

Data for SF₆ – technology with respect to environment and safety

Properties of SF₆

- global warming potential in comparison to CO₂ is 22'800 times higher
- lifetime in atmosphere is about 3200 years
- no ecotoxic potential is known so far
- no depletion of ozone layer
- minor load in case of fire

Compact electrical devices and plants

- up to 90% reduction of space and materials
- enables location of switchgear in urban and industrial areas close to the consumers
- positive impact on urban architecture due to indoor installations
- enables adequate power supply to high density urban and industrial areas
- low noise emission level

Technically uncomplicated power supply systems

- low resource consumption
- independent from weather conditions

Low susceptibility to faults and failures

- high safety through insulated metallic shielding
- low maintenance due to weather-protected and non-ageing insulation
- highly reliable power supply

Long service life of switchgear

- economical raw materials and power use
- easy disposal

Efficient low loss power supply system

- high freedom of choice of substation sites
- lower transmission losses and emissions
- conservation of primary resources

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Swiss voluntary agreement for the use of SF₆ in electrical switching devices and switchgear



Emissions reduction guidelines for Swiss switchgear manufacturers and SF₆ handlers

Switchgear manufacturers and users, being aware that SF₆ is classified as a very stable and effective greenhouse gas, act according to the following principles:

Emissions of SF₆ shall be avoided whenever possible.

Manufacturers and users aim at limiting SF₆ – emissions in Switzerland to less than 4 tons 2012), reducing to 3.2 tons (reduction until 2020) per year respectively from manufacturing and operation of medium, high and extra high voltage plants.

The companies endorsing this declaration subscribe to the following measures:

- During manufacturing, installation, operation and maintenance of SF₆ switchgear, measures in line with the most recent techniques are implemented in order to avoid emissions of SF₆.
- The same applies to manufacturing, transportation and storage of SF₆, as well as to all arrangements in connection with re-use, recycling or disposal of SF₆.
- As a rule, gas-filled compartments are permanently monitored in order to detect and quickly repair any leakage of SF₆.
- Manufacturers guarantee a leakage rate of less than 0.5% per year; experience shows the value during operation to be less than 0,3% per year for high voltage plants and less than 0.1% for medium voltage plants.
- Used SF₆ is either directly re-used or recovered and re-used in a closed cycle process.
- The improvement management described in the Memorandum of Understanding has to be met.

- Switchgear manufacturers, SF₆ distributors, SF₆ users and SF₆ disposal companies are committed to ensure that used SF₆ is re-used. For SF₆ that cannot be re-used, environmentally correct disposal is assured. SF₆ manufacturers and distributors will provide specific information upon request.
- SF₆-handling staff is trained on a regular basis.
- Maintenance is carried out by qualified staff only.
- For exports, the same quality standards and services apply - this includes the handling of SF₆.
- Manufacturers and distributors of SF₆ keep a statistical record of SF₆ quantities produced and delivered. Manufacturers and users of SF₆ switching devices and switchgear will keep a statistical record of SF₆ consumption and stocks.
- Distributors, manufacturers and users of SF₆ – filled switching devices and switchgear provide the Federal Office for the Environment (FOEN) with requested statistical data.
- An SF₆ monitoring survey is carried out on a yearly basis. The survey provides information about the use of SF₆ in switching devices and switchgear in Switzerland.

This declaration is part of a voluntary agreement, which is recognised by the FOEN in accordance with Art. 41a of the Environmental Protection Law (USG). The voluntary agreement consists of the present declaration from switchgear manufacturers and handlers, the corresponding declaration from operators of particle beam accelerators, the guideline for users, provided by the Swiss Electric Utility Association (VSE), and the Memorandum of Understanding between the FOEN and Swissmem (2013).

Use of SF₆ as an insulating and arc quenching gas for power transmission and distribution switchgear:

SF₆ Turnover in Switzerland (2012):

Approximately 220 t per year in Switzerland (<10% domestic and 90% export).

Stock: About 405 t in electrical plants of Swiss utilities and industries. Refill quantities (leakage and handling loss) <1% per year.

Application:

In sealed, monitored systems, leakage rate of less than 0.5% per year is guaranteed. In practice it is found to be less than 0,3% per year for high voltage plants and less than 0.1% for medium voltage plants.

Lifetime of switchgear:

At least 35 years, more likely 40 – 50 years.

Emissions:

Quantities emitted today are limited. Emissions in the past were mainly due to improper handling during production, testing and maintenance; minor emissions are observed due to leakage and disturbances in service.

Removal and Re-use:

SF₆ can be safely and properly removed in an environmentally compatible manner. SF₆ gas is routinely reclaimed and re-used.

New technologies:

No short and medium term solution is available. Taking into account the technical, economic and ecological point of view, no better alternatives to SF₆ as an insulating and arc quenching medium are currently known.

Other technical solutions based on semiconductors and supra-conductors are not available at present. Research for better solutions is ongoing.