Review of Revisions to the GHGRP for Electrical Equipment (Subparts DD & SS)

U.S. Environmental Protection Agency

October 22, 2024

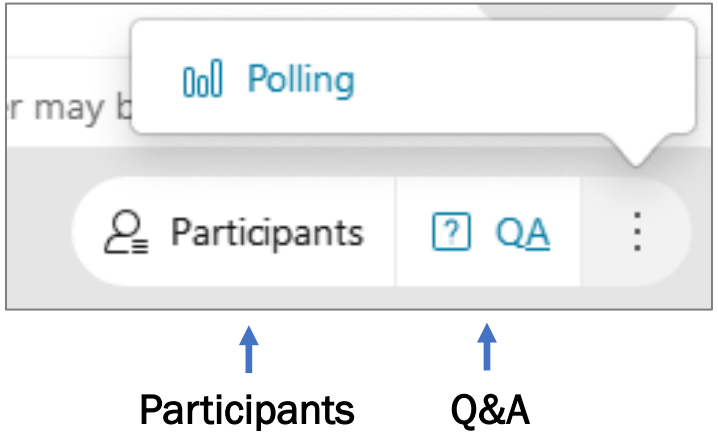
Webinar Panels

We will use two panels

- Participants, and Question & Answer (Q&A)
- Use the arrow to expand or collapse the panels

Adding Panels

- If some panels don't appear, select the desired panels in the lower right
- Select More Options (...) for additional panels



Q&A

- Participants are muted
- Questions will be moderated at the end

  - To ask a question:
    1. Select “All Panelists” from the drop-down menu
    2. Enter your question in the Q&A box
    3. Hit “Send”
- EPA will post webinar materials to the web in the coming weeks: www.epa.gov/ghgreporting

Disclaimer

This training is provided by EPA solely for informational purposes. It does not provide legal advice, have legally binding effect, or expressly or implicitly create, expand, or limit any legal rights, obligations, responsibilities, expectations, or benefits in regard to any person.

Overview of Updates to Subparts DD and SS

- Inclusion of all insulating gases
  - Except, in most cases, those with GWPs $\leq$ 1
- Threshold and emissions calculations
- New and revised definitions
- Procedure for (optional) measurement of nameplate capacities
- Changes will be effective starting on January 1, 2025.

Source Category Definitions for Subparts DD and SS will include all F-GHGs

- Revised source category definition for DD: "The electrical transmission and distribution equipment use source category consists of all electric transmission and distribution equipment and servicing **inventory insulated with or containing fluorinated GHGs, including but not limited to** sulfur hexafluoride (SF_6) and perfluorocarbons (PFCs)…"
- This change affects both applicability and the emissions calculations, **but only "reportable insulating gases" (those with GWPs over 1) count toward threshold calculations and must be reported** (change from the proposed rule).
- **For subpart SS**, only reportable insulating gases count toward threshold calculations and are included in emissions totals. However, **certain quantities of other insulating gases must be reported,** including the quantities delivered to customers in new equipment, charged into equipment at customer sites, and provided to customers in containers. The nameplate capacities of the equipment containing the other insulating gases must also be reported.

Threshold Calculation (Subpart DD)

- Applicability based on the total nameplate of equipment containing reportable insulating gases, the weight fraction of each fluorinated GHG in the insulating gas, the GWP, and an assumed emission factor of 10%.
- $E = \sum_j \sum_i NC_{EPS,j} * GHG_{i,w} * GWP_i * EF * 0.000453592$

E = Annual emissions for threshold applicability purposes (metric tons CO2e).

$NC_{EPS,j}$ = the total nameplate capacity of equipment containing reportable insulating gas j (excluding hermetically sealed-pressure equipment) located within the facility plus the total nameplate capacity of equipment containing reportable insulting gas j (excluding hermetically sealed-pressure equipment) that is not located within the facility but is under common ownership or control (lbs).

$GHG_{i,w}$ = The weight fraction of fluorinated GHG i in reportable insulating gas j in the gas insulated equipment included in the total nameplate capacity $NC_{other,j}$, expressed as a decimal fraction. If fluorinated GHG i is not part of a gas mixture, use a value of 1.0.

GWPi = Gas-appropriate GWP as provided in Table A-1 to subpart A of this part.

EF = Emission factor for electrical transmission and distribution equipment (lbs emitted/lbs nameplate capacity). For all gases, use an emission factor of 0.1.

