hoses or other flow lines that connect the container to the equipment that is being filled).

(g) Estimate the mass of SF₆ or the PFC emitted during the period p downstream of the containers used to fill equipment or cylinders (e.g., emissions from hoses or other flow lines that connect the container to the equipment or cylinder that is being filled) using Equation SS–5 of this section:

\[ E_L = \sum_{i=1}^{n} F_{Ci} \times EF_{Ci} \] (Eq. SS–5)

where:
- \( E_L \) = The mass of SF₆ or the PFC emitted during the period p downstream of the containers used to fill equipment or cylinders and in cases where a flowmeter is used, downstream of the flowmeter during the period p (e.g., emissions from hoses or other flow lines that connect the container to the equipment or cylinder that is being filled).
- \( F_{Ci} \) = The total number of fill operations over the period p for the valve-hose combination Ci.
- \( EF_{Ci} \) = The emission factor for the valve-hose combination Ci.
- \( n \) = The number of different valve-hose combinations \( C \) used during the period p.

(h) The mass of SF₆ or the PFC disbursed to customers in new equipment over the period p must be determined either by using the nameplate capacity of the equipment or, in cases where equipment is shipped with a partial charge, by calculating the partial shipping charge. Calculate the partial shipping charge by multiplying the nameplate capacity of the equipment by the ratio of the densities of the partial charge to the full charge. To determine the equipment’s actual nameplate capacity, you must measure the nameplate capacities of a representative sample of each make and model and take the average for each make and model as specified at §98.454(f).

(i) Estimate the annual SF₆ and PFC emissions from the equipment that is installed at an off-site electric power transmission or distribution location before the title to the equipment is transferred by using Equation SS–6 of this section:

\[ EI = MF + MC - NI \] (Eq. SS–6)

where:
- \( EI \) = Total annual SF₆ or PFC emissions from equipment installation at electric transmission or distribution facilities.
- \( MF \) = The total annual mass of the SF₆ or PFCs, in pounds, used to fill equipment.
- \( MC \) = The total annual mass of the SF₆ or PFCs, in pounds, used to charge the equipment prior to leaving the electrical equipment manufacturer facility.
- \( NI \) = The total annual nameplate capacity of the equipment, in pounds, installed at electric transmission or distribution facilities.

§98.454 Monitoring and QA/QC requirements.

(a) For calendar year 2011 monitoring, you may follow the provisions of §98.3(d)(1) through (d)(2) for best available monitoring methods rather than follow the monitoring requirements of this section. For purposes of this subpart, any reference in §98.3(d)(1) through (d)(2) to 2010 means 2011, March 31 means June 30, and April 1 means July 1. Any reference to the effective date in §98.3(d)(1) through (d)(2) means February 28, 2011.

(b) Ensure that all the quantities required by the equations of this subpart have been measured using either flowmeters with an accuracy and precision of ±1 percent of full scale or better or scales with an accuracy and precision of ±1 percent of the filled weight (gas plus tare) of the containers of SF₆ or PFCs that are typically weighed on the scale. For scales that are generally
used to weigh cylinders containing 115 pounds of gas when full, this equates to ±1 percent of the sum of 115 pounds and approximately 120 pounds tare, or slightly more than ±2 pounds. Account for the tare weights of the containers. You may accept gas masses or weights provided by the gas supplier e.g., for the contents of cylinders containing new gas or for the heels remaining in cylinders returned to the gas supplier) if the supplier provides documentation verifying that accuracy standards are met; however, you remain responsible for the accuracy of these masses and weights under this subpart.

(c) All flow meters, weigh scales, and combinations of volumetric and density measures that are used to measure or calculate quantities under this subpart must be calibrated using calibration procedures specified by the flow-meter, scale, volumetric or density measure equipment manufacturer. Calibration must be performed prior to the first reporting year. After the initial calibration, recalibration must be performed at the minimum frequency specified by the manufacturer.

(d) For purposes of Equations SS–5 of this subpart, the emission factor for the valve-hose combination (EF_{C}) must be estimated using measurements and/or engineering assessments or calculations based on chemical engineering principles or physical or chemical laws or properties. Such assessments or calculations may be based on, as applicable, the internal volume of hose or line that is open to the atmosphere during coupling and decoupling activities, the internal pressure of the hose or line, the time the hose or line is open to the atmosphere during coupling and decoupling activities, the frequency with which the hose or line is purged and the flow rate during purges. You must develop a value for EF_{C} (or use an industry-developed value) for each combination of hose and valve fitting, to use in Equation SS–5 of this subpart. The value for EF_{C} must be determined for each combination of hose and valve fitting of a given diameter or size. The calculation must be recalculated annually to account for changes to the specifications of the valves or hoses that may occur throughout the year.

