

SF₆

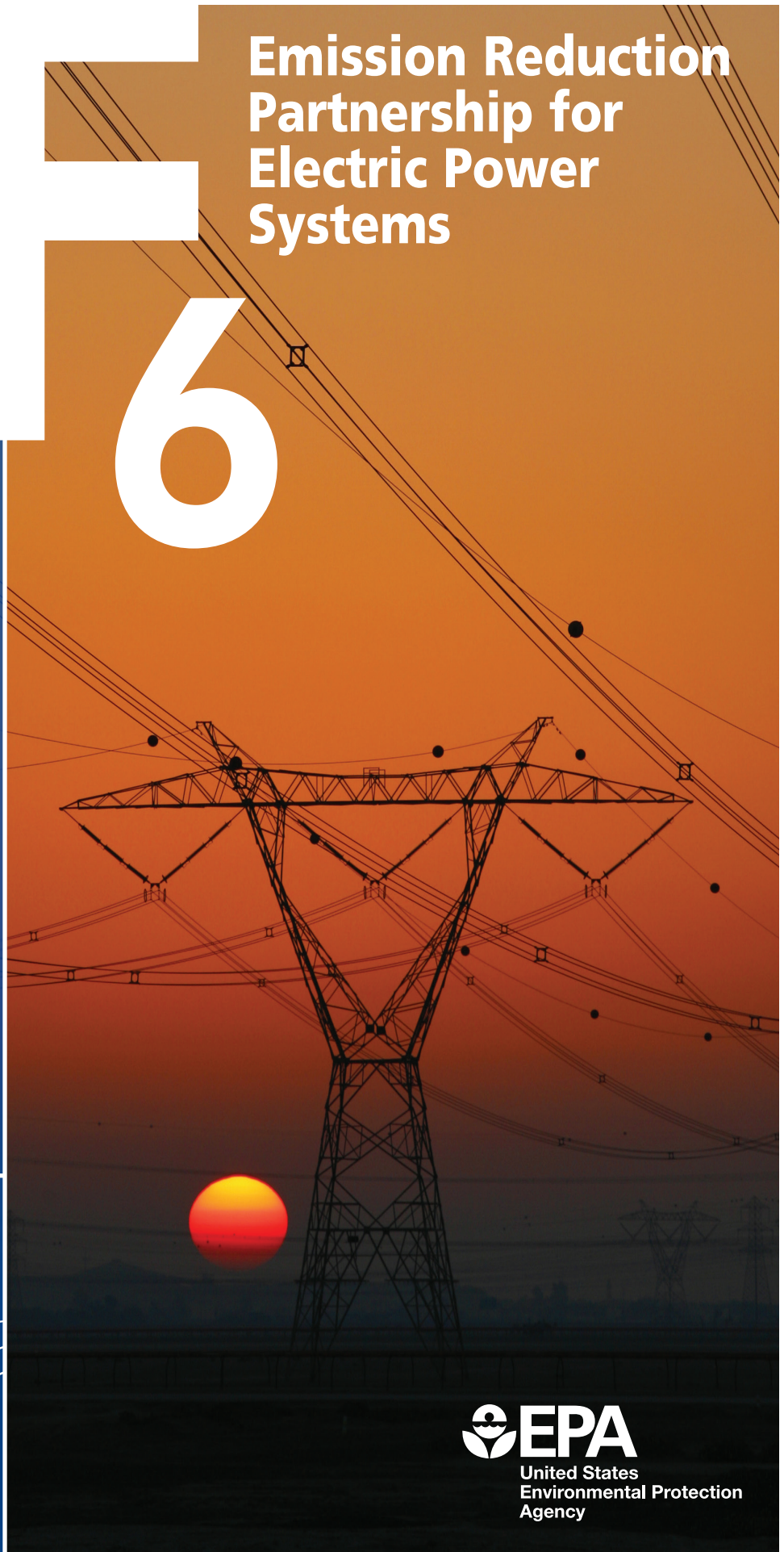
Emission Reduction Partnership for Electric Power Systems

2014 Annual Report

March 2015



**SF₆ Emission Reduction
Partnership for Electric Power Systems**



1999

Inception of the “Partnership” with 49 Charter Partners.

2000

1st International Conference on SF₆ and the Environment held in San Diego, CA.

2001–2003

Technical literature developed and made available on program web site including, “Byproducts of SF₆ Use in the Electric Power Industry” and “Catalog of Guidelines and Standards for the Handling and Management of SF₆.”

2nd International Conference on SF₆ and the Environment held in San Diego, CA in 2002.

2004

3rd International Conference on SF₆ and the Environment held in Scottsdale, AZ (substation tour).

