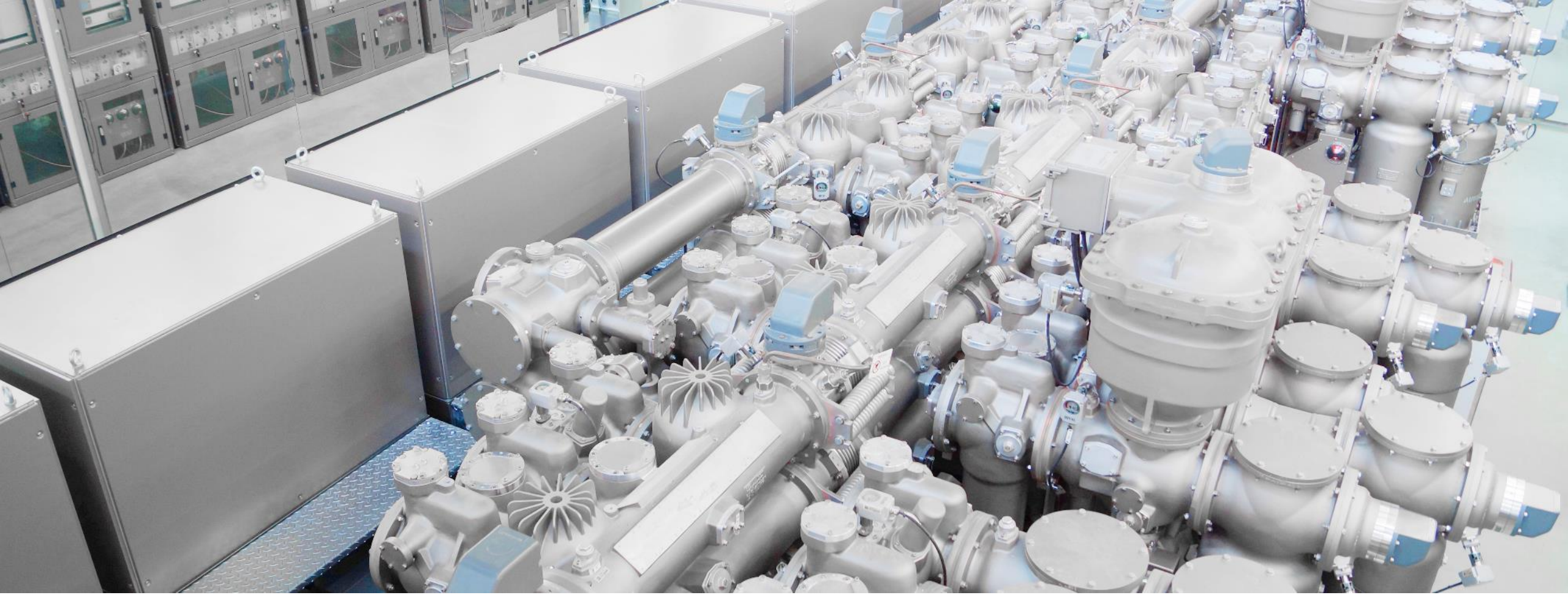




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Trends, Tendencies, Technology

Digital and Eco-efficient technologies in Substations by ABB

Marcus Doerfler, GIS Territory Marketing Manager Central & Southern Europe



- Increased environmental awareness and emphasis on green solutions
- Increasing climate change policies (e.g. reduction of CO₂ emissions)
- SF₆ reporting obligation and taxation in certain countries
- Availability of SF₆ alternatives
- «Energiewende» (energy transition) in Europe (renewables)

