



DILO 2nd Annual SF6 Gas Management Seminar
Tampa FL, November 2017



Nameplate Adjustments

SF6 Emission Reporting Challenges

- Nameplate Background
- State and Federal Regulations
- Reporting Challenges
- Solution - Nameplate Adjustment

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Who We Are



- **Electric Transmission and Distribution SF6 Coalition**
 - OEMs, Gas Producers and Distributors, Gas Management Firms
 - Regulator Participation
 - Open for Electric Utilities to Join

- **National Electrical Manufacturers Association**
 - 350 Members; American Manufacturers in the Electrical Sector
 - Standards Development Organization
 - Efficiency, Safety, Interoperability, Environmental Awareness and Market Enhancement



Nameplate Background



HISTORY AND CONTEXT

- Primarily Logistical Purpose (not safety)
 - Approximate mass once filled to proper density
 - Calculated by OEM: $\text{Volume (ft}^3\text{)} / \text{Density} = \text{Mass (lbs)}$
- Accurate Enough for Logistics is Not Precise Enough for Emissions Tracking/Reporting



US ENVIRONMENTAL PROTECTION AGENCY

- Owners And Operators Of Electric Power Transmission and Distribution Equipment With a Total Nameplate Capacity Exceeding 17,820 lbs
- Any Equipment Insulated with SF6
- Emissions = (Decrease in SF6 Inventory) + (Acquisitions of SF6) – (Disbursements of SF6) – (Net Increase in the Nameplate Capacity of Equipment)



CALIFORNIA AIR RESOURCES BOARD

- Same Threshold and Calculation
- Requires Reporting of Emissions in Relation to Total Nameplate Capacity Under Management (Emission Rate)
- Reduction Target = 1% Emission Rate by 2020



MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

- Same Calculation
- Threshold: Emission Rate or lbs of SF6 Emitted
- Requires Reporting of Emissions in Relation to Total Nameplate Capacity Under Management (Emission Rate)
- Reduction Target = 1% Emission Rate by 2020

DISCREPANCIES BETWEEN NAMEPLATE AND ACTUAL MASS

- **GIE Filled to Improper Density**
 - Intentional overfill
 - Other field errors

- **GIE Filled to Proper Density**
 - Imprecise nameplates



WHY ARE NAMEPLATES OFTEN IMPRECISE?

- Changes in Equipment Design
- Acceptable Manufacturing Tolerances
- Density = mass/volume
 - GIE Series A, Model 1: $0.38 \text{ lbs./ft}^3 = 526.3 \text{ lbs/200 ft}^3$
 - GIE Series A, Model 2: $0.38 \text{ lbs./ft}^3 = 513 \text{ lbs/195 ft}^3$
- Frequency: Informal Data Suggests Approx. 80%
- Regulators are Aware
 - “It will all come out in the wash“
 - Enforcement Discretion

WHEN ARE REPORTING ENTITIES IMPACTED?

- Installation
- Decommissioning
- Change in Inventory
- When Gas is Distributed



Solution – Nameplate Adjustment

EXPOSURE – NET INCREASE IN NAMEPLATE CAPACITY

NEW GIE		RETIRED GIE	
New Equipment NC	500	Retired Equipment NC	500
Acquisition	500	Acquisition	0
Disbursement	0	Disbursement	490
Fill to Proper Density	510	Fill to Proper Density	490
Inventory Decrease	10	Inventory Decrease	0
$(10) + (500) - (0) - (500) = 10$		$(0) + (0) - (490) - (-500) = 10$	

Emissions = (Decrease in SF6 Inventory) + (Acquisitions of SF6) – (Disbursements of SF6) – (Net Increase in the Nameplate Capacity of Equipment)



Solution – Nameplate Adjustment



EXPOSURE – INVENTORY AND DISTRIBUTION

Status January 1	Status December 31
GIE: Nameplate 100 lbs (charge 100 lbs) (Assumption: improper density)	GIE: Nameplate 100 lbs (charge 105 lbs) (Assumption: proper density)
Cylinder A: Empty	Cylinder A: 100 lbs
Cylinder B: 105 lbs	Cylinder B: Empty
Current Emission Calculation Method: $(5) + (0) - (0) - (0) = 5$ lbs	

Emissions = (Decrease in SF6 Inventory) + (Acquisitions of SF6) – (Disbursements of SF6) – (Net Increase in the Nameplate Capacity of Equipment)

PROCESS TO IDENTIFY PRECISE NAMEPLATE

- Ascertain Level of Gas Purity
- Record Initial System Pressure
- If Necessary, Bring Equipment to Proper Density
- Recover SF6 to blank-off of <math><3.5\text{ Torr}</math> (5-min Hold)
- Mass of SF6 Removed = Precise Nameplate
- Adjust for Level of Purity



Solution – Nameplate Adjustment

UTILITIES SHOULD BE ALLOWED TO ADJUST THE NAMEPLATE TO THE PRECISE FIGURE

NEW GIE		RETIRED GIE	
New Equipment NC	500	Retired Equipment NC	500
Acquisition	500	Acquisition	0
Disbursement	0	Disbursement	490
Fill to Proper Density	510	Fill to Proper Density	490
Inventory Decrease	10	Inventory Decrease	0
$(10) + (500) - (0) - (500) = 10$		$(0) + (0) - (490) - (-500) = 10$	
$(10) + (500) - (0) - (510) = 0$		$(0) + (0) - (490) - (-490) = 0$	

Emissions = (Decrease in SF6 Inventory) + (Acquisitions of SF6) – (Disbursements of SF6) – (Net Increase in the [adjusted] Nameplate Capacity of Equipment)



Solution – Nameplate Adjustment



UTILITIES SHOULD BE ALLOWED TO ADJUST THE NAMEPLATE TO THE PRECISE FIGURE

Status January 1	Status December 31
GIE: Nameplate 100 lbs (charge 100 lbs) (Assumption: improper density)	GIE: Nameplate 100 lbs (charge 105 lbs) (Assumption: proper density)
Cylinder A: Empty	Cylinder A: 100 lbs
Cylinder B: 105 lbs	Cylinder B: Empty
Current Emission Calculation Method: $(5) + (0) - (0) - (0) = 5$ lbs	
Proposed Emission Calculation Method: $(5) + (0) - (0) - (5) = 0$ lbs	

Emissions = (Decrease in SF6 Inventory) + (Acquisitions of SF6) – (Disbursements of SF6) – (Net Increase in the Nameplate Capacity of Equipment)

REGULATORY RELIEF – UNIFIED SOLUTION

- California: Rule Change
 - Retroactive reports
 - Specified time period
 - Credit/offset for alternatives
 - Phase-out

- Massachusetts: ??

- US EPA: Open to Discussion



POTENTIAL DOWNSIDE

- Hidden Emissions: Imprecise Nameplate and Real Emission, but the Emission is Less than the Mass-Nameplate Delta
- Negative Emissions: Nameplate is Lower than Actual Mass Even Though Equipment is Filled to Proper Density
- Can We Play Both Sides of the Ball?



- Nameplate Value Never Intended to be Used for Emissions Reporting
- Nameplates Are Accurate for Logistics but Not Precise for Reporting
- Utilites Can Empirically Demonstrate What the Precise Nameplate Value is
- Utilites Should be Able to Use the Precise Figure for Reporting





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SF6 Emissions Reporting Challenges

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**National Electrical Manufacturers Association
Electric Transmission & Distribution SF6 Coalition**

<http://www.nema.org/Products/Pages/The-Electric-Transmission-and-Distribution-SF6-Coalition.aspx>

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