Intelligent Substation for EV- Charging

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Because
Power Matters

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Time is money, uptime is more money

What do all these charging stations have in common?

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They have ‘a grid connection box’

With ‘Siemens’ inside

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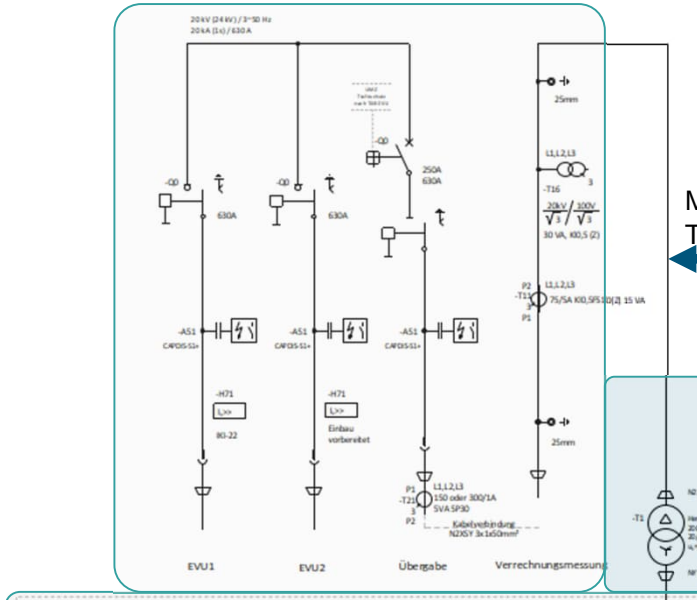
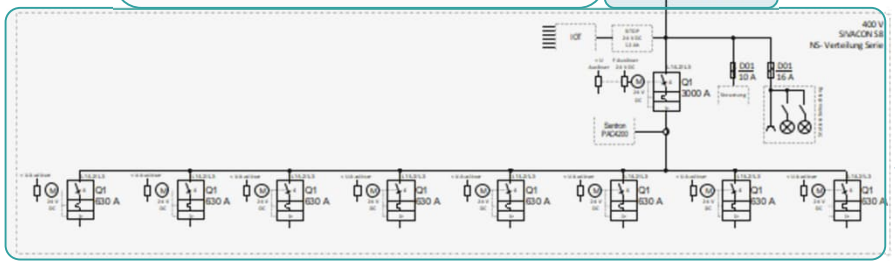
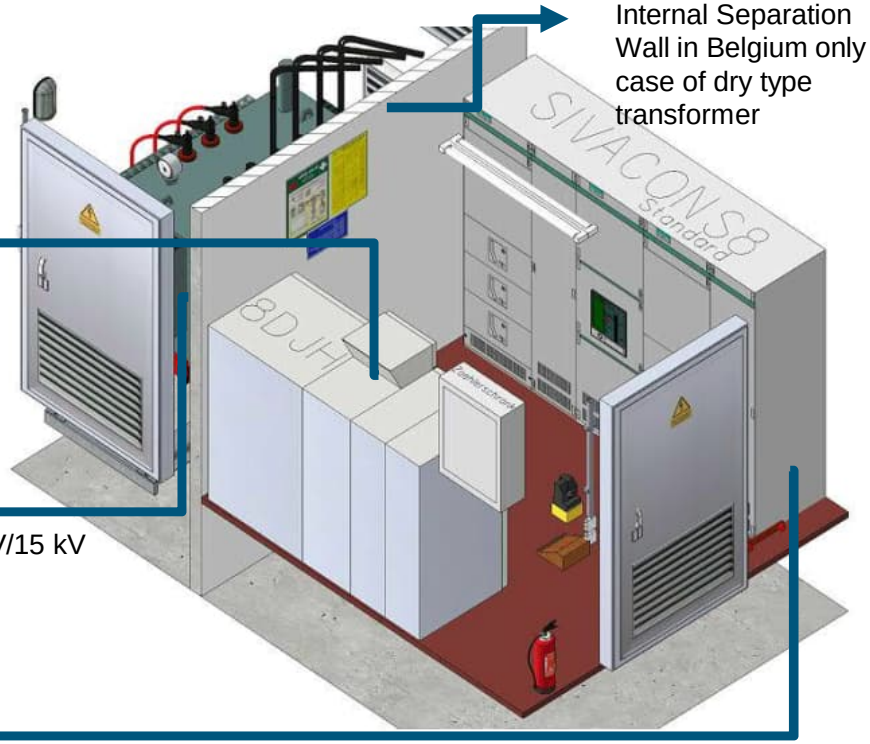
(Intelligent) Substation
Technical Example







Internal Separation Wall in Belgium only in case of dry type transformer

MV gas-insulated switchgear
Type 8DJH, RRL M1100

Transformer

1,000 - 2,000 kVA , 10 kV/15 kV

SIVACON S1/S4/S8 – Low Voltage compartment,

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Wat causes downtime?

