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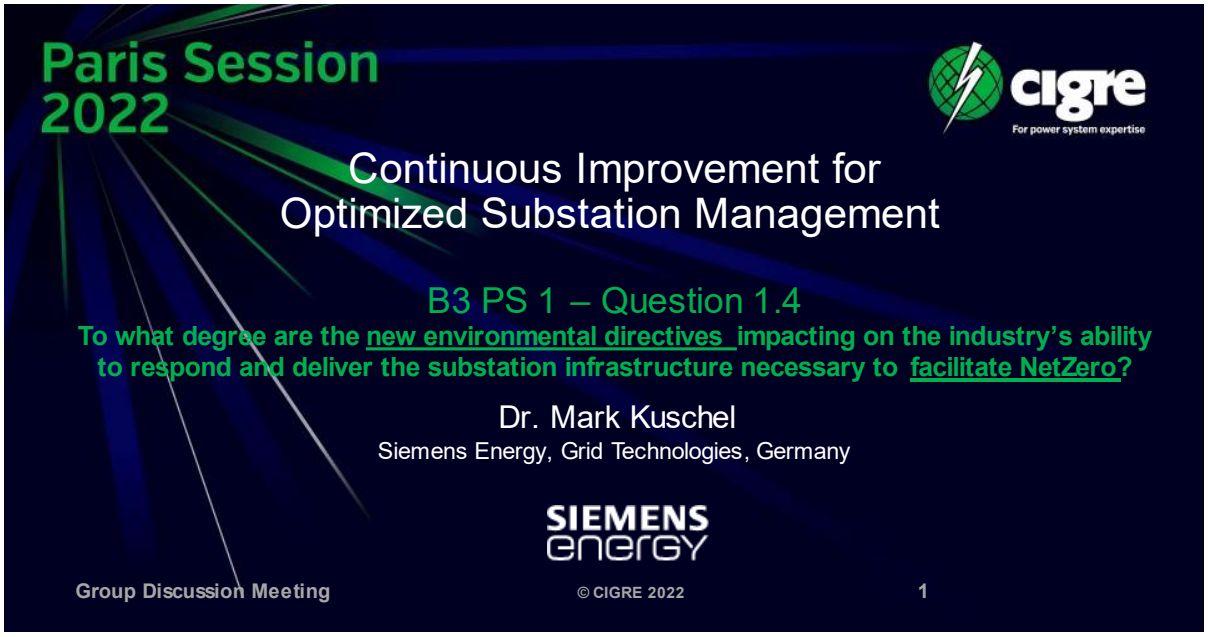
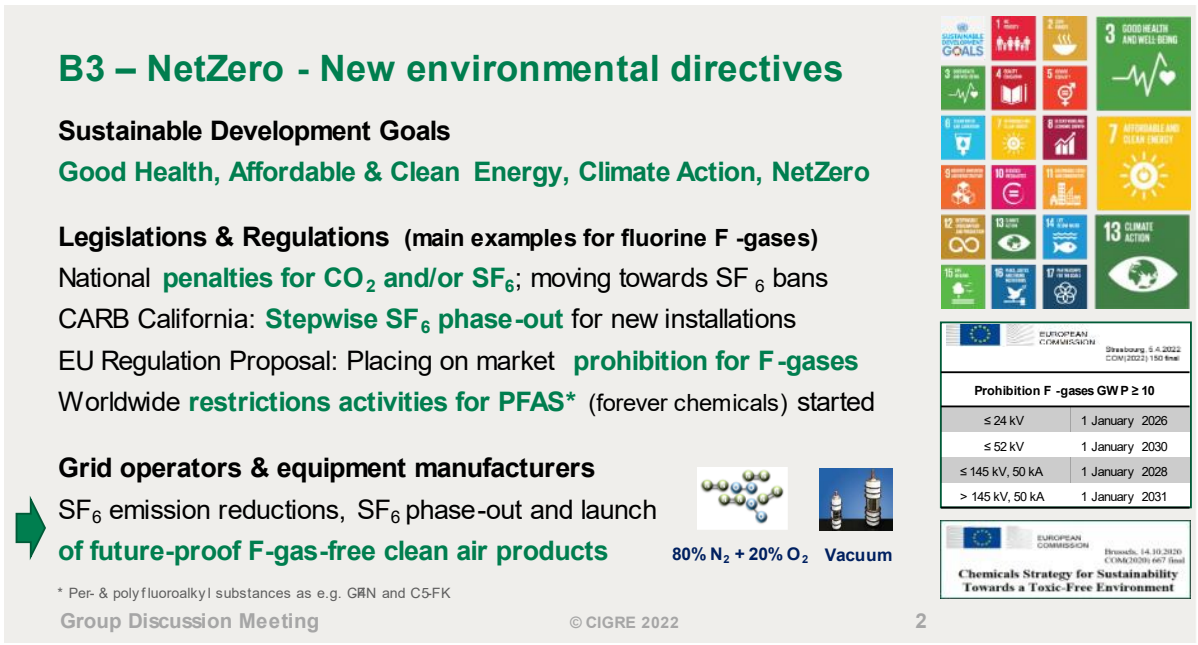
COUNTRY : Germany	PREF. SUBJECT: PS1
REGISTRATION NUMBER: 185	QUESTION N°: 1.4

