reflect the scoping speciations, emission factors, and emission characterizations that are measured for those processes in 2013 or subsequent years. If the operating scenario for 2011 or subsequent years is different from all of the operating scenarios for which emission factors or emission characterizations are developed in 2013 or subsequent years, use Equation L-23 of §98.123(c)(3)(viii) to adjust the emission factor(s) or emission characterization(s) measured for the new operating scenario(s) to account for the differences.

(5) *Approval criteria.* To obtain approval, the owner or operator must demonstrate to the Administrator's satisfaction that it is not reasonably feasible to acquire, install, or operate the required piece of monitoring equipment, to procure measurement services from necessary providers, or to gain physical access to make required measurements in a facility according to the requirements of this subpart by the dates specified in paragraphs (o)(2), (3), and (4) of this section for any of the reasons described in paragraph (o)(2)(ii) of this section, or, for requests under paragraph (o)(4) of this section, any of the reasons described in paragraph (o)(4)(ii)(B) of this section.

§ 98.125 Procedures for estimating missing data.

(a) A complete record of all measured parameters used in the GHG emissions calculations in §98.123 is required. Therefore, whenever a quality-assured value of a required parameter is unavailable, a substitute data value for the missing parameter must be used in the calculations as specified in the paragraphs (b) and (c) of this section. You must document and keep records of the procedures used for all such estimates.

(b) For each missing value of the fluorinated GHG concentration or fluorine-containing compound concentration, the substitute data value must be the arithmetic average of the quality-assured values of that parameter immediately preceding and immediately following the missing data incident.

(c) For each missing value of the mass produced, fed into the production process, fed into the transformation process, or fed into destruction devices, the substitute value of that parameter must be a secondary mass measurement where such a measurement is available. For example, if the mass produced is usually measured with a flowmeter at the inlet to the day tank and that flowmeter fails to meet an accuracy or precision test, malfunctions, or is rendered inoperable, then the mass produced may be estimated by calculating the change in volume in the day tank and multiplying it by the density of the product. Where a secondary mass measurement is not available, the substitute value of the parameter must be an estimate based on a related parameter. For example, if a flowmeter measuring the mass fed into a destruction device is rendered inoperable, then the mass fed into the destruction device may be estimated using the production rate and the previously observed relationship between the production rate and the mass flow rate into the destruction device.

§ 98.126 Data reporting requirements.

(a) *All facilities.* In addition to the information required by §98.3(c), you must report the information in paragraphs (a)(2) through (a)(~~6~~7) of this section according to the schedule in paragraph (a)(1) of this section, except as otherwise provided in paragraph (j) of this section or in §98.3(c)(4)(vii) and Table A-7 of ~~S~~subpart A of this part.

(1) *Frequency of reporting under paragraph (a) of this section.* The information in paragraphs (a)(2), (3), (4), (5), (6), and (7) of this section must be reported annually. ~~(5), and (6) of this section must be reported annually. The information in paragraphs (a)(3) and (4) of this section must be reported once by March 31, 2012 for each process and operating scenarios that operates between December 31, 2010 and December 31, 2011. For other processes and operating scenarios, the information in paragraphs (a)(3) and (4) of this section must be reported once by March 31 of the year following the year in which the process or operating scenario commences or recommences.~~

(2) *Generically-identified process.* For each production and transformation process at the facility, you must:~~-~~ ~~You must report the total mass in metric tons of each fluorinated GHG emitted from:~~

(i) Provide a number, letter, or other identifier for the process.

(ii) Indicate whether the process is a fluorinated gas production process, a fluorinated gas transformation process where no fluorinated GHG reactant is produced at another facility, or a fluorinated gas transformation process where one or more fluorinated GHG reactants are produced at another facility; and

(iii) Indicate whether the process could be characterized as reaction, distillation, or packaging (include all that apply).

(iv) For each generically-identified process and each fluorinated GHG group, report the methods used to determine the mass emissions of that fluorinated GHG group from that process from vents, i.e., mass balance, process-vent-specific emission factor, or process-vent-specific emission calculation factor.

(v) For each generically-identified process and each fluorinated GHG group, report the method(s) used to determine the mass emissions of that fluorinated GHG group from that process from equipment leaks, unless you used the mass balance method for that process.

~~(i) Each fluorinated gas production process and all fluorinated gas production processes combined.~~

~~(ii) Each fluorinated gas transformation process that is not part of a fluorinated gas production process and all such fluorinated gas transformation processes combined, except report separately fluorinated GHG emissions from transformation processes where a fluorinated GHG reactant is produced at another facility.~~

~~(3) The chemical identities of the contents of the stream(s) (including process, emissions, and destroyed streams) analyzed under the initial scoping speciation of fluorinated GHG at § 98.124(a), by process.~~

(3) *Process level, multiple products.* If your facility produces multiple fluorinated gas products, for each generically identified process and each fluorinated GHG group, you must report the total GWP-weighted emissions of all fluorinated GHGs in that group emitted from the process, in metric tons CO2e.

