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Question: Much development has taken place to reduce SF_6 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?

Reduction of SF6 emissions by exchange of SF6 gas with C4-FN/N_2/O_2

The concept of retrofill is based on the dielectric performance of C4-FN/N_2/O_2, which can deliver equivalent insulation performance as SF_6 with an increase of less than 5% in filling pressure. The existing equipment, that has still an economic design life, can be reused without any additional refurbishment. Furthermore, it offers the advantage of eliminating the emissions of SF_6 and the associated carbon footprint. It provides the highest financial benefit from equipment investments by enabling them to be operated to the end of their expected service life.

The retrofill solution was qualified for most of the passive gas compartments of a 420 kV GIS design. The SF_6, which is potentially over 1000 tons from currently installed switchgear of this 420 kV GIS design, can be recycled or reused for other equipment, that cannot yet be converted to a SF_6 alternative. Looking beyond this specific design, the retrofill concept can be applied to other products and voltage levels, feasibility and qualification provided.

Pilot project
In 2021, the first retrofill was successfully done at an installation in Richborough in the United Kingdom. This is the world's first replacement of SF_6 in existing high voltage equipment and 755 kg of SF_6 were removed and replaced with a C4-FN/N_2/O_2 mixture.

Figure: 420 kV GIL at Richborough UK where first Retrofill was performed