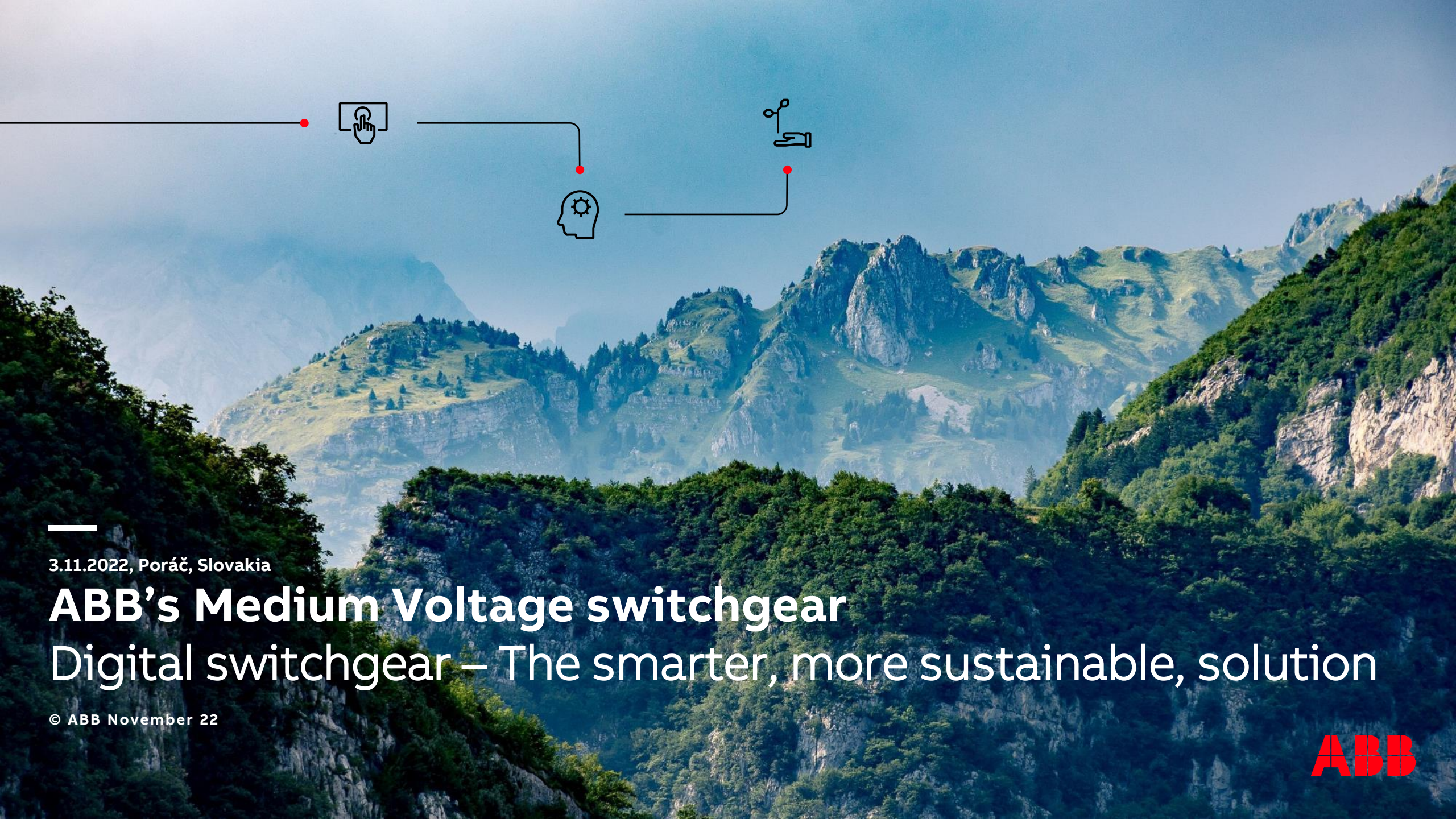


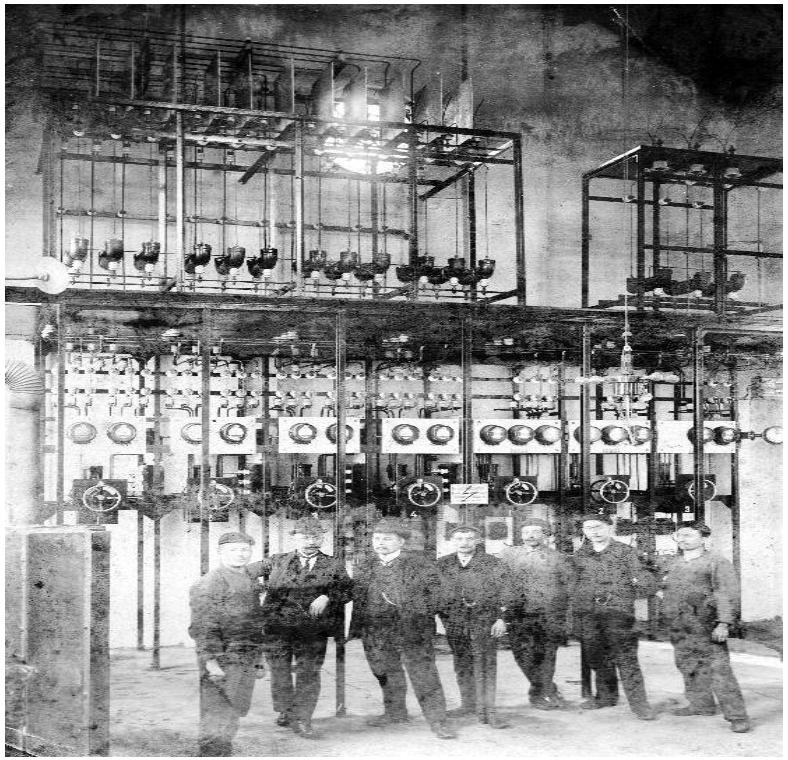
3.11.2022, Poráč, Slovakia

ABB’s Medium Voltage switchgear

Digital switchgear – The smarter, more sustainable, solution

Switchgear evolution is tremendous

From 1910 up to 21st century the safety standard for operators and users improved as technology evolved



Conventional vs. digital switchgear

You don’t recognize the difference from outside, the “beauty” is hidden inside

UniGear ZS1 “conventional”

UniGear ZS1 Digital

UniGear Digital –
The smarter AIS from ABB

At ABB, we believe in a world in which nature and technology go hand in hand. A world in which powering your operations also means powering positive change – for your business and our planet. We strive to create products and solutions that make a difference.

Be digital, smart and sustainable.

That’s the thinking behind our philosophy for medium-voltage, Primary Air Insulated-Switchgear (AIS): **UniGear Digital.**

Digital Switchgear
Energy saving

250 MWh ≈ 150 tons of CO_2

Saves energy, thus it saves also CO_2 emissions

A typical substation with 14 panel switchgear saves up to 250 MWh over 30 years of operation with UniGear Digital compared to conventional switchgear

- 25 million kms in Eurostar between London and Paris*
- 3.2 million kms travel in a small electric vehicle in UK*
- 1 million kms in long-haul economy flights*
- Carbon sequestered by 0.85 sq.km of US forests in 1 year**

Use the energy saving calculator:
UniGear Digital web app | ABB

* ourworldindata.org/travel-carbon-footprint

** epa.gov/energy/greenhouse-gas-equivalencies-calculator

*** for a typical switchgear 14 panels, and lifetime of 30 years

Instrument transformers vs. current/voltage sensors

Digital MV switchgear

Instrument transformers vs. current/voltage sensors

Current & Voltage Sensors

Why are current & voltage sensors better in the switchgear?