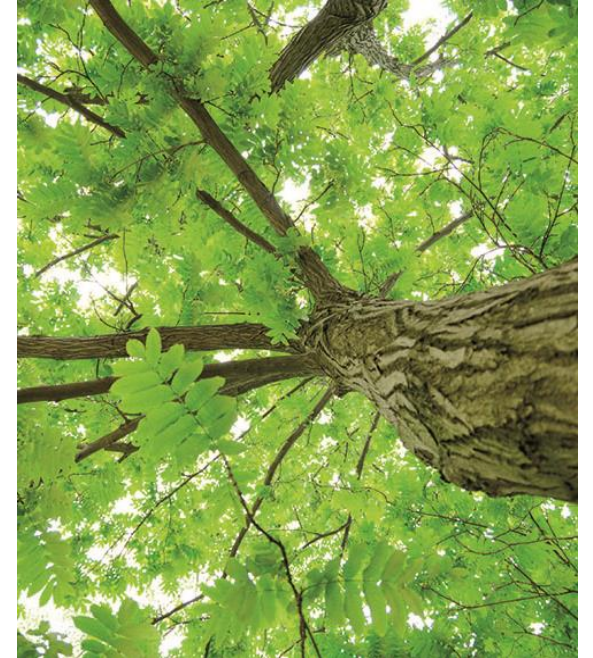


Trends, Tendencies, Technology

Market Drivers for GIS

Marcus Doerfler, GIS Territory Marketing Manager Central & Southern Europe

- With the new eco-efficient gas mixture, ABB's GIS has the potential to lower carbon dioxide (CO₂) equivalent emissions by up to 50% throughout the lifecycle of the GIS
- Reduced life cycle cost due to avoidance of SF₆ taxes (where applicable)
- The new mixture is practically nontoxic* and has zero ozone depletion potential
- Safeguards investment over a long period of time
- Main issues faced by use of SF₆ avoided, such as maintaining inventory records as per local regulatory requirements and the care required during gas handling while gas filling as well as while decommissioning the equipment
- Compliance with existing /future SF₆ regulations



Trends, Tendencies, Technology

Market Drivers for GIS

Marcus Doerfler, GIS Territory Marketing Manager Central & Southern Europe





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Trends, Tendencies, Technology

Digital and Eco-efficient technologies in AIS-Breakers

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Digital and Eco-efficient technologies in Hybrid Modules Type PASS

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Trends, Tendencies, Technology

Digital and Eco-efficient technologies in EWZ-Substation Oerlikon 170 KV

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S/S Oerlikon, 8 Bays 170 KV



S/S Oerlikon, 50 Bays 24 KV

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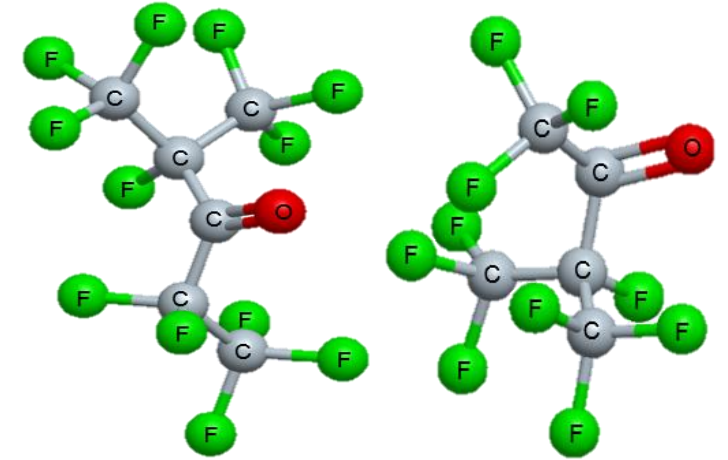
Trends, Tendencies, Technology

Digital and Eco-efficient technologies in GIS Type GLK-14 170 KV

Marcus Doerfler, GIS Territory Marketing Manager Central & Southern Europe



- Gas mixtures of CO₂ and O₂ with Perfluoroketones (C5 PFK) have a GWP of less than 1
- Insulation in transmission range may be covered with C5 PFK as additives to air or CO₂
- Insulation and arc interruption performance for HV indoor applications is close to SF₆ and this enables the design of cost effective circuit-breakers
- C5 PFK as a single gas component has a much better dielectric strength than SF₆
- C5 PFK has a boiling point of 25° C hence it needs to be mixed with O₂ and N₂ or CO₂



