

# Reducing SF<sub>6</sub> Emissions in Electric Power Systems: Best Industry Practices

EPA has partnered with the electric power industry to identify and highlight cost-effective methods of reducing SF<sub>6</sub> emissions to the atmosphere. Utility experience shows that implementing and following best practices leads to emission reductions. Utilities continue to improve practices related to gas handling and prevent emissions.



## Establish lifecycle approach for SF<sub>6</sub> management through company policies, protocols, and standard operating procedures.

This approach helps track SF<sub>6</sub> inventory and costs, detect and repair leaks, and properly handle, recover and recycle SF<sub>6</sub>. Established policies can be continually improved upon and expanded to incorporate other options for reducing SF<sub>6</sub> emissions.

### Successful company policies and programs:



Cover all practices



Allow for innovation



Designate responsible parties



Train & empower employees



## Establish procedures for gas inventory, accounting, and tracking.

Tracking procedures include:

- Labeling and inventory of gas cylinders
- Using log sheets for warehouse cylinders
- Inventory of all SF<sub>6</sub> equipment

### A variety of SF<sub>6</sub> tracking software tools are available on the market that:



Automatically scan cylinder barcodes



Track real-time leak rates



Track inconsistent data and scrutinize outliers



Forecast trends and identify chronic leaking equipment

Tracking leak history of equipment identifies priorities for repairs and replacements.



## Ensure good management of SF<sub>6</sub> acquisitions and gas inventory.

Utilities are consolidating storage inventory and selecting a single vendor.

### Vendors can support best practices by:



Optimizing cylinder size



Customizing the cylinder delivery system



Minimizing cylinder handling



Limiting inventory



Maximizing gas utilization from every cylinder



## Train employees annually in SF<sub>6</sub> handling and in using the necessary equipment.

Training enables employees to follow procedures properly, understand the environmental and health impacts of SF<sub>6</sub>, and learn about emission reduction options.

### Partners can:



Require on-the-job training for field employees who handle SF<sub>6</sub>.



Maintain in-house certification requirements for gas handling.



## Recycle SF<sub>6</sub> gas at equipment servicing or disposal.

Using gas cart recovery equipment to off-load and transfer SF<sub>6</sub> for maintenance and recycling reduces emissions. It is critical to follow correct procedures when using service carts and to ensure that gas carts are properly maintained.

### How can I verify that residual SF<sub>6</sub> is removed from equipment?



Use mass flow scales or weight scales



Refer to temperature/pressure curves



Use properly functioning recovery equipment, gauges, and scales



## Implement leak detection and repair strategies.

**Leak detection** with soap and water solutions, bagging, or thermal imaging to detect minor, chronic leaks without taking equipment out of service. Leak detection teams regularly inspect equipment to identify SF<sub>6</sub> leaks and prioritize repair or replacement. Technologies are available to provide real-time monitoring of SF<sub>6</sub> leaks and to identify components that require the most immediate repair.

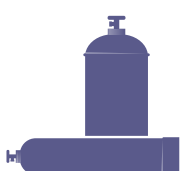
**Leak repair** is most efficient when the equipment is tested before and after repairs, using proper SF<sub>6</sub> recovery procedures. Effective leak repair requires advanced planning, prioritization to target worst performers, and evaluation of whether the best approach is to replace GIE.



## Upgrade equipment to reduce SF<sub>6</sub> use and leaks.

New equipment designs use less SF<sub>6</sub> and tighter seals to reduce leaks. Other alternative designs use alternatives to SF<sub>6</sub>, like fluoronitrile or fluoroketone, or vacuum based technology with CO<sub>2</sub>, or "Clean Air" as a base gas. While new equipment requires new maintenance procedures, training, and management adjustments, a systematic approach to anticipating equipment replacement can significantly reduce emissions.

Medium-voltage alternatives have existed for the past decade; high-voltage alternatives are increasingly available.



## Decommission equipment properly.

Proper decommissioning using SF<sub>6</sub> recovery systems is important to prevent emissions. For closed-pressure systems,



Utilities can purify used SF<sub>6</sub> onsite or off-site or



Send non-reusable gas for destruction.

## Evacuate SF<sub>6</sub> from all equipment including hermetically sealed pressure equipment.