SICAM Navigator Applications (IoT)

Franziska Diestel – Software & Digitalization

VAR Partner Day 2022 | September 12 -14 | Zagreb, Croatia

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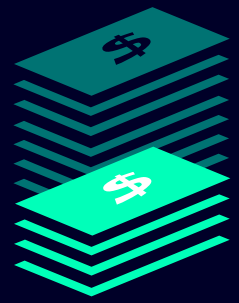
Distribution grids need to become intelligent

Page 2

Distribution grids need to become intelligent – but ~ 90% of are still dumb

What are the challenges?

High number of assets and IED



Technology must scale at low cost

"Plug n' Play" solutions at scale

Modern IoT technology masters these challenges!

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What is the role of IoT and cloud based apps?

SCADA is necessary for operation

… like a steering wheel.

IoT simplifies operation and maintenance

… like driver assistance and fault evaluation systems.

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Grid Diagnostic Suite

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We enable grid operators to cope with the growing challenges of electrification

SIPROTEC Dashboard

Protection Relay Monitoring

SICAM Navigator

Distribution transformer station monitoring

SICAM GridEdge

11 00 10 00 01

11 00 10 00 01

11 00 10 00 01

Primary Substation

HV

HV, MV Protection Relays

Instant notification and remote access to fault records for a more efficient fault restoration

MV

Secondary Substation

SICAM FCM

SICAM A8000 RTU

Continuous load measurements of sub-stations to avoid down-time and extend the asset lifetime

MV/ LV

SICAM FCM

LV Grid

Instant notification of fault location reduces downtime and labor by typically 30%

LV

Highly sensitive data in critical infrastructure!

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SICAM Navigator

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Challenges in distribution grids