Partners start receiving customized benchmark reports on their progress in the program. Service Provider directory made available.

2005

Webcast tutorials on estimating and reporting SF₆ emissions offered. Field study on leak rates from circuit breakers manufactured between January 1998 and December 2002 is completed.

2006

4th International Conference on SF₆ and the Environment held in San Antonio, TX (substation tour). Partnership participation increases to 77 companies representing 42% of U.S. grid.

2007–2009

The SF₆ emission rate continues to drop; by 2007, Partners have reduced SF₆ emissions by more than half of baseline emissions. In 2009, the Partnership celebrates its 10-year anniversary at the 5th Workshop in Phoenix, AZ. Partners convene at a Partner Meeting in Chicago in June 2009, hosted by Partner utility ComEd.

2010

Partner utility Oncor hosts Partner Meeting in May in Dallas, TX.

2012

Partner utility Georgia Power Company hosts Partner meeting in April in Atlanta, GA.

2014

The lowest SF₆ emission rate of the program to-date, 1.9%, is set. Partner utility Southern California Edison hosts Partner Meeting in May in Long Beach, CA.

The SF₆ Emission Reduction Partnership for Electric Power Systems

Since 1999, members of the U.S. electric power industry and the U.S. Environmental Protection Agency (EPA) have been working together to identify and implement opportunities to reduce SF₆ emissions. The SF₆ Emission Reduction Partnership for the Electric Power Systems (the Partnership) is one of the many voluntary public-private partnerships managed by EPA that aim to reduce or slow the growth of greenhouse gas emissions. Partner utilities voluntarily commit to reduce emissions of sulfur hexafluoride, or SF₆, a potent and long-lived greenhouse gas with a global warming potential (GWP) 22,800¹ times that of carbon dioxide (CO₂). This means that SF₆ is 22,800 times more effective at trapping infrared radiation than an equivalent amount of CO₂ over a 100-year period. Greenhouse gases range in their potency, and SF₆ is classified as the highest GWP gas. Although SF₆ is emitted in smaller quantities than many other greenhouse gases, its extremely long atmospheric lifetime of 3,200 years causes it to accumulate in the earth's atmosphere for centuries.

Because of its unique dielectric properties, electric utilities rely heavily on SF₆ in electric power systems for voltage electrical insulation, current interruption, and arc quenching in the transmission and distribution of electricity. While SF₆ should theoretically remain contained within equipment, in reality, the gas is inadvertently emitted into the atmosphere as leaks develop during various stages of the equipment's lifecycle. SF₆ can also be released at the time of equipment manufacture, installation, servicing, or de-commissioning. Because there is no clear alternative to SF₆, Partners reduce their greenhouse gas emissions through implementing emission reduction strategies such as detecting, repairing, and/or replacing problem equipment, as well as educating gas handlers on proper handling techniques of SF₆ gas during equipment installation, servicing, and disposal. The Partnership fosters information sharing of these better management practices. This report presents the SF₆ emission reduction achievements of the Partnership through 2013.

¹ IPCC Fourth Assessment Report.

Inside the 2014 SF₆ Emission Reduction Partnership Annual Report

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Partner Accomplishments

As part of their commitment to the Partnership, each year Partners report their SF₆ emissions and nameplate capacity estimates to EPA. (Note: Under EPA's Greenhouse Gas Reporting Program, Partners with a total nameplate capacity exceeding 17,820 pounds must report emissions and nameplate capacity under subpart DD - Use of Electric Transmission and Distribution Equipment.) EPA collects and aggregates Partner information to determine the overall accomplishments of the Partnership. The results of the 2013 reporting year for the Partnership, including the cumulative emissions reduction for the program in comparison to the 1999 baseline year, are presented in the following section.

Partner-Reported Emissions Summary

The Partnership's annual average SF₆ emission rate, the ratio of SF₆ emissions relative to total SF₆ nameplate capacity (i.e., the total quantity of SF₆ contained in electrical equipment), is a benchmark metric by which achievements of the Partnership are tracked. As illustrated in Figure 1, the annual average SF₆ emission rate of Partners has decreased drastically since 1999. In the past five years, the emission rate has halved, from over 4 percent to just below 2 percent. Overall, the annual average SF₆ emission rate for the Partnership is down approximately 87 percent from the 1999 baseline emission rate of 14.2 percent to 1.9 percent in 2013. Table 1 summarizes the Partnership's aggregate SF₆ emissions, nameplate capacity, and emission rate for the 1999 to 2013 reporting years.²

² The SF₆ emission rate is a valuable assessment of Partnership trends because it allows for a normalized comparison. While Partners vary in total SF₆ nameplate capacity, a larger utility, although using more SF₆, will not necessarily have a higher emission rate than a smaller utility.