The short contribution is dedicated to Question 4 of PS 1 and addresses the path for sustainable Net Zero substation infrastructure, slide 1:



Slide 2 gives an overview about the current main environmental directives related to fluorine (F-) insulation gases.

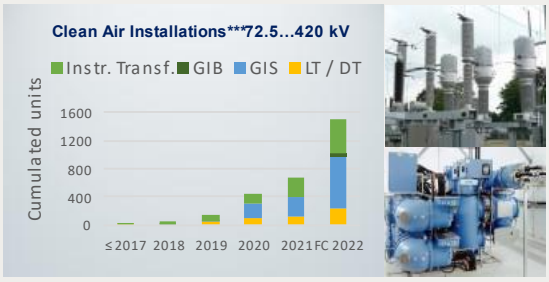


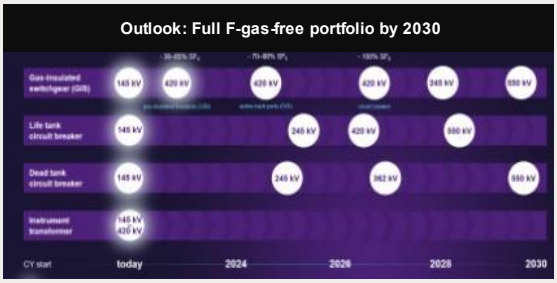
Slide 3 shows the status of introduction of zero CO_2 emission T&D equipment, which can be only achieved with new equipment without any SF_6 and with products using insulation gases based on clean air and vacuum interrupter switching technology with GWP = 0. More details can be found in e.g. [1, 2, 3, 4]

B3 – NetZero - Introduction of F-/PFAS-gas-free products

-> Installations with GWP* = 0 are growing rapidly worldwide
-> More than 900 units successful in operation up to 420 kV
-> More than 2500 units contracted, ~ 2.500.000 tons CO2 -eq saved
-> Zero GHG** emissions in grids possible (Scope1 Grid Operator)

Double break VI CB 420 kV





* Global Warming Potential ** Greenhouse Gas ***GIB: Gas -insulated busducts, GIS: Gas-insulated switchgear, LT / DT: Life Tank & Dead Tank Circuit Breaker

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] Tobias Goebels et al, Investigation of the Switching Behaviour, Voltage Distribution and Post-Arc Current of series-connected Vacuum Interrupter Units for Live Tank and Dead Tank Circuit Breakers ≥ 420 kV, 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