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GRID RELIABILITY

REDUCE OUTAGES AND COSTS WITH PREDICTIVE APPLICATIONS

Patrick Accord
Area Sales Manager

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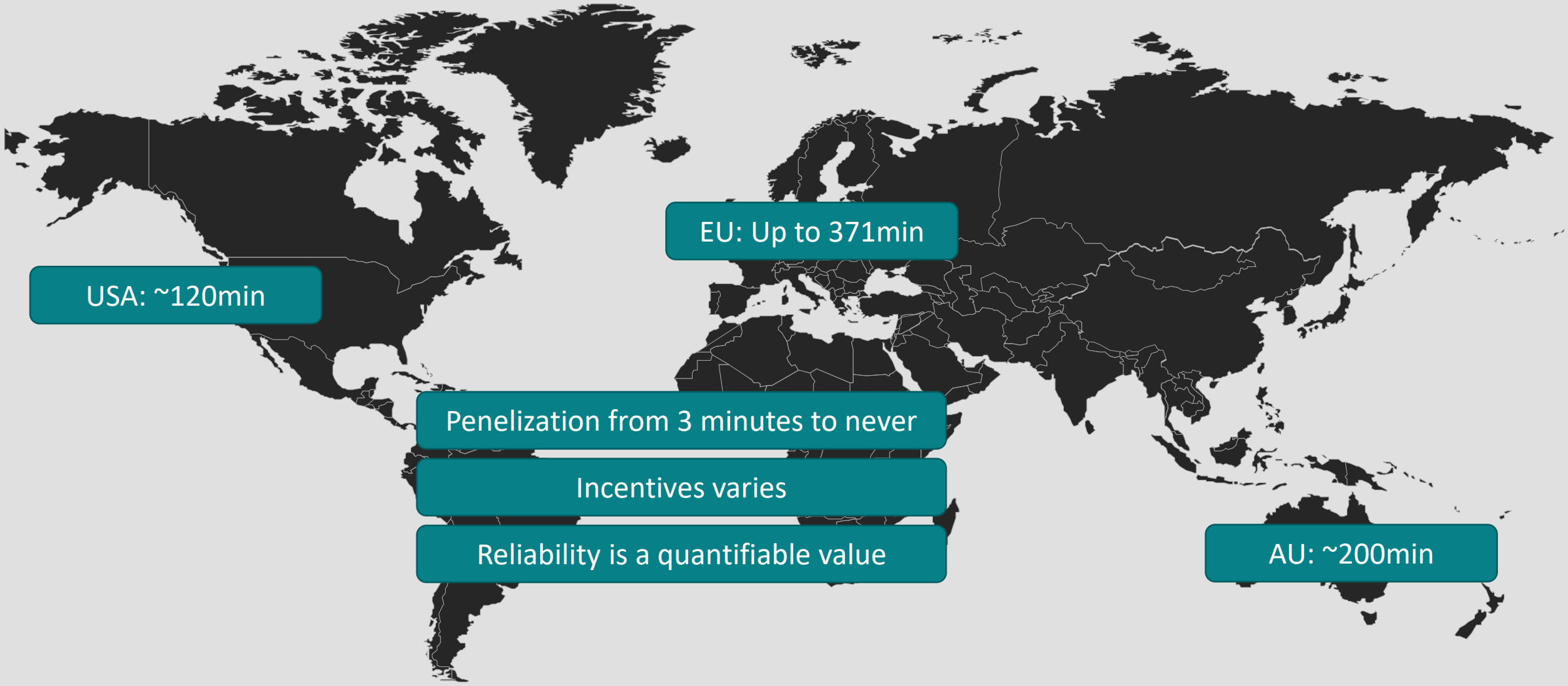
USA: ~120min
EU: Up to 371min
Penelization from 3 minutes to never
Incentives varies
Reliability is a quantifiable value
AU: ~200min

Electrical outages in Indonesia

System Average Interruption index
250 minutes/customer/year

80-90% of faults occur in distribution
ID= 6-20kV

80-90% of all faults are earth faults

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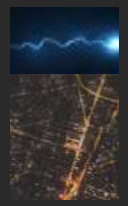
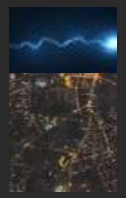
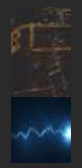