~~(4) The location and function of the stream(s) (including process streams, emissions streams, and destroyed streams) that were analyzed under the initial scoping speciation of fluorinated GHG at § 98.124(a), by process.~~

(4) *Facility level, multiple products.* If your facility produces multiple fluorinated gas products, you must report the information in paragraphs (a)(4)(i) and (a)(4)(ii) of this section, as applicable.

(i) For each fluorinated GHG with emissions of 1,000 metric tons of CO2e or more from the facility as a whole, you must report the total mass in metric tons of the fluorinated GHG emitted from the facility as a whole.

(ii) Aggregate and report the total GWP-weighted emissions of all other fluorinated GHGs by fluorinated GHG group for the facility as a whole, in metric tons of CO2e.

~~(5) The methods used to determine the mass emissions of each fluorinated GHG, i.e., mass balance, process-vent-specific emission factor, or process-vent-specific emission calculation factor, at the facility. If you use the process-vent-specific emission factor or process-vent-specific emission calculation factor method, report the methods used to estimate emissions from equipment leaks.~~

(5) *Facility level, one product only.* If your facility produces only one fluorinated gas product, aggregate and report the total GWP-weighted emissions of fluorinated GHGs by fluorinated GHG group for the facility as a whole, in metric tons of CO2e, with the following exception: Where emissions consist of a major fluorinated GHG constituent of a fluorinated gas product, and the product is sold or transferred to another person, report the total mass in metric tons of each fluorinated GHG emitted that is a major fluorinated GHG constituent of the product.

~~(6) The chemical formula and total mass produced of the fluorinated gas product in metric tons, by chemical and process.~~

(6) *Destruction processes and container heel venting.* You must report the total mass in metric tons of each fluorinated GHG emitted from:

~~(iii)~~(i) Each fluorinated gas 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.

~~(iv)~~(ii) Venting of residual fluorinated GHGs from containers returned from the field.

(7) *Effective destruction efficiency*. For each generically identified process, use Table L-2 to this subpart to report the range that encompasses the effective destruction efficiency, $DE_{effective}$, calculated for that process using Equation L-35 of this subpart. The effective destruction efficiency must be reported on a CO2e basis.

(b) *Reporting for mass balance ~~approach~~ method for reporting years 2011, 2012, 2013, and 2014*. If you used the mass-balance method to calculate emissions for any of the reporting years 2011, 2012, 2013, or 2014, you must conduct mass balance reporting for that reporting year. For processes whose emissions ~~are~~ were determined using the mass-balance ~~approach~~ method under the former §98.123(b), you must report the information listed in paragraphs (b)(1) ~~through~~and (b)(~~13~~2) of this section for each process on an annual basis. ~~Identify and separately report fluorinated GHG emissions from transformation processes where the fluorinated GHG reactants are produced at another facility~~. ~~If you use an element other than fluorine in the mass-balance equation pursuant to § 98.123(b)(3), substitute that element for fluorine in the reporting requirements of this paragraph.~~

(1) If you calculated the relative and absolute errors under the former §98.123(b)(1), the overall absolute and relative errors calculated for the process under the former ~~paragraph~~ §98.123(b)(1), ~~as well as the data (including quantities and their accuracies and precisions) used in these calculations.~~ in tons and decimal fraction, respectively.

~~(2) [Reserved] The balanced chemical equation that describes the reaction used to manufacture the fluorinated GHG product and each fluorinated GHG transformation product.~~

~~(3) The mass and chemical formula of each fluorinated GHG reactant emitted from the process in metric tons.~~

~~(4) The mass and chemical formula of the fluorinated GHG product emitted from the process in metric tons.~~

~~(5) The mass and chemical formula of each fluorinated GHG by-product emitted from the process in metric tons.~~

~~(6) The mass and chemical formula of each fluorine-containing reactant that is fed into the process (metric tons).~~

~~(7) The mass and chemical formula of each fluorine-containing product produced by the process (metric tons).~~

~~(8) If you use § 98.123(b)(4) to estimate the total mass of fluorine in destroyed or recaptured streams, report the following.~~

~~(i) The mass and chemical formula of each fluorine-containing product that is removed from the process and fed into the destruction device (metric tons).~~

~~(ii) The mass and chemical formula of each fluorine-containing by-product that is removed from the process and fed into the destruction device (metric tons).~~

~~(iii) The mass and chemical formula of each fluorine-containing reactant that is removed from the process and fed into the destruction device (metric tons).~~

