

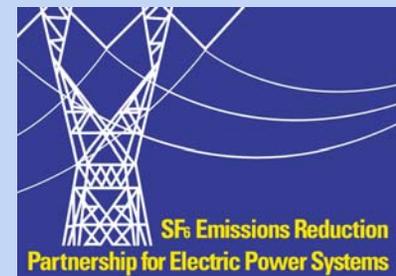
U.S. EPA's SF₆ Emission Reduction Partnership for Electric Power Systems

A Look Back on 10 Years and Opportunities for the Future

*EPA's 2009 Workshop on SF₆ Emission
Reduction Strategies*



February 4-5, 2009
Hyatt Phoenix
Phoenix, Arizona



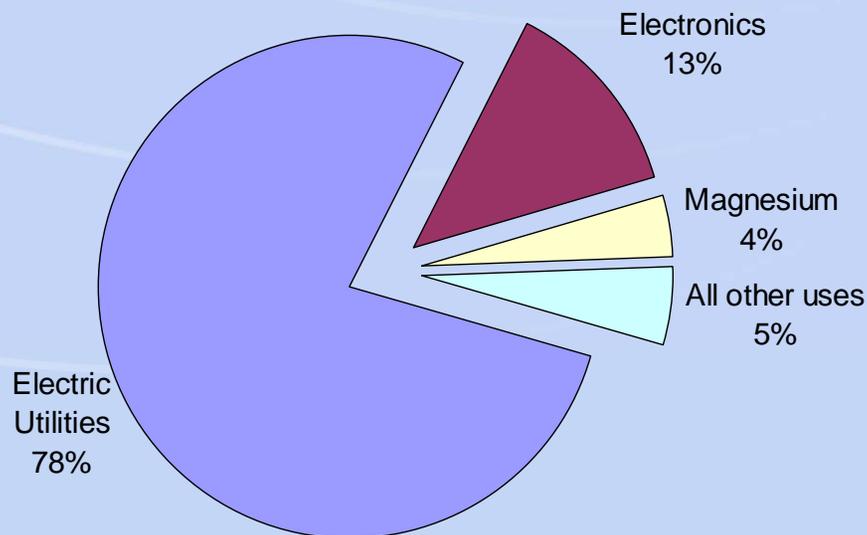
Overview

- SF₆ Gas Emissions from Electric Power Systems
- SF₆ Emission Reduction Partnership for Electric Power Systems
- Program Accomplishments
- Challenges
- Looking Ahead: Areas of Focus for 2009 and Beyond

Sulfur Hexafluoride (SF₆) and Electric Power Systems

The electric power industry is the primary industry user of SF₆ gas world-wide.

Breakdown of Total SF₆ Sales by Industry: 2003



Total 2003 Global Sales: 6,438 metric tons

Source: RAND Corporation, 2004

SF₆ Emissions Are a Concern Because...

- **SF₆ is the most potent greenhouse gas**
 - Global warming potential (GWP) of 23,900
 - 1 pound of SF₆ = 23,900 pounds (or 11 metric tons) of CO₂
- **SF₆ is a very persistent greenhouse gas**
 - Atmospheric lifetime of 3,200 years
 - Irreversible impacts
- **Lost SF₆ gas bad for Electric Power Systems**
 - Leakage means buying more SF₆ gas, diminished transmission efficiency and increased maintenance expenses
 - “Carbon price” is high

How Does SF₆ Gas Compare to Other Greenhouse Gases?

Compound	Atmospheric Life (Years)	Global Warming Potential (100-year time horizon)
CO ₂	—	1
CH ₄	12	21
HFC-134a	14.6	1,300
CF ₄	50,000	6,500
HFC-23	264	11,700
SF₆	3,200	23,900

The SF₆ Emission Reduction Partnership



- Formed in 1999 between EPA and 48 Charter Partners, Happy 10 Year Anniversary!
- A collaborative, voluntary agreement between EPA and the electric power industry
- Designed to cost-effectively reduce SF₆ emissions from electrical transmission operations
- Partners are encouraged to implement practices that are economically and technically feasible
- Currently 78 Partner utilities representing approximately 42% of total U.S. grid

Benefits of Joining the Partnership

- Be ready for local, state, regional, national, international policies and measures to reduce GHG emissions
- Create a voluntary record of reductions & establish and improve SF₆ gas inventory tracking methods
- Be recognized as an environmental leader actively addressing climate change
- Build network with industry peers and draw upon others' experiences and successes in reducing SF₆ emissions
- Experience improved system reliability
- Save money and increase operational efficiency