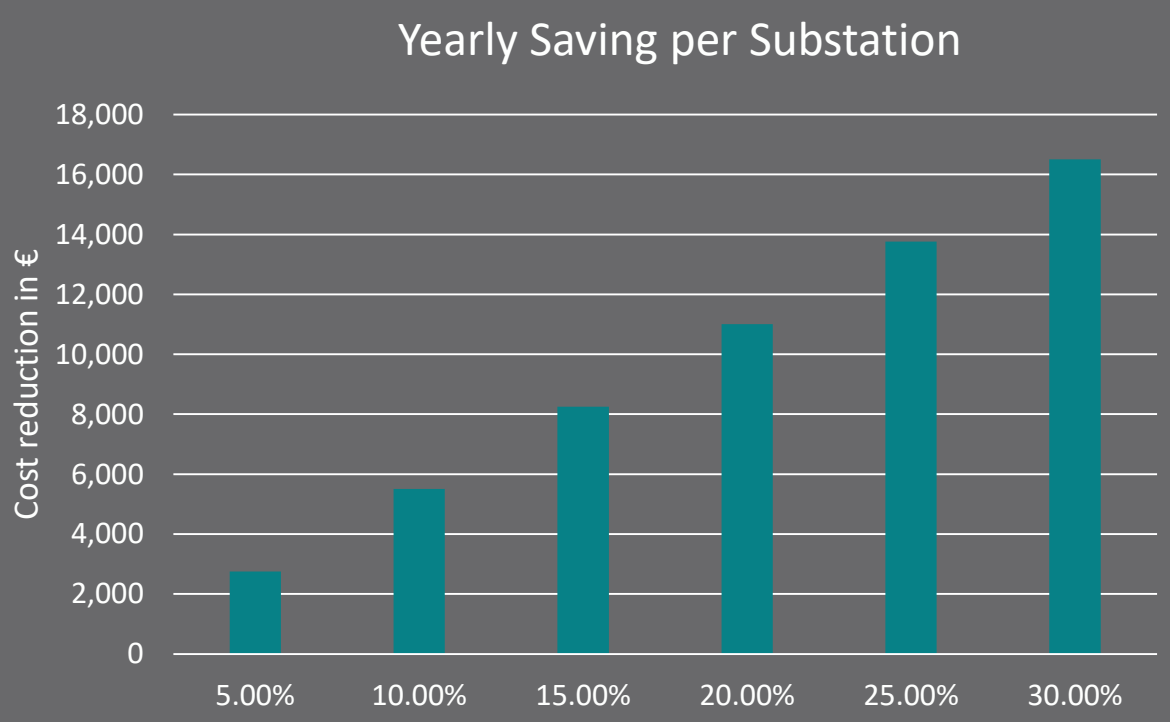




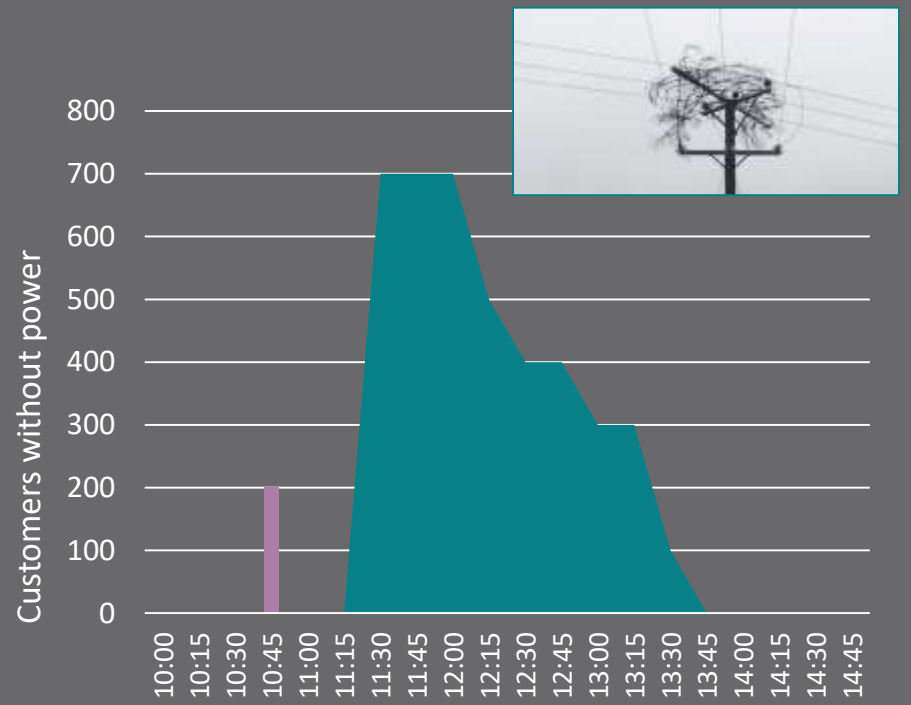
Business case Sweden

SAIDI= 150 min **Total cost for society is 93 000 000 €**

EXAMPLE WITH 150 000 ELECTRICAL CONSUMER POINTS



CUSTOMER EXAMPLE



The DNO/DSO Challenge

80-90 % OF GRID PROBLEMS OCCUR IN MV DISTRIBUTION. EARTH FAULTS ARE DOMINANT.

NO AVAILABLE INPUT FOR EARLY WARNINGS AND CONDITION BASED STATUS.

A MIX OF DIFFERENT BRANDS AND GENERATIONS OF ASSETS.

COMPLEX OR IMPOSSIBLE TO IDENTIFY ROOT CAUSE AFTER GRID FAILURE.

DIFFICULT TO TRANSFORM FROM REACTIVE/PREVENTIVE MAINTENANCE TO PREDICTIVE.

