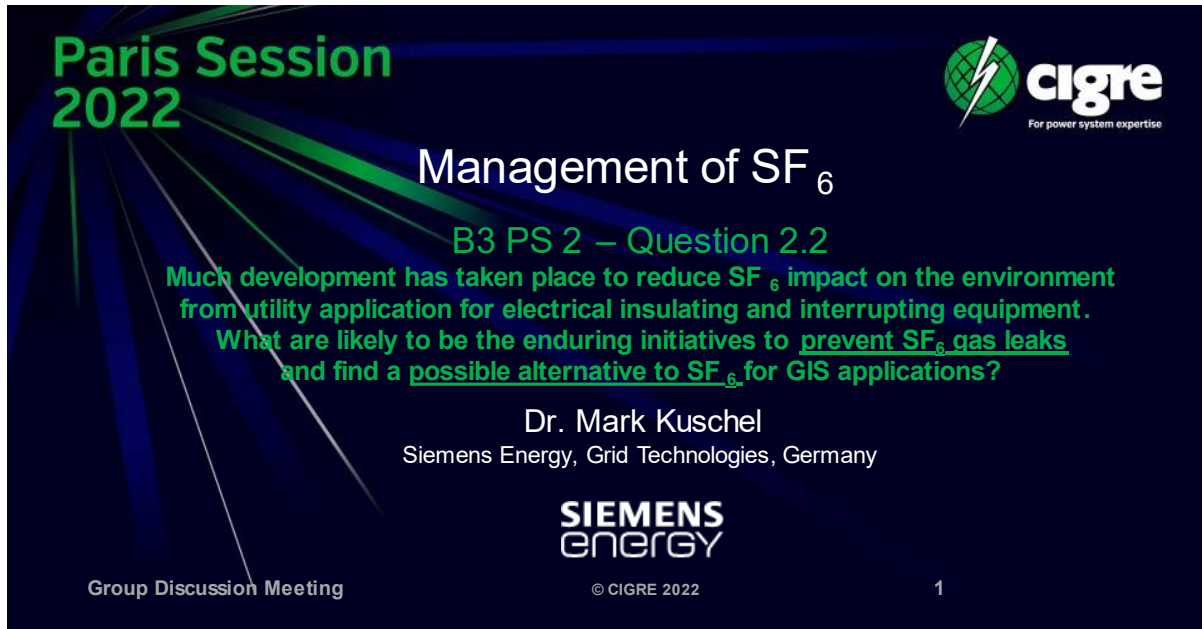


NAME : Dr. Mark Kuschel
COUNTRY : Germany
REGISTRATION NUMBER: 185

GROUP REF.: B3
PREF. SUBJECT: PS2
QUESTION N°: 2.2

The contribution is dedicated to Question 2 of PS 2 and addresses SF₆ Management, slide 1:



Paris Session 2022

Management of SF₆

B3 PS 2 – Question 2.2

Much development has taken place to reduce SF₆ impact on the environment from utility application for electrical insulating and interrupting equipment. What are likely to be the enduring initiatives to prevent SF₆ gas leaks and find a possible alternative to SF₆ for GIS applications?

Dr. Mark Kuschel
Siemens Energy, Grid Technologies, Germany

SIEMENS ENERGY

Group Discussion Meeting © CIGRE 2022 1

The prevention of SF₆ emissions for the installed basis is addressed in several Cigre brochures as shown in slide 2. However even if the SF₆ emissions can be minimized by proper treatment and attention, they cannot be fully avoided and reduced to zero.

B3 - Management of SF₆ – Prevention of emission for installed basis

Cigre information: TB 276 - SF₆ Handling Guide; TB 430 - SF₆ Gas Tightness Guide
Ongoing JWG B3/A3.59 - Guidelines for SF₆ end-of-life treatment of T&D equipment > 1 kV

Best practices / Recommendations to prevent gas emissions:

- Maintenance of T&D equipment in accordance with the manufacturer recommendation
- Trained and certified personal & appropriate gas handling equipment as well as processes
- Early detection (continuous gas monitoring, trend analyses) and immediate repair of leaks
- Condition based asset management including i) asset modernisation (e.g. Retrofit from central to decentralised gas monitoring, LPIT) and/or ii) replacement with new equipment

- ➡ **SF₆ emission can be minimized by proper treatment, but can't be reduced to zero**
- ➡ **Zero CO₂ emissions can only be reached with new equipment and GWP = 0 gas**

Zero CO₂ emission from T&D equipment can be only achieved with new equipment without any SF₆ and with products using insulation gases with a GWP = 0, slide 3. More information can be found in e.g. [1, 2, 3, 4]

B3 - Management of SF₆ – Zero CO₂ emission with new equipment

Cigre information: TB 589 - Vacuum switching at transmission, TB 730 - Dry air, N₂, CO₂, SF₆/N₂ mixtures; TB 802 - Application & TB 849 - Electric performance of Non -SF₆ gases; TB 851 - SF₆-free current interruption; Ongoing JWG B3/A3.60 - User guide for non -SF₆ gases and gas mixtures in substations

F-gas-free products with GWP = 0 in line with the GWP > 10 prohibition proposal in EU



➔ Zero CO₂ emission enable climate neutral power grids without CO₂ compensation!

Group Discussion Meeting

© CIGRE 2022

* own evaluation for a typical 630 kV GIS bay, cont. 145 kV, 800 A, Produced 2022
European power-mix, around 400 g CO₂/kWh and in 2050 0 CO₂ emission from power generation
** Typical substation with 7 Bays

References:

- [1] D. Helbig et al, Transition to Climate Neutral, Safe and Sustainable Power Grids – Benefits for Society, Grid Operators and Manufacturers, Cigre Session C3, Paris 2022
- [2] S. Kosse et al, Performance of High-Voltage Vacuum Interrupter up to 245 kV for CO₂-neutral Transmission Equipment, CIGRE A3 Session, 2022
- [3] P. Gronbach et al, Experience with F-gas-free High voltage equipment for On- and Offshore applications, CIGRE A3 Session, 2022
- [4] M. Kuschel et al, First F-gas-free and climate-neutral insulated 420 kV GIS busducts installation at TransnetBW, CIGRE B3 Session, 2022