~~(iv) The mass and chemical formula of each fluorine-containing by-product that is removed from the process and recaptured (metric tons).~~

~~(v) [Reserved] The demonstrated destruction efficiency of the destruction device for each fluorinated GHG fed into the device from the process in greater than trace concentrations (fraction).~~

~~(9) [Reserved] If you use § 98.123(b)(15) to estimate the total mass of fluorine in destroyed or recaptured streams, report the following.~~

~~(i) The mass of fluorine in each stream that is fed into the destruction device (metric tons).~~

~~(ii) The mass of fluorine that is recaptured (metric tons).~~

~~(iii) The weighted average destruction efficiency of the destruction device calculated for each stream under § 98.123(b)(16).~~

~~(10) The fraction of the mass emitted that consists of each fluorine-containing reactant.~~

~~(11) The fraction of the mass emitted that consists of the fluorine-containing product.~~

~~(12) The fraction of the mass emitted that consists of each fluorine-containing by-product.~~

(~~13~~2) The method used to estimate the total mass of fluorine in destroyed or recaptured streams (specify the former §98.123(b)(4) or (15)).

(c) *Reporting for emission factor and emission calculation factor approach.* For processes whose emissions are determined using the emission factor approach under §98.123(c)(3) or the emission calculation factor under §98.123(c)(4), you must report the following for each generically-identified process. ~~Fluorinated GHG emissions from transformation processes where the fluorinated GHG reactants are produced at another facility must be identified and reported separately from other fluorinated GHG emissions.~~

(1) [Reserved] ~~The identity and quantity of the process activity used to estimate emissions (e.g., tons of product produced or tons of reactant consumed).~~

(2) [Reserved] ~~The site-specific, process-vent-specific emission factor(s) or emission calculation factor for each process vent.~~

(3) ~~The mass of~~ For each fluorinated GHG group, the total GWP-weighted mass of all fluorinated GHGs in that group emitted from ~~each~~all process ~~vent (~~vents combined, in metric tons~~).~~ of CO2e.

(4) ~~The mass of~~ For each fluorinated GHG group, the total GWP-weighted mass of all fluorinated GHGs in that group emitted from equipment leaks ~~(~~. in metric tons~~).~~ CO2e.

(d) *Reporting for missing data.* Where missing data have been estimated pursuant to §98.125, you must report;

(1) The reason the data were missing, the length of time the data were missing, and the method used to estimate the missing data.

(2) Estimates of the missing data for all missing data associated with data elements required to be reported in this section. ~~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.~~

(e) *Reporting of destruction device excess emissions data.* Each fluorinated gas production facility that destroys fluorinated GHGs must report the excess emissions that result from malfunctions of the destruction device, and these excess emissions ~~would~~must be reflected in the fluorinated GHG estimates in the former §98.123(b) and in §98.123 (c). Such excess emissions would occur if the destruction efficiency was reduced due to the malfunction.

(f) *Reporting of destruction device testing.* By March 31, 2012 or by March 31 of the year immediately following the year in which it begins fluorinated GHG destruction, each fluorinated gas production facility that destroys fluorinated GHGs must submit a report containing the information in paragraphs (f)(1) through (f)(4) of this section. This report is one-time unless you make a change to the destruction device that would be expected to affect its destruction efficiencies.

(1) [Reserved] ~~Destruction efficiency (DE) of each destruction device for each fluorinated GHG whose destruction the facility reflects in § 98.123, in accordance with §98.124(g)(1)(i) through (iv).~~

(2) Chemical identity of the fluorinated GHG(s) used in the performance test conducted to determine destruction efficiency, including surrogates, and information on why the surrogate is sufficient to demonstrate the destruction efficiency for each fluorinated GHG, consistent with requirements in §98.124(g)(1), vented to the destruction device.

(3) Date of the most recent destruction device test.

(4) Name of all applicable Federal or State regulations that may apply to the destruction process.

(5) If you make a change to the destruction device that would be expected to affect its destruction efficiencies, submit a revised report that reflects the changes, including the revised destruction efficiencies measured for the device under §98.124(g)(2)(ii), by March 31 of the year that immediately follows the change.

(g) *Reporting for destruction of previously produced fluorinated GHGs.* Each fluorinated gas production facility that destroys fluorinated GHGs must report, separately from the fluorinated GHG emissions reported under paragraphs (b) or (c) of this section, the following for each previously produced fluorinated GHG destroyed:

(1) [Reserved] ~~The mass of the fluorinated GHG fed into the destruction device.~~

(2) The mass of the fluorinated GHG emitted from the destruction device.

(h) *Reporting of emissions from venting of residual fluorinated GHGs from containers.* Each fluorinated gas production facility that vents residual fluorinated GHGs from containers must report the following for each fluorinated GHG vented:

(1) The mass of the residual fluorinated GHG vented from each container size and type annually (metric tons).