DIGITALIZATION MIGHT SEEM ”FLUFFY”

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REDUCE OUTAGES AND COSTS WITH DIGITALIZATION

IDENTIFY PROBLEMS BEFORE IT LEADS TO AN OUTAGE

RETROFIT ALL BRANDS AND GENERATION OF SUBSTATIONS

SUSTAINABILITY BY BALANCING TRADITIONAL INVESTMENTS AND SMART GRID TECHNOLOGY

AUTOMATIC POWER QUALITY ANALYSIS

AUTOMATIC IDENTIFICATION OF INCIDENTS IN THE ELECTRICAL DISTRIBUTION GRID

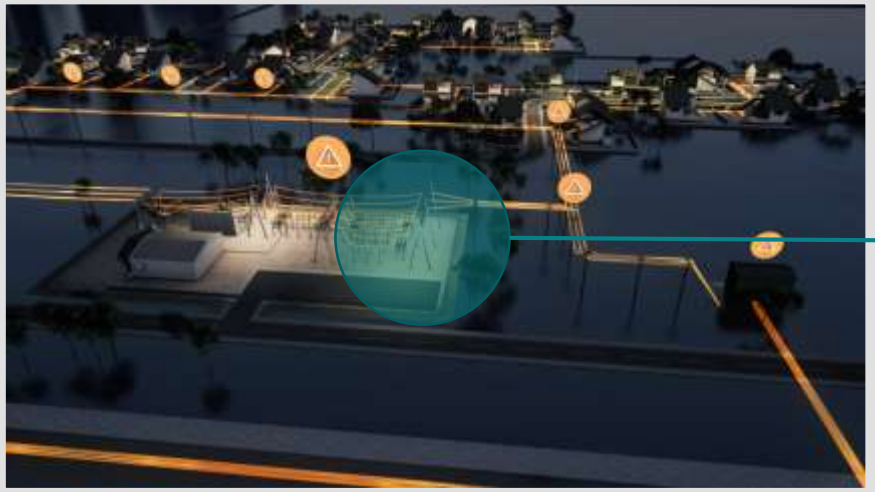
STATISTICS FOR ASSET MANAGEMENT DECISIONS

EASY ACCESS TO FULL CHAIN OF EVENTS LEADING UP TO A FAILURE

MOVING TO A PREDICTIVE METHOD

TODAY		TOMORROW
REACTIVE	PREVENTIVE	PREDICTIVE
Repair when broken ▪ High cost for material ▪ High cost for labour ▪ High risk ▪ Outage - time	Repair before broken ▪ Planned ▪ Scheduled ▪ Proactive ▪ Risk for breakdown/outage ▪ Increase cost	Don’t repair, fix root cause ▪ Predictive ▪ Trends ▪ Efficient resource allocation ▪ Avoid outage

Step 1: Condition based data



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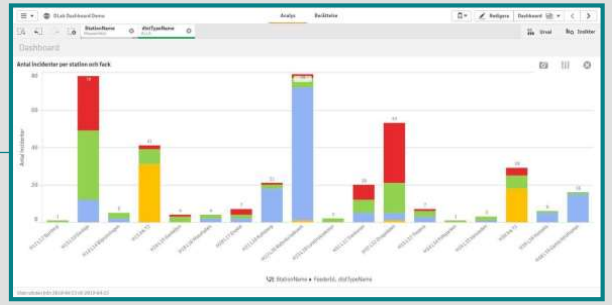
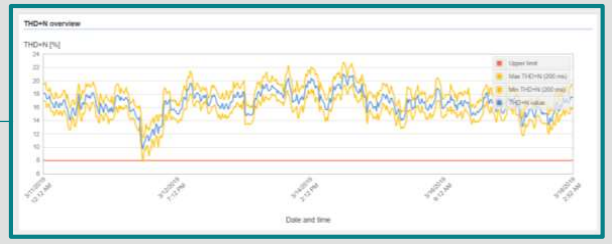
dHub