Long fault localization time

Equipment fails

Expensive grid expansion

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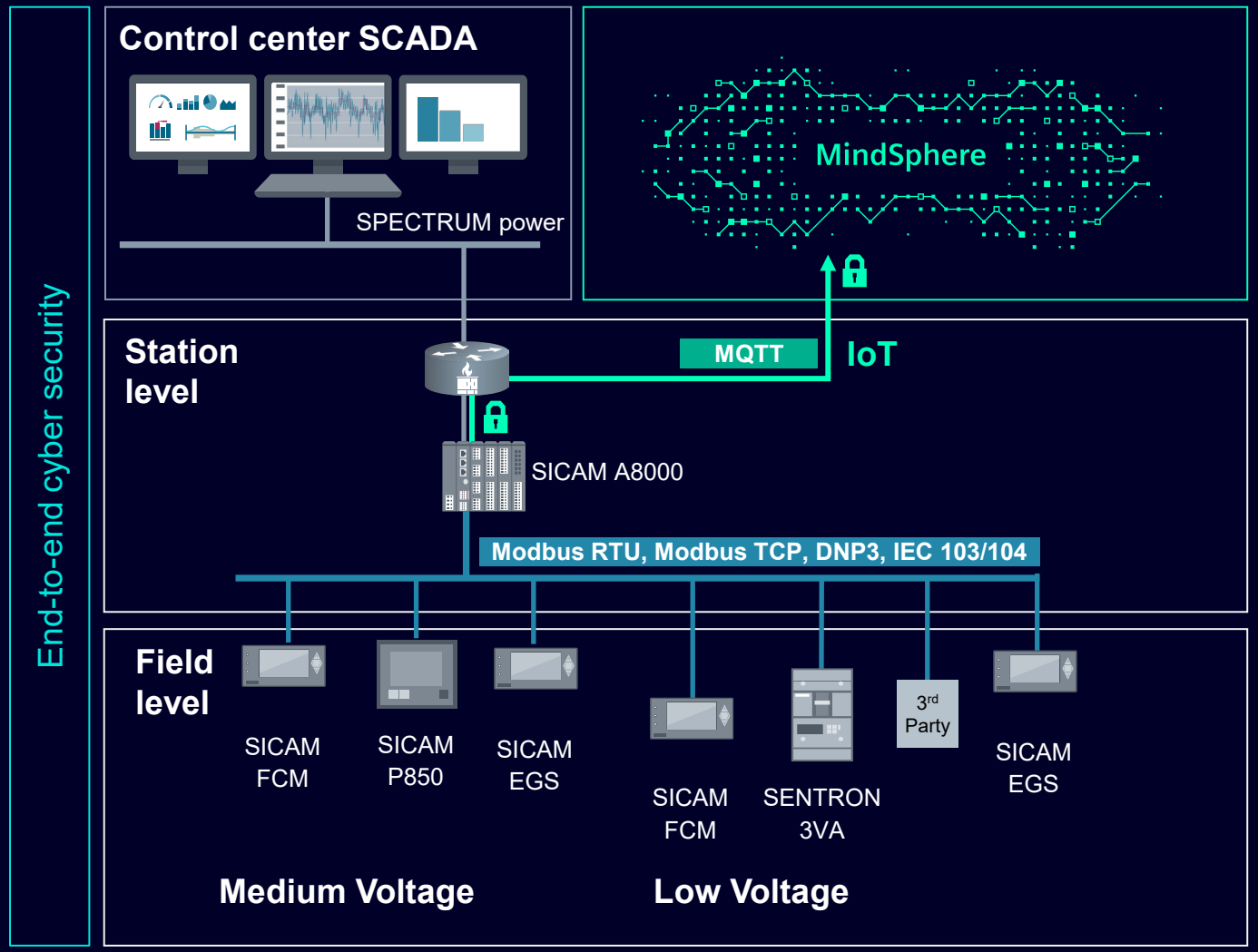
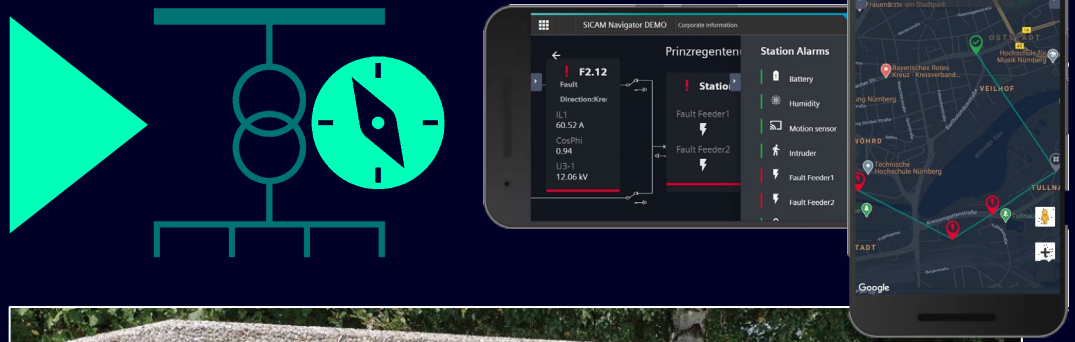
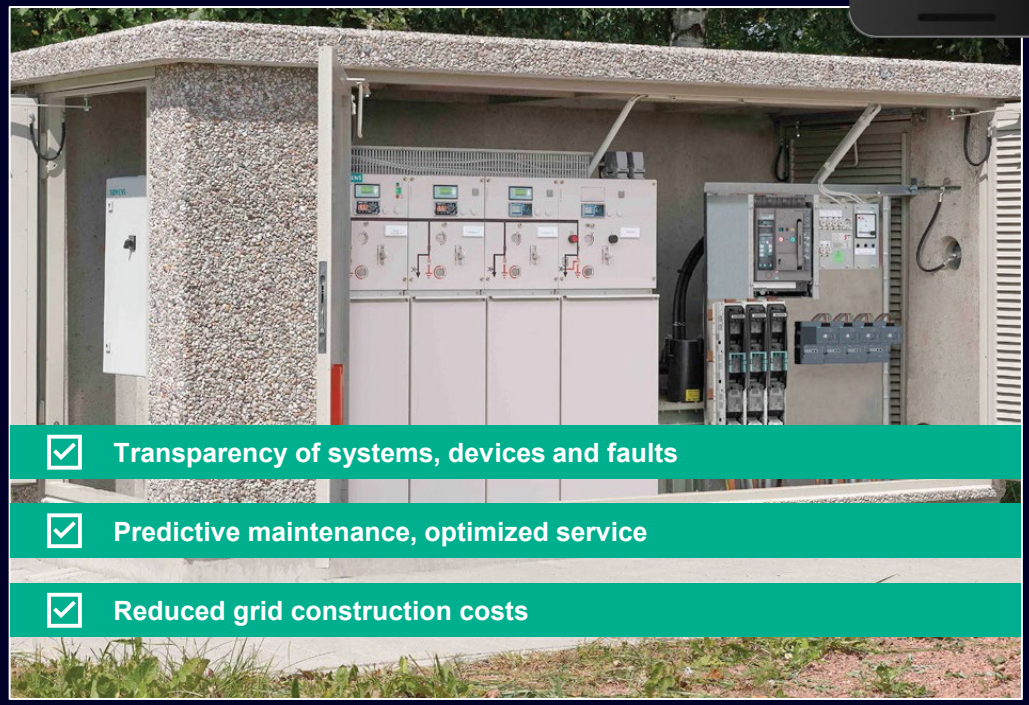
Grid Diagnostic Suite – SICAM Navigator
Technical setup







