

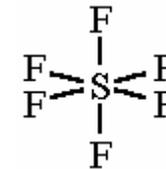


# Sulphur Hexafluoride @ CERN



## ◆ What is SF<sub>6</sub>

- A colorless, odorless, nontoxic, nonflammable gas
- A chemically inert and completely stable gas in the presence of most materials up to temperatures of about +204°C at 28 bar.
- A powerful greenhouse gas



## ◆ Common use

- For high and medium voltage electrical power systems
  - as an insulating gas in substations,
  - as an insulating and cooling medium in transformers
  - as an insulating and arc quenching medium in switchgear
- In insulated windows (mixed with argon),
- In the metal industry (magnesium casting)
- In eye surgery as a cooling agent
- As a fire extinguishing agent

## ◆ Use at CERN

- For high and medium voltage electrical power systems
- In particle detectors



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## ◆ Greenhouse effect

### ■ The Global Warming Potential (GWP)

- The concept of a global warming potential (GWP) was developed to compare the ability of each greenhouse gas to trap heat in the atmosphere relative to another gas. The definition of a GWP for a particular greenhouse gas is the ratio of heat trapped by one unit mass of the greenhouse gas to that of one unit mass of CO<sub>2</sub> over a specified time period.

Gas		Lifetime (years)	Global Warming Potential		
			Time horizon		
			20 years	100 years	500 years
Carbon dioxide CO <sub>2</sub>		120	1	1	1
Methane CH <sub>4</sub>		12	62	23	7
Nitrous oxide N <sub>2</sub> O		114	275	296	156
Sulphur hexafluoride SF <sub>6</sub>		3200	15100	22200	32400



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## ◆ Law



UN

- Kyoto protocol: enters into force the 16<sup>th</sup> February 2005; adopting countries must reduce emissions between 2008 and 2012 (France and Switzerland reduction of 8% below 1990 levels)



UE

- Decision No. 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol, Art. 1-12 “The Community and the Member States have the obligation [...] to take the necessary measures to comply with their emission levels determined pursuant to that Decision”; Art. 3-1 “Member States shall, for the assessment of actual progress and to enable the preparation of annual reports by the Community [...] determine and report to the Commission by 15 January each year [...] their anthropogenic greenhouse gas emissions [...]”.



Switzerland

- Ordonnance sur les substances dangereuses pour l’environnement No. 814.013, Annexe 3.5, art. 431 “quiconque met en service ou hors service un appareil ou une installation contenant plus de 1 kg d’hexafluorure de soufre doit le déclarer a l’office fédéral”.



France

- Arrête du 24 décembre 2002 relatif a la déclaration annuelle des émissions polluantes des installations classées soumises a autorisation, Art.3.I “pour les installations dont la masse annuelle de rejets dans l’air [...] d’un polluant de l’annexe II est supérieure au seuil indique [SF<sub>6</sub> = 20 kg], l’exploitant déclare les émissions annuelles de ce polluant”.



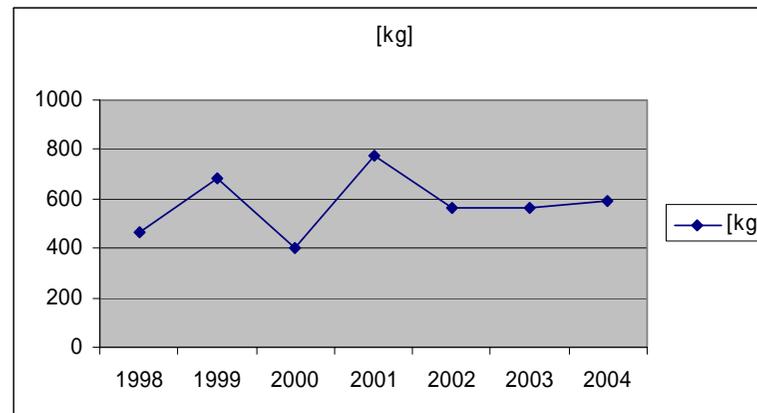
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## ◆ Results of preliminary analysis of the situation at CERN (October 2004)

- SF<sub>6</sub> is used both in electrical power systems and particle detectors
- CERN acquires about 550kg of SF<sub>6</sub> per year

Year	Kg
1998	466.5
1999	685.5
2000	403
2001	774.5
2002	565
2003	565
2004	592.2
Average	578.8143
	Estimated



- From 2007, estimated increase of SF<sub>6</sub> consumption equal to 250kg
- Data on CERN emissions are missing
- European Union emission in 2001 was of about 400,000kg
- French emission in 2002 was of about 65,000kg



# Sulphur Hexafluoride @ CERN



- ◆ **Detailed assessment (required by the CERN Direction)**
  - **Collect specific data from Departments and Experiments on present and future:**
    - use of SF<sub>6</sub>
    - acquisition of SF<sub>6</sub>
    - amount of SF<sub>6</sub> stored on site
    - emission into atmosphere
    - possibility to reduce the use of SF<sub>6</sub> at CERN, based on scientific, economic and environmental considerations
  - **Preliminary results**
    - SF<sub>6</sub> is not used within DSU and AT departments
    - SF<sub>6</sub> will not be used in the LHCb experiment
    - about 100kg/year of SF<sub>6</sub> will be emitted by Alice experiment
    - about 11 kg/year of SF<sub>6</sub> will be emitted by the Atlas experiment
  - **Follow-up**
    - collect data from all Departments and Experiments involved
    - propose possible solutions to decrease SF<sub>6</sub> emissions