Estimation Methods

Results in Table 1 are based on Partners in the program in 2013 as the

representative population size for estimates for the entire time-series (1999–2013). To estimate emissions and nameplate capacity not reported by Partners, a set of assumptions was developed. For example, if a Partner reported for 2011 and 2013 but not for 2012, 2012 estimates were determined through linear interpolation.

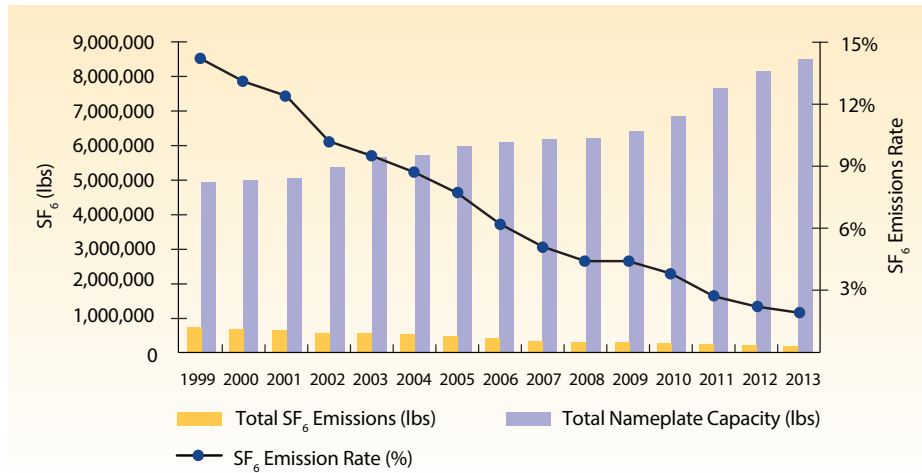
Additionally, Partnership emission estimates for all years have been revised to reflect the global warming potential (GWP) provided in the IPCC Fourth Assessment Report (AR4) (IPCC 2006). International reporting standards now require the use of AR4 GWP values, which reflect an updated understanding of the atmospheric properties of greenhouse gases. Prior Partnership estimates benchmarked the IPCC Second Assessment Report (SAR) (IPCC 1996). The AR4 GWP value for SF₆ of 22,800 is lower than the SAR GWP (23,900), leading to an overall decrease in emissions across the Partnership time series. The atmospheric lifetime of SF₆ is estimated to be 3,200 years.

*GWP is a measure of the total energy that a gas absorbs over a particular period of time (usually 100 years) compared to CO₂.

Sources: IPCC (2006) 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The National Greenhouse Gas Inventories Programme, The Intergovernmental Panel on Climate Change, H.S. Eggleston, L. Buendia, K. Miwa, T. Ngara, and K. Tanabe (eds.). Hayama, Kanagawa, Japan.

IPCC (1996) Climate Change 1995: The Science of Climate Change. Intergovernmental Panel on Climate Change. J.T. Houghton, L.G. Meira Filho, B.A. Callander, N. Harris, A. Kattenberg, and K. Maskell. (eds.). Cambridge University Press. Cambridge, United Kingdom.

Figure 1: SF₆ Emission Rate Trends



From 2012 to 2013, total SF₆ emissions have decreased to 160,523 pounds, while the Partnership nameplate capacity increased to 8,459,306 pounds. Both of these changes led to an overall decrease in the annual average Partnership SF₆ emission rate. A summary of the Partnership’s SF₆ emissions and reductions are presented in Table 2. The SF₆ emission reductions, presented in terms of pounds of SF₆ and million metric tons of carbon dioxide equivalent (MMTCO_{2e}), were calculated using a baseline year of 1999.

TABLE 1: Summary of Partnership SF₆ Emissions, Nameplate Capacity, and Emission Rate

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total SF ₆ Emissions (lbs)	695,738	648,883	622,759	544,614	536,596	497,348	460,694	378,872	311,181	270,761	282,950	257,474	202,774	174,769	160,523
Total Nameplate Capacity (lbs)	4,896,316	4,962,428	5,024,421	5,339,647	5,632,412	5,694,533	5,954,138	6,084,171	6,136,808	6,182,346	6,370,735	6,810,708	7,634,502	8,128,139	8,459,306
SF ₆ Emission Rate (%) ^a	14.2%	13.1%	12.4%	10.2%	9.5%	8.7%	7.7%	6.2%	5.1%	4.4%	4.4%	3.8%	2.7%	2.2%	1.9%

Note: Historical estimates have been updated based on the estimation methodology used by EPA and data made available by Partners.
^a Emission rate is defined as total emissions divided by total nameplate capacity (i.e., the total quantity of SF₆ contained in electrical equipment).

