PI Connector for IEC 61850

Tapping into the data stored in 61850 based substations

Presented by Anne van der Molen
Alex Meeuwisse

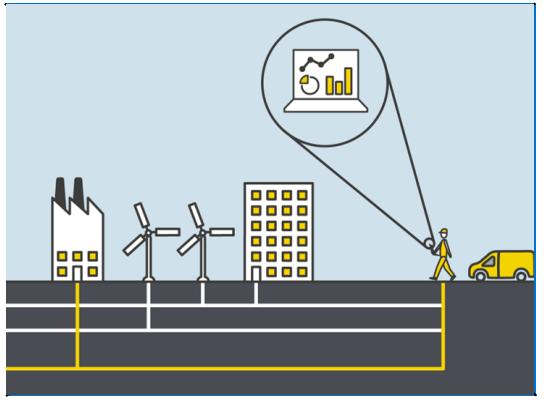
STEDIN NET VOOR DE NIEUWE ENERGIEGENERATIE

Summary

COMPANY and GOAL

In order to continue to provide its customers **reliable** and **affordable** energy transportation services, Stedin wants to improve on **asset performance management** of the assets in its **substations**.

Better visibility of asset performance data helps to **improve asset maintenance**, **reduce outages** and **increase technical lifespan**



CHALLENGE

Poor availability of in-service performance data of individual assets outside the primary substation.

- Although substations are equipped with sensors, data is not/poorly used outside the substation
- Maintenance cycle relies on manual inspection records, SCADA- and outage data.
- Control room relies on SCADA, wants to get better and faster access to in service performance data of critical assets, allowing them to take preventative actions when needed and reduce outage frequency (SAIFI).

SOLUTION

Substation equipment connected to a PI System. Initially SCADA and in second stage directly from substation using the PI Connector for IEC 61850.

- "The PI Connector for IEC 61850 allows us drill deep into the substation. We can check 'under the hood' and can monitor things we could not do before, like line distance protection round trip times or circuit breaker switching performance. In real-time if we want to."

RESULTS

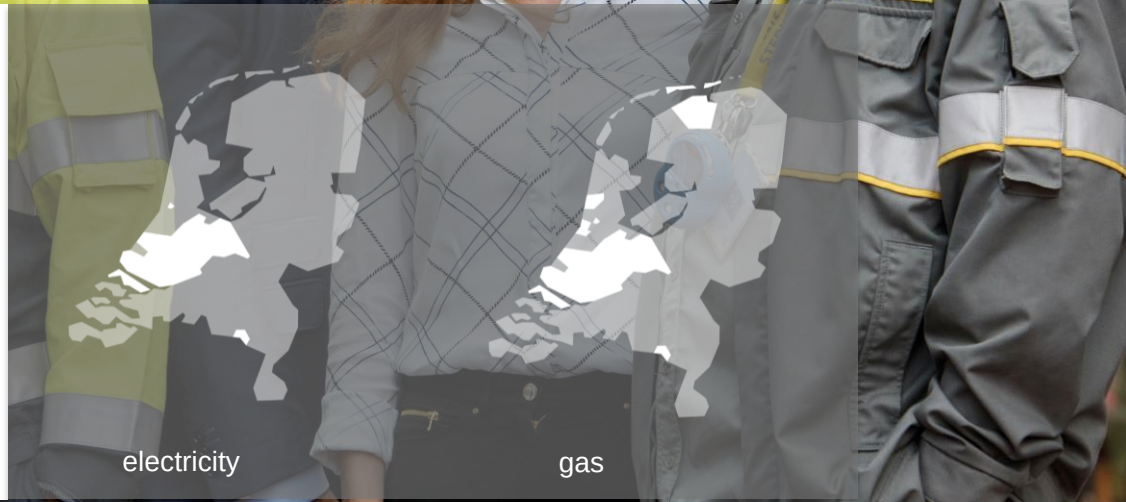
Better visibility of asset condition data brings us a step further in (real-time) asset performance management

- SAIFI reduction and maintenance optimization a multi-million Euro business case for Stedin.