Carbon price of SF6 relative to CO2

\$/metric ton of CO2	\$5	\$10	\$20
CO2 (1 metric ton) 1 X \$	\$5	\$10	\$20
SF6 (one lb) 10.8 CO2 eq* x \$	\$54	\$108	\$216
SF6 cylinder = 115 lbs.	\$6,210	\$12,420	\$24,840

* Assuming SF6 GWP-100 of 23,900

Common Methods Partners are Implementing to Reduce SF₆ Emissions

- Systematic operations and inventory tracking including cylinder management and SF₆ gas recycling cart use
- Equipment leak detection and repair
- Equipment upgrades and the replacement of old equipment
- Training employees in best management practices to handle, manage, and monitor SF₆
- Learning new strategies from the experiences of other Partners!
 - Information sharing on new mitigation strategies and effective ways to implement existing strategies to reduce SF₆ emissions.

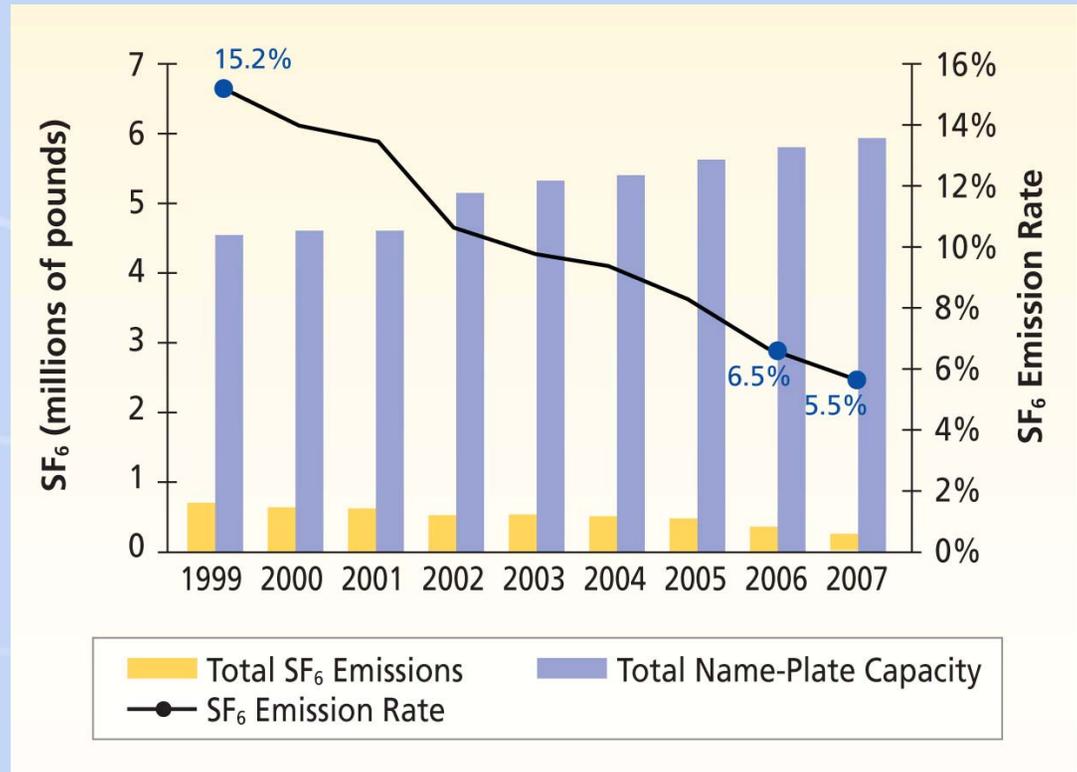
Program Accomplishments

- Partnership's annual average SF₆ emission rate:

- In 1999: **15.2%**
- In 2007: **5.5%**

- Total cumulative SF₆ emission reductions relative to the 1999 baseline:

**1,554,279
pounds**

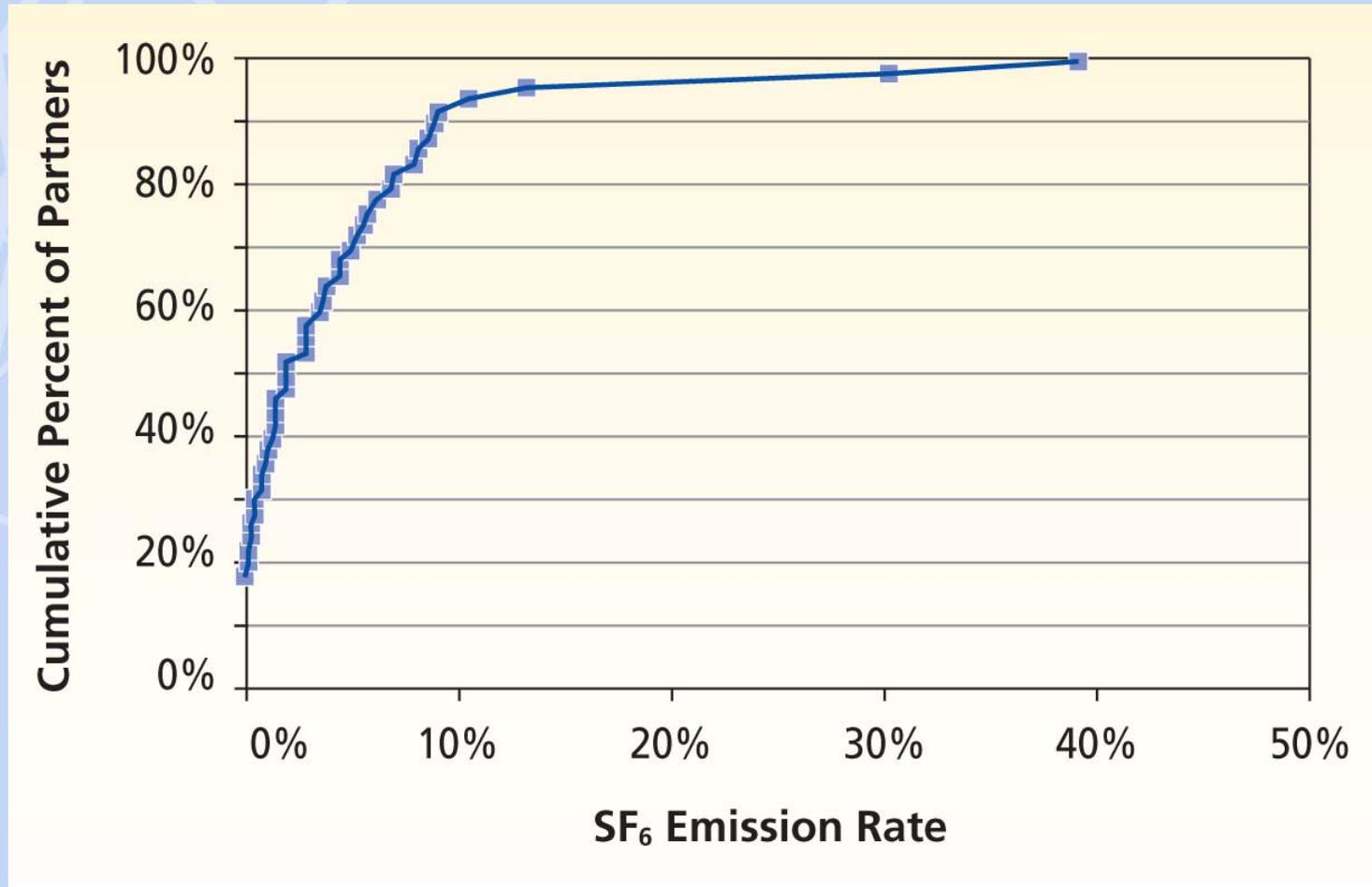


Program Accomplishments (cont.)

- Reductions of **1,554,278 pounds** equate to the CO₂ equivalent emission reductions from:
 - **3.1 million cars** not driven for one year
 - **39.1 million barrels of oil** not used
 - **4.4 million households** reducing electricity use by 50 percent for one year
 - Each year for 3,200 years

Source: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Spectrum of Emission Rates (2007)



New Partners since 2006

- City of Palo Alto
 - Palo Alto, CA
- ITC Transmission
 - Novi, Michigan
- New York State Electric & Gas
 - Ithaca, New York
- Oglethorpe Power
 - Tucker, GA
- PNM Resources
 - Albuquerque, NM
- VT Transco LLC
 - Rutland, Vermont



A listing of all current Partners is available in the Partnership's Annual Report available on the Partnership Web site at:

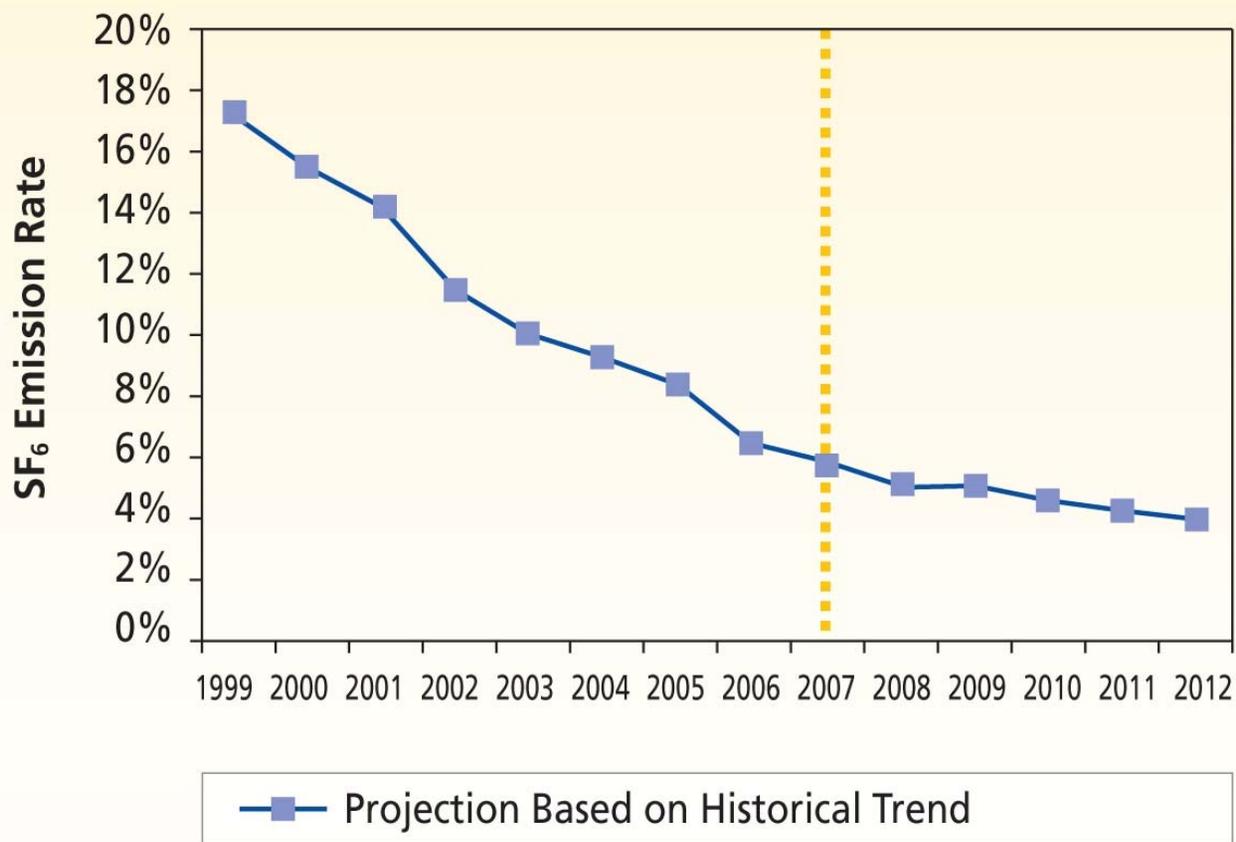
<http://www.epa.gov/electricpower-sf6/>

Partner Spotlight:

ITC Transmission

- Based in Novi, Michigan
- Joined Partnership in 2007
- Reduced SF₆ emissions by 58 percent between 2005 and 2007 through the following initiatives
 - Infrastructure Improvement Program
 - Circuit Breaker Replacement Project and GIS Infrastructure Replacement Project
 - Preventive Maintenance Program
 - To repair leaks from equipment that does not require replacement. Generally, this equipment was manufactured between the 1970s and 1990s
- Partnership Case Studies is available at:
<http://www.epa.gov/electricpower-sf6/documents/>

Looking ahead – How low can you go?



Areas of Focus for 2009 and Beyond

- Improve SF₆ gas inventory tracking and reporting
 - Have to measure to manage
 - Mass-balance method sound but requires well organized, rigorous system
- Continue to explore and expand SF₆ emission mitigation options
 - Policies and measures are coming
 - 3,200 years is a very long time
 - Expand industry participation
 - What's the other 58% of the grid doing?
 - Where are your Trade Associations?
- What do Partners need to succeed? EPA wants to hear your ideas for:
 - Technical studies?
 - Webinars?
 - Training materials?

Help me, help you

- By the end of the Workshop identify
 - 3 things your company needs to succeed at reducing emissions
 - 3 things the electric power sector needs to succeed at reducing emissions

**EPA congratulates the achievements of
current Partners and invites all remaining
U.S. electric power systems to join the SF₆
Emission Reduction Partnership for Electric
Power Systems**

Thank you.

Sally Rand, US EPA
Program Manager, SF₆ Emissions Reduction Partnership
for Electric Power Systems
1-202-343-9739
rand.sally@epa.gov

www.epa.gov/electricpower-sf6