- Transparency of systems, devices and faults
- Predictive maintenance, optimized service
- Reduced grid construction costs

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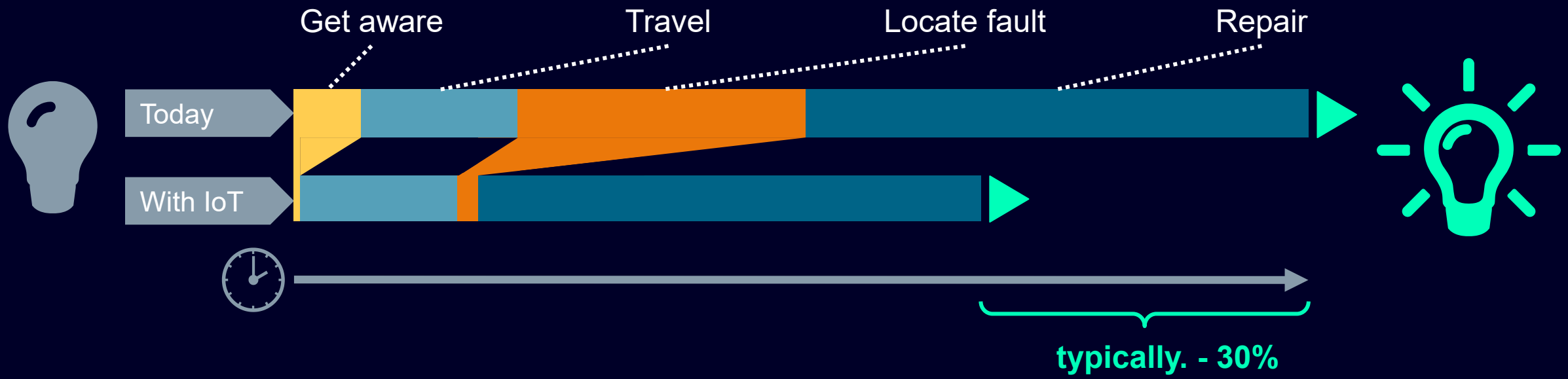
Fault Management

Instant notification of fault location reduces downtime and labor by typically 30%:



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Predictive Maintenance

Continuous load measurements avoid down-time and extend the asset lifetime

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Reduced outage time by swift fault clearance & prevention
Distribution grid monitoring with SICAM Navigator

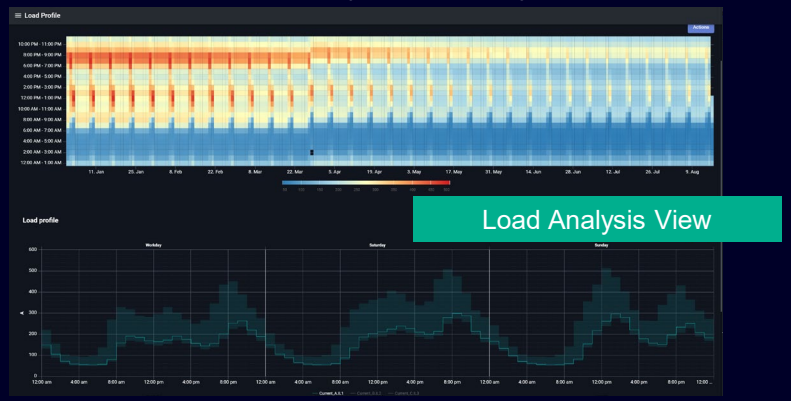
ELECTRICITY DEPARTMENT
Government of GOA

With SICAM Application we reduced the average time to notify and localize faults **from 60 to 3 minutes**!