(2) [Reserved] ~~If applicable, the heel factor calculated for each container size and type.~~

(i) *Reporting of fluorinated GHG products of incomplete combustion (PICs) of fluorinated gases.* Each fluorinated gas production facility that destroys fluorinated gases must submit 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 that are fluorinated GHGs during the destruction of fluorinated gases. The report must include the methods and results of any measurement or modeling studies, including the products of incomplete combustion for which the exhaust stream was analyzed, as well as copies of relevant scientific papers, if available, or citations of the papers, if they are not. No new testing is required to fulfill this requirement.

(j) Special provisions for reporting years 2011 and 2012 only. For reporting years 2011 and 2012, the owner or operator of a facility must comply with paragraphs (j)(1), (j)(2), and (j)(3) of this section.

(1) Timing. The owner or operator of a facility is not required to report the data elements at §98.3(c)(4)(iii) and §98.126(a)(2), (a)(3), (a)(4), (a)(6), (b), (c), (d), (e), (f), (g), and (h) of this section until the later of March 31, 201 or the date set forth for that data element at §98.3(c)(4)(vii) and Table A-7 of Subpart A of this part.

(2) Excess emissions. Excess emissions of fluorinated GHGs resulting from destruction device malfunctions must be reflected in the reported facility-wide CO_2e emissions but are not required to be reported separately.

(3) Calculation and reporting of CO_2e. You must report the total fluorinated GHG emissions covered by this subpart, expressed in metric tons of CO_2e. This includes emissions from all fluorinated gas production processes, all fluorinated gas transformation processes that are not part of a fluorinated gas production process, all fluorinated gas destruction processes that are not part of a fluorinated gas production process or a fluorinated gas transformation process, and venting of residual fluorinated GHGs from containers returned from the field. To convert fluorinated GHG emissions to CO_2e for reporting under this section, use Equation A-1 of §98.2. For fluorinated GHGs whose GWPs are not listed in Table A-1 of Subpart A of this part, use either the default GWP specified below or your best estimate of the GWP based on the information described in §98.123(c)(1)(vi)(A)(3). Use of quantitative structure activity relationships (QSARs) is an acceptable method for determining GWPs in situations where pure standards of the “target” fluorinated GHG are not available, the “target” fluorinated GHG cannot be isolated from gas streams, and FTIR spectra for the impurities are not available.

(i) If you choose to use a default GWP rather than your best estimate of the GWP for fluorinated GHGs whose GWPs are not listed in Table A-1 to this subpart, use a default GWP of 10,000 for fluorinated GHGs that are fully fluorinated GHGs and use a default GWP of 2000 for other fluorinated GHGs.

(ii) Provide the total annual emissions across fluorinated GHGs for the entire facility, in metric tons of CO$_2$e, that were calculated using the default GWP of 2000.

(iii) Provide the total annual emissions across fluorinated GHGs for the entire facility, in metric tons of CO$_2$e, that were calculated using the default GWP of 10,000.

(iv) Provide the total annual emissions across fluorinated GHGs for the entire facility, in metric tons of CO$_2$e, that were calculated using your best estimate of the GWP.

(k) *Submission of complete reporting year 2011, 2012, and 2013 GHG reports.* By March 31, 2015, you must submit annual GHG reports for reporting years 2011, 2012, and 2013 that contain the information specified in paragraphs (a) through (h) of this section. The reports must calculate CO2e using the GWPs in Table A-1 to subpart A of this part (as in effect on January 1, 2015) and Table L-1 of this subpart (as applicable), Prior submission of partial reports for these reporting years under paragraph (j) of this section does not affect your obligation to submit complete reports under this paragraph.

§ 98.127 Records that must be retained.

In addition to the records required by §98.3(g), you must retain the dated records specified in paragraphs (a) through (k) of this section, as applicable.

(a) *Process information records.*

(1) Identify all products and processes subject to this subpart. Include the unit identification as appropriate~~.~~, along with the generic process identification reported for the process under §98.126(a)(2)(i) through (iii); which product the process is associated with; whether the process is a reaction, distillation, or packaging process (include all that apply); and whether the process is a production process, a transformation process where no fluorinated GHG reactant is produced at another facility, or a transformation process where one or more fluorinated GHG reactants are produced at another facility.

(2) Monthly and annual records, as applicable, of all analyses and calculations conducted as required under §98.123, including the data monitored under §98.124, and all information reported as required ~~and~~ under §98.126.

(3) Identify all fluorinated GHGs with emissions of 1,000 metric tons CO2e or more from the facility as a whole, and identify all fluorinated GHGs with total emissions less than 1,000 metric tons CO2e from the facility as a whole.

