

# Paris Session 2022



## Monitoring for C4-FN mixtures solutions

Gas Insulated Substations

Sustainability Management Challenges in Substations

Question PS2.1

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Group Discussion Meeting

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1

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# Question and our contribution

## Question B3-PS2-Q1

- What are the management challenges to maintaining existing substations in both the short term and long term? What new ideas and concepts will provide insight on asset life extension and reduced cost while improving reliability?

## Our contribution

- A feedback on the capitalization of SF<sub>6</sub> experience in HV for the reliability and life extension of equipment is given. It is focused on site-maintenance and monitoring of SF<sub>6</sub>-free solutions.

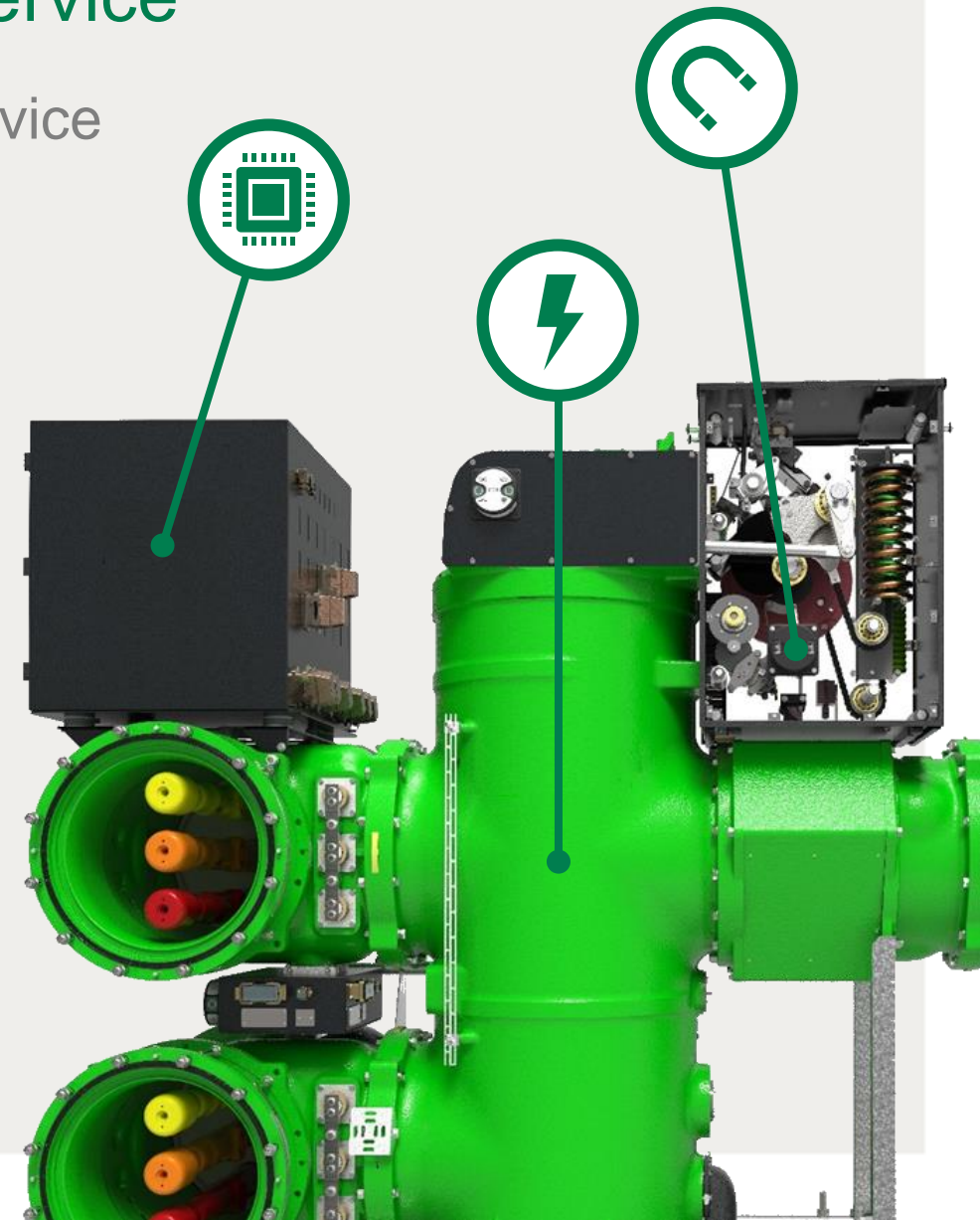
# Monitoring C4-FN mixtures solutions in service

- High **reliability** is required for HV equipment in service
  - Ensure isolation, permit switching, etc.