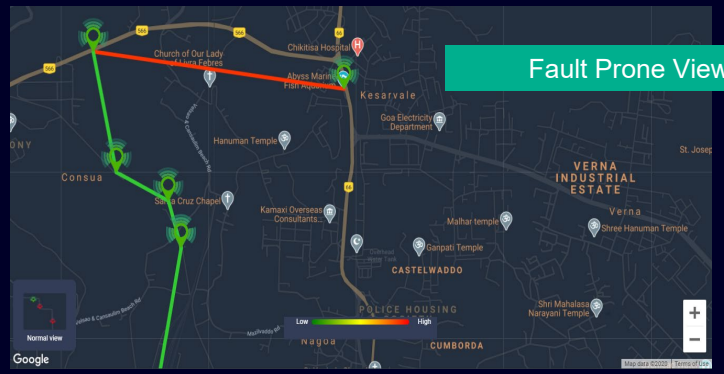
33kV OHL
Goa Electricity Board, India

Immediate fault localization
and notification via SMS or e-mail

Improved grid planning
via load transparency and analysis



Fault prevention
via fault prone zones and trend analysis



⬇30% downtime & labor*

⬇10% grid expansion costs*

⬆15% grid availability*

⬇SAIDI & SAIFI

* typical values

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EGS

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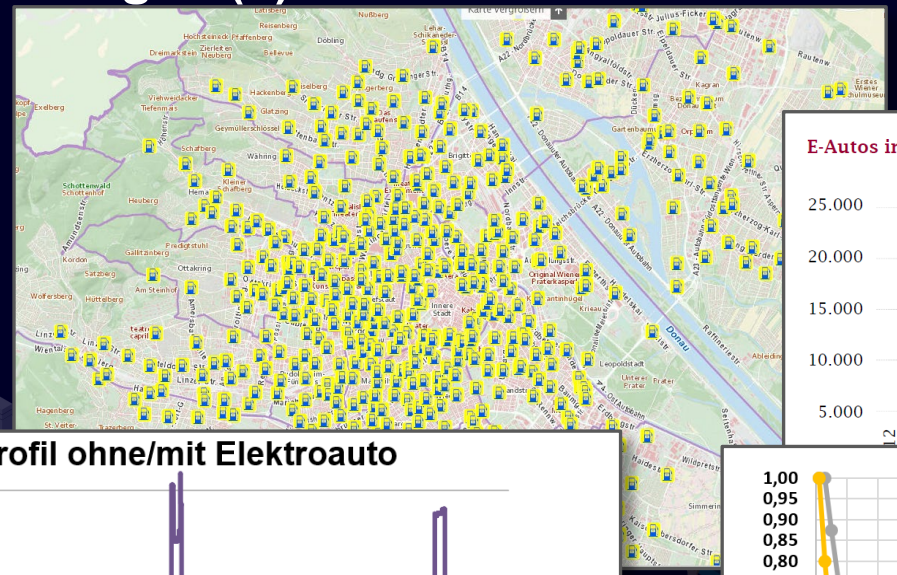
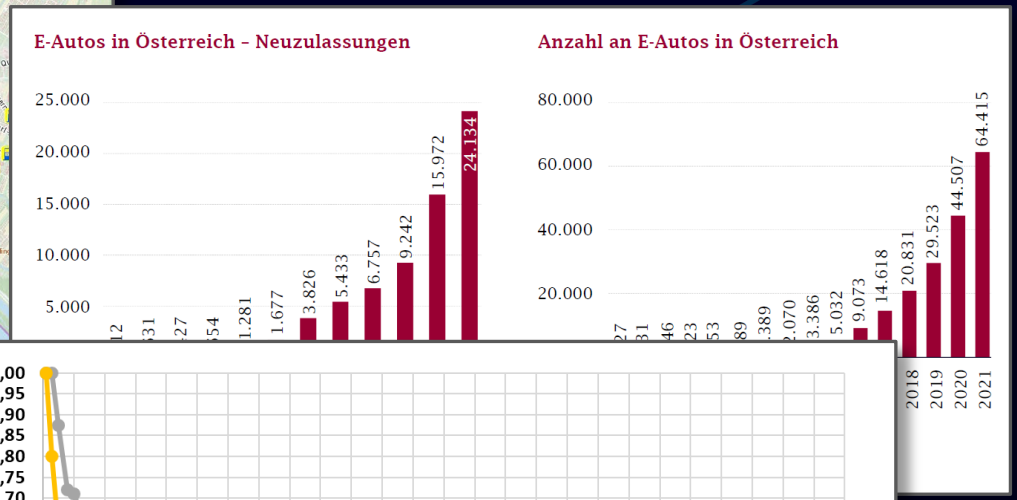
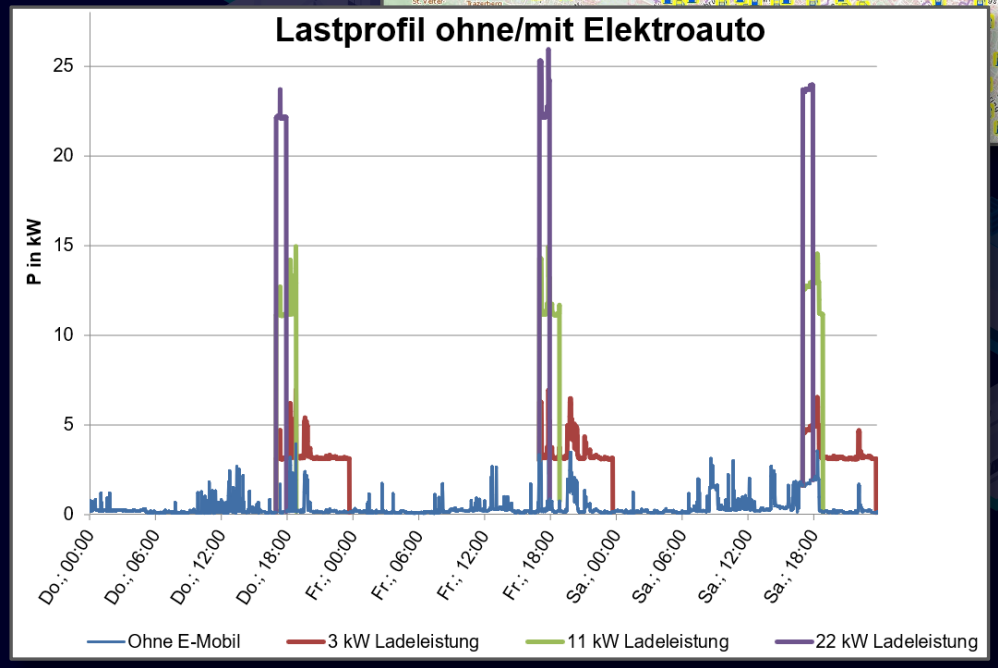
Energy Transition Challenges (1)