dInsights

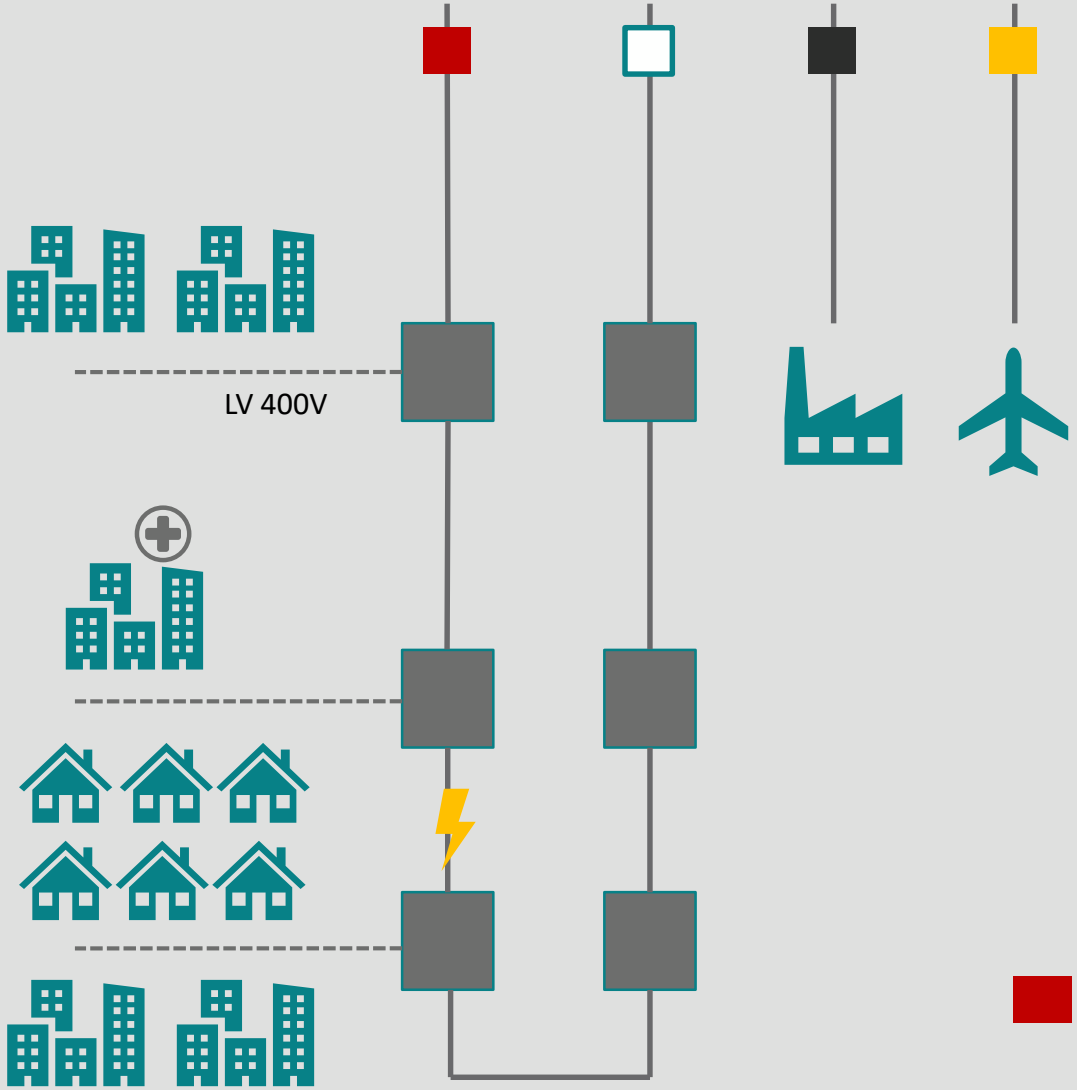
dAnalyzer



dQuality

Additional substation data

PRIMARY SUBSTATION
Distribution feeder lines (normally 10-30kV)



