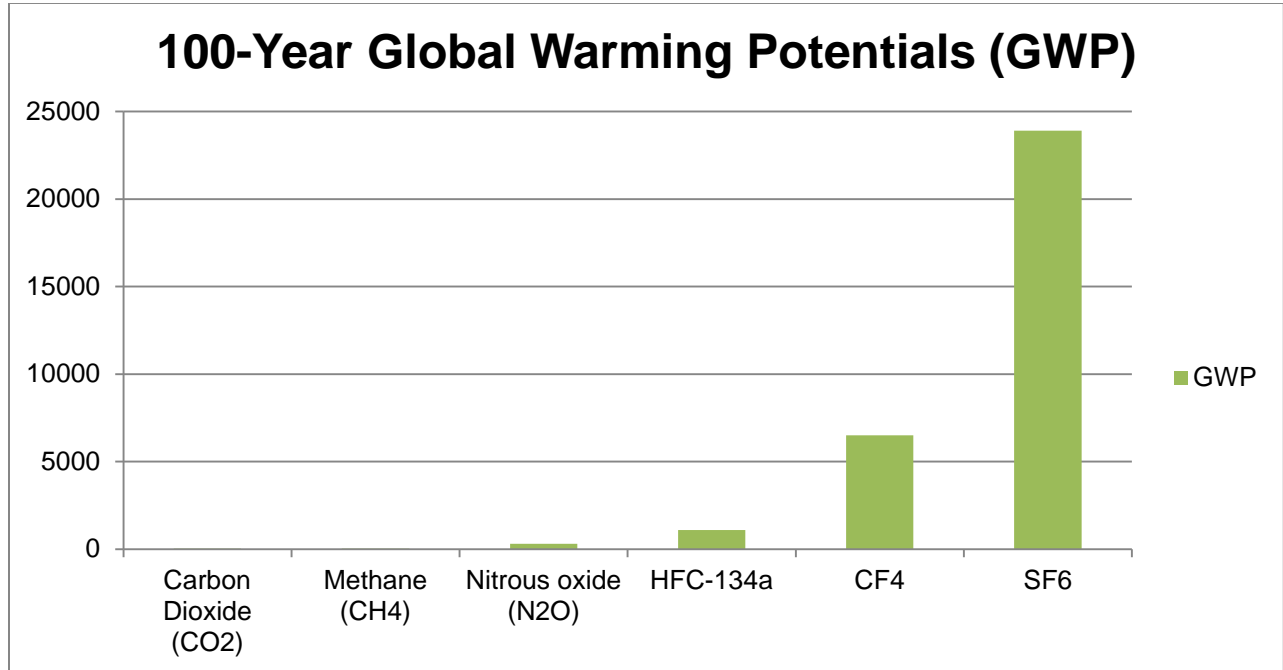


Review of California Air Resources Control Board (CARB) Sulfur Hexafluoride (SF₆) and Fluorinated Gas Regulations

The California Global Warming Solutions Act of 2006 (AB 32) charges the California Air Resources Board (CARB) to enact regulations which reduce greenhouse gas emissions.

Toward the goal of greenhouse gas emission reduction, CARB is enacting regulations to reduce the emissions of SF₆ and other fluorinated gases due to their high global warming potential (GWP), as illustrated in the graph below.



Following is a review of the three CARB regulations affecting use and storage of SF₆ and other fluorinated gases. These regulations are to be adopted and legally enforceable by **January 1, 2010**.

[Sulfur Hexafluoride \(SF₆\) Reductions from Non-Electric and Non-Semiconductor Applications](#)

[Semiconductor and Related Devices Operations](#)

[Sulfur Hexafluoride Emission Reductions from Gas Insulated Switchgear](#)

If you are affected by these regulations or have any questions, please contact Office of Environment, Health & Safety via email at ehs-ep@berkeley.edu

Sulfur Hexafluoride (SF₆) Reductions from Non-Electric and Non-Semiconductor Applications

Reference: <http://www.arb.ca.gov/cc/sf6nonelec/sf6nonelec.htm>

Current Status

This regulation has been approved and is effective beginning **January 1, 2010**. Registration, recordkeeping and reporting requirements become effective **March 30, 2010**.

Overview

This regulation applies to any individual who uses, possesses, purchases, distributes, manufactures, offers for sale or sells sulfur hexafluoride or products containing SF₆ in California, with a limited number of exemptions.

Exemptions

1. Usage of SF₆ in chemical vapor deposition (CVD) chamber cleaning
2. Usage of SF₆ in etching
3. Usage of SF₆ as a dielectric medium including equipment containing sulfur hexafluoride for use as a dielectric medium
4. Usage of SF₆ as an arc quenching medium including equipment containing sulfur hexafluoride for use as a arc quenching medium
5. Use in a one-time testing per laboratory fume hood (provided that the use is in compliance with Cal/OSHA ventilation requirements) for the purpose of reducing fume hood face velocity when hood is unattended and realizing associated energy savings.
6. Medical uses which includes only the following applications:
 - a. Entry of SF₆ into a humans or animal body for the purpose of improving health
 - b. Use of SF₆ in a diagnostic tool in order to either identify a disease or condition by its outward signs and symptoms or analyze the underlying physiological/ biochemical cause(s) of a disease or condition
 - c. Use of SF₆ in a medical treatment process for a disease or other medical condition
7. Use in equipment calibration and in testing to find alternatives to SF₆ use
8. Use in testing hyperspectral remote sensing systems to detect toxic gases in the infrared portion of the spectrum
9. Usage for research in a research facility (university).