Charging points, example Vienna (without home chargers)

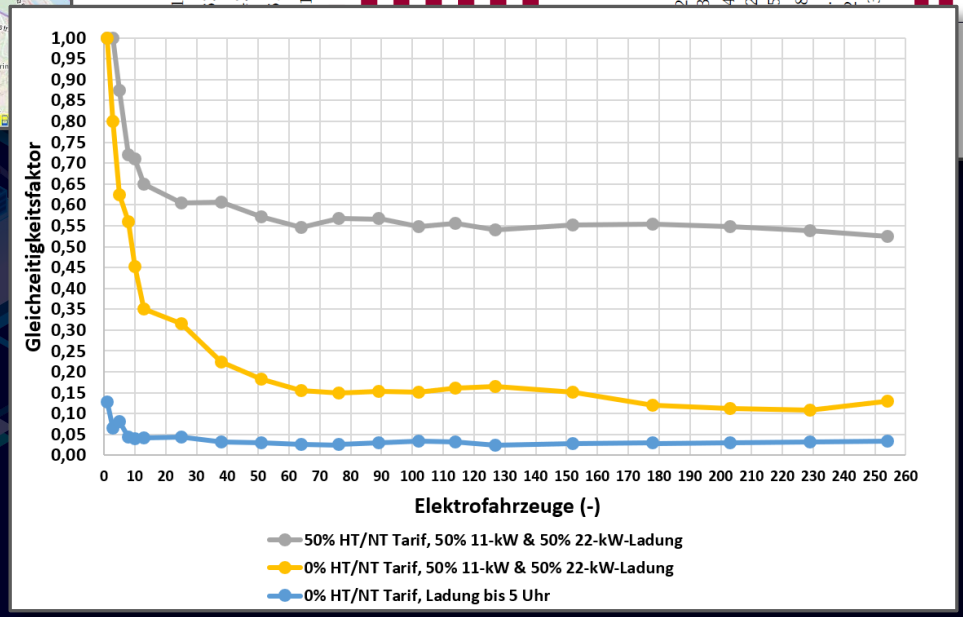
This year another 200 charging points on top to the 1000 existing ones are planned.