Threshold Calculation (Subpart SS)

- Applicability based on the total purchases of reportable insulating gases, the weight fraction of each fluorinated GHG in the insulating gas, and the GWP of the fluorinated GHG.
- $E = \sum_j \sum_i P_j * GHG_{i,w} * GWP_i * EF * 0.000453592$

E = Annual production process emissions for threshold applicability purposes (metric tons CO2e).
P_j = Total annual purchases of reportable insulating gas j (lbs).
$GHG_{i,w}$ = The weight fraction of fluorinated GHG i in reportable insulating gas j if reportable insulating gas j is a gas mixture. If not a mixture, use 1.
GWPi = Gas-appropriate GWP as provided in Table A-1 to subpart A of this part.
EF = Emission factor for electrical transmission and distribution equipment (lbs emitted/lbs nameplate capacity). For all gases, use an emission factor of 0.1.

- Because the revised calculation results in an emissions estimate that facilities can compare directly to the 25,000 mtCO2e threshold, we are removing subpart SS from table A–3 and including it in table A–4 to subpart A. This will require facilities to determine applicability according to 40 CFR 98.2(a)(2) and consider the combined emissions from stationary fuel combustion sources (subpart C), miscellaneous use of carbonates (subpart U), and other applicable source categories.

Emissions Calculation (Subpart DD)

- Emissions calculations include emissions of all insulating gases with weighted average GWPs > 1
  - User Emissionsi = $\Sigma_j GHG_{i,w} * [($Decrease in Inventory of Reportable Insulating gas j) + (Acquisitions of Reportable Insulating gas j) – (Disbursements of Reportable Insulating gas j) – (Net Increase in Total Nameplate Capacity of Equipment Operated Containing Reportable Insulating gas j)]

- Facilities must track their inventories, acquisitions, disbursements and changes to total installed nameplate capacity by F-GHG and composition.

Emissions Calculation (Subpart SS)

- Emissions calculations include emissions of all insulating gases with weighted average GWPs > 1
  - User Emissionsi = $\Sigma_j GHG_{i,w} * [($Decrease in Inventory of Reportable Insulating gas j) + (Acquisitions of Reportable Insulating gas j) – (Disbursements of Reportable Insulating gas j)]
- Facilities must track their inventories, acquisitions, and disbursements by F-GHG and composition.

Definitions to Clarify Terms (Subparts DD and SS)

- *Insulating gas*, for the purposes of subparts DD and SS, means any fluorinated GHG or fluorinated GHG mixture, including but not limited to SF_6 and PFCs, that is used as an insulating and/or arc quenching gas in electrical equipment.
- *Reportable insulating gas*, for purposes of subparts DD and SS, means an insulating gas whose weighted average GWP, as calculated in equation DD–3 to §98.302 or equation SS-2 to § 98.452, is greater than one. A fluorinated GHG that makes up either part or all of a reportable insulating gas is considered to be a component of the reportable insulating gas.

Definitions to Clarify Terms (Subpart DD)

- *Energized,* for the purposes of subpart DD, means
  - connected through busbars or cables to an electrical power system or
  - fully-charged, ready for service, and being prepared for connection to the electrical power system.
  - Energized equipment does not include spare gas insulated equipment (including hermetically-sealed pressure switchgear) in storage that has been acquired by the facility, and is intended for use by the facility, but that is not being used or prepared for connection to the electrical power system.

Definitions to Clarify Terms (Subpart DD, cont.)

- *New equipment,* for the purposes of subpart DD, means either
  - any gas insulated equipment, including hermetically-sealed pressure switchgear, that is not energized at the beginning of the reporting year but is energized at the end of the reporting year, or
  - any gas insulated equipment other than hermetically-sealed pressure switchgear that has been transferred while in use, meaning it has been added to the facility's inventory without being taken out of active service (e.g., when the equipment is sold to or acquired by the facility while remaining in place and continuing operation).
- *Retired equipment,* for the purposes of subpart DD, means either
  - any gas-insulated equipment, including hermetically-sealed pressure switchgear, that is energized at the beginning of the reporting year but is not energized at the end of the reporting year, or
  - any gas insulated equipment other than hermetically-sealed pressure switchgear that has been transferred while in use, meaning it has been removed from the facility's inventory without being taken out of active service (e.g., when the equipment is acquired by a new facility while remaining in place and continuing operation).