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Moisture / weather influence

Sabotage / collison

Transformer Failure

Emergency Stop pressed

Short Circuit

Overload

Communication Problems with CPO

HV Grid Failure

Firmware bugs of Chargers

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How can we increase the uptime of our grid connection.

Actual situation and new requirements

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Standard solution for nearly all “1st stations in Belgium was CAPEX inspired

- Focus on lowest investment cost
- No concept for later power upgrades
- Limit is 2MVA

- Works fine and is great under following preconditions:
- A stable grid with very limited or no interruptions
- People with HV training available on site
- Power <2MVA (or <1MVA injection)

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More diagnostics please

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Who is the right person to send?
Or can we even avoid sending someone here?

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Increase the uptime of our grid connection...
with digitalization

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Problemsolving with enhanced digitalization

On site intervention

- Moisture / weather influence -You know it
- Sabotage / collison

Remote problem solving through expert evaluation

- Transformer Failure -> early alarms can reduce damage
- Emergency Stop pressed -> you know it
- Short Circuit -> you know it
- Overload –> you can adjust power setpoints

Simple remote problem solving

- Communication Problems with CPO -> Remote hard reset
- HV Grid Failure -> automatic reclosure
- Firmware bugs of Chargers -> Remote hard reset

Increase the uptime of our grid connection...
with digitalization step by step

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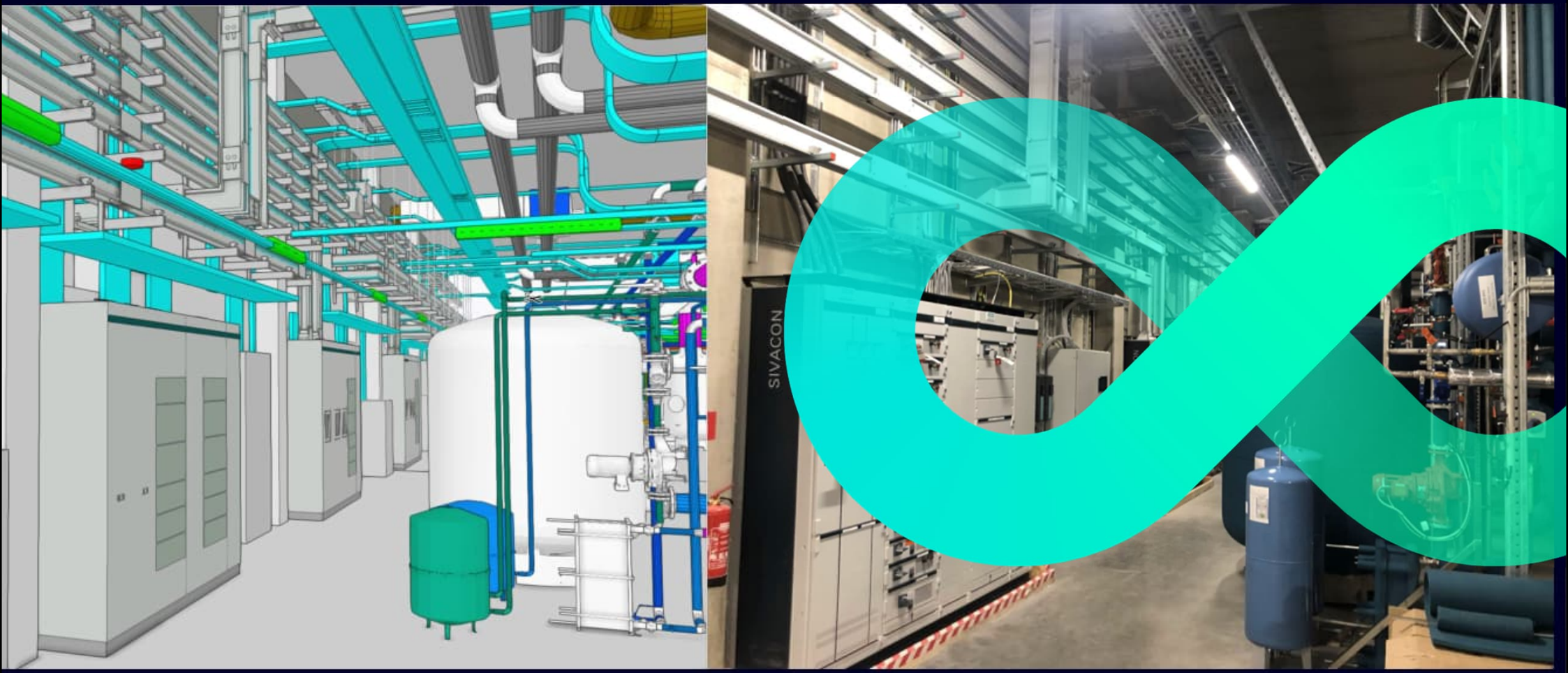
Start with a good electrical design, by combining the real and the virtual worlds