Source: Vorarlberg Netz



Source: Vorarlberg Netz

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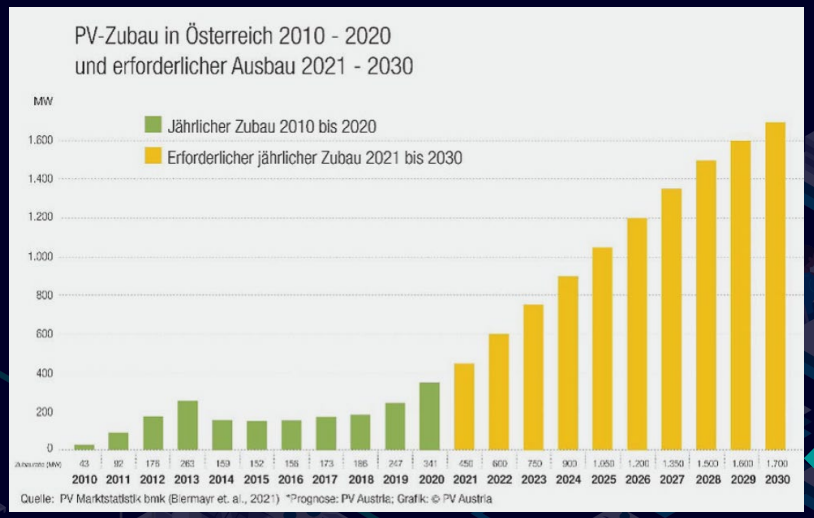
Energy Transition Challenges (2)

PV generation

Until 2030:
Additional 11 TWh
(Erneuerbaren
Ausbaugesetz)

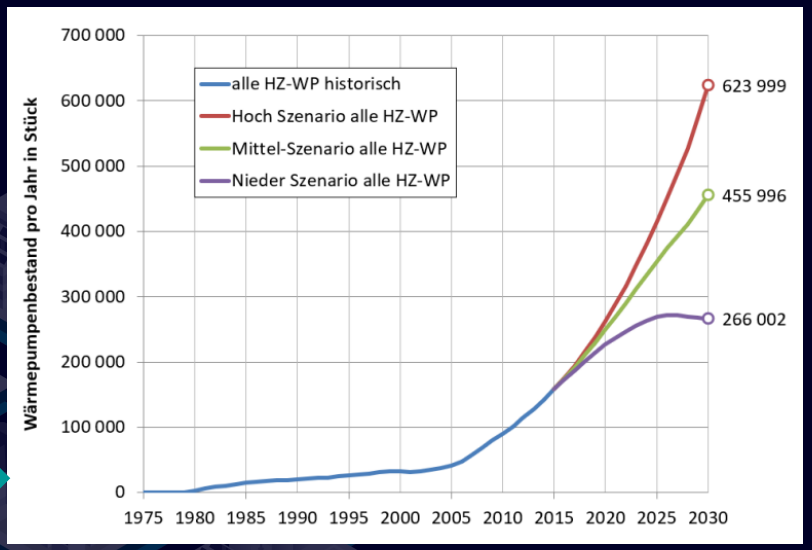


Source: PV Marktstatistik bmk / PV Austria

Heat pumps

Expected number of heat pumps (heating) until 2030

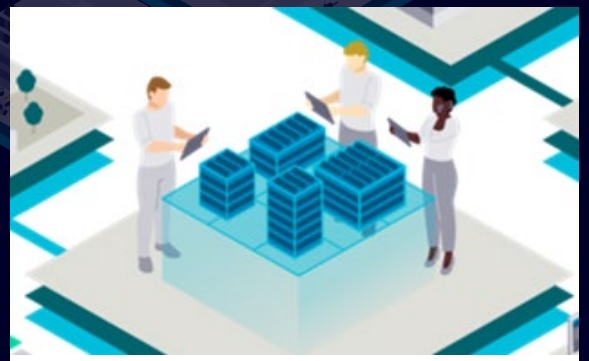
Simultaneity factor Close to 100%



Source: Wärmepumpe Austria

Legal / regulatory framework

- EAG: Renewable Energy Communities – Reduced grid tariff
- In preparation: Power oriented tariff structures, reduced grid tariffs if customers provide DSO access to controllable loads/generation devices
- Reduction of investment hurdles for renewable generation.
- TOR: Relay contacts for controllable customer assets – in the future: Digital interface



Legislation

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Distribution Grid Digitalization
System architecture

Backend IT

Open Source

Backend applications e. g. load forcasting, grid planning and optimization.....

Grid analytic

Data visualization & data management

Time series | Graph data | Context | Meter data

Data bus

Data provisioning / Middleware (backend apps in Docker Container)

Interfaces to external IT systems

Broker MQTT

Interface to Smart Metering Systems

Control System

MV & LV field devices

Private networks | Public networks

IT Standards

Field functionality provided by field apps (Docker Container)

Platform based field devices

Linux | docker | MQTT

Industry standards

- **Sensors**
- **Intelligent nodes**
- **Intelligent actors**

Prosumer & Grid Edge

Public networks | Grid interface | Internet

Grid customer - Gateway

OCPP, Modbus.....