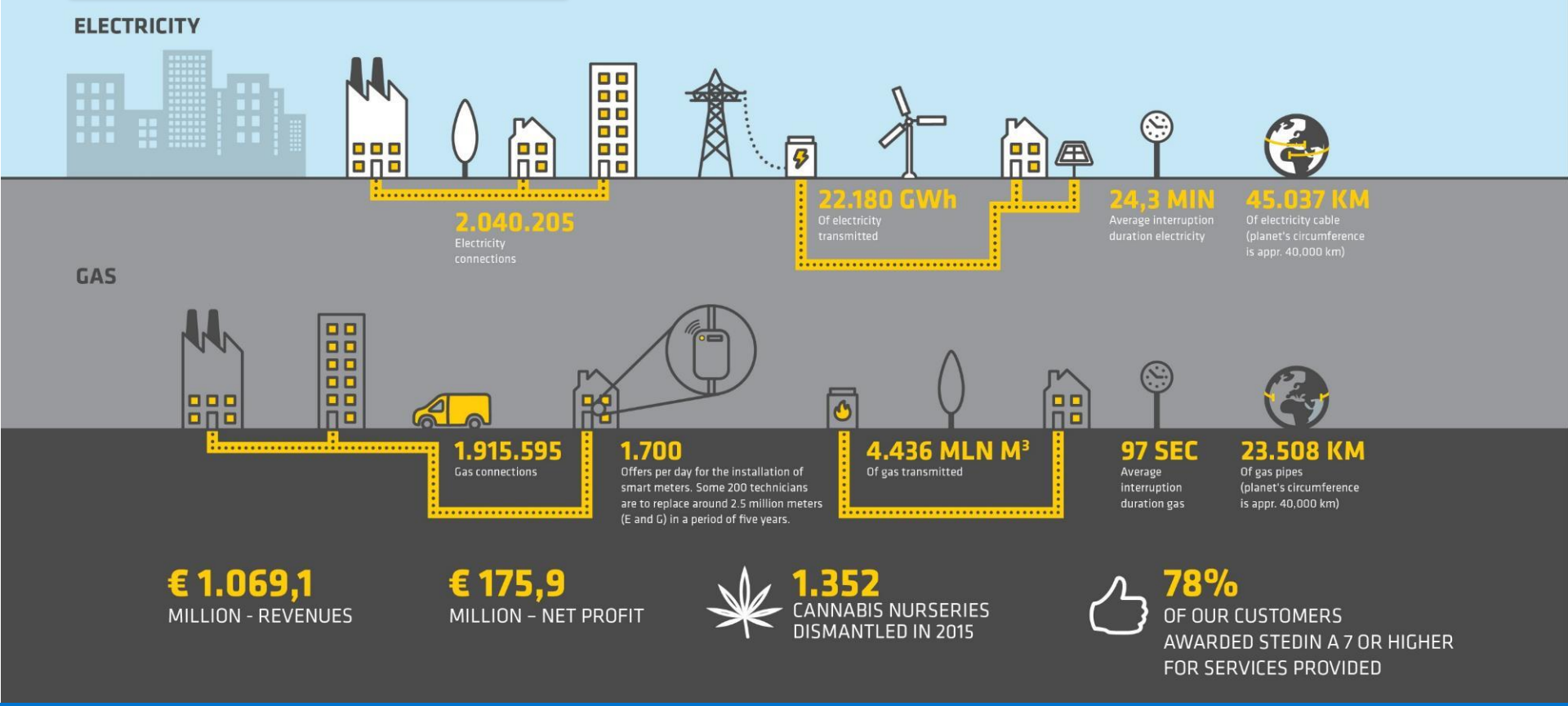
Agenda

- About Stedin
- Substation condition assessment
- Stedin and 61850
- PI Connector for 61850
  - Approach
  - How the PI system was applied
  - Implementation details
- Results obtained and business impact
- Conclusion