(4) Calculations used to determine the total GWP-weighted emissions of fluorinated GHGs by fluorinated GHG groups for each process, in metric tons CO2e.

(b) *Scoping speciation.* Retain records documenting the information ~~reported~~collected under ~~§98.126(a)(3) and (4)~~ §98.124(a).

(c) *Mass-balance method.* Retain the following records for each process for which the mass-balance method was used to estimate emissions in reporting years 2011, 2012, 2013, or 2014. If you used an element other than fluorine in the mass-balance equation pursuant to the former § 98.123(b)(3), substitute that element for fluorine in the recordkeeping requirements of this paragraph.

(1) The data and calculations used to estimate the absolute and relative errors associated with use of the mass-balance approach.

(2) The data and calculations used to estimate the mass of fluorine emitted from the process.

(3) The data and calculations used to determine the fractions of the mass emitted consisting of each reactant (FER$_d$), product (FEP), and by-product (FEB$_k$), including the preliminary calculations in the former §98.123(b)(8)(i).

(d) *Emission factor and emission calculation factor method.* Retain the following records for each process for which the emission factor or emission calculation factor method was used to estimate emissions.

(1) Identify all continuous process vents with emissions of fluorinated GHGs that are less than 10,000 metric tons CO_2e per year and all continuous process vents with emissions of 10,000 metric tons CO_2e per year or more. Include the data and calculation used to develop the preliminary estimate of emissions for each process vent.

(2) Identify all batch process vents.

(3) For each vent, identify the method used to develop the factor (i.e., emission factor by emissions test or emission calculation factor).

(4) The emissions test data and reports (see §98.124(c)(5)) and the calculations used to determine the process-vent-specific emission factor, including the actual process-vent-specific emission factor, the average hourly emission rate of each fluorinated GHG from the process vent during the test and the process feed rate, process production rate, or other process activity rate during the test.

(5) The process-vent-specific emission calculation factor and the calculations used to determine the process-vent-specific emission calculation factor.

(6) The annual process production quantity or other process activity information in the appropriate units, along with the dates and time period during which the process was operating and dates and time periods the process vents are vented to the destruction device. As an alternative to date and time periods when process vents are vented to the destruction device, a facility may track dates and time periods that process vents by-pass the destruction device.

(7) Calculations used to determine annual emissions of each fluorinated GHG for each process and the total fluorinated GHG emissions for all processes, i.e., total for facility.

(e) *Destruction efficiency testing.* A fluorinated GHG production facility that destroys fluorinated GHGs and reflects this destruction in §98.123 must retain the emissions performance testing reports (including revised reports) for each destruction device. The emissions performance testing report must contain all information and data used to derive the destruction efficiency for each fluorinated GHG whose destruction the facility reflects in §98.123, as well as the key process and device conditions during the test. This information includes the following:

(1) Destruction efficiency (DE) determined for each fluorinated GHG whose destruction the facility reflects in §98.123, in accordance with §98.124(g)(1)(i) through (iv).

(2) Chemical identity of the fluorinated GHG(s) used in the performance test conducted to determine destruction efficiency, including surrogates, and information on why the surrogate is sufficient to demonstrate destruction efficiency for each fluorinated GHG, consistent with requirements in §98.124(g)(1)(i) through (iv), vented to the destruction device.

(3) Mass flow rate of the stream containing the fluorinated GHG(s) or surrogate into the device during the test.

(4) Concentration (mass fraction) of each fluorinated GHG or surrogate in the stream flowing into the device during the test.

(5) Concentration (mass fraction) of each fluorinated GHG or surrogate at the outlet of the destruction device during the test.

(6) Mass flow rate at the outlet of the destruction device during the test.

(7) Test methods and analytical methods used to determine the mass flow rates and fluorinated GHG (or surrogate) concentrations of the streams flowing into and out of the destruction device during the test.

(8) Destruction device conditions that are normally monitored for device control, such as temperature, total mass flow rates into the device, and CO or O_2 levels.

(9) Name of all applicable Federal or State regulations that may apply to the destruction process.

(f) *Equipment leak records.* If you are subject to §98.123(d) of this subpart, you must maintain information on the number of each type of equipment; the service of each piece of equipment (gas, light liquid, heavy liquid); the concentration of each fluorinated GHG in the stream; each piece of equipment excluded from monitoring requirement; the time period each piece of equipment was in service, and the emission calculations for each fluorinated GHG for all processes. Depending on which equipment leak monitoring approach you follow, you must maintain information for equipment on the associated screening data concentrations for greater than or equal to 10,000 ppmv and associated screening data concentrations for less than 10,000 ppmv; associated actual screening data concentrations; and associated screening data and leak rate data (i.e., bagging) used to develop a unit-specific correlation. If you developed and follow a site-specific leak detection approach, provide the records for monitoring events and the emissions estimation calculations, as appropriate, consistent with the approach for equipment leak emission estimation in your GHG Monitoring Plan.