= OK

= Early warning, high ohmic

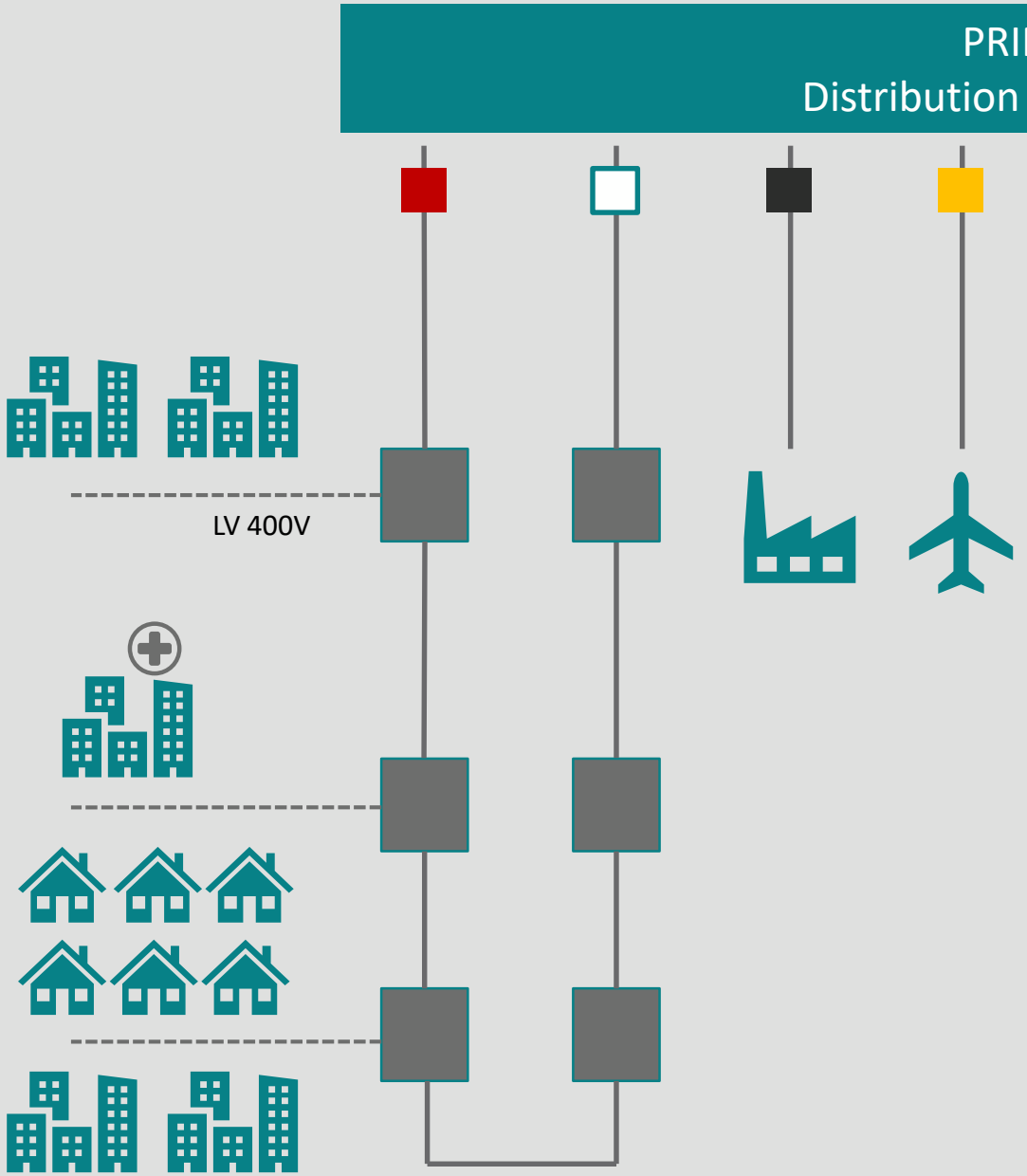
= Early warning, low

= Early warning, medium

= Power quality warning

= Trip or Trip warning high

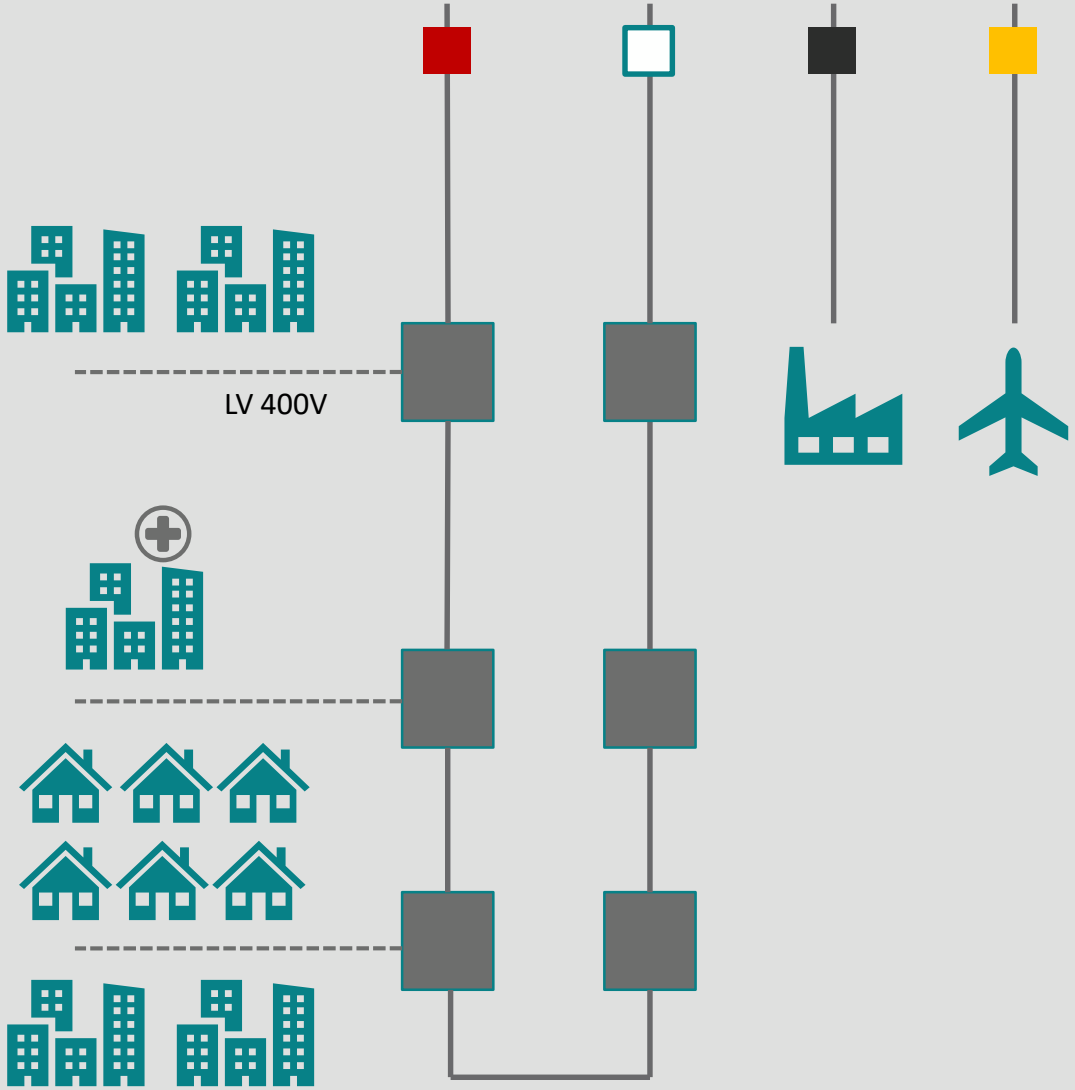
= the only visible signal to customers today, but not always and often with very limited information.