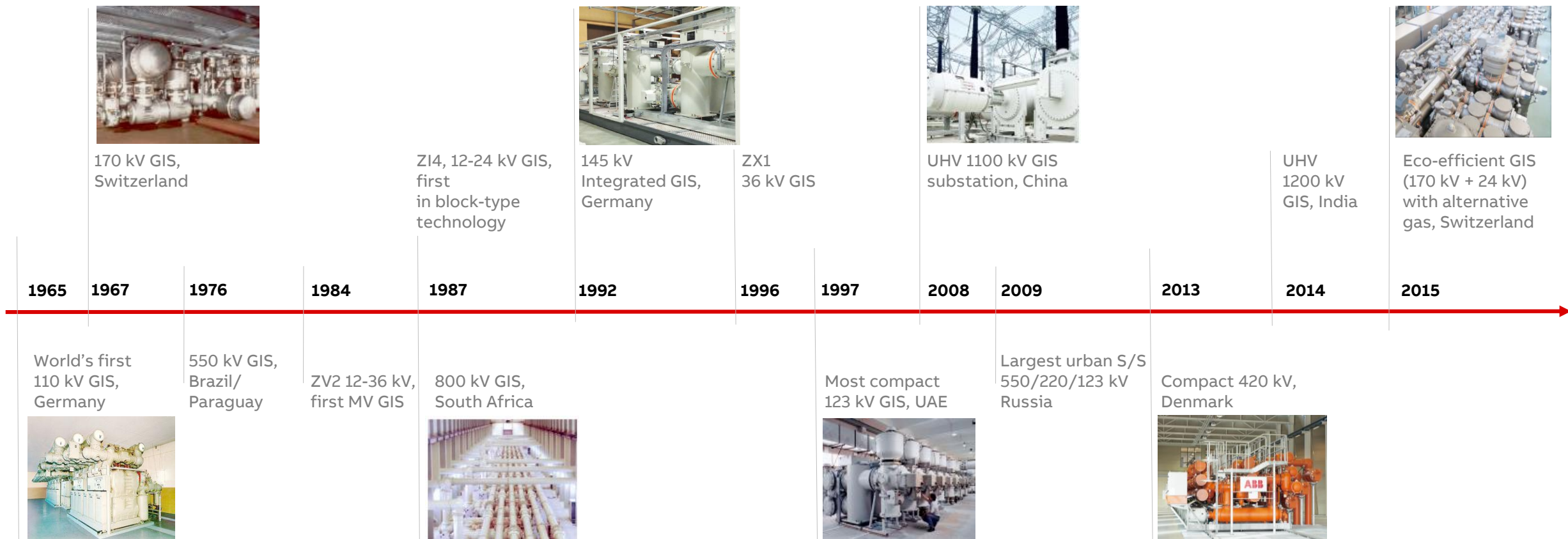
Molecular model of the Fluoroketones C₆F₁₂O (left) and C₅F₁₀O (right)

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Trends, Tendencies, Technology

Digital and Eco-efficient technologies – New isolating gas

Marcus Doerfler, GIS Territory Marketing Manager Central & Southern Europe



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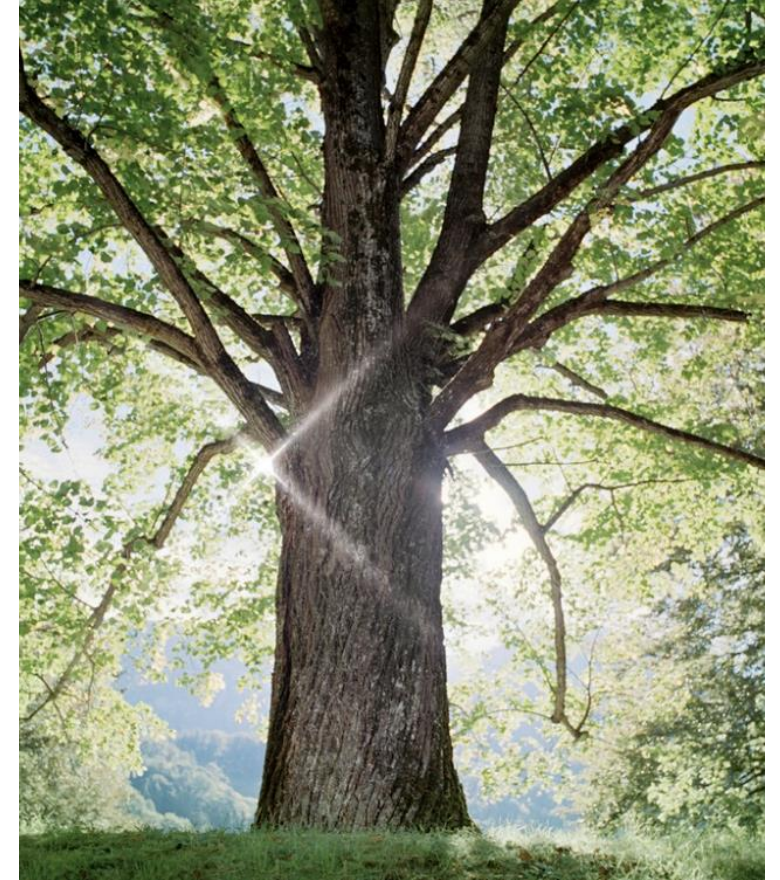
Digital and Eco-efficient technologies – New isolating gas

