



Transition to SF₆ Free HV Equipment Picking Pace

by Muhammad Usman, *Research Analyst – at Power Technology Research*

- Global warming potential of SF₆ is 23,500 times higher than that of CO₂ over a span of 100 years and has an atmospheric life of 3,200 years.
- It is significant to note that the EU is leading the transition from conventional SF₆ based electrical grid equipment to SF₆ free equipment.
- Regulations and public funding are expected to play a critical role in pushing and incentivizing utilities to deploy SF₆ free equipment in place of conventional equipment.

Sulphur hexafluoride (SF₆) is a highly remarkable insulator that has the ability to extinguish arcs in high voltage grid applications, for instance HV switchgear and circuit breaker but at the same time it is the most potent and persistent greenhouse gas. Global warming potential of SF₆ is 23,500 times higher than that of CO₂ over a span of 100 years and has an atmospheric life of 3,200 years.

Advanced economies across the globe led by the EU member states in pursuit of their climate goals stipulated under the Paris Agreement in 2015 are discouraging the use of SF₆ in the electrical grid equipment. EU's 2006 F-gas Regulation limited the EU F-gas emissions to 2010 levels. The 2014 F-gas Regulation built on earlier measures, introduced a quota system, and prohibited the use of F-gases in several sub-sectors as well. This was aimed at reducing EU's F-gas emissions by two thirds in 2030 if compared with F-gas emission levels in 2014.

Recently, during April of 2022, a legislative proposal was released by the European Commission that called for the upgradation of 2014 F-gas Regulation to better regulate F-gases and align them with the proposals in the EU Green Deal. It is significant to note that the legislative proposal plans to ban the sale of SF₆ switchgear by 2031.

Deadline for Installation and Replacement of SF₆ Electrical Switchgear

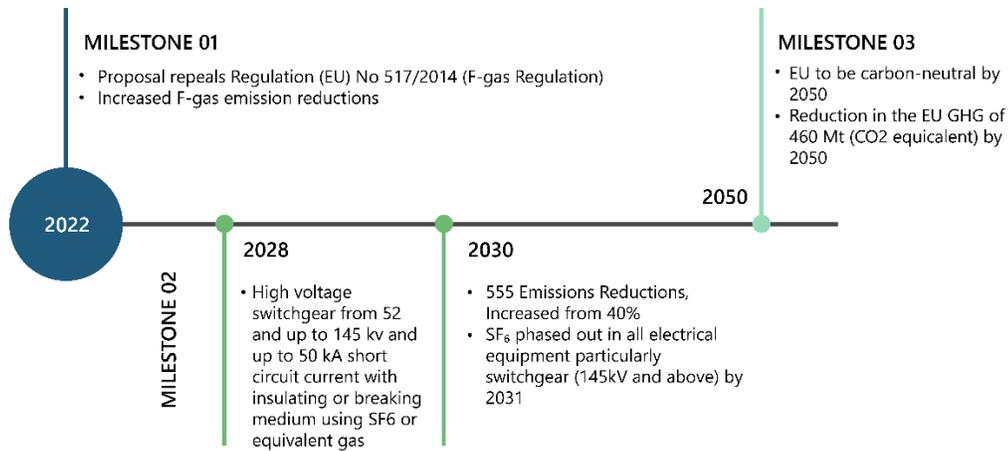


Figure 1: Deadline for Installation and Replacement of SF₆ Electrical Switchgear.

Source: Based on proposal draft by EU released in 2022.

Recent Developments Regarding SF₆ free HV Equipment

Hitachi Energy claimed that it has introduced world's first eco-efficient 420 kV circuit breaker which is expected to be commercialized by the end of 2022. GE is also introducing a similar product which is expected to be commercialized in 2023. Keeping in mind the timeline envisioned in the EU Report 2020 for introducing HV SF₆ free switchgear, OEMs are currently ahead of it as solutions for up to 245 kV might get introduced by 2025 with commercialization expected later. It is significant to note that the Commission expected the commercialization of the SF₆ free switchgear for voltages up to 145 kV by 2025.