STEDIN: A DUTCH DSO



KEY FIGURES



€ 1.069,1
MILLION - REVENUES

€ 175,9
MILLION – NET PROFIT

1.352
CANNABIS NURSERIES DISMANTLED IN 2015

78%
OF OUR CUSTOMERS AWARDED STEDIN A 7 OR HIGHER FOR SERVICES PROVIDED

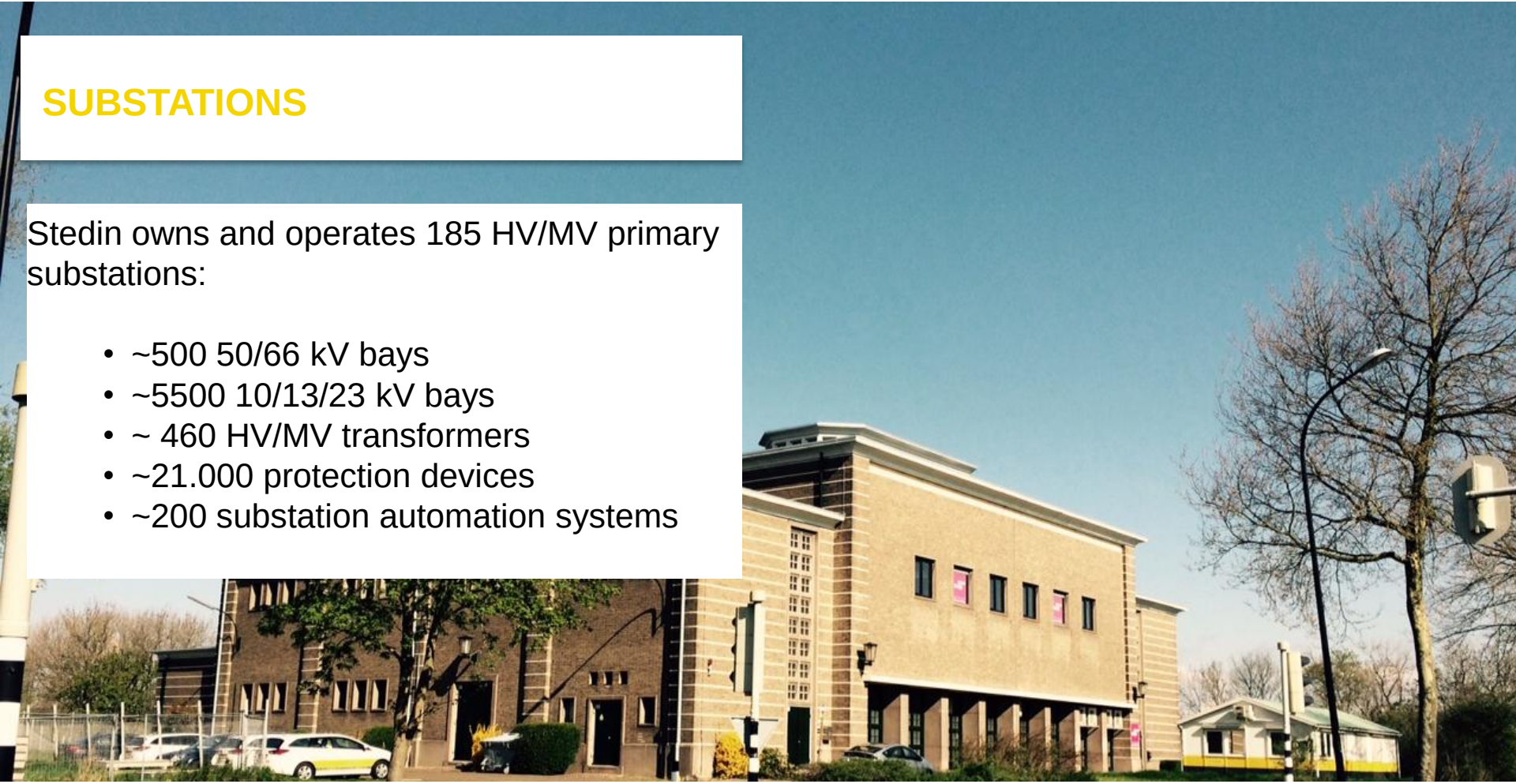
SUSTAINABLE ENERGY FOR EVERYONE

TOWARDS SMART GRID OPERATIONS

SUBSTATIONS

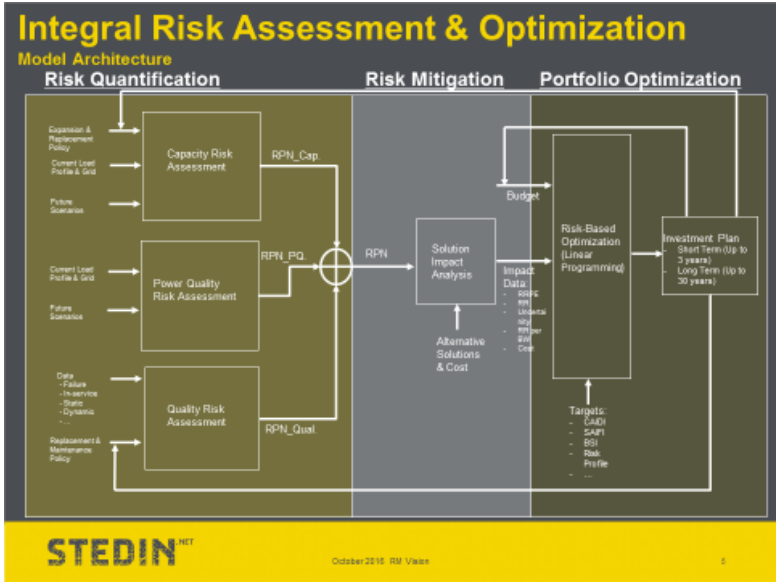
Stedin owns and operates 185 HV/MV primary substations:

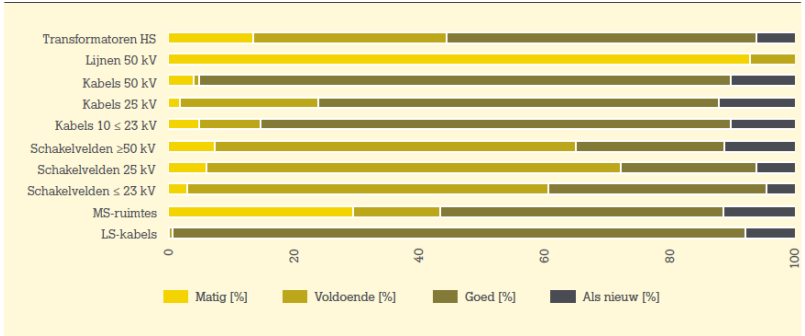
- ~500 50/66 kV bays