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Choose for ‘Smart Grid’ at your Grid operator to avoid the mandatory undervoltage release

- “Smart” grid feeders (Mandatory in Flanders, Option in Wallonia)
- Motorised panels give the grid operators the advantage that they can faster resolve problems
- Grid operators can ‘cut’ their loop so they can implement a load shedding to limit combined starting currents

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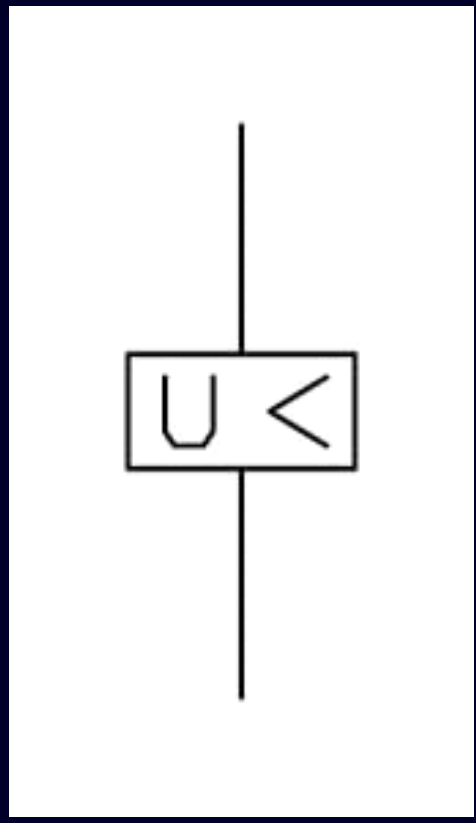
Choose Automatic Reclosure



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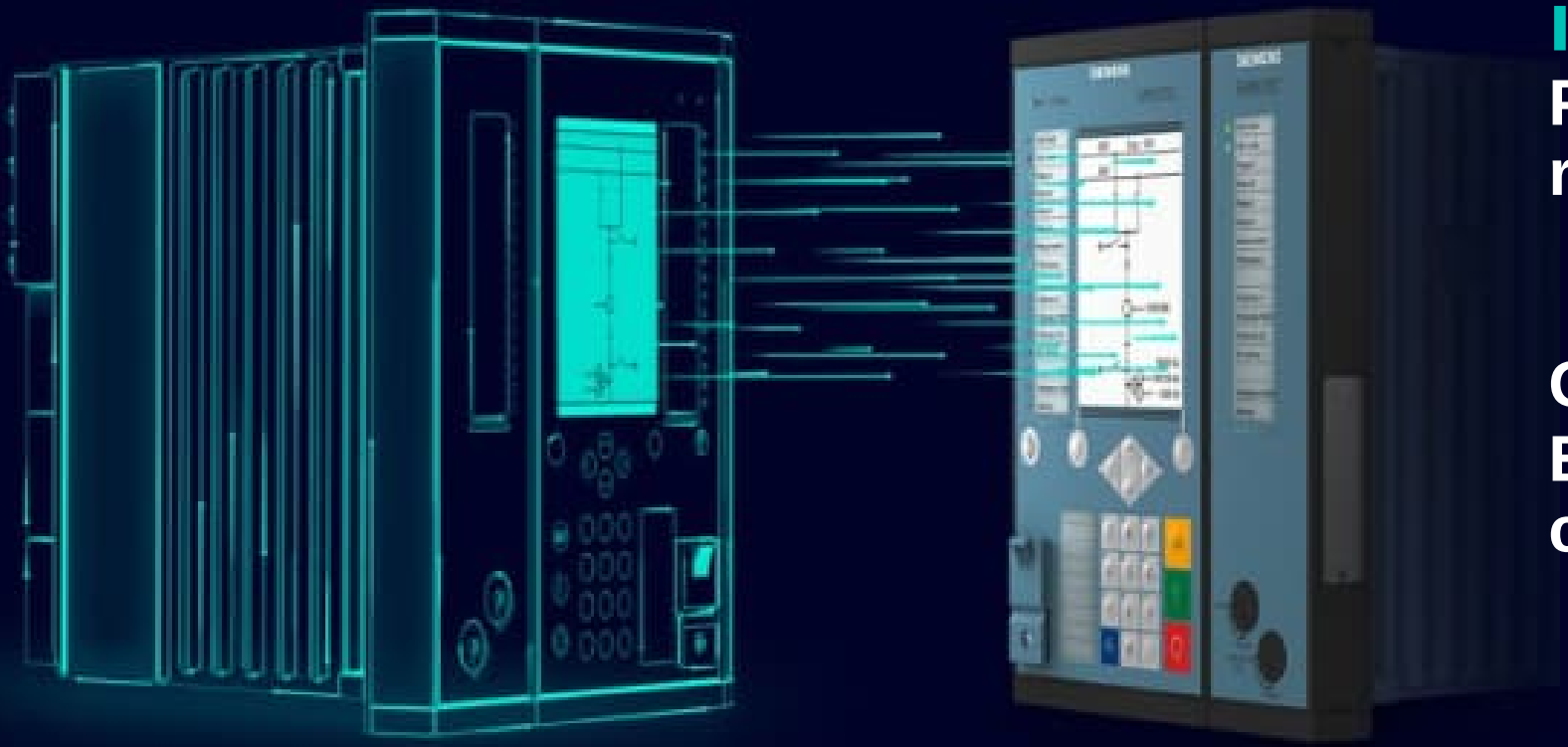