Marcus Doerfler, GIS Territory Marketing Manager Central & Southern Europe



The new gas mixture:

- Is extremely eco-efficient with a GWP < 1 and no ozone depletion potential
- Can be used for arc interruption
- Can be a viable alternative to SF₆
- Is suitable for indoor applications
- Does not require special care during handling as it is not harmful for the environment
- Is not affected by regulation



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Trends, Tendencies, Technology

Digital and Eco-efficient technologies – New isolating gas

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1. Substation automation protection and control system with IEC61850-8-1 station bus and connected communication system
2. Fully digital LCC with IEDs for control and protection plus monitoring functions
3. IEC 61850-9-2 process bus, connecting the switchgear components to the protection and control system
4. Non-conventional instrument transformers reduce substation wiring complexity, increase safety and provide late customization
5. Stand-alone merging units, bridging the gap between analog and digital world. Compliant to IEC 61850-9-2



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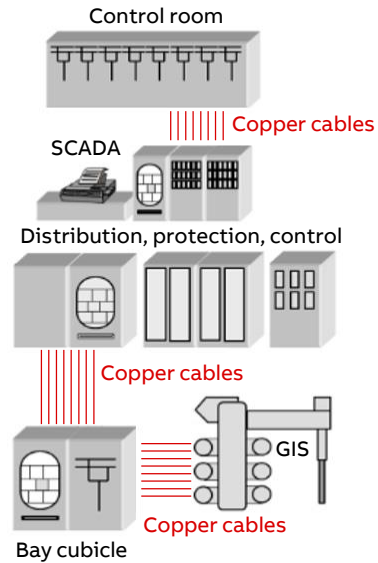
Trends, Tendencies, Technology

Digital and Eco-efficient technologies – What is a digital substation?

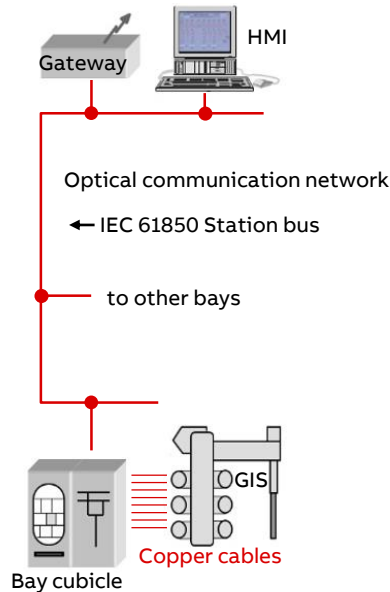
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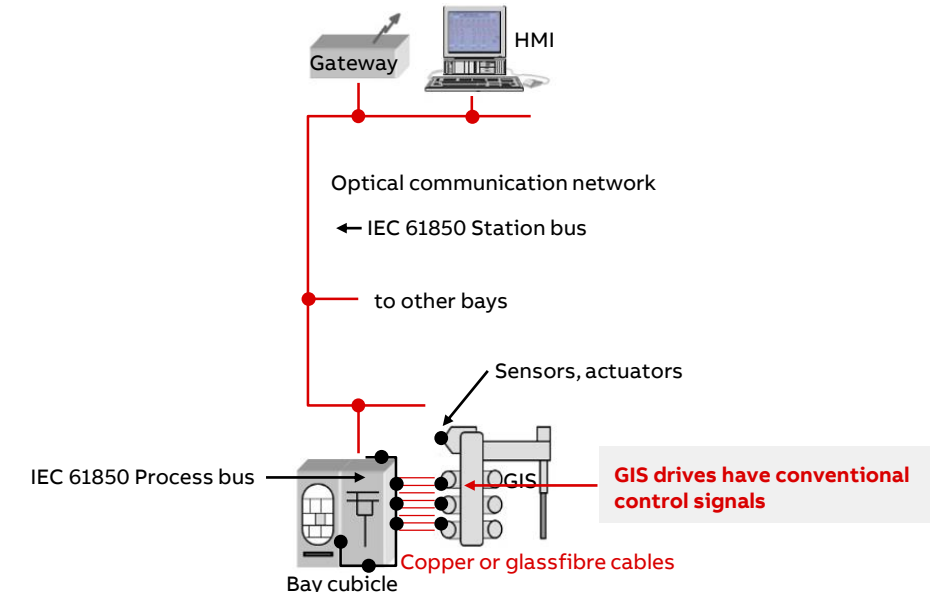
SA conventional