- Accurate in the whole operating range and no saturation
- Offers flexibility towards varying load flows and changing loads in the network

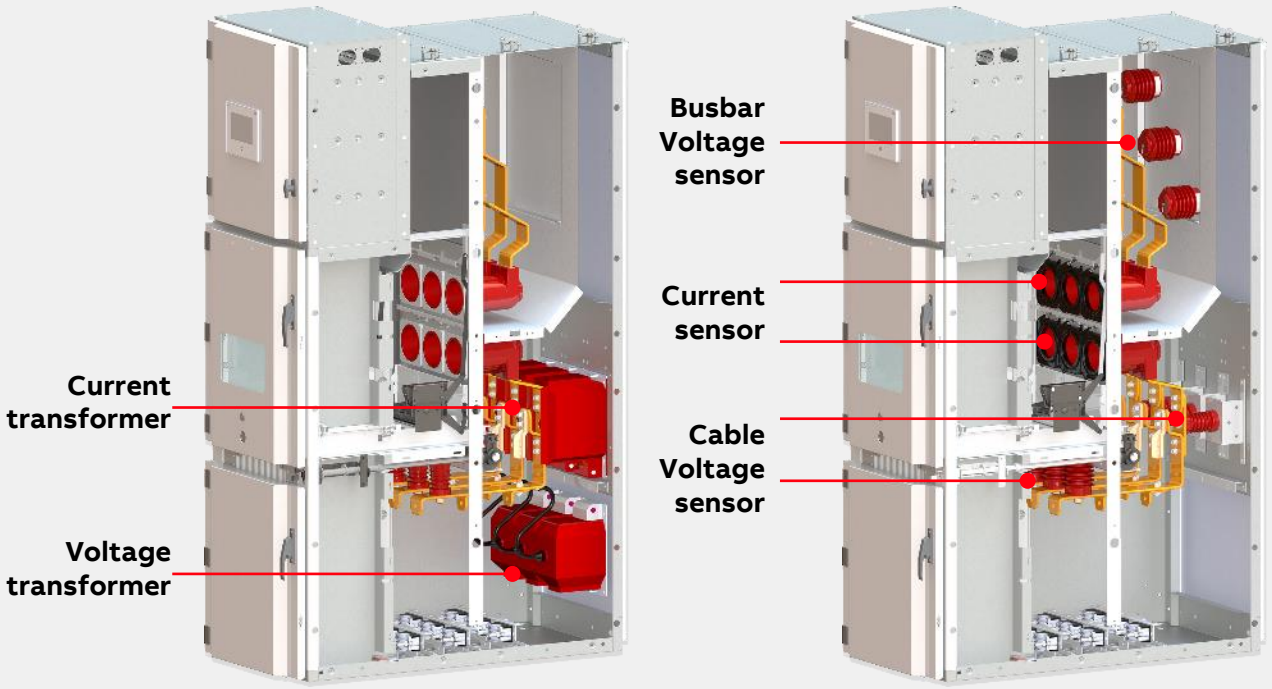
Benefits

- Based on well-established technology
- Off the shelf material

Upsides

- **Safety:** Increased personnel safety due to passive design
- **Flexibility:** Enables late customizations and changes
- **Efficiency:** Minimal electrical losses, no saturation and linear
- **Handling:** Light and compact enabling easy installation / replacement
- **Sustainability:** Lowers the environmental impact / energy losses

Conventional switchgear → Digital switchgear



Instrument transformers

Current/Voltage Sensors

IEC 61850 with horizontal bus communication (IEC 61850-9-2)

Digital MV switchgear

Horizontal bus communication with IEC 61850

Replacing traditional hard-wired loops

One bus – for many protocols of universal IEC 61850 standard

- 8-1 “GOOSE” for binary signals (Interlockings, Pos. indication)
- 9-2 “Sampled values” for analog signal (Current/Voltage measurements)

Most suited applications

- Switchgear with multiple relays, often Secondary distribution SWG
- Especially beneficial for large & complex SWG line-ups