Choose an **intelligent** Protection relay

Grab the **data!** Enable communication

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Choose an intelligent Protection relay

- Auto reclosure comes nearly integrated
- Don’t be limited at 2MVA (from then it’s mandatory)

- **<u>Know what happened (in case of fault)</u>**

- **Avoid separate systems. Thnx to an integration of protection with logic functions and powerfull fault memory detailed fault analysis can be done**

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Grab the data! Enable communication

- **Start to use the protection relay as a data source!**
- **Start to use the protection relay as IO-input module**
- **All relevant current,voltage, fault, IO are present in the protection relay.**
- *This is the hardware solution I should recommend to all of you!*

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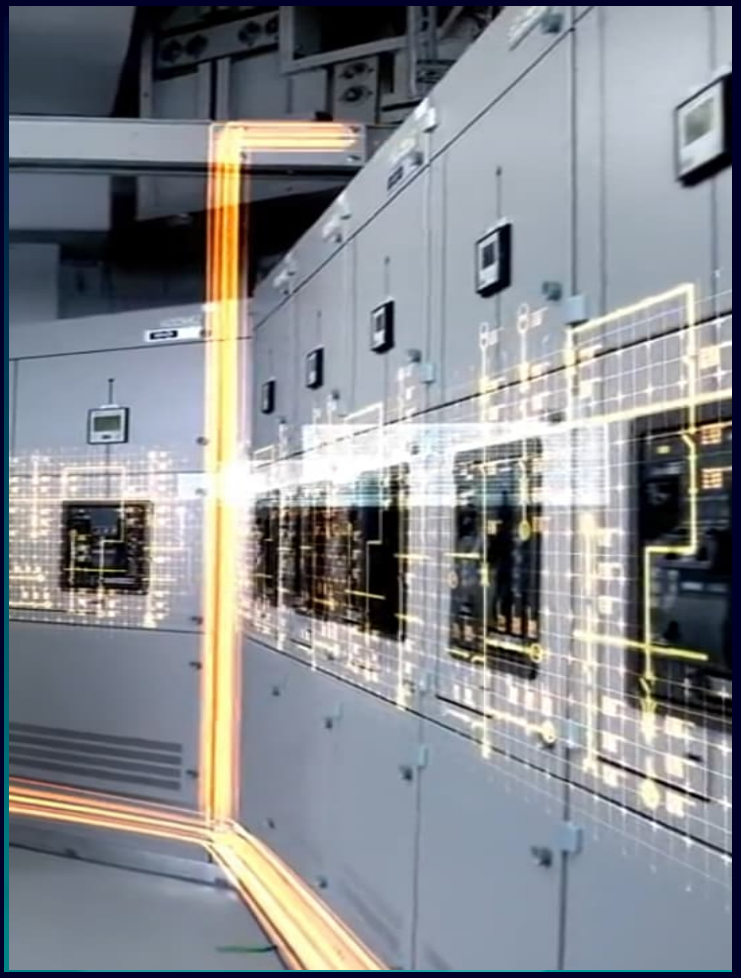
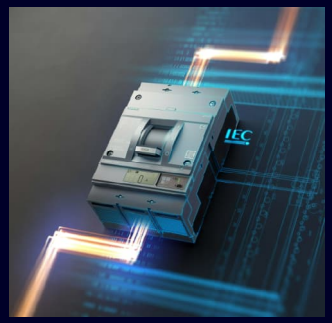
Grab the data! Enable communication



