Clearing the Air About SF₆

Sulfur hexafluoride, or SF₆, is a colorless, odorless, synthetic gas that's primarily used by the electrical equipment industry for its excellent insulation and arc-extinguishing properties. Manufacturers began using SF₆ in the 1950s as an alternative to insulating oil, which is flammable. With electric utilities increasingly going "green," there's a misconception that the U.S. Environmental Protection Agency will ultimately ban SF₆ because it's considered a "greenhouse" gas.

The U.S. government is NOT banning or planning to ban the use of SF₆-filled electrical equipment.

SF₆ Provides Superior Insulation

 SF_6 gas is a popularly used insulating medium in high-voltage switching and protection equipment. It's non-flammable, non-toxic, and inert. SF_6 has 2.5 times the dielectric strength of air and is 100 times more effective at quenching arcs. It also dissipates heat much better than air. No other gas offers better combined insulating and interrupting properties.

Compared to insulating media such as air and oil, SF_6 provides safer operating practices for utility personnel, too. With SF_6 -filled equipment, circuit interruption is performed within a sealed container, limiting the consequences of an arc flash if an internal fault were to occur. All current-carrying components are protected from moisture, corrosion, vegetation, and animal intrusion.

SF₆ and the Environment

Thirty years ago, scientists discovered a hole in the Earth's ozone layer and theorized that chlorofluorocarbons (CFCs) had damaged the upperatmosphere ozone layer, allowing ultraviolet and other high-energy radiation to reach the Earth's surface. CFCs were deemed to be "greenhouse" gases because they trap the infrared radiation reflected from the Earth's surface, heating the atmosphere.

 SF_6 is not a CFC. And it doesn't affect the upperatmosphere ozone layer. But it does contribute to the greenhouse gas effect because the SF_6 molecule is reflective and helps trap infrared radiation.

Because SF_6 only comprises a very small percentage of the greenhouse gases emitted to the atmosphere—the concentration of SF_6 is estimated to be approximately 3.2 parts per trillion by volume—it's not a major contributor to global warming. Although this amount





is negligible compared to carbon dioxide (CO_2), it nevertheless draws attention because SF_6 has a global warming potential and an atmospheric lifetime that are much greater than CO_2 .

EPA and the Electrical Industry Team Up

Users of SF₆-filled equipment have expressed concern about the future of this insulating medium. Some have heard that the U.S. government is planning to ban the use of SF₆-filled equipment because of its global warming potential. This is not true.

In fact, the U.S. Environmental Protection Agency (EPA) actively supports users of SF_6 -filled electrical equipment. To that end, it has created the SF_6 Emission Reduction Partnership for Electric Power Systems, a voluntary partnership between the U.S. EPA and the electric power industry focused on reducing SF_6 emissions. The U.S. EPA also supports SF_6 conferences and other educational opportunities to help reduce SF_6 emissions.

 SF_6 is safe and reliable when fully contained in electrical equipment. It's understood that precautions must be taken to prevent the release of the gas to the atmosphere during routine equipment maintenance and during recycling at equipment end of life. Such precautions are analogous to those required for equipment insulated with oil or other media.

The partnership facilitates electrical utilities' efforts to inventory the emissions of their SF_6 -filled equipment, properly handle and recycle SF_6 , and establish programs for replacing older equipment. The partnership has proven to be a success. According to the U.S. EPA's "Overview of SF6 Emissions Sources and Reduction Options in Electric Power Systems" published in 2018, the reported SF_6 emission rate of partner utilities has decreased 74% since 1999.







Global Warming Potential (GWP) Emissions Comparison: Vista[®] Underground Distribution Switchgear

S&C's "Sealed-for-Life" SF₆-Filled Products

More than 50 years ago, S&C was one of the first equipment manufacturers to use SF_6 as an insulating medium, in its circuit-switchers for transmission systems.

U.S. EPA is actively assisting the electrical power industry by "acting as a clearinghouse for technical information on successful strategies to reduce SF₆ emissions." -U.S. EPA website

Since then, the use of this proven technology has been expanded to include a variety of high-voltage devices for application in distribution substations, capacitor banks, reactors, and medium-voltage devices for application on overhead and underground distribution systems and wind plants.

All of S&C's SF₆-filled products are categorized as "sealed pressure systems," the highest level recognized by the International Electrotechnical Commission (IEC). Per the IEC, a sealed pressure system is "an assembly for which no further gas processing is required during its expected operating life."

S&C's SF₆-filled products are designed to be filled once-at the factory. Because there is no requirement to field-fill them and their leak rates are so low as to be negligible, these devices are considered sealed for life. As shown in the diagram above, for normal operations there are zero GWP emissions from a Vista switchgear unit sealed for life. Even if there is an unlikely leak, the amount of GWP released would be similar to a continental flight.

All of S&C's SF₆-filled products are factoryfilled to full pressure and "sealed for life."

S&C's SF₆-filled products have demonstrated leak rates are far lower than those reported by the SF₆ Emission Reduction Partnership for Electric Power Systems. S&C's SF₆-filled products are fully compliant with the U.S. EPA's Greenhouse Gas Mandatory Reporting Rule, issued December 1, 2010.

SF₆ in S&C's Factory

All of S&C's SF₆-filled products contain the minimum amount of gas required for the application. Best practices are used to accurately monitor the amount of SF₆ that S&C purchases and uses in its products.

All SF₆ emissions at the factory are, of course, reported to the U.S. EPA in accordance with the Greenhouse Gas Mandatory Reporting Rule. Although the U.S. EPA does not require that electrical equipment manufacturers reduce their SF₆ emissions during the manufacturing process, S&C has set an interim internal goal of less than 1% emissions . . . with an ultimate goal of zero emissions. In the interest of attaining this goal, S&C is constantly improving its sealing technology. In addition, S&C has upgraded or replaced gas-filling equipment, enhanced employee awareness, and increased employee training. S&C is continuously learning new methods for reducing SF_6 emissions from partner utilities of the SF_6 Emission Reduction Partnership for Electric Power Systems. Together, S&C and its partner utilities can responsibly use SF_6 , keeping the lights on and the environment safe.

Connect with us:



S&C Electric Company