Less failures & higher safety

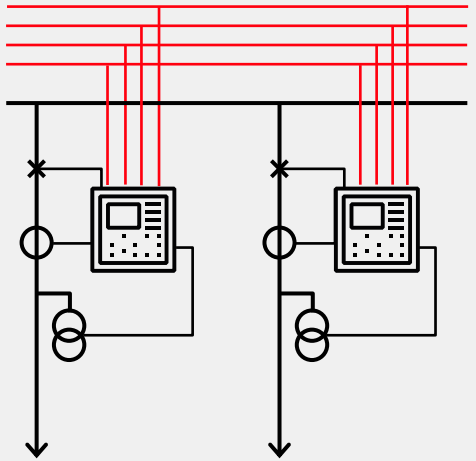
- Supervised communication & redundancy
- Safe to touch low-energy signals

High flexibility & Efficiency

- Easy wiring and automated documentation
- Changes can be done by software fast

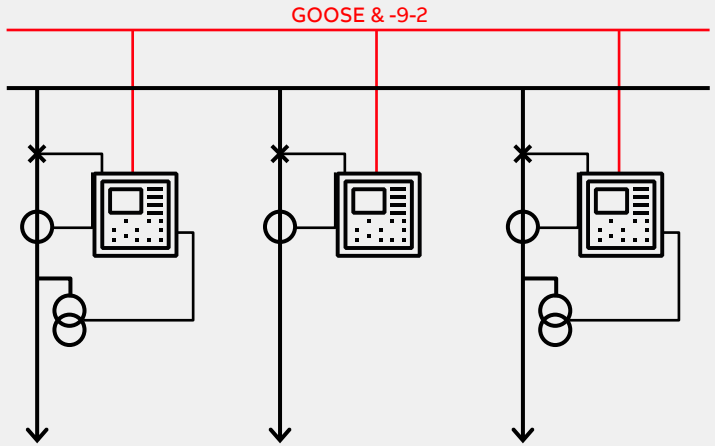
Traditional solution:

Many hard-wired inter-panel loops



Digital solution:

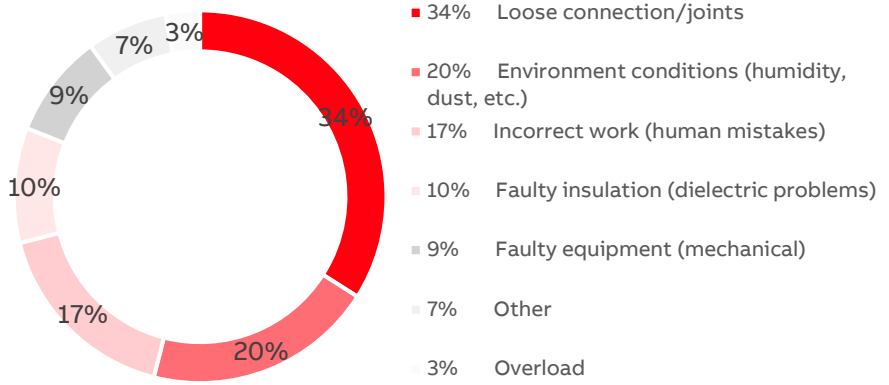
One bus for all inter-panel signals



Monitoring & Diagnostics solution Features & Architecture

Monitoring & Diagnostics outlook

How does M&D fit to the low-maintenance AIS?



Which monitoring makes sense?

Detecting **loose cable connection & hotspots** before they cause a serious problem

Monitor **panel safety interlocks** Install mechanics to ensure all in working order

Monitor circuit-breaker mechanism/coils to **detect anomalies** to determine maintenance needs early and based on operating conditions

Circuit breaker **remaining life**

Monitor **environment** to ensure design conditions and detect potential corrosion

Monitor **insulation health** through partial discharge sensing to avoid major impact

Monitoring & Diagnostics outlook

Maintenance Concept

Without M&D → **With M&D**

1. Corrective maintenance

Run to failure

2. Time- / Usage-based maintenance

Every 5 years / 5000 operations

3. Condition-based maintenance

Upon health status warning

4. Predictive maintenance

When in the future?