- ~5500 10/13/23 kV bays
- ~ 460 HV/MV transformers
- ~21.000 protection devices
- ~200 substation automation systems



SUBSTATION ASSET PERFORMANCE MANAGEMENT
RISK BASED ASSET MANAGEMENT

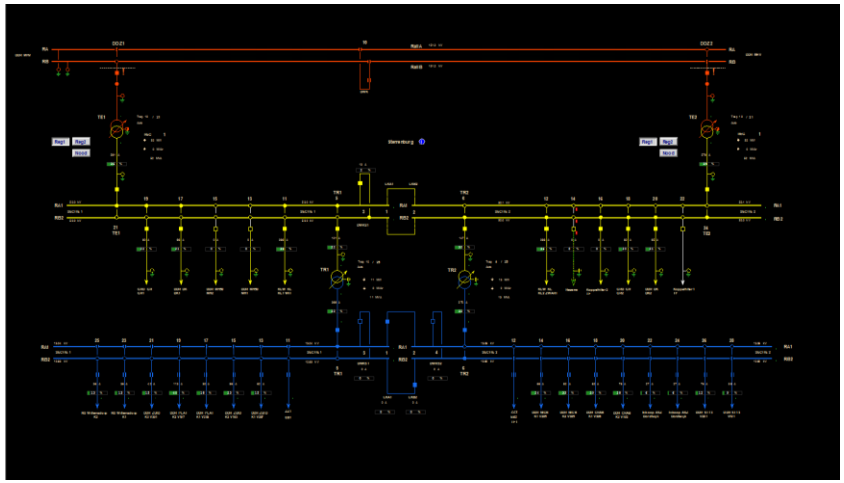
- Maintenance-, overhaul- and replacement policies are risk based.
- risk determined from a.o. equipment age, overhaul dates, manufacturer data, in-service performance, maintenance- and inspection data.
- Data collected from asset register, maintenance management and SCADA systems.

