Study Committee B3

Substations and Electrical Installations

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# RTE compact substation industrial strategy due to clean energy transition

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## Motivation

- In the context of the fight against global warming, the electricity sector will play an important role in controlling greenhouse effects.
- RTE's objective is to reduce $SF_6$ leaks from GIS to less than 4.5 tons per year from 2025.

## Methods

- In the segment of compact substation solutions, RTE has implemented an industrial strategy for the construction or reconstruction of substations, in order to limit the carbon impact and the installed mass of $SF_6$.

## Technology choice criteria

- The technology choice criteria for the construction or reconstruction of substations are studied by RTE according to following prioritization:
  - Define the minimum substation structure with regard to the sustainability and scalability of the needs, and the operational challenges.
  - Implement compact substation technologies with a reduced environmental impact, if reconstruction using conventional air substation technology proves to be impossible.

## Approach

- To establish this industrial strategy, a full cost comparison of each solution was carried out. The different costs taken into account by this tool are:
  - Qualification
  - Footprint of the future substation (price per $m^2$)
  - Engineering (civil engineering, HV equipment, infrastructure, ...)
  - Maintenance (preventive and corrective)
  - Impact of $CO_2$ emissions ($CO_2$ equivalent valued in € from dielectric leaks during the use phase over the life cycle).

*3D view of HV Example of compact Indoor Air Insulated Substation*

*Example of $SF_6$-free GIS*

## Conclusions and work in progress

- The first results of this strategy, when compactness is required, is described as follows.
- This strategy continues to evolve. Work is already in progress. Prioritization could be adapted in the next years especially due to evolutions of the RTE's objectives and availability of $SF_6$-free technologies.

| | 63 kV / 90 kV | 225 kV | 400 kV |
|---|---|---|---|
| Preferential | HV compact Indoor Air Insulated Substation without greenhouse gases | $SF_6$-free GIS after 2025 | No immediate needs, wait for $SF_6$-free technology |
| As default | $SF_6$-free GIS | | |
| Last resort | GIS with $SF_6$ | | |