Sulfur Hexafluoride (SF₆) Reductions from Non-Electric and Non-Semiconductor Applications (continued)

Relevant requirements of proposed regulation to Campus under the Research Exemption include:

Effective **March 30, 2010**, usage of SF₆ for research in a research facility (University) must be registered with CARB and all persons who purchase or use sulfur hexafluoride must keep records showing the annual quantity of SF₆ purchased and used. Records must be maintained for three years. Beginning calendar year 2011, all persons who purchase or use SF₆ for research purposes, except under exemptions 1-8 above, must submit an annual report to CARB by **March 30th** for the previous calendar year. The report must include the following:

- The total quantity of SF₆ purchased and used in the previous year
- Quantity of SF₆ used for each research activity undertaken in the previous year
- Explanation of each research activity
- Description of efforts undertaken to minimize sulfur hexafluoride emissions

The Office of Environment, Health & Safety will coordinate all reporting requirements. Labs will be required to report annual usage of SF₆ to EH&S promptly each year.

**If this regulation applies to your research, contact Office of Environment,
Health & Safety via email at
ehs-ep@berkeley.edu**

Semiconductor and Related Devices Operations

Reference: <http://www.arb.ca.gov/cc/semiconductors/semiconductors.htm>

Current Status

This regulation has been approved and is effective beginning **January 1, 2010**.

Overview

This regulation applies to all owners or operators of semiconductor or related devices operations that use fluorinated gases or heat transfer fluids. This includes, but is not limited to, the processing of diodes, zeners, stacks, rectifiers, integrated microcircuits, transistors, solar cells, light-sensing devices and light-emitting devices.

Owners or operators of a process that emit 0.0008 million metric tons or less of CO₂e must meet annual reporting and recordkeeping requirements. **Annual reports must be submitted to CARB by March 1st of each calendar year, beginning with calendar year 2011.**

Annual Reporting to CARB must include:

- Company name, address, telephone number, contact person and email
- Annual amounts (in kg) of each of the following fluorinated gas used for CVD chamber cleaning and etching:
 - Hexafluoroethane
 - Octafluoropropane
 - Octafluorocyclopentane
 - Trifluoromethane
 - Difluoromethane
 - Octafluorocyclobutane
 - Octafluorotetrahydrofuran
 - Hexafluoro-1,3-butadiene
 - Carbon fluoride oxide
 - Nitrogen trifluoride
 - Sulfur hexafluoride
- Annual CO₂e emissions determined in accordance with CARB procedures
- The volume of fluorinated heat transfer fluids used in the processing of semiconductors
- The volume of fluorinated heat transfer fluids purchased
- Whether the heat transfer fluid was added to an existing cooling system, used to fill a new system, or both
- The volume of heat transfer fluid added to an existing cooling system or used to fill a new system and specific brand name of the heat transfer fluid used
- A certification statement from the owner or operator that the information provided is true, accurate and complete

Semiconductor and Related Devices Operations (continued...)

Routine recordkeeping also must include:

- Annual records documenting all purchased quantities of fluorinated gases and fluorinated heat transfer fluids
- Monthly records of emission control equipment malfunctions and failures including an explanation of the occurrence, date of occurrence, duration, cause (if known) and action taken for each equipment malfunction and/or failure.

These records should be readily accessible and maintained on site for at least three calendar years. EH&S will work with research labs to comply with the annual recordkeeping and reporting requirements.

**If this regulation applies to your research, contact Office of Environment,
Health & Safety via email at
ehs-ep@berkeley.edu**

Sulfur Hexafluoride Emission Reductions from Gas Insulated Switchgear

Reference: <http://www.arb.ca.gov/cc/sf6elec/sf6elec.htm>

Current Status

This regulation has been approved and is effective beginning **June 17, 2011**.

Current Status

This regulation applies to owners of SF₆ gas insulated switchgear (GIS), or all electrical power equipment insulated with SF₆ gas regardless of location. This includes switches, stand-alone gas insulated equipment and any combination of electrical disconnects, fuses, electrical transmission lines, transformers and/or circuit breakers used to isolate gas insulated electrical equipment.

This regulation defines a maximum annual (calendar year) allowable SF₆ emission rate for each GIS owner's active GIS equipment, beginning in 2011. The campus emission rate is defined as the total annual SF₆ emissions from all active GIS equipment divided by the total SF₆ nameplate capacity of all active GIS equipment. The maximum annual SF₆ emissions rate allowed in 2011 is 10%; each following year reduces this allowance by one percent until 2020 when the rate will be kept at a total allowable level of one percent.

In addition, GIS owners must keep an inventory and documentation of all SF₆ cylinders (and cylinder weight) and GIS equipment and follow annual reporting requirements. Annual reporting includes information on the calculated annual SF₆ emission rate and inventory reports.

Emergency Event Exemption

- GIS owners may request emissions from an emergency event to be exempted from the calculation of the maximum allowable emission rate if it is demonstrated to CARB that the release of SF₆ was beyond the control of the GIS owner and could not be prevented by the exercise of prudence, diligence and care. Exemption requests must be submitted in writing within 30 calendar days after the occurrence of the emergency event.

If you have any questions about this regulation, contact Office of Environment, Health & Safety via email at ehs-ep@berkeley.edu