Corrective Maintenance

Reliability centered maintenance

ABB offering for digital medium-voltage switchgear

AIS for primary power distribution

- Relion® protection relay with IEC 61850 GOOSE/SMV
- Current sensor
- Voltage sensor
- MDC data concentrator and local HMI*
- Temperature sensor
- Environmental Sensor
- Partial Discharge Monitoring

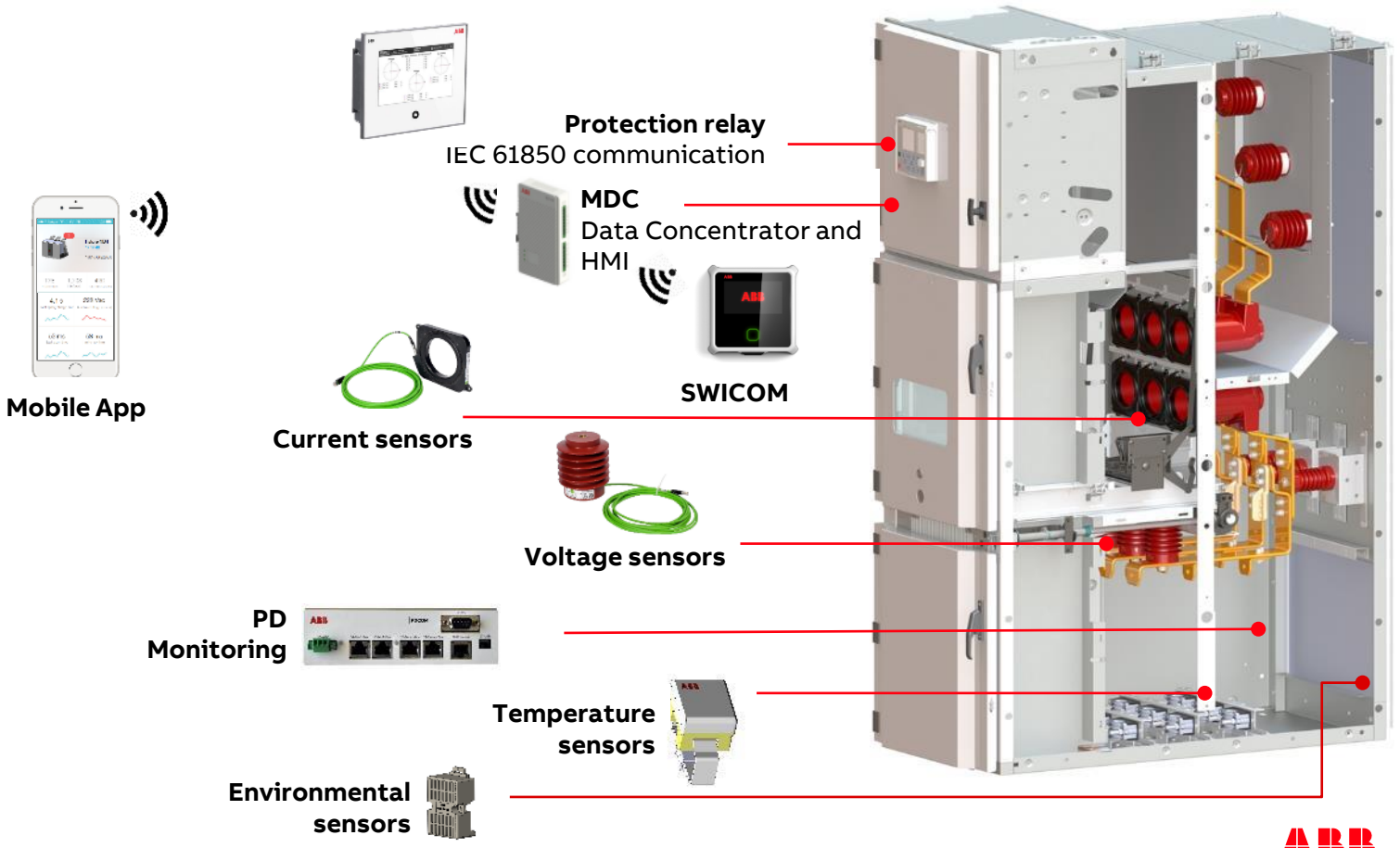
SWICOM – line-up HMI

*Human–machine interface

UniGear Digital