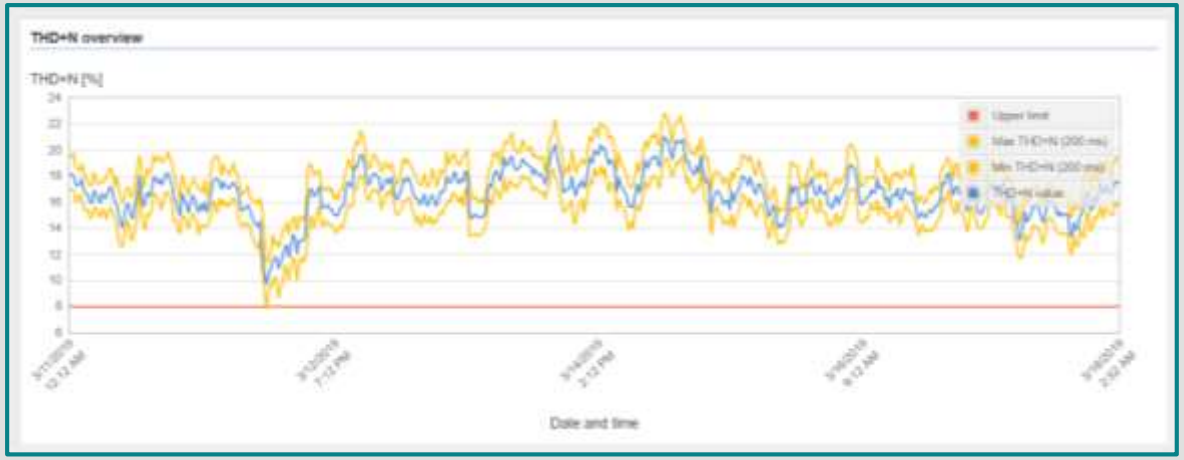


- “Real time” overview of all feeder lines
- Registers all unnormal grid events and categorizes them
- Detect incipient fault
- Reduces troubleshooting time and enables root cause analysis

PRIMARY SUBSTATION

Distribution feeder lines (normally 10-30kV)