TABLE 2: Summary of Absolute Partnership SF₆ Emission Reductions

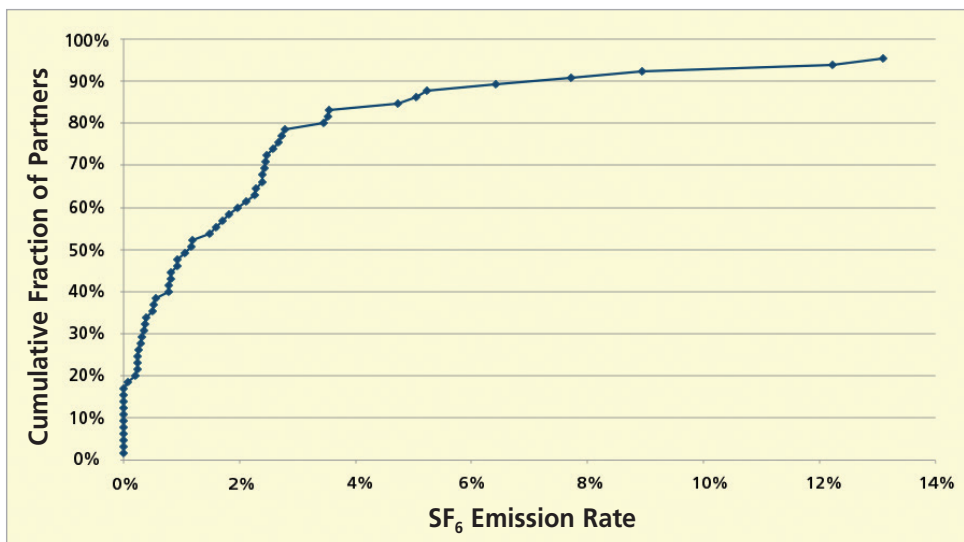
	1999 ^b	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total Partner-Reported SF ₆ Emissions (lbs)	695,738	648,883	622,759	544,614	536,596	497,348	460,694	378,872	311,181	270,761	282,950	257,474	202,774	174,769	160,523
Total Partner-Reported SF ₆ Emissions (MMTCO _{2e})	7.19	6.71	6.44	5.63	5.55	5.14	4.76	3.92	3.22	2.80	2.93	2.66	2.10	1.81	1.66
Reduction from Baseline (lbs)		46,855	72,979	151,124	159,142	198,390	235,044	316,866	384,557	424,977	412,788	438,264	492,964	520,969	535,215
Reduction from Baseline (MMTCO _{2e})		0.48	0.75	1.56	1.65	2.05	2.43	3.28	3.98	4.39	4.27	4.53	5.10	5.39	5.53
Percent Reduction from Baseline		6.7%	10.5%	21.7%	22.9%	28.5%	33.8%	45.5%	55.3%	61.1%	59.3%	63.0%	70.9%	74.9%	76.9%

Note: Historical estimates have been updated based on the estimation methodology used by EPA and data made available by Partners.
^b Baseline year.

To date, Partners have decreased absolute emissions of SF₆ by 75 percent. Annual SF₆ reductions collectively made by Partners from 2011 to 2012 were 28,235 pounds, or the CO₂ equivalent of 0.31 MMTCO₂e. From 1999 through 2012, Cumulative Partnership emissions reductions totaled close to 3.8 million pounds of SF₆ or 41 MMTCO₂e (i.e., based on the sum of “Reduction from Baseline” as provided in Row 3, Table 2). If the Partnership’s SF₆ emission rate of 14 percent remained unchanged since 1999, then the total amount of emissions emitted to the atmosphere since 1999 would be 6.1 million pounds greater than has actually occurred.

Figure 2 displays the distribution of Partners according to their emission rate. As illustrated, around 85 percent of Partners are below an emission rate of 5 percent, and around 70 percent of all Partners have achieved an emission rate of 2.5 percent or less. Emission rates of Partners vary due to a number of factors such as total nameplate capacity within their system, transmission miles, age and geographic location of equipment, and the number of years participating in the Partnership.

Figure 2: SF₆ Emission Rate Trends



Cumulative SF₆ emissions reductions of 4,390,000 pounds relative to the 1999 baseline are equivalent to CO₂ emissions reductions from:

- **9.6 million** passenger cars not driven for one year
- **105.6 million** barrels of oil not used
- **11.9** coal-fired power plants not used for one year

Because SF₆ has an atmospheric lifetime of 3,200 years (100-year lifetime, reported in the IPCC Fourth Assessment Report), the benefits of reducing emissions accrue for many generations.