- Start to use the LV relay as a data source!
- Start to use the LV breakers as measuring module
- All relevant current,voltage, fault, IO are present in the LV breakers.
- This enables “remote Hard Reset” of a charger



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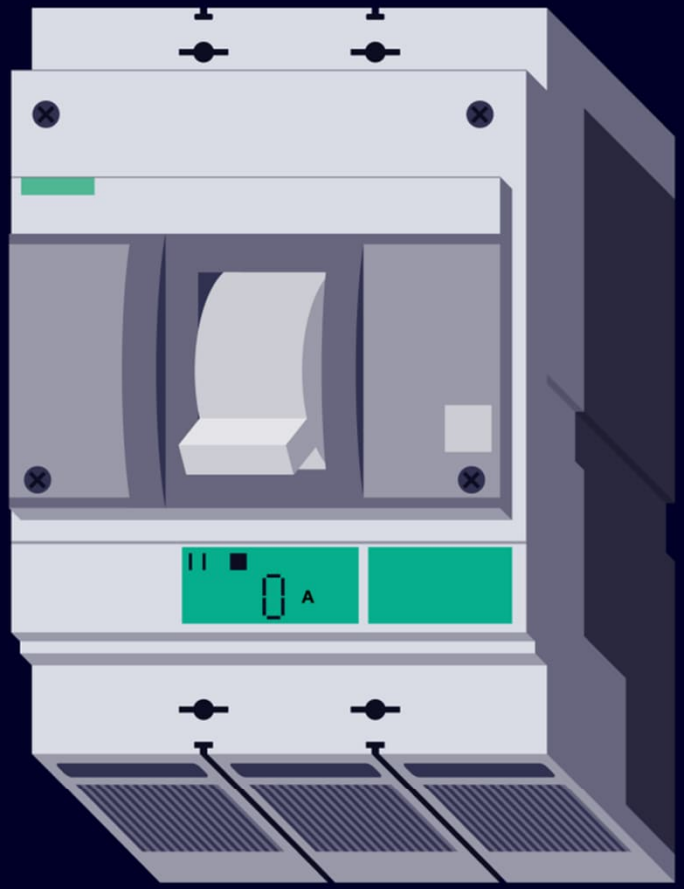

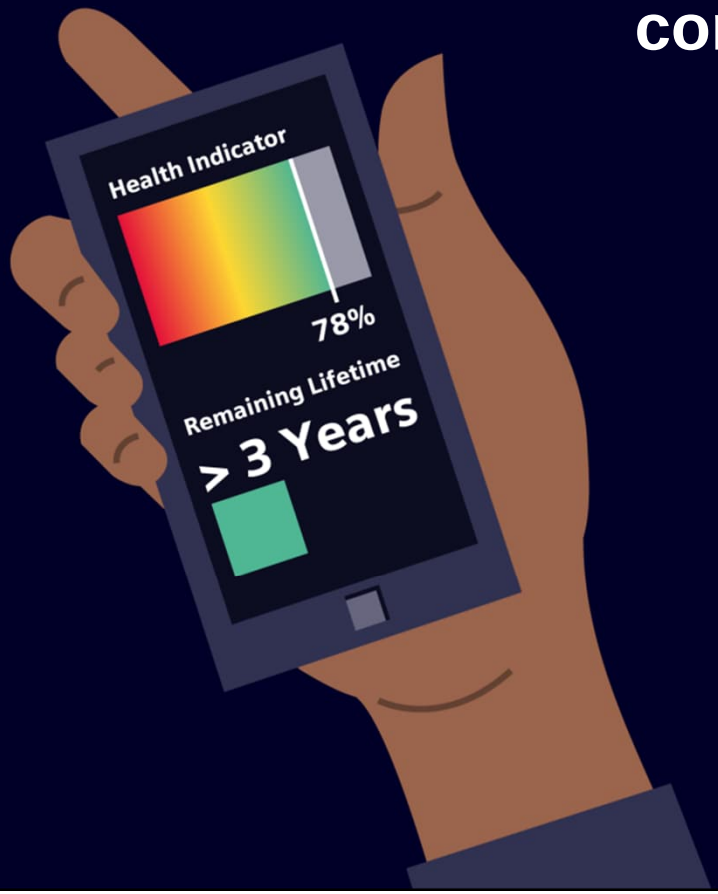

Grab the data!
Enable communication

Also for low voltage components

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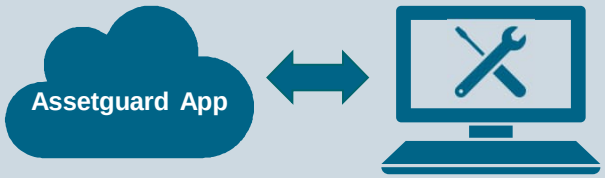
Go IOT
Remote Asset management , Load & Energy management

