

ATTACHMENT A

Calculation of SF₆ Emissions

Calculate the annual SF₆ emissions using a mass balance approach that tracks and systematically accounts for all operator uses of SF₆, as follows. Any quantity of SF₆ that cannot be accounted for is then assumed to have been emitted into the atmosphere.

The mass balance approach was created by the U.S. EPA SF₆ Emission Reduction Partnership for Electric Power Systems.

(a) Calculate the change in inventory of SF₆ in storage using the following equation:

$$\Delta S_{\text{Inv}} = S_{\text{Inv-Begin}} - S_{\text{Inv-End}}$$

Where:

- ΔS_{Inv} = Change in inventory of SF₆ in storage, kilograms (“Storage” includes cylinders, gas carts, and other storage containers, but excludes equipment. Value will be negative if quantity of SF₆ increases during the year);
- $S_{\text{Inv-Begin}}$ = Quantity of SF₆ in storage at the beginning of the year, kilograms;
- $S_{\text{Inv-End}}$ = Quantity of SF₆ in storage at the end of the year, kilograms.

(b) Calculate the sum of all SF₆ acquired from other entities during the year either in storage containers or in equipment using the following equation:

$$S_{\text{PA}} = S_{\text{Cyl}} + S_{\text{Equip}} + S_{\text{Recyc-ret}}$$

Where:

- S_{PA} = Sum of all SF₆ acquired from other entities during the year either in storage containers or in equipment, kilograms;
- S_{Cyl} = Quantity of SF₆ purchased from producers or distributors in cylinders, kilograms;
- S_{Equip} = Quantity of SF₆ provided by equipment manufacturers with/inside equipment, kilograms;
- $S_{\text{Recyc-ret}}$ = Quantity of SF₆ returned to site after off-site recycling, kilograms.

(c) Calculate the sum of all SF₆ sold or otherwise disbursed during the year either in storage containers or in equipment using the following equation:

$$S_{\text{SD}} = S_{\text{Sales}} + S_{\text{Returns}} + S_{\text{Destruct}} + S_{\text{Recyc-off}}$$

Where:

- S_{SD} = Sum of all SF₆ sold or otherwise disbursed during the year either in storage containers or in equipment, kilograms;
- S_{Sales} = Quantity of SF₆ sold to other entities (including gas left in equipment that is sold), kilograms;

- S_{Returns} = Quantity of SF₆ returned to suppliers, kilograms;
- S_{Destruct} = Quantity of SF₆ sent to destruction facilities, kilograms;
- $S_{\text{Recyc-off}}$ = Quantity of SF₆ sent off-site for recycling, kilograms.

(d) Calculate the change in nameplate capacity of equipment using the following equation:

$$\Delta S_{\text{Cap}} = S_{\text{Cap-new}} - S_{\text{Cap-retire}}$$

Where:

- ΔS_{Cap} = Change in total nameplate capacity of equipment using SF₆ in storage, kilograms (“Total nameplate capacity” refers to the full and proper charge of the equipment rather than to the actual charge, which may reflect leakage. Value will be negative if retiring equipment has a total nameplate capacity larger than the total nameplate capacity of new equipment);
- $S_{\text{Cap-new}}$ = Total nameplate capacity (proper full charge) of new equipment, kilograms;
- $S_{\text{Cap-retire}}$ = Total nameplate capacity (proper full charge) of retired or sold equipment, kilograms.

(e) Calculate total annual emissions using the following equation:

$$S = (\Delta S_{\text{Inv}} + S_{\text{PA}} - S_{\text{SD}} - \Delta S_{\text{Cap}})$$

Where:

- S = Annual SF₆ emissions;
- ΔS_{Inv} = Change in inventory of SF₆ in storage, kilograms (“storage” includes cylinders, gas carts, and other storage containers, but excludes equipment. Value will be negative if quantity of SF₆ increases during the year);
- S_{PA} = Sum of all SF₆ acquired during the year either in storage containers or in equipment, kilograms;
- S_{SD} = Sum of all SF₆ sold or otherwise disbursed during the year either in storage containers or in equipment, kilograms;
- ΔS_{Cap} = Change in total nameplate capacity of equipment using SF₆ in storage, kilograms (“total nameplate capacity” refers to the full and proper charge of the equipment rather than to the actual charge, which may reflect leakage. Value will be negative if retiring equipment has a total nameplate capacity larger than the total nameplate capacity of new equipment);