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

Partnership Announcements and Updates

This section covers updates on outreach events, the latest developments in the Greenhouse Gas Reporting Program, and new Partners to the program.

2014 Workshop on SF₆ Emission Reduction Strategies

On May 6–7, 2014, the Partnership held a workshop on SF₆ emission reduction strategies at the Hilton Long Beach Hotel in Long Beach, CA.

This workshop brought together 129 participants from Partner utilities, service providers, gas producers and distributors, and equipment manufacturers. Sessions were held on various topics, including leak detection and monitoring, inventory systems, and an update on climate science and policy. A roundtable discussion was held, allowing an open forum for Partners in attendance to discuss improving SF₆ emission and nameplate capacity estimates, best management practices, and mitigation strategies for SF₆ emission reductions and the future of the SF₆ partnership. Presentations are available on the Partnership website.

Workshop participants were also offered a site tour of Southern California Edison's Distribution Apparatus Shop, located in Westminster, CA. The shop serves the utility's 50,000-square-mile territory and is responsible for storing new SF₆ equipment, servicing and decommissioning equipment, storing and dispatching carts and leak detectors, and weighing and inventorying SF₆ cylinders.

2014 Workshop: Long Beach, CA

EPA would like to specially recognize and thank Partner utility Southern California Edison (SCE). This successful workshop would not have been possible without the hard work and hospitality of SCE.



SOUTHERN CALIFORNIA
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The workshop was also supported by the following sponsors:

- **Electric T&D SF₆ Coalition (NEMA)**
- **Proline Utility Technologies**
- **Solon Manufacturing**
- **WIKA**

At the workshop, EPA presented Partnership recognition awards to two Partners:

- **Commonwealth Edison Company (ComEd) for their organizational and team leadership.** ComEd is a unit of Chicago-based Exelon Corporation which is an electric and gas utility holding company. ComEd is the largest electric power delivery service company in Illinois, providing service to more than 3.7 million customers across Northern Illinois. ComEd does not own or operate electric power generation facilities.

ComEd's SF₆ emission reduction efforts are led by a team that is responsible for setting annual program targets and reduction goals for SF₆ as part of ComEd's overall corporate environmental goals. The team meets at the beginning of each year to review progress and identify continuous improvement opportunities and then meets throughout the year to track actions and accomplishments. As a result of its enhanced SF₆ reduction strategic planning, ComEd has decreased its SF₆ leak rate in each of the past ten years. While industry average leak rates (emissions/total nameplate capacity) are 3.8 percent, ComEd's leak rate was 0.55 percent for 2012 and 0.25 percent for 2013. Joining in 1999, ComEd was one of the founding Partners of the program.



Sally Rand, EPA, with Marvin Landeros, Lorinda Alms, and Mark Slezak from ComEd



John Kahabka from New York Power Authority with Sally Rand, EPA

- **New York Power Authority (NYPA) for their excellence in SF₆ inventory and data collection system.** NYPA is one of New York State's leading suppliers of electricity, operating 16 generating facilities and more than 1,400 circuit-miles of transmission lines. NYPA is a state-owned and -operated public power organization and sells electric power to government agencies, community-owned electric systems and rural electric cooperatives, companies, private utilities for resale to their customers, and neighboring states.

NYPA was awarded for its recognition of the importance of high quality data for use not only in required reporting but in the trending of equipment. NYPA embarked on an effort to design a system to track SF₆ information in an easy to use format while providing data reports required for external and internal greenhouse gas reporting programs.

Estimating Nameplate Capacity

Since 2012, EPA, Partners, the original equipment manufacturers (OEMs) of SF₆-insulated electric transmission and distribution equipment (GIE), and other industry representatives have studied and worked through identifying best practices for collecting consistent and comparable nameplate capacity data, a key component used to estimate emissions. The nameplate capacity of GIE refers to the full and proper charge of gas in the equipment, in pounds, which is determined based on density, psig/degree C, per manufacturer's filling instructions. This is referred to as the stated nameplate capacity, as it is determined by the equipment manufacturer and identified either on a label on the GIE and/or in the manufacturer's specifications. Reportedly, the manufacturer's stated nameplate capacity may not always be representative of the mass, in pounds, needed to reach the full and proper charge of the equipment. Industry has noted that the following two practices are taking place:

- Underfilling, i.e., filling to a density which results in a mass, in pounds, that is lower than the stated nameplate capacity, and
- Overfilling, i.e., filling to a density which results in a mass, in pounds, that is higher than the stated nameplate capacity.