SA with station bus



SA with process bus



Past

From wired to optical communication

Present

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Trends, Tendencies, Technology

Digital and Eco-efficient technologies – Evolution of substation automation

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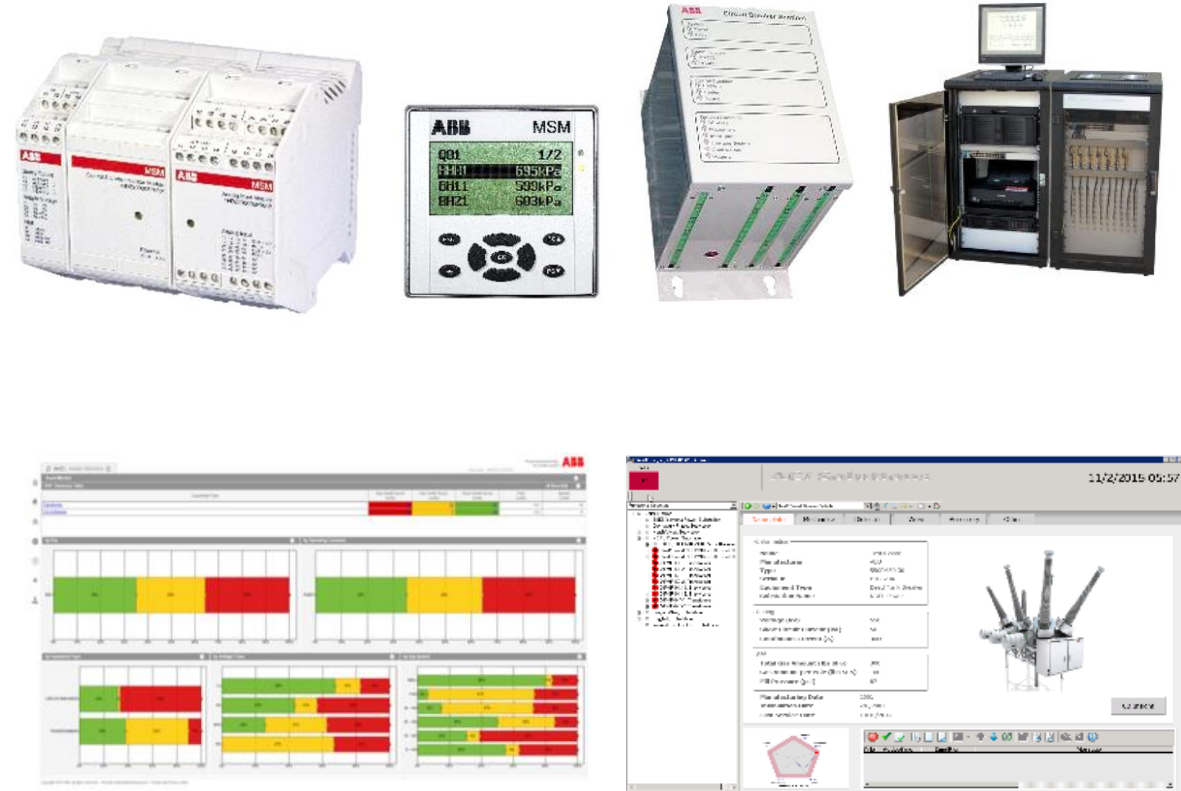


Sensible set of monitoring functions with

- MSM for SF₆ monitoring
- CBS for circuit-breaker monitoring
- GIS-monitor for partial discharge monitoring*

Connection to **ABB Asset Management System**

- Asset Health Center (AHC)
- Asset Condition Intelligence (ACi)
- Improves maintenance management