Asset Management

All the data from Intelligent devices in Field

Comprehensive data Visualisation and management

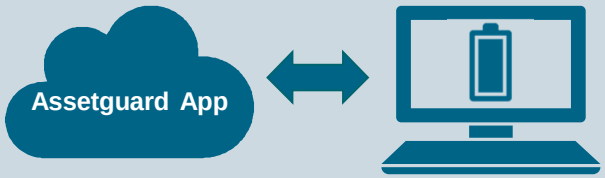


Asset Information and Control

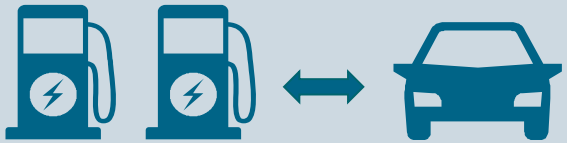
Load Management

Load Management Module for reduction command

Load Management Requests Predefined Peaks



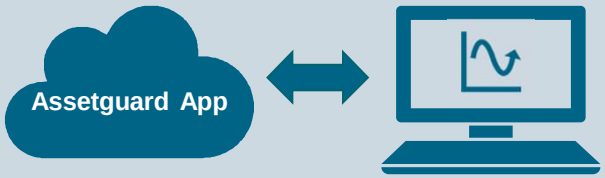
Reduction commands



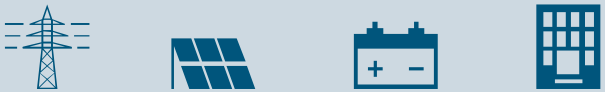
Energy Management

Energy Management Module for demand management

Energy Management transparency and peak management



Reduction commands



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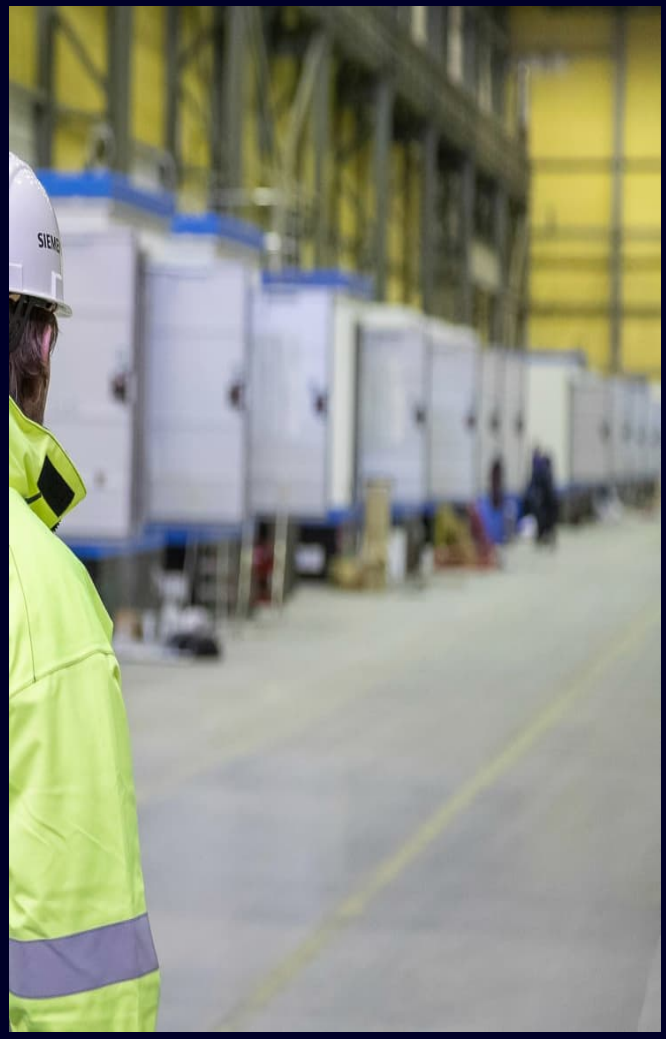
The full way.
Showcase BP Aral (Germany)



