

T&D Europe position paper on SF6 technology and SF6 alternative technologies.

F-Gas Regulation, SF6 Technology and Alternatives for Electrical Switchgear

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Introduction

T&D Europe¹ supports the new F-Gas regulation 517/2014 that came into effect on 1st January 2015. During its elaboration process, T&D Europe has actively contributed to provide relevant information to facilitate its implementation in order to help the EU and its Member States to reach their targets in the reduction of greenhouse gas emissions. Modifications from previous F-Gas 842/2006 concerning the electrical switchgear will be implemented by all actors in electricity Transmission and Distribution.

Taking into account the provision of Article 21.4 for an assessment of the availability of cost-effective, technically feasible, energy-efficient and reliable alternatives to the use of SF6 in medium-voltage secondary switchgear, and the latest progress of on-going R&D works made by the sector, T&D Europe prepared a common position in this paper on SF6 technology and alternatives for electrical switchgear.

As an expert stakeholder, T&D Europe is in ideal position and welcomes this opportunity to contribute to reach the EU targets for CO₂ emission reduction.

Electrical switchgear technologies for Transmission and Distribution Grids

Electrical switchgear ensures secure and reliable public and private electrical networks in different situations and applications, such as power generation, transmission, distribution in urban or rural areas, wind farms, railway networks, ships, airports, ports and industrial applications (e.g. steel mills, oil & gas, mines, subsea substations, refineries and the paper industry). As a consequence, different types of equipment are necessary to meet the requirements of such varying applications.

T&D Europe members deliver optimized solutions using either SF6 technology or SF6-free technology. Existing SF6-free equipment is appropriate for specific applications but cannot

¹ ¹ T&D Europe (www.tdeurope.eu) is the European Association of the Electricity Transmission & Distribution Equipment and Services Industry, which members are the European National Associations representing the interests of the electricity transmission and distribution equipments manufacturing and derived solutions. The companies represented by T&D Europe account for a production worth over € 25 billion EUR, and employ over 200,000 people in Europe.

cover all requirements. SF6 insulated switchgear evolved from air, oil and solid insulated switchgear, because of better performance with respect to compactness, sensitivity to environmental conditions, maintenance, cost, and environmental impact.

The European electrical switchgear manufacturing industry (particularly the companies within T&D Europe) represent the technological leadership in the international market. This position is based on deep knowledge of the technical background and is maintained by continuous R&D programs. Due to this, T&D Europe member companies have an important export activity and their products are highly appreciated and demanded all over the world.

SF6 Technology and alternative technologies

SF6 is used for insulation and arc quenching in products rated from one thousand volts to more than one million volts in electricity networks, demanding the highest level of reliability. There is no insulation medium known to be a direct replacement for SF6. T&D Europe members conduct intensive R&D programs for alternative solution where promising candidates for SF6 replacement are identified and regularly evaluated.

The electricity industry is continuously committed to decrease SF6 emissions to the lowest level possible. To achieve this, R&D efforts were initiated decades ago, even before the awareness of global warming implications. These R&D works have been made in two directions, first reducing emissions from SF6 switchgear throughout all phases of their life cycle, and later searching for alternative solutions to SF6 technology as well.

With the intention to reduce emissions from SF6 insulated switchgear, our industry has gradually improved the design of switchgear leading to equipment with reduced SF6 content and improved tightness of the enclosures. In parallel, SF6 handling procedures were improved by manufacturers as well as by users and are monitored by voluntary regulations. This has been reflected in international standards from the IEC series. These standards are regularly reviewed to take into account state-of-the-art technical knowledge and procedures. Thanks to these actions, SF6 emissions are reduced to a very low level. Additionally, SF6 is used in a closed cycle, where systematical procedures are mastered for recovery of SF6 at the end of life of the switchgear and later on reclaiming SF6 for re-use, initiating new use cycles.

Looking for SF6-free solutions, T&D Europe members have explored many possibilities. Some alternative technologies already exist and are available for certain applications. The vacuum technology is frequently used for switching purpose in medium voltage equipment, often associated with SF6 as insulation medium for compactness requirements, but very few vacuum technology switchgear are available for application at higher voltage. In some types of switchgear, insulation is made by air and polymeric materials, but compactness, withstand to harsh environments and available rating voltages are not equivalent to SF6 insulated switchgear.

In the HV applications, gas mixtures based on SF6 are used in large installations to reduce the SF6 content in the equipment, or in very cold climate for technical reasons. Another alternative relies on research into new gases and mixtures having equivalent properties for insulation and/or current breaking combined with a much lower GWP than SF6. Some of these

mixtures are under scientific scrutiny, technical development and evaluation procedures including pilot projects.

Assessment of future new alternatives to SF6

T&D Europe acknowledges and welcomes the efforts of its member companies to reduce the emissions of gas from SF6 filled equipment and to search for alternatives to SF6 usage, and recognizes the results already achieved.

However, it is important to understand that all alternative technologies must be duly proved before they are placed on the market, where the security of the electrical equipment and the safety of persons in the network are the highest priority.

Consequently, for widespread implementation and application of new technology, it is desirable to develop and agree on standardized performance criteria to ensure a comparison of the currently discussed technologies with respect to ratings, dimensional footprint, switching performance, chemical and physical data, environmental aspects, health and safety issues, life-cycle and handling information.

Another relevant aspect that should be taken into account, refers to the international competitiveness of the European switchgear industry. Any new technology substituting SF6 technology in Europe will most probably have economic and technical implications if not given the time needed to mature, as it involves products with a typical life time expectancy of 20/30/40 years. Otherwise, the very relevant export activity of the European Industry would be seriously affected, making it unable to compete on equal terms with international manufacturers allowed to freely use the well-proven and highly performing SF6 technology.

It must also be mentioned that the legal product liability that spans the entire life of the product, requires a careful and prudent approach, preventing unexpected drawbacks in the future. It will require the completion of extensive experimentation, beyond a standardized testing and even limited pilot experiences. These tests should cover the complete lifecycle of the product and identify any medium or long term potential risks. New technical standards have to be drafted and existing ones modified. The above consideration, linked to specific technical applications, may give room for further flexibility to the manufacturers who are meanwhile carrying on with investments. In conclusion it will provide peace of mind to all, i.e. authorities, users, manufacturers and general public.

F-Gas Regulation and Future Actions

Article 23 of the new Regulation No. 517/2014 on fluorinated greenhouse gases intends to establish a Consultation Forum to advise the Commission on its implementation, which will gather all stakeholders, including manufacturers. This Consultation Forum shall provide advice and expertise to the EU Commission in relation to the implementation of this Regulation, in particular with regard to the availability of alternatives to fluorinated greenhouse gases, including the environmental, technical, economical and safety aspects of their use.



The European Association of the Electricity Transmission
and Distribution Equipment and Services Industry

Since T&D Europe is the only European industry association representing the high and medium voltage electrical switchgear industry, the European Commission is requested to consider T&D Europe as a relevant stakeholder to participate in this Consultation Forum. With such participation, T&D Europe will provide a high level of knowledge and expertise to contribute to the best solutions to reach the EU environmental targets in CO₂ emission reduction.