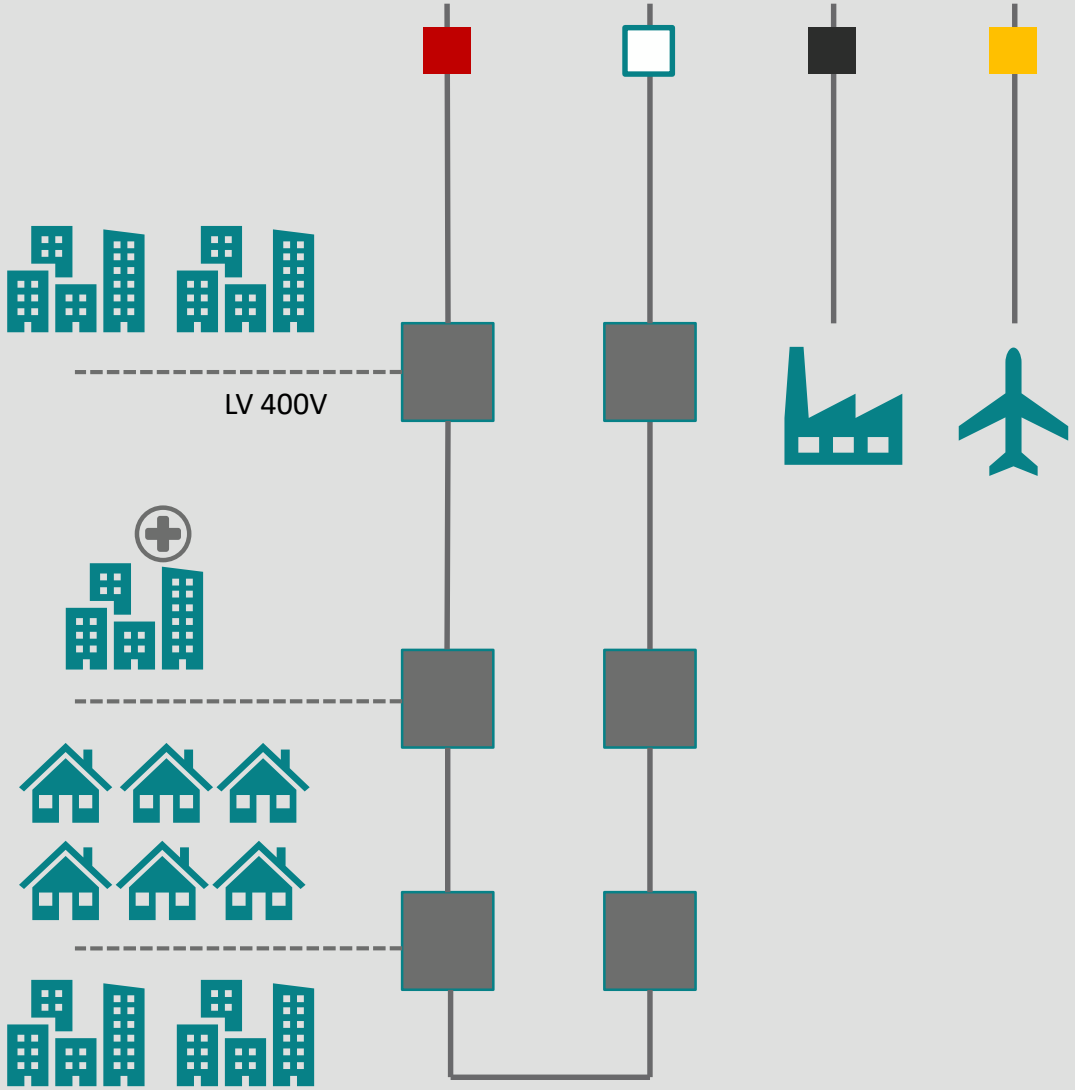
According to IEC 61000-4-30 & 61000-4-7

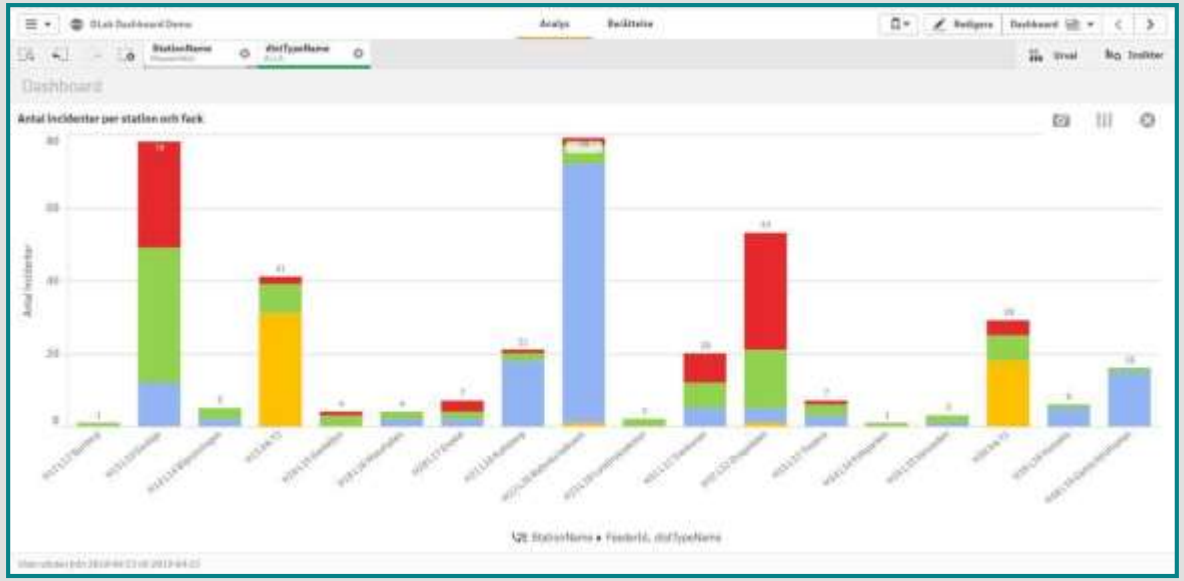
Current based PQ gives further assistance.

Automatic reporting

PRIMARY SUBSTATION

Distribution feeder lines (normally 10-30kV)





Operations , Maintenance and investment planning

Communication and transparency

Prepared for other external data

Application Summary

dAnalyzer

- Incipient faults.
- Directional earth fault.
- Non-directional earth fault.
- Neutral point voltage/ Residual voltage fault.
- Non-directional overcurrent fault.
- Intermittent earth faults.
- Number of transients at earth fault.
- High resistance earth faults.
- What line/bay is affected by the fault.