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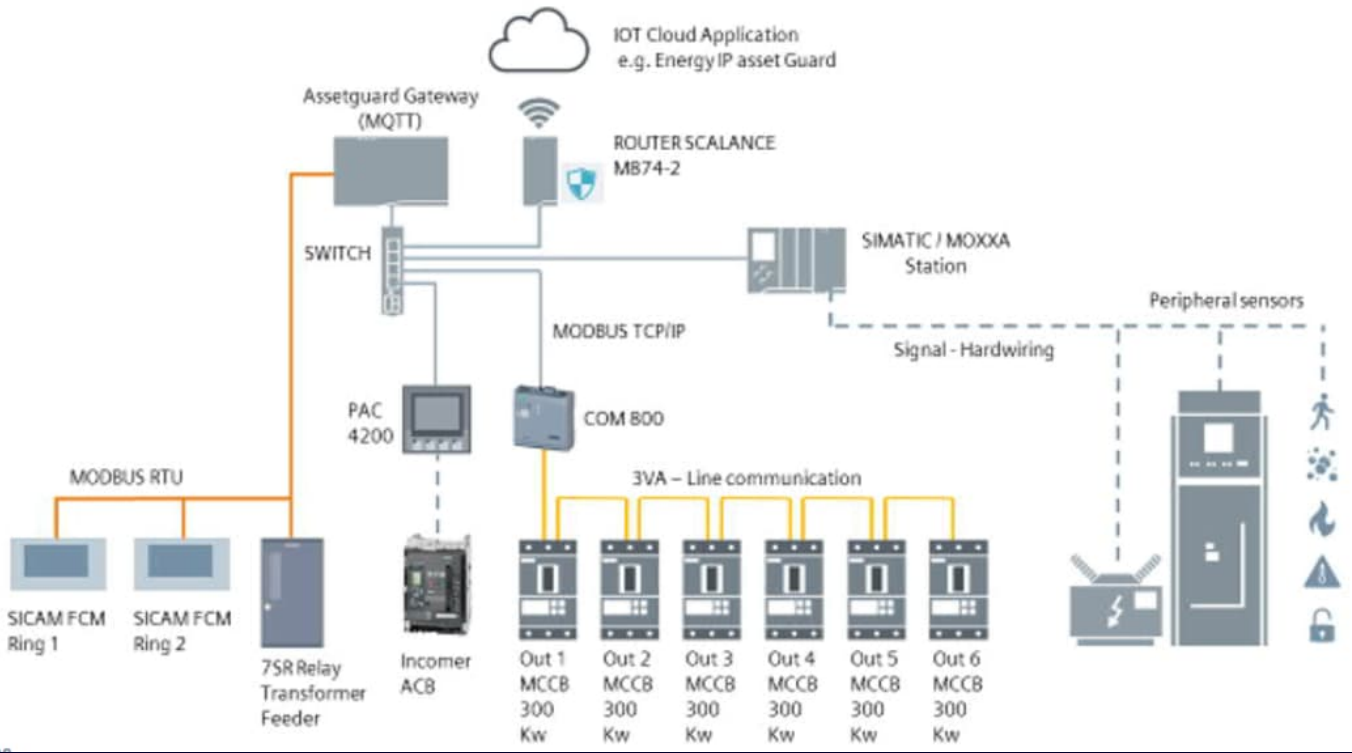
The digital substation architecture

Digital Substation System Architecture

Hardwire Signal	Qty
Digital Input	11
Digital Output	3
Analog Input/output	2
Temperature Input (PT100)	33

Device Communication	Qty
MODBUS TCP/IP	3
MODBUS RTU	3
PROFIBUS DP	0
IEC 61850	0



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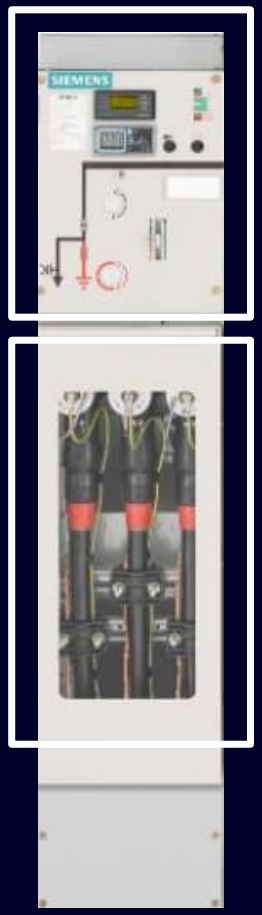
Information to catch?
MV



SF6 Indication

Measurement and fault monitoring

Temperature monitoring

Temperature monitoring of
- Cable connections
- Or for customized solutions

PT1000 temperature sensors
- Design as part of cable connection
- Simple mounting direct at the measuring point
- Rugged, simple sensor, low space requirements