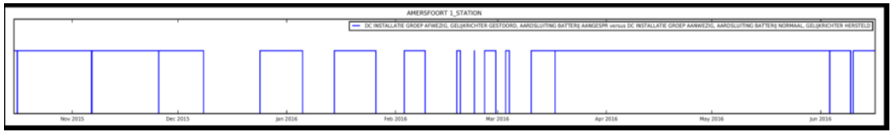




SUBSTATION ASSET PERFORMANCE MANAGEMENT
TAPPING INTO SCADA DATA

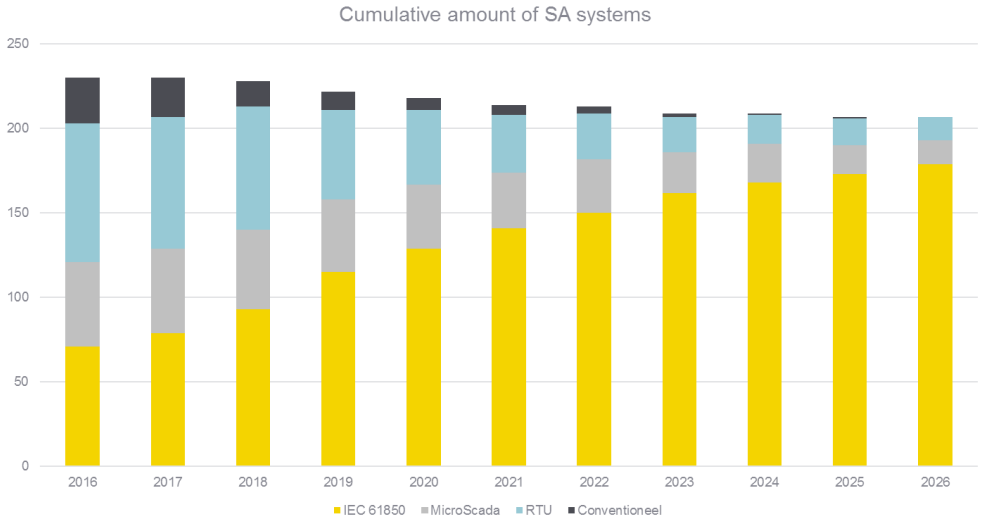
- Control room uses SCADA to monitor actual in-service performance of the grids.
- PI System introduced to improve control room visibility of (trends in) in-service performance of assets, including the non-service affecting ones
- Results depend on the quality and availability of SCADA data.
- The 61850 interface was brought up as alternative.





STEDIN AND 61850

- Stedin adopted 61850 in 2007 as its 3rd generation substation automation architecture.
- Ambition to have >90% of primary substations on IEC61850 in 2030.
- Stedin is a [strong] international supporter of IEC61850 standard.