Smart Meter Data

Meter interface

Car chargers, intelligent buildings, Energy Communities

Standard products supporting Plug and Play based on DSO specific standard configurations

Support for future proof solutions

- **Prepared for AI**
- **Integration of 3rd party products**

Seamless App and Middleware-management (app distribution / maintenance)

Seamless system and device management

Integrated Cyber Security

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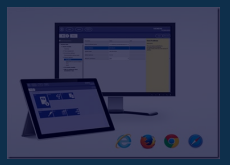

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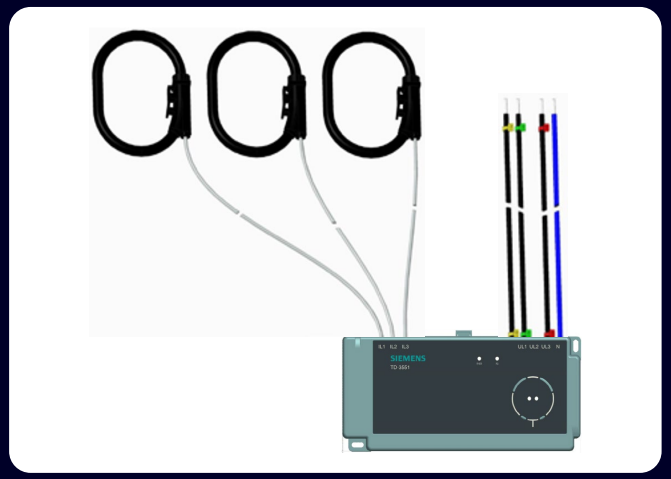
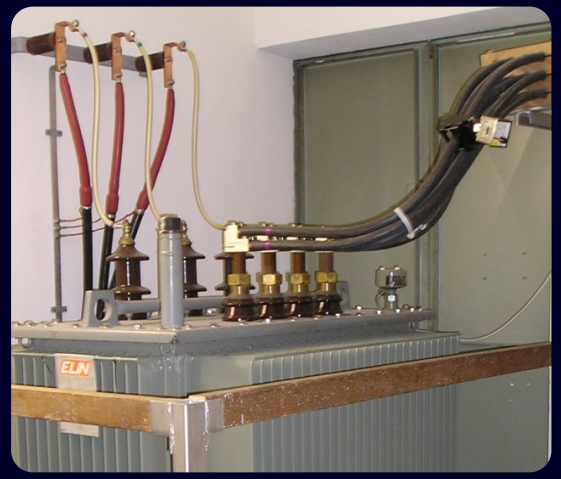
Enhanced Grid Sensor (EGS)
A new LV sensor – why?





DSOs require transparency on asset loading in low-voltage infrastructure

- Lots of sensors are available, but they need interface converters, communication devices, additional cabinets, current transformers extensive wiring and do not provide IoT capabilities.
- EGS is a “one box solution” for LV transformer stations, cable distribution cabinets and building connection boxes
- Grid sensors are the foundation of distribution grid digitalization solutions

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Enhanced Grid Sensor (EGS)
Functionality and features

Measurement values

- Measures 3 voltages and 3 currents in real time (50Hz fundamental and r.m.s.)
- Frequency measurement
- Calculates P, Q, cos phi
- Adjustable averaging time for measurement values
- Integrated memory supports replacement of trailing pointer devices

Communication

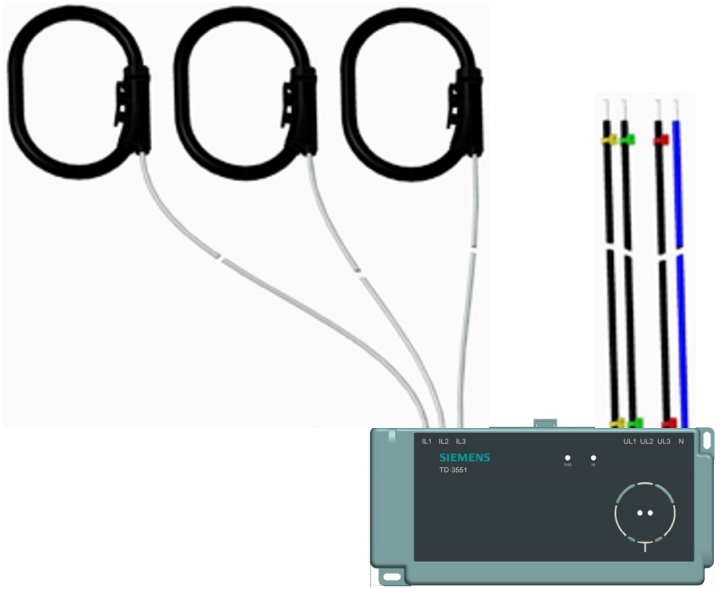
- Two ethernet interfaces (MQTT/OPC-UA, 60870-5-104, 61850, HTTPS)
- Integrated GPRS / LTE Cat M1 communication
- Integrated security functions
- Support for A8000 Containers/Apps (e. g. tap changer control)