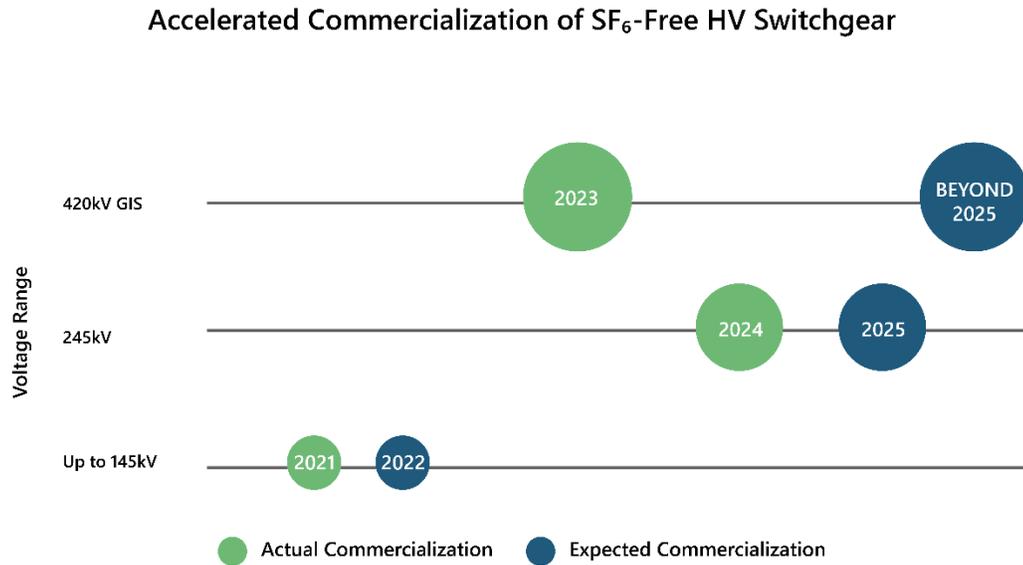


Figure 2: Accelerated commercialization of SF₆ free HV switchgear.

Source: Power Technology Research

Increased Adoption of SF₆ free Equipment

As per Power Technology Research, the rate of adoption of SF₆ free equipment including the switchgear and circuit breakers have increased over the years mainly due to climate concerns. Customers of the SF₆ free equipment including switchgear and CBs now appear to be satisfied with the availability of the product range and the compatibility of the equipment with conventional grid infrastructure specifically in the transmission systems. It is noteworthy that initially the consumers did not opt for the SF₆ free electrical equipment due to compatibility issues.

Hitachi Energy will be providing Tennet with SF₆ free 420 kV gas insulated switchgear (GIS) for a critical node in Germany. On the other hand, Siemens Energy will be supplying Tensio which is Norway's second largest power grid company with SF₆ free GIS protection, control, and operation equipment from their 'Blue' portfolio. The work on substations will be carried out in stages which is expected to begin in 2023 and end in 2031. Siemens Energy is also expected to commission a HV SF₆ free substation in 2023 for National Grid U.S. Furthermore, Toshiba has also won an order for a 72 kV SF₆ free switchgear from a Japanese utility TEPCO which is expected be commissioned by December 2022.

Looking Ahead

It is significant to note that the EU is leading the transition from conventional SF₆ based electrical grid equipment to SF₆ free equipment. But other countries have also initiated efforts that are somewhat similar to how the EU is dealing with the problem. For instance, in the US in order to promote the deployment of SF₆ free GIS, EPA has formed a partnership with the electric utilities in the country. Countries other than the EU member states are lagging behind as far as the transition to SF₆ free switchgear is concerned. Regulations and public funding are expected to play a critical role in pushing and incentivizing utilities to deploy SF₆ free equipment in place of conventional equipment. This is important especially in present circumstances where the ongoing Russia-Ukraine conflict has further increased the prices of the equipment. Power Technology Research estimates that in the medium term (10 years) the price differential between the SF₆ free and conventional GIS will be negligible.

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