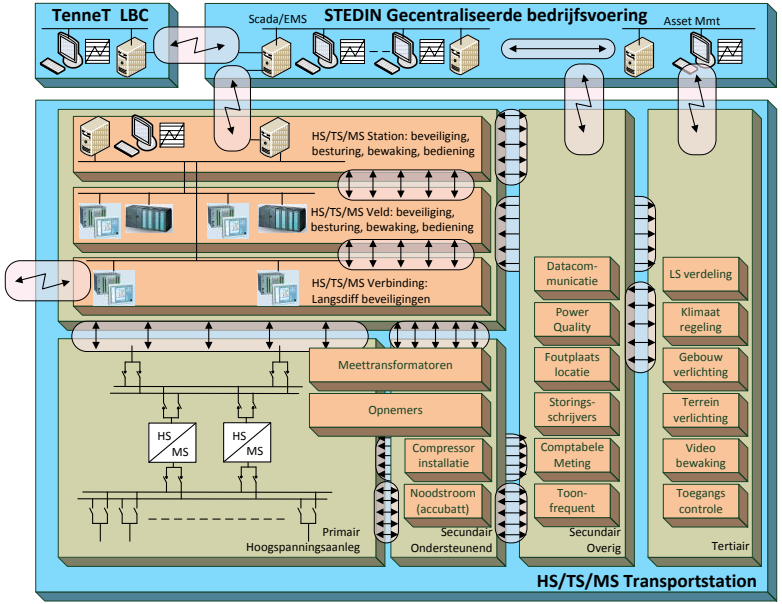


SUBSTATION ASSET PERFORMANCE MANAGEMENT
TAPPING INTO SUBSTATION DATA

- The IED's in an IEC61850 system offer a wealth of measurements and events.

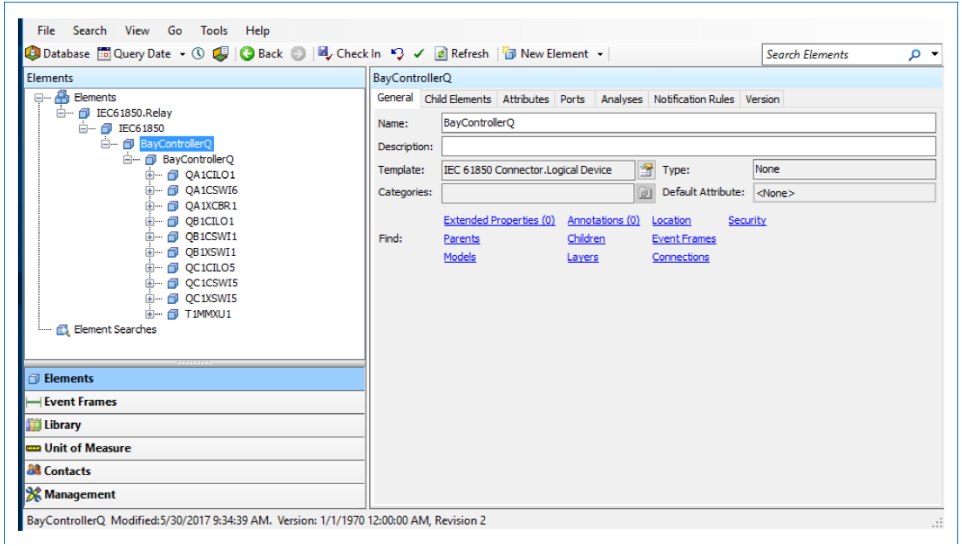
- Better access to that unused value:
  - Improve (real-time) condition assessment.
  - Enable 'remote inspections'.
  - Increase operational context for the control room.

- Remotely add, change and remove measurements whenever needed.