(g) *Container heel records.* If you vent residual fluorinated GHGs from containers, maintain the following records of the measurements and calculations used to estimate emissions of residual fluorinated GHGs from containers.

(i) If you measure the contents of each container, maintain records of these measurements and the calculations used to estimate emissions of each fluorinated GHG from each container size and type.

(ii) If you develop and apply container heel factors to estimate emissions, maintain records of the measurements and calculations used to develop the heel factor for each fluorinated GHG and each container size and type and of the number of containers of each fluorinated GHG and of each container size and type returned to your facility.

(h) *Missing data records.* Where missing data have been estimated pursuant to §98.125, you must record 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.

(i) *All facilities.* Dated records documenting the initial and periodic calibration of all analytical equipment used to determine the concentration of fluorinated GHGs, including but not limited to gas chromatographs, gas chromatography-mass spectrometry (GC/MS), gas chromatograph-electron capture detector (GC/ECD), fourier transform infrared (FTIR), and nuclear magnetic resonance (NMR) devices, and all mass measurement equipment such as weigh scales, flowmeters, and volumetric and density measures used to measure the quantities reported under this subpart, including the industry standards or manufacturer directions used for calibration pursuant to §98.124(e), (f), (g), (m), and (n).

(j) GHG Monitoring Plans, as described in §98.3(g)(5), must be completed by April 1, 2011.

(k) For fluorinated GHGs whose GWPs are not listed in Table A-1 to subpart A of this part, maintain records of the GWPs used to calculate facility-wide CO_2e emissions under §98.127(j). Where you used your best estimate of the GWP, maintain records of the data and analysis used to develop that GWP, including the data elements at §98.123(c)(1)(vi)(A)(1)through (3). If you have used QSARs to estimate the GWP, include information documenting the level of accuracy of the QSAR-derived GWP, including information on how the structure of the “target” fluorinated GHG is similar to the structures of the fluorinated GHGs used to model the radiative forcing and/or reaction rate of the “target” fluorinated GHG, the quality and quantity of the measurements of the radiative forcings and/or reaction rates of the fluorinated GHGs used to model these parameters for the “target” fluorinated GHG, any estimated uncertainties of the modeled forcings and/or reaction rates, and descriptions and results of any efforts to validate the QSAR model(s).

§ 98.128 Definitions.

Except as provided in this section, all of the terms used in this subpart have the same meaning given in the Clean Air Act and subpart A of this part. If a conflict exists between a definition provided in this subpart and a definition provided in subpart A, the definition in this subpart shall take precedence for the reporting requirements in this subpart.

Batch process or *batch operation* means a noncontinuous operation involving intermittent or discontinuous feed into equipment, and, in general, involves the emptying of the equipment after the batch operation ceases and prior to beginning a new operation. Addition of raw material and withdrawal of product do not occur simultaneously in a batch operation.

Batch emission episode means a discrete venting episode associated with a vessel in a process; a vessel may have more than one batch emission episode. For example, a displacement of vapor resulting from the charging of a vessel with a feed material will result in a discrete emission episode that will last through the duration of the charge and will have an average flow rate equal to the rate of the charge. If the vessel is then heated, there will also be another discrete emission episode resulting from the expulsion of expanded vapor. Other emission episodes also may occur from the same vessel and other vessels in the process, depending on process operations.

By-product means a chemical that is produced coincidentally during the production of another chemical.

Completely destroyed means destroyed with a destruction efficiency of 99.99 percent or greater.

Completely recaptured means 99.99 percent or greater of each fluorinated GHG is removed from a stream.

Continuous process or operation means a process where the inputs and outputs flow continuously throughout the duration of the process. Continuous processes are typically steady state.

Destruction device means any device used to destroy fluorinated GHG.

Destruction process means a process used to destroy fluorinated GHG in a destruction device such as a thermal incinerator or catalytic oxidizer.

Difficult-to-monitor means the equipment piece may not be monitored without elevating the monitoring personnel more than 2 meters (7 feet) above a support surface or it is not accessible in a safe manner when it is in fluorinated GHG service.

Dual mechanical seal pump and *dual mechanical seal agitator* means a pump or agitator equipped with a dual mechanical seal system that includes a barrier fluid system where the barrier fluid is not in light liquid service; each barrier fluid system is equipped with a sensor that will detect failure of the seal system, the barrier fluid system, or both; and meets the following requirements:

(1) Each dual mechanical seal system is operated with the barrier fluid at a pressure that is at all times (except periods of startup, shutdown, or malfunction) greater than the pump or agitator stuffing box pressure; or

(2) Equipped with a barrier fluid degassing reservoir that is routed to a process or fuel gas system or connected by a closed-vent system to a control device; or

(3) Equipped with a closed-loop system that purges the barrier fluid into a process stream.