These inconsistencies and uncertainties can lead to errors in emissions estimates. Preventative measures to avoid discrepancies can be taken to reduce estimation error. These measures include:

At Purchase:

- **Account for any partial charge.**
 - » Equipment users should account for any partial charge, the value of which should be conveyed by the OEM.

At Installation:

- **Discontinue overfilling and underfilling.**
 - » Discontinue the practice of knowingly overfilling or underfilling GIE to any density other than the stated nameplate capacity.
- **Use accurate measuring devices and filling techniques.**
 - » Ensure that all filling GIE (e.g., regulator, hose assembly) and temperature and pressure gauges used at installation are properly calibrated and accurate.
 - » Gauges supplied with breakers reportedly are not always accurate.
- **Confirm the filled density.**
 - » Ensure that GIE is filled to the stated nameplate capacity, which is determined based on density (psig/degree C) per the manufacturer's filling instructions.

At Servicing and Refurbishment:

- **Discontinue overfilling and underfilling.**
 - » Discontinue knowingly overfilling or underfilling GIE to any density other than the stated nameplate capacity.
 - » With refurbishment, clearly document any change in the internal volume of GIE. Any adjustment to nameplate capacity should be referenced through the lifetime of the equipment for servicing and retirement.
- **Use accurate measuring devices and gas recovery and filling techniques.**
 - » Personnel should have an understanding of the recovery process, as a significant amount of gas can remain in equipment even when the equipment is drawn down to a vacuum.
- **Confirm the filled density.**

At Decommissioning:

- Use accurate measuring devices and gas recovery and filling techniques.
 - Conduct a density check before recovery.
 - » Measure temperature and pressure of the gas prior to recovery and compare to temperature-adjusted pressure to which GIE is supposed to be filled.
- This practice facilitates identifying whether a discrepancy exists between the mass of gas recovered and the stated nameplate capacity, which may be due to:
- leaks;
 - underfilling/overfilling (e.g., during the most recent servicing of the decommissioned equipment); or
 - an inaccuracy in the nameplate capacity.

These measures can help mitigate data quality concerns but may not address all challenges. Partners subject to mandatory reporting must adhere to any applicable regulation for compliance. In EPA's voluntary program, Partners are encouraged to share examples of their experiences with nameplate capacity data and to continue the exchange of information, successes, and lessons learned with industry peers.

Mandatory Reporting of Greenhouse Gases Rule

In response to the FY2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110-161), in 2009, EPA issued the Final Mandatory Reporting of Greenhouse Gases Rule. The rule requires reporting of greenhouse gas (GHG) emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions.

Reporting requirements for Partners as well as other electric power systems, as set forth under Subpart DD of the regulation rule, can be found on EPA's Greenhouse Gas Reporting Program website at <http://www.epa.gov/ghgreporting/>. Emissions from electric power systems are covered by the rule if the total nameplate capacity of SF₆-containing equipment exceeds 17,820 pounds of SF₆, which is estimated to be the equivalent of an emissions threshold of 25,000 metric tons of CO₂eq per year.

Electric Power Systems subject to this rule must submit mandatory reports covering calendar year 2014 by March 31, 2015. GHGRP facility-specific emissions data are available at <http://ghgdata.epa.gov/ghgp/main.do>.

New Partners

In 2014, the Partnership welcomed two new Partners—Los Angeles Department of Water and Power and Vermont Electric Cooperative.

The Partnership has continued to grow in size, nearly doubling from 49 members to 86 members as of December 2014. Charter members are specially recognized in the complete Partner list, which can be referenced at the end of this report.

Continued Growth and Success

When EPA and the electric power industry launched the Partnership in 1999, the challenge to reduce SF₆ emissions in technically and economically feasible ways was at hand. EPA and Partners met this challenge making significant reductions primarily by identifying and replacing or repairing old, leaking breakers. Over the years, Partners advanced their strategies to reduce SF₆ emissions, examining their systems for all possible sources of potential emissions; purchasing new laser leak-detection cameras; working with their vendors to receive SF₆ inventory-related reports; tightening their gas cylinder inventories; purchasing more recycling carts; introducing software systems to better monitor and manage inventory; and improving on their overall management and training procedures. Voluntary action under the Partnership has yielded impressive results. In this reporting year, SF₆ Partners collectively reduced the average SF₆ emission rate to 1.9 percent compared to 3.8 percent in 2010 and 14.2 percent in 1999. SF₆ emissions in the 2013 reporting year are 87 percent lower than in the 1999 baseline year. Cumulatively, over the course of the Partnership, SF₆ Partners have prevented the escape of approximately 4.4 million pounds of SF₆ or 45 MMTCO₂e. Preventing the loss of this much gas into the atmosphere translates into an equivalent of \$35.1 million to \$52.7 million of avoided SF₆ purchases to replace such losses.³

³ Based on an SF₆ gas cost range of \$8 to \$12 per pound. Estimated cost savings does not consider other potential cost savings that might be realized indirectly, such as savings from reduced labor and maintenance expenditure or potential annual SF₆ cylinder rental fees.