dQuality

- IEC 61000-4-30 and IEC 61000-4-7
- Voltage level.
- Frequency stability.
- Dips.
- Harmonics analysis.
- Voltage asymmetry.
- Power Measurement.
- Current levels (additional)

dInsights

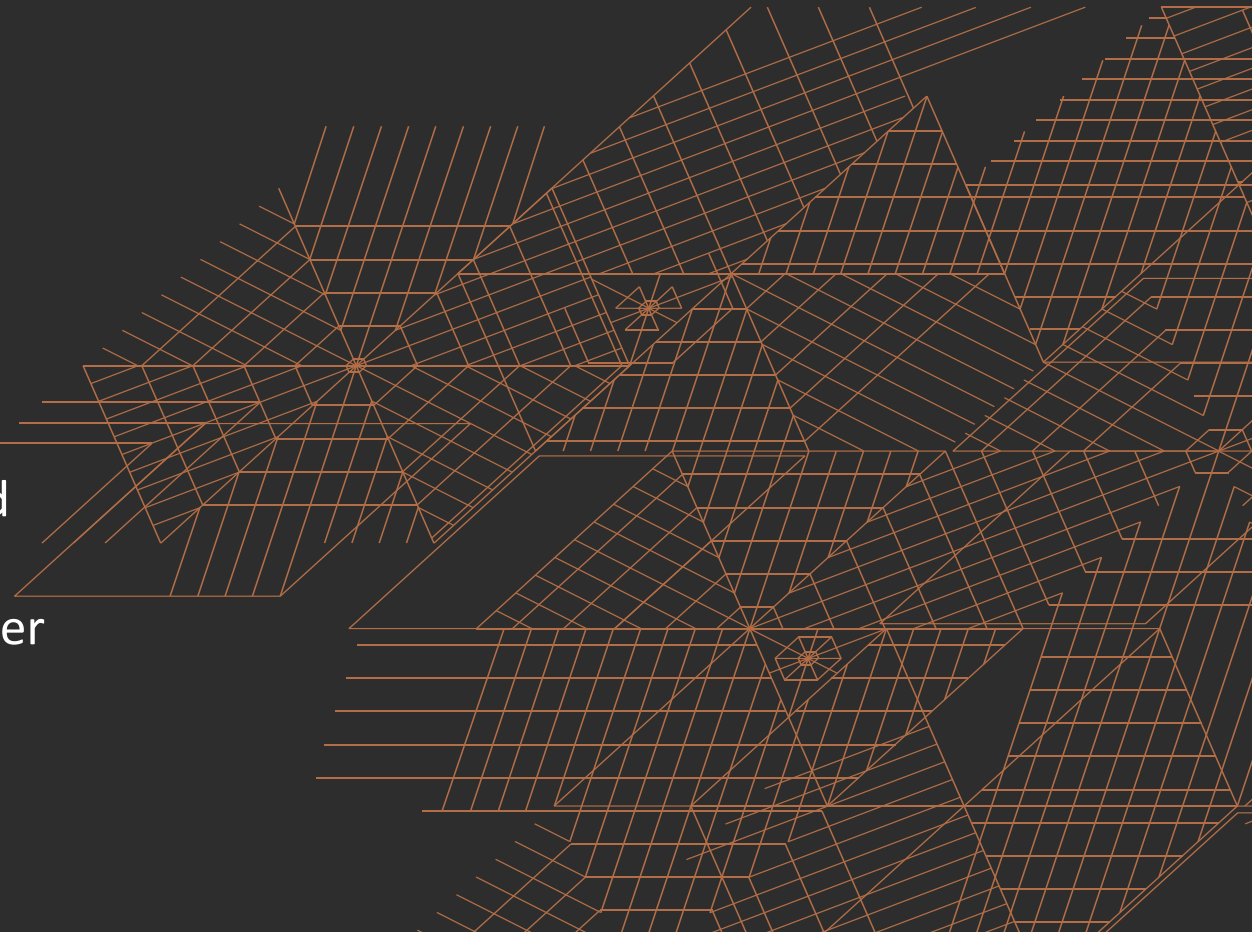
- STATISTICS AND KPIs
- PLANNING
- STRATEGY
- INVESTMENTS
- COMMUNICATION
- REPORTING

dHub

- Switchgear data
- Ambient data
- External Transducers
- IEC 61 850
- Cloud Service
- On Premise

SUMMARY

- Accessible overview of grid condition.
- Find incipient faults.
- Quick and high quality fault investigations.
- Power quality monitoring
- Trends of grid condition enables predictive maintenance.
- 24/7.
- Digitalize now, regardless of brand or generation.
- Supports decisions for operations, maintenance and planning.
- Enable condition based data for Switchgear and other substation components as well as ambient data.



Future concepts

Comtrade-files

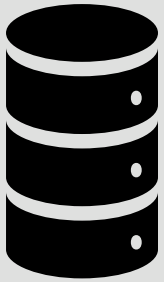
Statistics

Other sensor data
IEC 61850

Financial system

Incidents

Maintenance data



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dLaboratory covers 15 % of Swedish market

-24 %
Disturbances decreased with dAnalyzer

>19 000
Incidents analyzed

>100 000
Registrations analyzed

~100
No of accumulated operational years

kraftringen
Vimmerby energi & miljö ab
e·on
hem
ÖRESUNDS KRAFT
dalaenergi
SJÖBO ELNÄT AB
AFFÄRS VERKEN
Vaggeryds energi ab
Tekniska verken
VÄSTRA ORUSTS ENERGITJÄNST
bjäre kraft
VB ENERGI
ELLEVIO
ÖSTRA ELKRAFT KINDS
FALKENBERG ENERGI
OLOFSTRÖMS KRAFT AB

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