Equipment (for the purposes of §98.123(d) and §98.124(f) only) means each pump, compressor, agitator, pressure relief device, sampling connection system, open-ended valve or line, valve, connector, and instrumentation system in fluorinated GHG service for a process subject to this subpart; and any destruction devices or closed-vent systems to which processes subject to this subpart are vented.

Fluorinated gas means any fluorinated GHG, CFC, or HCFC.

Fluorinated GHG group means one of the following sets of fluorinated GHGs: Fully fluorinated GHGs; Saturated hydrofluorocarbons; Saturated hydrofluoroethers and saturated hydrochlorofluoroethers; Unsaturated PFCs, unsaturated HFCs, unsaturated HCFCs, unsaturated HFEs, and fluorinated ketones; or Other fluorinated GHGs.

Fluorinated GHG product means the product of the process, including isolated intermediates.

Fully fluorinated GHGs means fluorinated GHGs that contain only single bonds and in which all available valence locations are filled by fluorine atoms. This includes but is not limited to saturated perfluorocarbons, SF_6, NF_3, SF_5CF_3, fully fluorinated linear, branched and cyclic alkanes, fully fluorinated ethers, fully fluorinated tertiary amines, fully fluorinated aminoethers, and perfluoropolyethers.

Generically-identified process means a process that is (1) identified as a production process, a transformation process where no fluorinated GHG reactant is produced at another facility, or a transformation process where one or more fluorinated GHG reactants are produced at another facility; (2) further identified as a reaction, distillation, or packaging process, or a combination thereof; and (3) tagged with a discrete identifier, such as a letter or number, that remains constant from year to year.

In fluorinated GHG service means that a piece of equipment either contains or contacts a feedstock, by-product, or product that is a liquid or gas and contains at least 5 percent by weight fluorinated GHG.

In gas and vapor service means that a piece of equipment in regulated material service contains a gas or vapor at operating conditions.

In heavy liquid service means that a piece of equipment in regulated material service is not in gas and vapor service or in light liquid service.

In light liquid service means that a piece of equipment in regulated material service contains a liquid that meets the following conditions:

(1) The vapor pressure of one or more of the compounds is greater than 0.3 kilopascals at 20 °C.

(2) The total concentration of the pure compounds constituents having a vapor pressure greater than 0.3 kilopascals at 20 °C is equal to or greater than 20 percent by weight of the total process stream.

(3) The fluid is a liquid at operating conditions.

Note to definition of “in light liquid service”: Vapor pressures may be determined by standard reference texts or ASTM D–2879, (incorporated by reference, see §98.7).

In vacuum service means that equipment is operating at an internal pressure which is at least 5 kilopascals below ambient pressure.

Isolated intermediate means a product of a process that is stored before subsequent processing. An isolated intermediate is usually a product of chemical synthesis. Storage of an isolated intermediate marks the end of a process. Storage occurs at any time the intermediate is placed in equipment used solely for storage.

Major fluorinated GHG constituent means a fluorinated GHG constituent of a fluorinated GHG product that occurs in concentrations greater than 1 percent by mass.

No external shaft pump and *No external shaft agitator* means any pump or agitator that is designed with no externally actuated shaft penetrating the pump or agitator housing.

Operating scenario means any specific operation of a process and includes the information specified in paragraphs (1) through (5) of this definition for each process. A change or series of changes to any of these elements, except for paragraph (4) of this definition, constitutes a different operating scenario.

(1) A description of the process, the specific process equipment used, and the range of operating conditions for the process.

(2) An identification of related process vents, their associated emissions episodes and durations, and calculations and engineering analyses to show the annual uncontrolled fluorinated GHG emissions from the process vent.

(3) The control or destruction devices used, as applicable, including a description of operating and/or testing conditions for any associated destruction device.

(4) The process vents (including those from other processes) that are simultaneously routed to the control or destruction device(s).

(5) The applicable monitoring requirements and any parametric level that assures destruction or removal for all emissions routed to the control or destruction device.

Other fluorinated GHGs means fluorinated GHGs that are none of the following: fully fluorinated GHGs, saturated hydrofluorocarbons, saturated hydrofluoroethers, saturated hydrochlorofluoroethers, unsaturated perfluorocarbons, unsaturated hydrofluorocarbons, unsaturated hydrochlorofluorocarbons, unsaturated hydrofluoroethers, or fluorinated ketones.

