

## Data for SF<sub>6</sub> – technology with respect to environment and safety

### Properties of SF<sub>6</sub>

- global warming potential in comparison to CO<sub>2</sub> 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 SF<sub>6</sub> in electrical switching devices and switchgear



## **Emissions reduction guidelines for Swiss switchgear manufacturers and SF<sub>6</sub> handlers**

Switchgear manufacturers and users, being aware that SF<sub>6</sub> is classified as a very stable and effective greenhouse gas, act according to the following principles:

**Emissions of SF<sub>6</sub> shall be avoided whenever possible.**

**Manufacturers and users aim at limiting SF<sub>6</sub> – emissions in Switzerland to less than 4 tons per year from manufacturing and operation of medium and high voltage plants.**

The companies endorsing this declaration subscribe to the following measures:

- During manufacturing, installation, operation and maintenance of SF<sub>6</sub> switchgear, measures in line with the most recent techniques are implemented in order to avoid emissions of SF<sub>6</sub>.
- The same applies to manufacturing, transportation and storage of SF<sub>6</sub>, as well as to all arrangements in connection with re-use, recycling or disposal of SF<sub>6</sub>.
- As a rule, gas-filled compartments are permanently monitored in order to detect and quickly repair any leakage of SF<sub>6</sub>.
- Manufacturers guarantee a leakage rate of less than 1% per year; experience shows the value during operation to be lower than 0,5% per year.
- Used SF<sub>6</sub> is either directly re-used or recovered and re-used in a closed cycle process.
- SF<sub>6</sub> manufacturers and distributors are committed to ensure that used SF<sub>6</sub> is re-used. For SF<sub>6</sub> that cannot be re-used, environmentally correct disposal is assured. SF<sub>6</sub> manufacturers and distributors will provide specific information upon request.

- SF<sub>6</sub>-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 SF<sub>6</sub>.
- Manufacturers and distributors of SF<sub>6</sub> keep a statistical record of SF<sub>6</sub> quantities produced and delivered. Manufacturers and users of SF<sub>6</sub> switching devices and switchgear will keep a statistical record of SF<sub>6</sub> consumption and stocks.
- Distributors, manufacturers and users of SF<sub>6</sub> – filled switching devices and switchgear provide the Federal Office for the Environment (FOEN) with requested statistical data.
- An SF<sub>6</sub> monitoring survey is carried out on a yearly basis. The survey provides information about the use of SF<sub>6</sub> 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 and the guideline for users, provided by the Swiss Electric Utility Association (VSE).

## **Use of SF<sub>6</sub> as an insulating and arc quenching gas for power transmission and distribution switchgear:**

### **SF<sub>6</sub> Turnover in Switzerland (2010):**

Approximately 230 t per year in Switzerland (<10% domestic and 90% export).

### **Stock in Switzerland (2010):**

About 356 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 1% per year is guaranteed. In practice it is found to be less than 0,5% per year.

### **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:**

SF<sub>6</sub> can be safely and properly removed in an environmentally compatible manner. SF<sub>6</sub> 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 SF<sub>6</sub> 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 are ongoing.