Energy Monitoring

Circuit Breaker status monitoring

SF6 gas indication / status monitoring

Remote diagnosis, Fault finding and analysis

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Information to catch?
Transformer

Measurement and fault monitoring

Temperature monitoring

Temperature monitoring of
- Winding temperature

PT100 temperature sensors
- Design as part of Transformer
- Simple mounting direct at the measuring point
- Rugged, simple sensor, low space requirements

- **Energy Monitoring**

- **Oil pressure / level indication and status monitoring (DGPT2 Controller)**

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Information to catch?
LV

Remote diagnosis and control

Measurement and fault monitoring

Temperature monitoring

Temperature monitoring of
- Cable connections
- Or for customized solutions

PT100 temperature sensors
- Design as ring cable lug or pin cable lug
- Simple mounting direct at the measuring point
- Rugged, simple sensor, low space requirements
- Low-cost, tested solution
- Connection to different device systems with Pt100 interface possible

Energy Monitoring
- Energy monitoring of individual feeder
- Power quality monitoring

Remote diagnosis, access & control,
Fault finding and analysis

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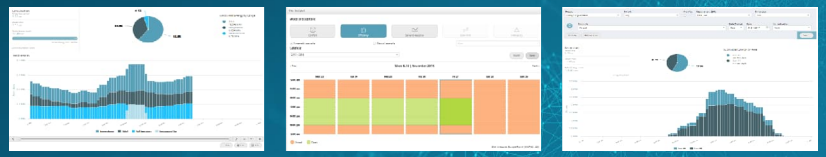
Intelligent Substation
IOT possibilities

Assetguard App

Digital Services - Web/mobile applications



Cloud-based, open IoT operating system

MQTT / OCPP

Field Assets

SIMARIS Gateway (With Local control)

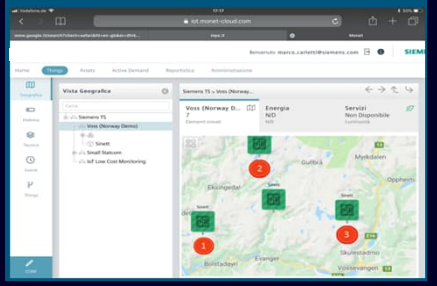
10 01 01 | 10 01 01 | 10 01 01 | 10 01 01 | 10 01 01

10 01 | 10 01 | 10 01 | 10 01 | 10 01

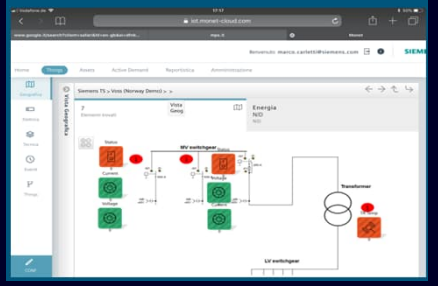
Circuit breaker | **Transformer** | **GIS Switchgear** | **IoT Sensors**

Assetguard application - Visualization

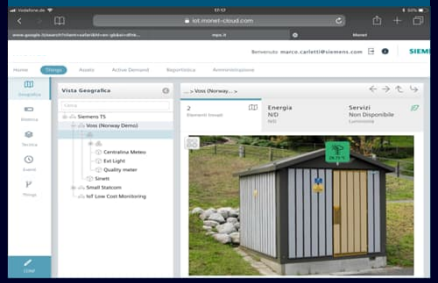
Immediate identification & location of fault in cloud



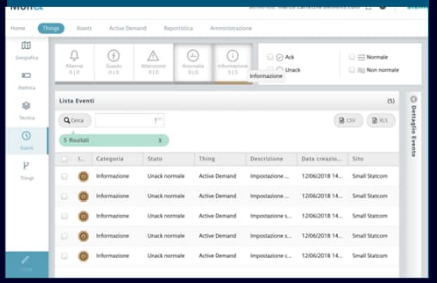
visualization of electrical status of particular substation



Visualization of environmental and security motoring



Event logging



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Problemsolving with enhanced digitalization

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Simple remote problem solving

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Time is money,
uptime is more money

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Key take-aways

1. Start with a good electrical design
2. Choose intelligent devices
3. Grab the data and know what’s going on

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8DJH switchgear from Siemens

- Synergrid homologated
- Gas-insulated, sealed for life
- Very safe and robust design 21kA IAC
- Low maintenance requirements
- Busbar 630 A, feeders up to 630 A
- Flexible due to extension option
- Individual panels (modular) and block versions (RMU)
- AA10 or AA15 (with pressure absorber)

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LV switchgear from Siemens

- Robust
- Type tested
- Circuit breakers / fuses
- Reliable
- High safety standard

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Disclaimer

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.

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