Requirements for (Optional) Facility-Measured Nameplate Capacities (Subpart DD)

- Addresses concern that nameplate capacities provided by equipment manufacturers may not always be accurate, leading to over- or underestimated emissions.
- Applies to closed-pressure electrical equipment with a voltage capacity greater than 38 kV.
- Measurement is voluntary, but if facility measures the nameplate capacity (NC) of any equipment, it must measure NC of all eligible equipment that was installed or retired in that year or subsequent years.
- If facility-measured NC is more than two percent different from manufacturer-specified NC, facility must adopt measured value. If facility-measured NC is within two percent of manufacturer-specified NC, facility is not be required to adopt measured value, but if facility elects to adopt, it must adopt all facility-measured NCs within two percent of manufacturer-specified value.

Requirements for Measuring Nameplate Capacity of New Equipment (Subpart DD)

- Record the amount of insulating gas in the equipment at the time the equipment was acquired (pounds).
- If you add insulating gas to the equipment before energizing it for the first time, transfer the insulating gas to the equipment to reach the temperature-compensated design operating pressure per manufacturer specifications. Follow the manufacturer-specified procedure to ensure that the measured temperature accurately reflects the temperature of the insulating gas. Measure and calculate the total amount of reportable insulating gas added to the device using one of the following methods:
  - Weigh the gas container being used to fill the equipment before and after adding the gas to the equipment and take the difference between the "before" and "after" weights. Account for any gas contained in hoses before and after the transfer.
  - Use a flowmeter. During gas transfer, you must keep the mass flow rate within the range specified by the mass flow meter manufacturer to assure an accurate and precise mass flow meter reading. After filling, close the connection to the equipment from the mass flow meter hose and ensure that the gas trapped in the filling hose returns through the mass flow meter. Calculate the amount of gas transferred from the mass reading on the mass flow meter.
- Sum the results of the first two main bullets to obtain the measured nameplate capacity for the new equipment.
- See subpart DD, paragraph 98.303(b)(4), for detailed requirements.

Requirements for Measuring Nameplate Capacity of Retiring Equipment (Subpart DD)

- Measure and record the initial system pressure and vessel temperature prior to removing any insulating gas.
- Compare the initial system pressure and temperature to the equipment manufacturer's temperature/ pressure curve for that equipment and insulating gas.
- If the temperature-compensated initial system pressure of the electrical equipment does not match the temperature-compensated design operating pressure specified by the equipment manufacturer, you may either:
  - Add or remove insulating gas to/ from the electrical equipment until the manufacturer-specified value is reached, or
  - Under certain conditions, use equation DD–5 (described on next slide)
- Weigh the gas container being used to receive the gas and record this value.
- Recover insulating gas from the electrical equipment until five minutes after the pressure in the electrical equipment reaches a pressure of at most five pounds per square inch absolute (5 psia).
- Record the amount of insulating gas recovered (pounds) by weighing the gas container that received the gas and subtracting the starting weight. Account for any gas contained in hoses before and after the transfer.
- The amount of gas recovered shall be the measured nameplate capacity for the electrical equipment unless
  - the final temperature-compensated pressure of the electrical equipment exceeds 0.068 psia (3.5 Torr), in which case you must use equation DD-5, or
  - you are calculating the nameplate capacity using equation DD-5 for other reasons.
- See subpart DD, paragraph 98.303(b)(5), for detailed requirements.

Requirements for Measuring Nameplate Capacity of Retiring Equipment (Subpart DD, cont.)

- **Under limited circumstances**, Subpart DD allows facilities to recover less than 100% of the charge (e.g., if retiring equipment has leaked) and to calculate full charge (NC) based on ratio of pressures (Equation DD-5):

$$NC_C = \frac{P_{NC}}{\left(P_i - P_f\right)} \times M_R$$

- Conditions for using Equation DD-5:
  - the starting pressure of the equipment *must be between its temperature-compensated design operating pressure and 5 psi below that pressure*, and
  - the insulating gas *must be recovered to a pressure no higher than 5 psia (259 Torr).*
- Without these conditions, using Equation DD-5 to measure the nameplate capacity could lead to large errors because SF_6 does not behave like an ideal gas. **The conditions for using Equation DD-5 may represent a significant change from current practices in some cases.**

Requirements for Measuring Devices for Nameplate Capacity Measurements (Subpart DD)

- To avoid large errors that can affect flowmeter accuracy at low flow rates, subpart DD
  - Requires facilities to keep the mass flow rate within the range specified by the flowmeter manufacturer when adding gas to equipment and
  - Prohibits use of flowmeters to measure quantities of gas recovered from equipment.
- Measuring devices must be certified by the manufacturer to be accurate and precise to within:
  - Flow meters: 1 percent of the largest value that the flow meter can, according to the manufacturer's specifications, accurately record
  - Pressure gauges: 0.5% of the largest value that the gauge can, according to the manufacturer's specifications, accurately record
  - Temperature gauges: +/- 1.0° F
  - Scales: One percent of true weight