(e) Electrical equipment manufacturers and refurbishers must account for SF₆ or PFC emissions that occur as a result of unexpected events or accidental losses, such as a malfunctioning hose or leak in the flow line, during the filling of equipment or containers for disbursement by including these losses in the estimated mass of SF₆ or the PFC emitted downstream of the container or flowmeter during the period P.

(f) If the mass of SF₆ or the PFC disbursed to customers in new equipment over the period P is determined by assuming that it is equal to the equipment’s nameplate capacity or, in cases where equipment is shipped with a partial charge, equal to its partial shipping charge, equipment samples for conducting the nameplate capacity tests must be selected using the following stratified sampling strategy in this paragraph. For each make and model, group the measurement conditions to reflect predictable variability in the facility’s filling practices and conditions (e.g., temperatures at which equipment is filled). Then, independently select equipment samples at random from each make and model under each group of conditions. To account for variability, a certain number of these measurements must be performed to develop a robust and representative average nameplate capacity (or shipping charge) for each make, model, and group of conditions. A Student T distribution calculation should be conducted to determine how many samples are needed for each make, model, and group of conditions as a function of the relative standard deviation of the sample measurements. To determine a sufficiently precise estimate of the nameplate capacity, the number of measurements required must be calculated to achieve a precision of one percent of the true mean, using a 95 percent confidence interval. To estimate the nameplate capacity for a given make and model, you must use the lowest mean value among the different groups of conditions, or provide justification for the use of a different mean value for the group of conditions that represents the typical practices and conditions for that make and model. Measurements can be conducted using SF₆.
another gas, or a liquid. Re-measurement of nameplate capacities should be conducted every five years to reflect cumulative changes in manufacturing methods and conditions over time.

(g) Ensure the following QA/QC methods are employed throughout the year:
(1) Procedures are in place and followed to track and weigh all cylinders or other containers at the beginning and end of the year.

(h) You must adhere to the following QA/QC methods for reviewing the completeness and accuracy of reporting:
(1) Review inputs to Equation SS–1 of this subpart to ensure inputs and outputs to the company’s system are included.

Do not enter negative inputs and confirm that negative emissions are not calculated. However, the decrease in SF\(_6\) inventory may be calculated as negative.

(3) Ensure that beginning-of-year inventory matches end-of-year inventory from the previous year.

(4) Ensure that in addition to SF\(_6\) purchased from bulk gas distributors, SF\(_6\) returned from equipment users with or inside equipment and SF\(_6\) returned from off-site recycling are also accounted for among the total additions.

§ 98.455 Procedures for estimating missing data.

A complete record of all measured parameters used in the GHG emissions calculations is required. Replace missing data, if needed, based on data from similar manufacturing operations, and from similar equipment testing and decommissioning activities for which data are available.

§ 98.456 Data reporting requirements.

In addition to the information required by §98.3(c), each annual report must contain the following information for each chemical at the facility level:
(a) Pounds of SF\(_6\) and PFCs stored in containers at the beginning of the year.

(b) Pounds of SF\(_6\) and PFCs stored in containers at the end of the year.

(c) Pounds of SF\(_6\) and PFCs purchased in bulk.

(d) Pounds of SF\(_6\) and PFCs returned by equipment users with or inside equipment.

(e) Pounds of SF\(_6\) and PFCs returned to site from off site after recycling.

(f) Pounds of SF\(_6\) and PFCs inside new equipment delivered to customers.

(g) Pounds of SF\(_6\) and PFCs delivered to equipment users in containers.

(h) Pounds of SF\(_6\) and PFCs returned to suppliers.

(i) Pounds of SF\(_6\) and PFCs sent off site for destruction.

(j) Pounds of SF\(_6\) and PFCs returned to suppliers.

(k) The nameplate capacity of the equipment, in pounds, delivered to customers with SF\(_6\) or PFCs inside, if different from the quantity in paragraph (f) of this section.

(l) A description of the engineering methods and calculations used to determine emissions from hoses or other flow lines that connect the container to the equipment that is being filled.

(m) The values for EF\(_C\) for each hose and valve combination and the associated valve fitting sizes and hose diameters.

(n) The total number of fill operations for each hose and valve combination, or, F\(_{Ci}\) of Equation SS–5 of this subpart.

(o) The mean value for each make, model, and group of conditions if the mass of SF\(_6\) or the PFC disbursed to customers in new equipment over the period p is determined by assuming that it is equal to the equipment’s nameplate capacity or, in cases where equipment is shipped with a partial charge, equal to its partial shipping charge.

(p) The number of samples and the upper and lower bounds on the 95 percent confidence interval for each make, model, and group of conditions if the mass of SF\(_6\) or the PFC disbursed to customers in new equipment over the period p is determined by assuming that it is equal to the equipment’s nameplate capacity or, in cases where equipment is shipped with a partial charge, equal to its partial shipping charge.

(q) Pounds of SF\(_6\) and PFCs used to fill equipment at off-site electric power transmission or distribution locations, or M\(_{F}\), of Equation SS–6 of this subpart.