EPA applauds all Partners for the program's success and encourages Partners to continue setting and working towards ambitious reduction goals with the program.

For additional information please contact:

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Email: rand.sally@epa.gov

List of Partners (as of December 2014)

*Charter Partner

Subsidiaries are bulleted under parent companies

American Electric Power (AEP)*
Columbus, OH

Arizona Public Service Company (APS)
Phoenix, AZ

Athens Electric Department*
Athens, AL

Austin Energy
Austin, TX

Bangor Hydro-Electric Company*
Bangor, ME

Big Rivers Electric Corporation*
Henderson, KY

Bonneville Power Administration*
Portland, OR

CenterPoint Energy*
Houston, TX

Central Maine Power Company*
Augusta, ME

Central Vermont Public Service Corporation*
Rutland, VT

City of Palo Alto
Palo Alto, CA

Consolidated Edison Company of New York, Inc. *
New York, NY

CPS Energy (formerly San Antonio City Public Service Board)*
San Antonio, TX

Duquesne Light Company*
Pittsburg, PA

Edison International
Rosemead, CA

El Paso Electric Company*
El Paso, TX

Entergy Corporation
New Orleans, LA

Eugene Water and Electric Board*
Eugene, OR

Exelon Energy Delivery (EED)

▶ **ComEd Energy Delivery***
Chicago, IL

▶ **PECO Energy Delivery**
Philadelphia, PA

FirstEnergy Corporation*
Akron, OH

▶ **Allegheny Power**
Greensburg, PA

Fort Pierce Utilities Authority*
Fort Pierce, FL

Grand Island Utilities Department*
Grand Island, NE

Hastings Utilities*
Hastings, NE

ITC Transmission
Novi, MI

Kings River Conservation District*
Fresno, CA

Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU)
Louisville, KY

Los Angeles Department of Water and Power
Los Angeles, CA

Lower Colorado River Authority (LCRA)
Austin, TX

Maine Public Service Company*
Presque Isle, ME

Manitowoc Public Utilities*
Manitowoc, WI

Memphis Light, Gas & Water Division
Memphis, TN

Menasha Utilities*
Menasha, WI

MidAmerican Energy
Des Moines, IA

Montana-Dakota Utilities
Bismarck, ND

Muscatine Power & Water*
Muscatine, IA

Nashville Electric Service (NES)
Nashville, TN

National Grid

▶ **Granite State Electric**
Northborough, MA

▶ **Massachusetts Electric**
Northborough, MA

▶ **Nantucket Electric**
Nantucket, MA

▶ **Narragansett Electric**
Providence, RI

▶ **New England Power Company**
Westborough, MA

➤ **New England Electric Transmission Corporation**
Westborough, MA

➤ **New England Hydro-Transmissions Company Inc.**
Westborough, MA

➤ **Niagara Mohawk Power Corporation**
Syracuse, NY

Nebraska Public Power District
Columbus, NE

New Hampshire Transmission-Seabrook Station
Seabrook, NH

New York Power Authority
New York, NY

New York State Electric and Gas
Ithaca, NY

Northeast Utilities Services Company*

➤ **Connecticut Light and Power Company**
Berlin, CT

➤ **Public Service Company of New Hampshire**
Manchester, CT

➤ **Western Massachusetts Electric Company**
West Springfield, MA

Northern Indiana Public Service Company (NIPSCO)
Merriville, IN

NSTAR Electric and Gas
Westwood, MA

➤ **Boston Edison Company**
Boston, MA;

