Estimating and Tracking SF_6 Nameplate Capacity for Electric Power Systems

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Overview

- Nameplate Capacity and SF_6 Emissions Reporting/Why a Presentation on SF_6 Nameplate Capacity?
- How Much Gas is in a Piece of Equipment
- Total System-wide Nameplate Capacity
- Challenges

Nameplate Capacity and SF_6 Emissions Reporting

- Ways to think of NPC:
  - NPC of an individual piece of equipment
  - System-wide NPC
  - Year-to-year changes in system-wide NPC

Why a Presentation on Nameplate Capacity?

- Huge effect on the overall emission rate, which is key relative performance indicator
  - Values that influence emission rate:
    - Total NPC of new equipment (D10)
    - Total NPC of retiring equipment (D11)
    - Total NPC in system
      - optional for Partnership reporting
- In proposed Mandatory Reporting Rule, reporting threshold is based on system-wide NPC

Why a Presentation on Nameplate Capacity? (cont.)

- Large Partners have found that system-wide NPC estimates were off up to 40%
- Varying levels of estimation and tracking methods among Partners
  - Some not fully aware of system-wide NPC (optional reporting parameter)
  - Some have been inventorying for years with assistance of asset management software
- So, very good opportunity for information sharing among Partners!

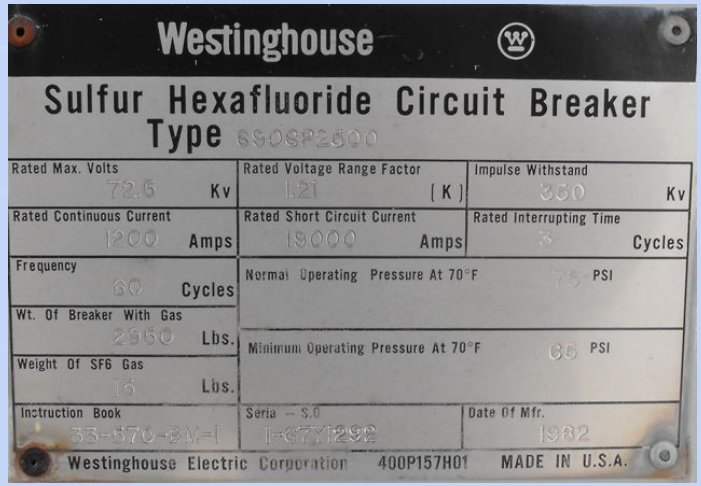
Options for Tracking Equipment Inventory

- Excel spreadsheet
- Computerized Maintenance Management System (CMMS)/Enterprise Asset Management (EIA)
  - e.g., Maximo
- Cost Accounting Management Software
  - e.g., Cascade
- The more tracking systems in place at one time the better → enables cross-checks.

How Much is in a Piece of Equipment?

- Capacity of SF_6 in lbs is affixed to equipment or provided in specs

- Measuring SF_6 charged into equipment
  - Mass flow meters
  - weighing cylinders before and after filling equipment
  - Temperature, pressure, and internal volume



Total System-wide Nameplate Capacity

- All SF_6-containing equipment should be included in total, including sealed-pressure
  - In current proposed rule it is not excluded

- Be careful about assuming all makes and models have same NPC
  - Different vintages can have different capacities

Year-to-Year System-wide Nameplate Capacity

Tracking year-to-year NPC:

- Most practical method:
  - *Current year NPC = previous year NPC + new nameplate – retiring nameplate*
- Most rigorous method:
  - Bottom-up assessment of equipment at each substation

Year-to-Year System-wide Nameplate Capacity (cont.)

Best balance of practicality and rigor?

- Will vary with system. Relatively new systems will typically require less attention.
- Asset Management Software will help squeeze out errors over time, making audits less necessary.
- Have any particular errors been found that could indicate more widespread problem?
- Measure amount of gas inside equipment when opportunities arise.

Year-to-Year System-wide Nameplate Capacity (cont.)

And the worst method is…

doing bottom-up assessment in first year of tracking and then adding/subtracting nameplate capacity changes indefinitely without ever auditing again.

Why?

- Small discrepancies each year can add up
- Original assessment could have been wrong

Challenges

1. Equipment has been delivered but will not be commissioned immediately

- For mass-balance to work properly:
  - the equipment must not be accounted for as new nameplate until it is energized.
  - gas inside equipment must be considered as storage inventory until equipment is energized
- Just think of the equipment not yet commissioned as a storage container

Challenges (cont.)

2. How much SF6 is in sealed-pressure equipment?

   - Not always provided with equipment
   - On the smaller equipment, OEMs may not even know
   - Crucial to communicate with OEMs

Challenges (cont.)

3. How much SF6 does old equipment contain?
   - Labeling can be imprecise, hard to read, or non-existent. Specs might not be on-hand.
   - Talk to OEMs. At a minimum, they can make calculations based on internal volumes, temperature, and pressure.

Challenges (cont.)

4. Internal structure of the equipment is altered through refurbishment or upgrade.
   - Change in NPC should be accounted for
     - Change in internal volume can be used to calculate new NPC, and OEMs should provide new NPC if performing job
     - Or, new amount of SF_6 that equipment holds could be weighed (more reliable, equipment needs to be refilled from scratch anyway)

Questions or Comments?

Thank you for your attention

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