Process means all equipment that collectively functions to produce a fluorinated gas product, including an isolated intermediate (which is also a fluorinated gas product), or to transform a fluorinated gas product. A process may consist of one or more unit operations. For the purposes of this subpart, process includes any, all, or a combination of reaction, recovery, separation, purification, or other activity, operation, manufacture, or treatment which are used to produce a fluorinated gas product. For a continuous process, cleaning operations conducted may be considered part of the process, at the discretion of the facility. For a batch process, cleaning operations are part of the process. Ancillary activities are not considered a process or part of any process under this subpart. Ancillary activities include boilers and incinerators, chillers and refrigeration systems, and other equipment and activities that are not directly involved (i.e., they operate within a closed system and materials are not combined with process fluids) in the processing of raw materials or the manufacturing of a fluorinated gas product.

Process condenser means a condenser whose primary purpose is to recover material as an integral part of a process. All condensers recovering condensate from a process vent at or above the boiling point or all condensers in line prior to a vacuum source are considered process condensers. Typically, a primary condenser or condensers in series are considered to be integral to the process if they are capable of and normally used for the purpose of recovering chemicals for fuel value (i.e., net positive heating value), use, reuse or for sale for fuel value, use, or reuse.

Process vent (for the purposes of this subpart only) means a vent from a process vessel or vents from multiple process vessels within a process that are manifolded together into a common header, through which a fluorinated GHG-containing gas stream is, or has the potential to be, released to the atmosphere (or the point of entry into a control device, if any). Examples of process vents include, but are not limited to, vents on condensers used for product recovery, bottoms receivers, surge control vessels, reactors, filters, centrifuges, and process tanks. Process vents do not include vents on storage tanks, wastewater emission sources, or pieces of equipment.

Saturated hydrochlorofluoroethers (HCFEs) means fluorinated GHGs in which two hydrocarbon groups are linked by an oxygen atom; in which two or more, but not all, of the hydrogen atoms in the hydrocarbon groups have been replaced by fluorine atoms and chlorine atoms; and which contain only single bonds.

Saturated hydrofluorocarbons (HFCs) means fluorinated GHGs that are hydrofluorocarbons and that contain only single bonds.

Saturated hydrofluoroethers (HFEs) means fluorinated GHGs in which two hydrocarbon groups are linked by an oxygen atom; in which one or more, but not all, of the hydrogen atoms in the hydrocarbon groups have been replaced by fluorine atoms; and which contain only single bonds.

Typical batch means a batch process operated within a range of operating conditions that are documented in an operating scenario. Emissions from a typical batch are based on the operating conditions that result in representative emissions. The typical batch defines the uncontrolled emissions for each emission episode defined under the operating scenario.

Uncontrolled fluorinated GHG emissions means a gas stream containing fluorinated GHG which has exited the process (or process condenser or control condenser, where applicable), but which has not yet been introduced into a destruction device to reduce the mass of fluorinated GHG in the stream. If the emissions from the process are not routed to a destruction device, uncontrolled emissions are those fluorinated GHG emissions released to the atmosphere.

Unsafe-to-monitor means that monitoring personnel would be exposed to an immediate danger as a consequence of monitoring the piece of equipment. Examples of unsafe-to-monitor equipment include, but are not limited to, equipment under extreme pressure or heat.

Unsaturated hydrochlorofluorocarbons (HCFCs) means fluorinated GHGs that contain only carbon, chlorine, fluorine, and hydrogen and that contain one or more bonds that are not single bonds.

Unsaturated hydrofluorocarbons (HFCs) means fluorinated GHGs that are hydrofluorocarbons and that contain one or more bonds that are not single bonds.

Unsaturated hydrofluoroethers (HFEs) means fluorinated GHGs in which two hydrocarbon groups are linked by an oxygen atom; in which one or more, but not all, of the hydrogen atoms in the hydrocarbon groups have been replaced by fluorine atoms; and which contain one or more bonds that are not single bonds.

Unsaturated perfluorocarbons (PFCs) means fluorinated GHGs that are perfluorocarbons and that contain one or more bonds that are not single bonds.

TABLE L-1 TO SUBPART L OF PART 98-DEFAULT GLOBAL WARMING POTENTIALS FOR COMPOUNDS THAT DO NOT APPEAR ON TABLE A-1 TO SUBPART A OF PART 98

Fluorinated GHG group	**Proposed Global warming potential (100 yr.)**
Fully fluorinated GHGs	10,000
Saturated hydrofluorocarbons (HFCs)	2,200
Saturated hydrofluoroethers (HFEs) and saturated hydrochlorofluoroethers (HCFEs)	1,600
Unsaturated PFCs, unsaturated HFCs, unsaturated HCFCs, unsaturated HFEs, and fluorinated ketones	1
Other fluorinated GHGs	100

Table L-2 of Subpart L – Ranges of Effective Destruction Efficiency

Range of Reductions
≥99%
≥95% to <99%
≥75% to <95%
≥0% to <75%