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Digital and Eco-efficient technologies – Monitoring and Asset Management

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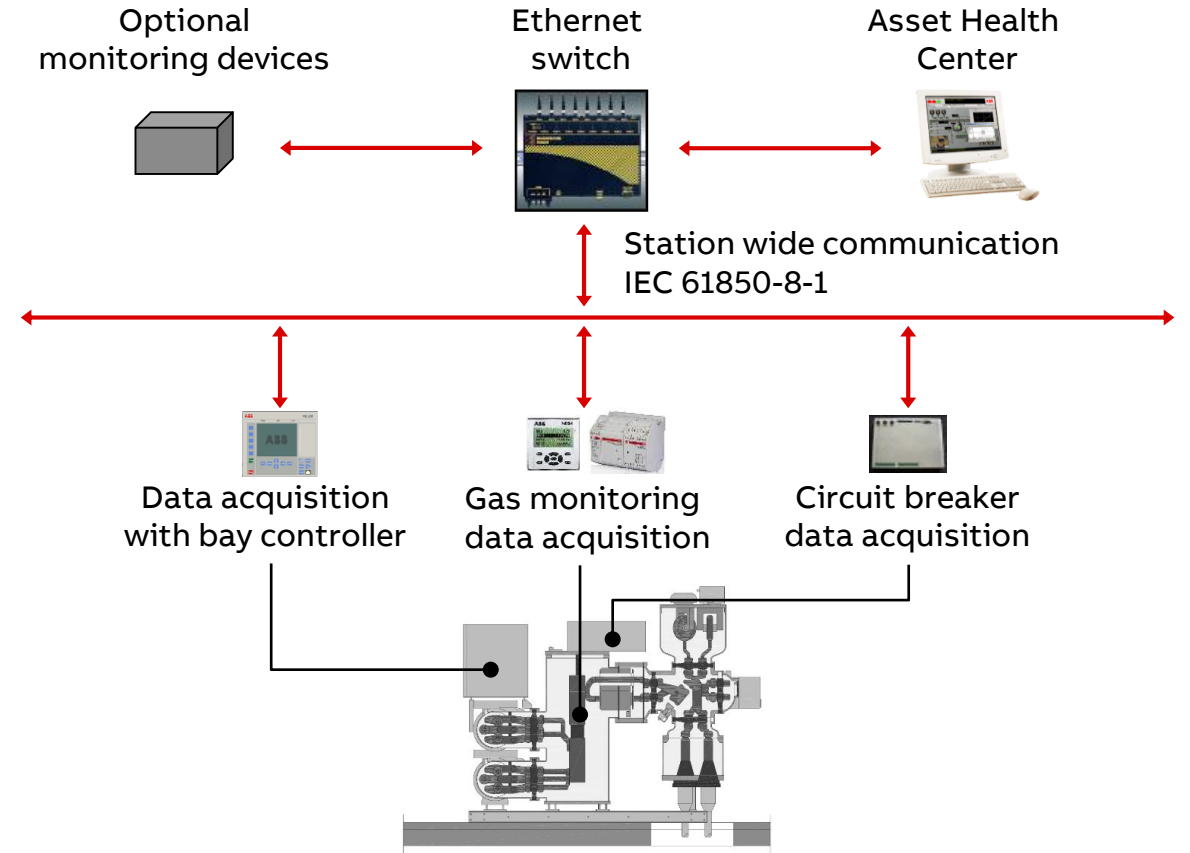


Comprehensive product portfolio

Scalable monitoring functionality satisfying even the highest customer requirements

Optimized solutions open for the integration of compliant devices and sub-systems according to your needs

Support of future extensions and upgrades with the benefit of safeguarding your investment from the beginning



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Trends, Tendencies, Technology

Digital and Eco-efficient technologies – Monitoring based on IEC 61850

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ENK 72,5 kV



ELK-04 145 kV



ELK-04 170 kV



ELK-14 C 245
kV



ELK-14 300 kV



ELK-3 C 420 kV



ELK-3 550 kV



ELK-4 800 kV



ELK-5 1100 kV

Our actual , SF₆-based solutions have the lowest gas-volume possible and make part of a transition phase.

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Digital and Eco-efficient technologies – Products for transition phase

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ABB