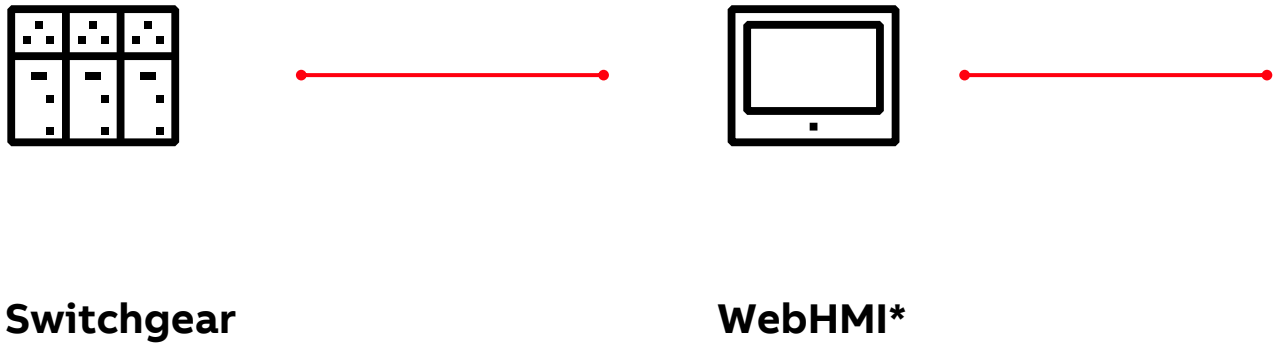
Same robust & safe design and user experience as conventional UniGear panels:

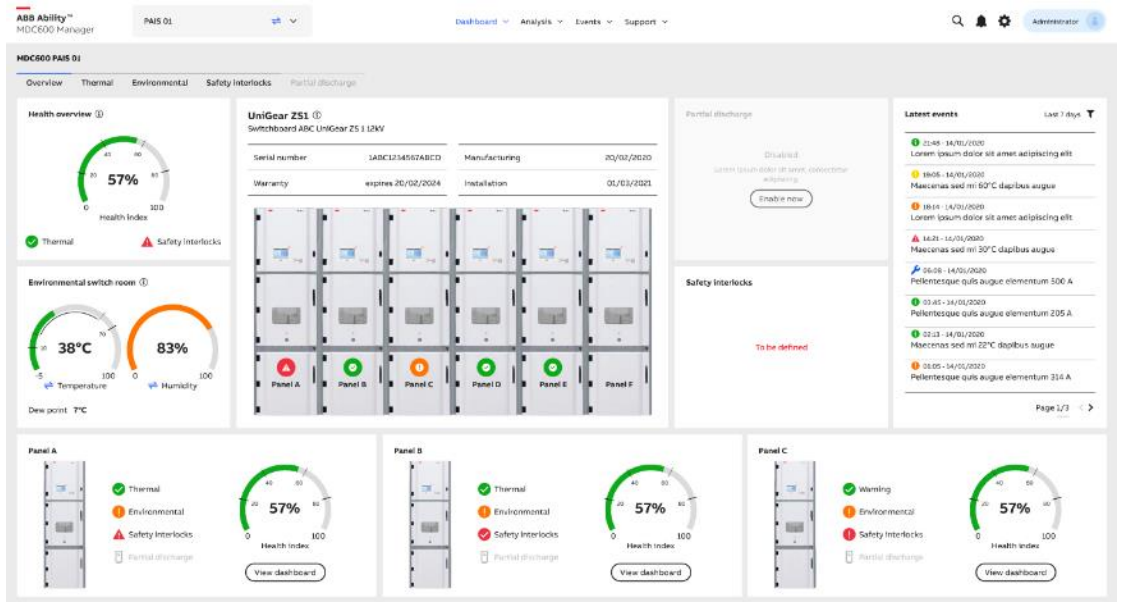
- Featuring Relion® series protection and control relays
- Self-supervised with GOOSE & Sample measured values over IEC 61850 bus
- Increased safety for operation & testing thanks to sensor technology
- Easy integration to increase digital functionality, such as ABB Ability solutions