## Monitoring possibilities to mitigate risks:

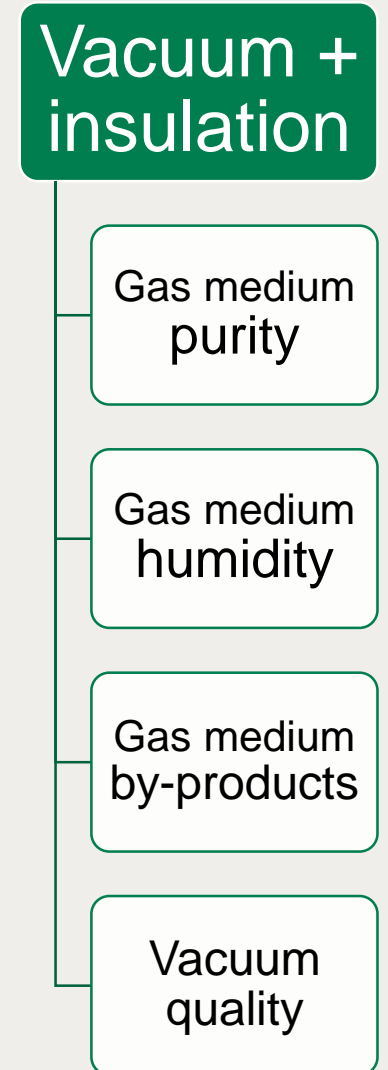
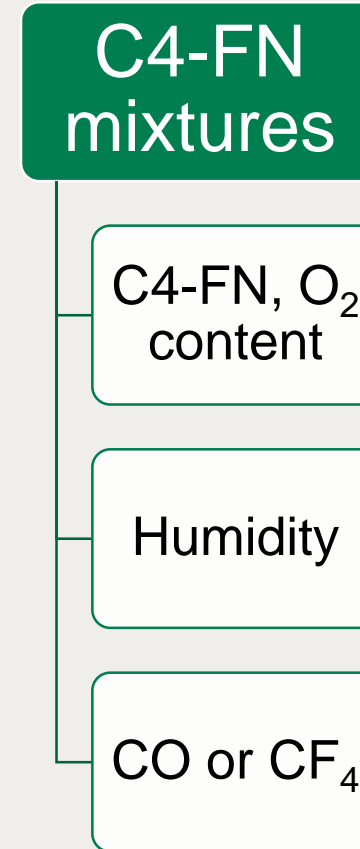
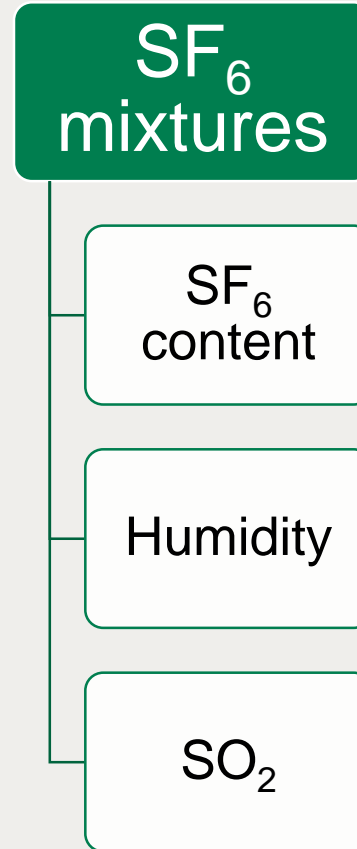
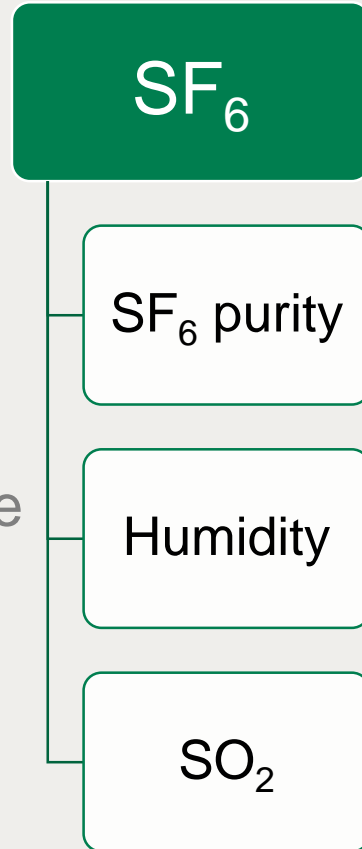
- LV control and auxiliary circuits
  - Power supply, coil and motor conditions, etc.
- Gas / vacuum
  - Gas or vacuum quality
- Asset management
  - Current condition, remaining lifetime

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# Pure gas medium monitoring

- Gas quality is an important aspect
- C4-FN mixtures very similar to SF<sub>6</sub>
- Analyzers are commercially available
- Vacuum adds an additional monitoring



# Equipment monitoring and asset life extension insights

- Several tools to check for the equipment condition
- No major difference between SF<sub>6</sub> and C4-FN mixtures
- SF<sub>6</sub> optimizations can be transposed easily to C4-FN mixtures, with similar savings



**High reliability**  
Limited control and  
interventions



**Connectivity**  
Remote-capable  
sensors



**Twin-models**  
Predictive condition  
assessment

Proven reliability for SF<sub>6</sub> equipment is directly transposable to C4-FN mixtures thanks to technology and equipment similarity