Implementing Nameplate Capacity Changes

- If the electrical equipment whose NC was measured will remain energized, facility must affix to the equipment a NC label showing the revised NC and the year the NC adjustment process was performed. (Manufacturer's previous NC label must remain visible.)
- For each piece of electrical equipment whose NC is adjusted during the reporting year, the revised NC value must be used in all rule provisions in which the NC is required to be recorded, reported, or used in a calculation.
- Facilities are allowed to measure and revise the NC value of any given piece of equipment only once, unless the NC itself is likely to have changed due to changes to the equipment (e.g., replacement of the equipment bushings).

For Additional Information

- For information on the GHGRP: https://www.epa.gov/ghgreporting
  - See the final rule here: https://www.govinfo.gov/content/pkg/FR-2024-04-25/pdf/2024-07413.pdf
    - After January 1, 2025, will be available here: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98?toc=1
  - Information and resources for reporting facilities
    - https://www.ccdsupport.com/confluence/display/faq/FAQs
  - GHGRP Help Desk: https://www.epa.gov/ghgreporting/forms/contact-us-about-ghg-reporting-0
- View and/or download the latest GHGRP Data
  - Envirofacts
  - Facility Level Information on GHGs Tool (FLIGHT)
  - 2017 Data Highlights
  - Industrial Profiles

Thank you for your attention!

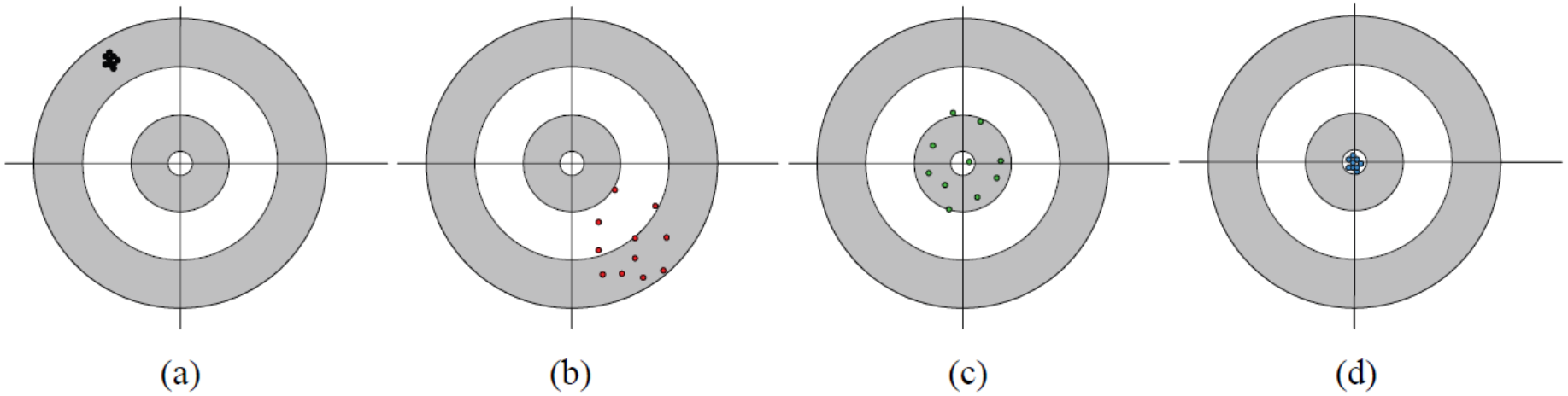
Current Reporting Threshold

§ 98.301 Reporting threshold.

(a) You must report GHG emissions from an electric power system if the total nameplate capacity of SF_6 and PFC containing equipment (excluding hermetically sealed-pressure equipment) located within the facility, when added to the total nameplate capacity of SF_6 and PFC containing equipment (excluding hermetically sealed-pressure equipment) that is not located within the facility but is under common ownership or control, exceeds **17,820 pounds** and the facility meets the requirements of § 98.2(a)(1).

Both Precision and Accuracy Affect Data Quality

(a) inaccurate but precise; (b) inaccurate and imprecise; (c) accurate but imprecise; and (d) precise and accurate



Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, *Volume 1, General Guidance and Reporting*, Chapter 3, "Uncertainties," page 3.8.