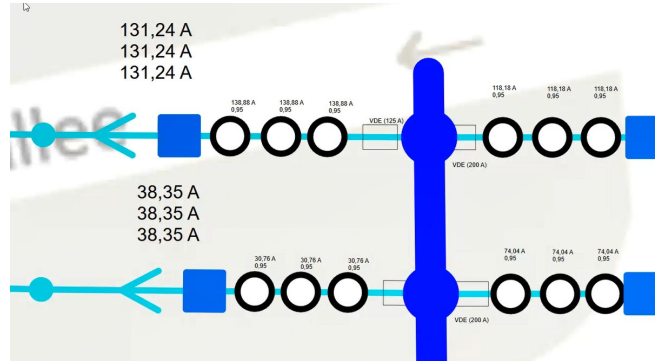
Mechanics

- Current measurements performed with Rogowski Coils
- Ruggedized design (IP54) for direct installation in cable distribution cabinets, building connection boxes and LV-transformer stations

Planned further developments

- Low cost 3-phase current sensor (measurement of additional feeders)
- Integration of Low Power Bluetooth communication to connect temperature Sensors





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Enhanced Grid Sensor (EGS)
Use Cases

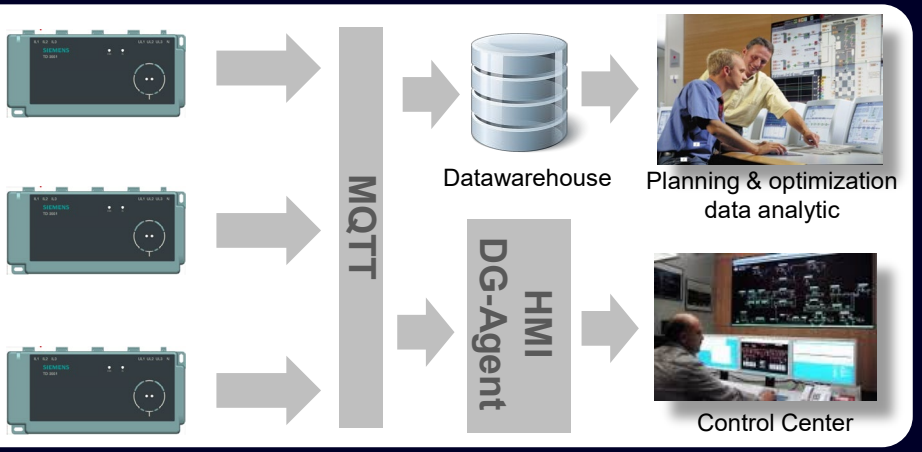
EGS as replacement for analogue trailing pointer (= Data logger)

Backend-IT

- Monitoring of grid asset utilization and operational limits
- Data base for trend forecast
- Generation of load profiles for typical customer

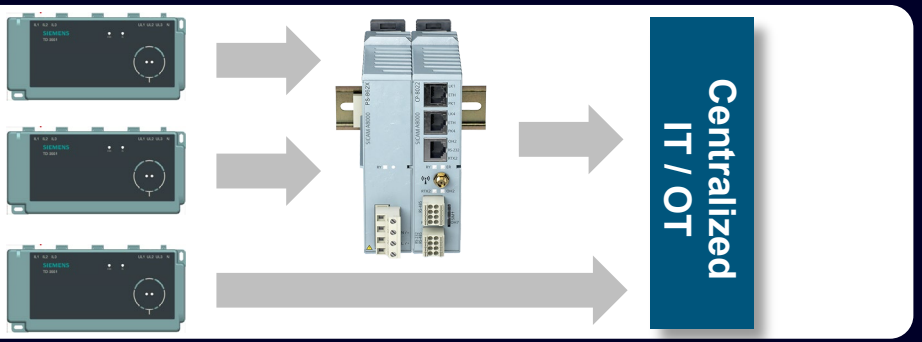
Operational IT

- Detection of critical grid states and failures (in case of active grid management).



Support for SICAM A8000 grid management applications:

- Grid watch dog
- Micro grid control
- Tap changer control
- Coordinated e-car charging



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