➤ **Cambridge Electric Light Company**
Boston, MA

➤ **Commonwealth Electric Company**
Boston, MA

Oglethorpe Power
Tucker, GA

Oklahoma Gas and Electric Corporation* (OG&E)
Oklahoma City, OK

Oncor (formerly TXU)*
Dallas, TX

Otter Tail Power Company
Fergus Falls, MN

Pacificorp
Portland, OR

➤ **Pacific Power**
Portland, OR

➤ **Rocky Mountain Power**
Salt Lake City, UT

Pacific Gas and Electric Corporation (PG&E)*
San Francisco, CA

PNM Resources
Albuquerque, NM

Public Utility District No. 1 of Douglas County
East Wenatchee, WA

Public Utility District No. 1 of Pend Oreille County*
Newport, WA

Rochester Gas and Electric Corporation
Rochester, NY

Salt River Project**
Phoenix, AZ

San Diego Gas & Electric
San Diego, CA

Seattle City Light
Seattle, WA

Silicon Valley Power*
Santa Clara, CA

South Carolina Electric & Gas Company
Columbia, SC

Southern Company*
Atlanta, GA

State of California – Department of Water Resources
Sacramento, CA

Tennessee Valley Authority (TVA)
Knoxville, TN

Texas Municipal Power Agency*
Bryan, TX

Vermont Electric Cooperative
Johnson, VT

VT Transco LLC
Rutland, VT

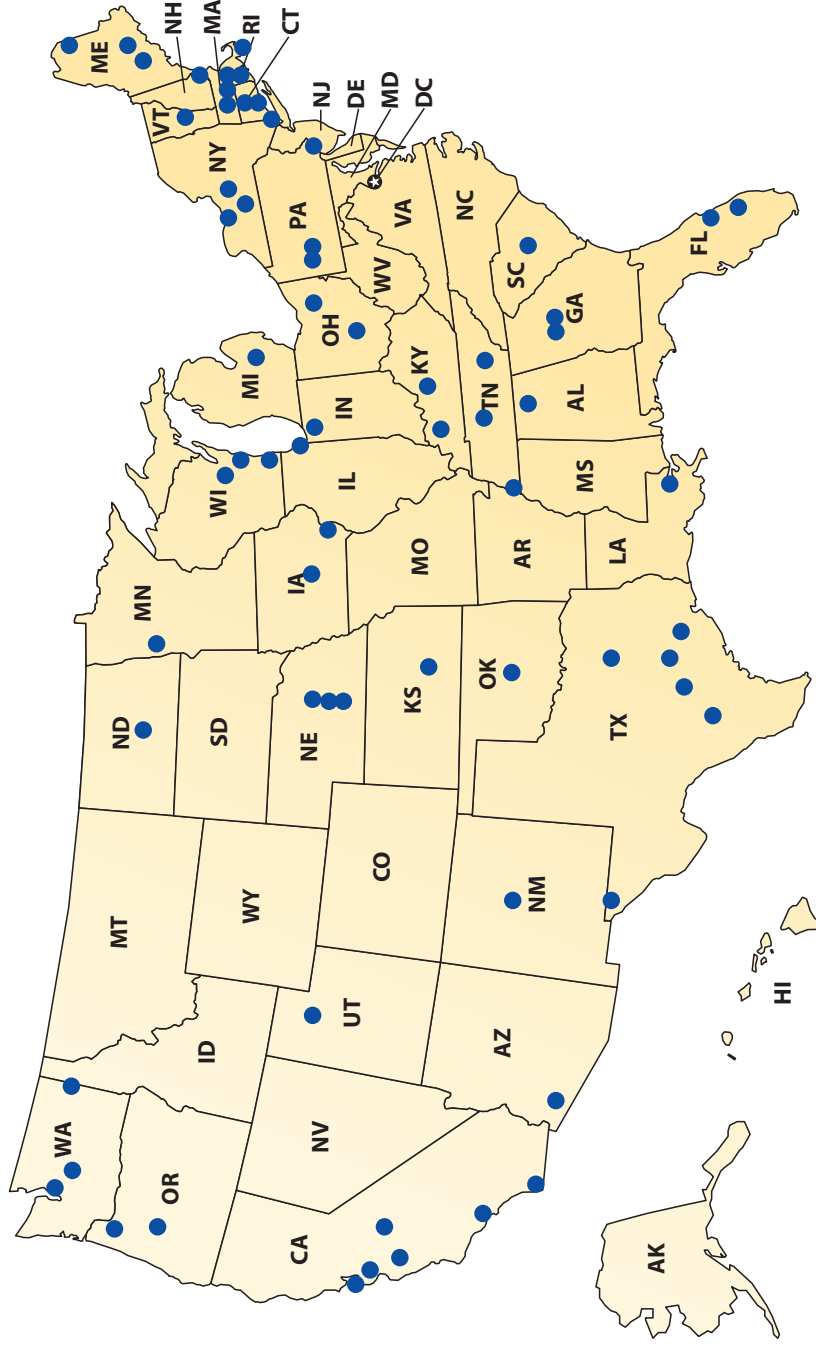
Wallingford Electric Division*
Wallingford, CT

We Energies*
Milwaukee, WI

Westar Energy
Wichita, KS

** Salt River Project is a Charter Partner that left the Partnership, but rejoined in 2009.

Distribution of Partners





United States
Environmental Protection
Agency

Climate Change Division (6207J)

www.epa.gov

March 2015