Monitoring & Diagnostics

Sample* WebHMI view of Multi-panel MDC

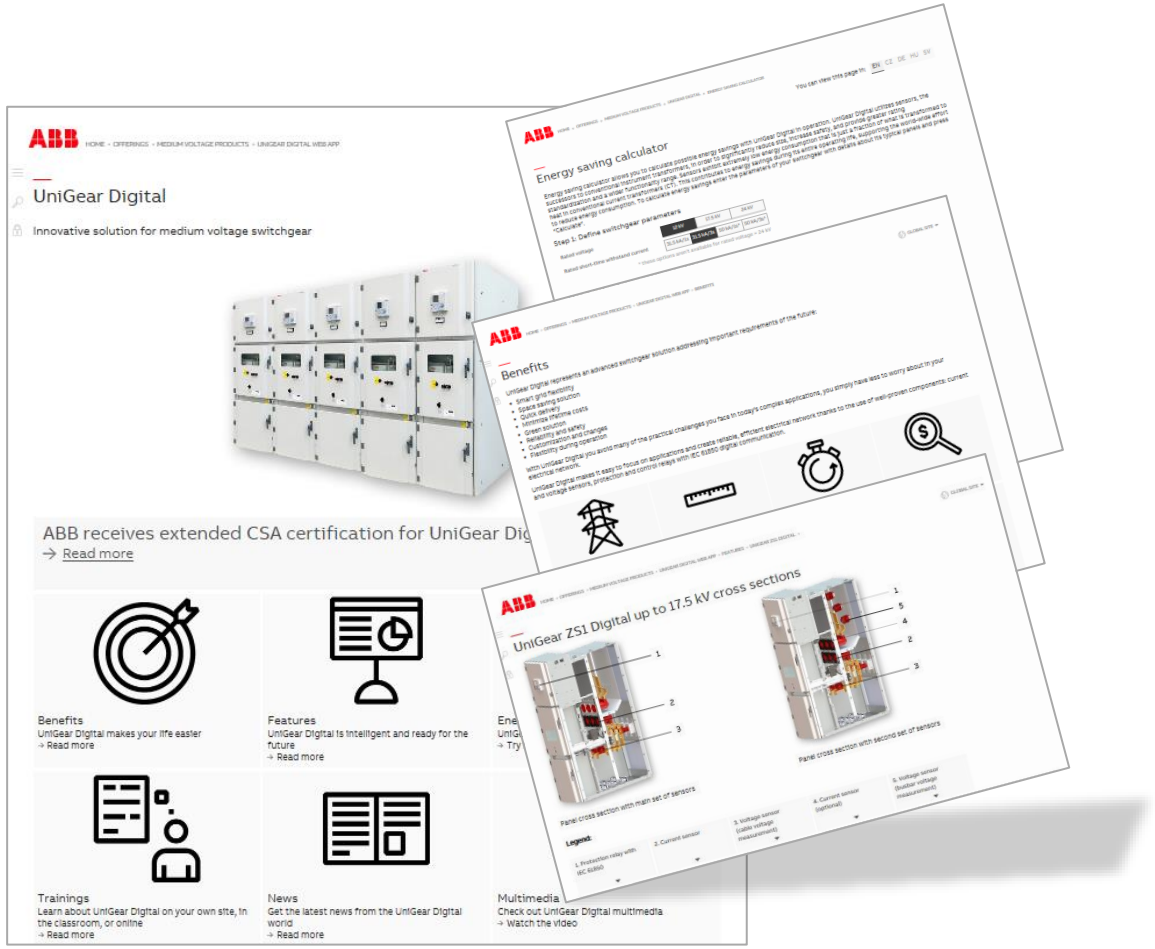




*Individual product WebHMI view may vary based on entire M&D solution selected

Find more about UniGear Digital on its web application

https://new.abb.com/medium-voltage/unigear-digital



https://new.abb.com/medium-voltage/unigear-digital

Thank you for your attention

Karol Majer

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