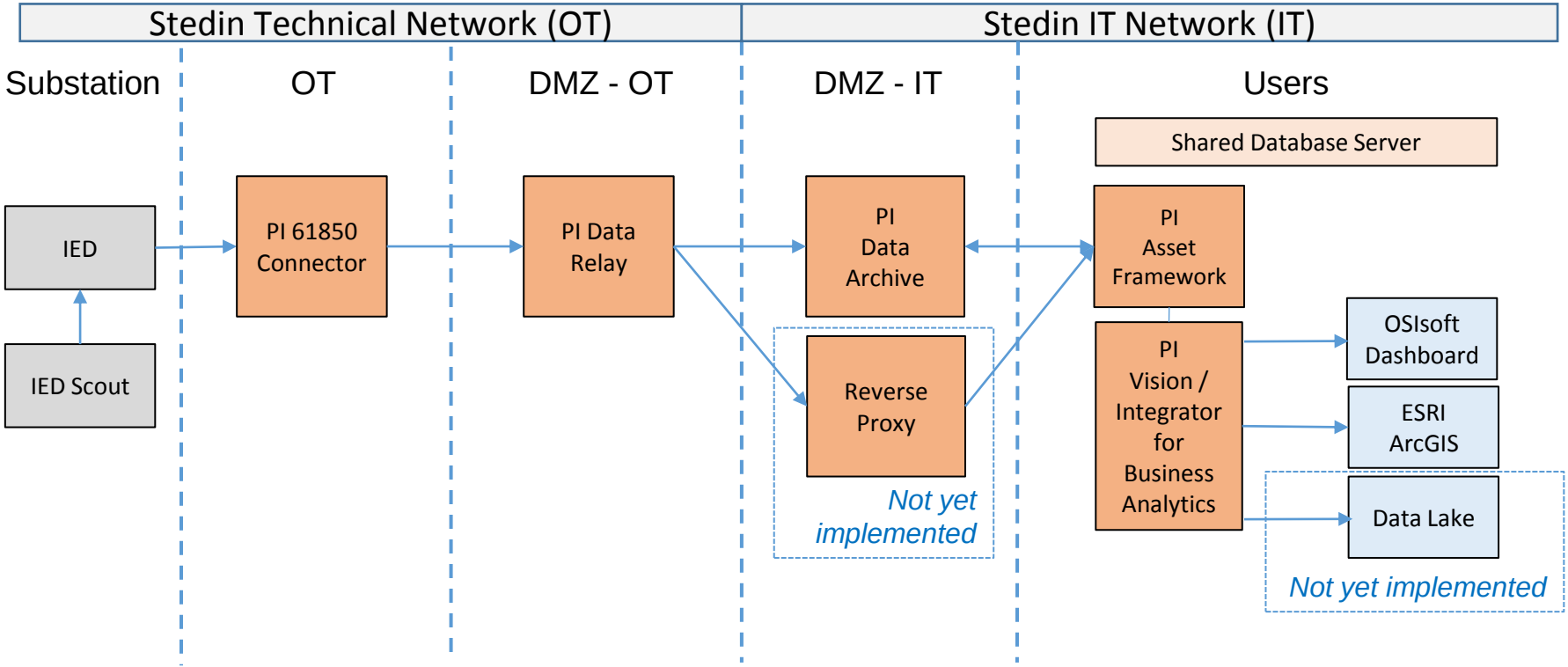


PI CONNECTOR FOR IEC 61850
GOALS

- The PI Connector for IEC 61850 was developed
  - Co-development between OSISoft and Stedin,
  - Co-development between Stedin IT, -control room and -asset management.
  - Joint R&D team, using OSISoft R&D labs and Stedin field test facilties.
- Features:
  - Collect asset information as well as real-time measurements from the station bus and store it in the PI System.
  - Allow flexible adding/removal of IEDs and reports



PI CONNECTOR FOR IEC 61850
IMPLEMENTATION



PI Connector for IEC 61850

Overview | Data Source List | Server List | Diagnostics

Overview

Connector details

Version 1.0.1.13

Status of the connector

Connector running as UMKSRV01T\OSIsoft

Connector is running - Stop connector

Data sources

- 50 kV 109 veldmodule Ready
- 10 kV 109 veldmodule (Beta license expires on Wednesday, dec 06, 2017)
- TR5 trafodiff Ready
- TR5 spanningregeling (Beta license expires on Wednesday, dec 06, 2017)
- 10 kV 404 veldmodule (Beta license expires on Wednesday, dec 06, 2017)
- 10 kV 405 veldmodule (Beta license expires on Wednesday, dec 06, 2017)

Add or modify data sources

Servers configured to receive data from the connector

- PI Relay server : PI Relay

Add or modify servers

PI Connector Relay

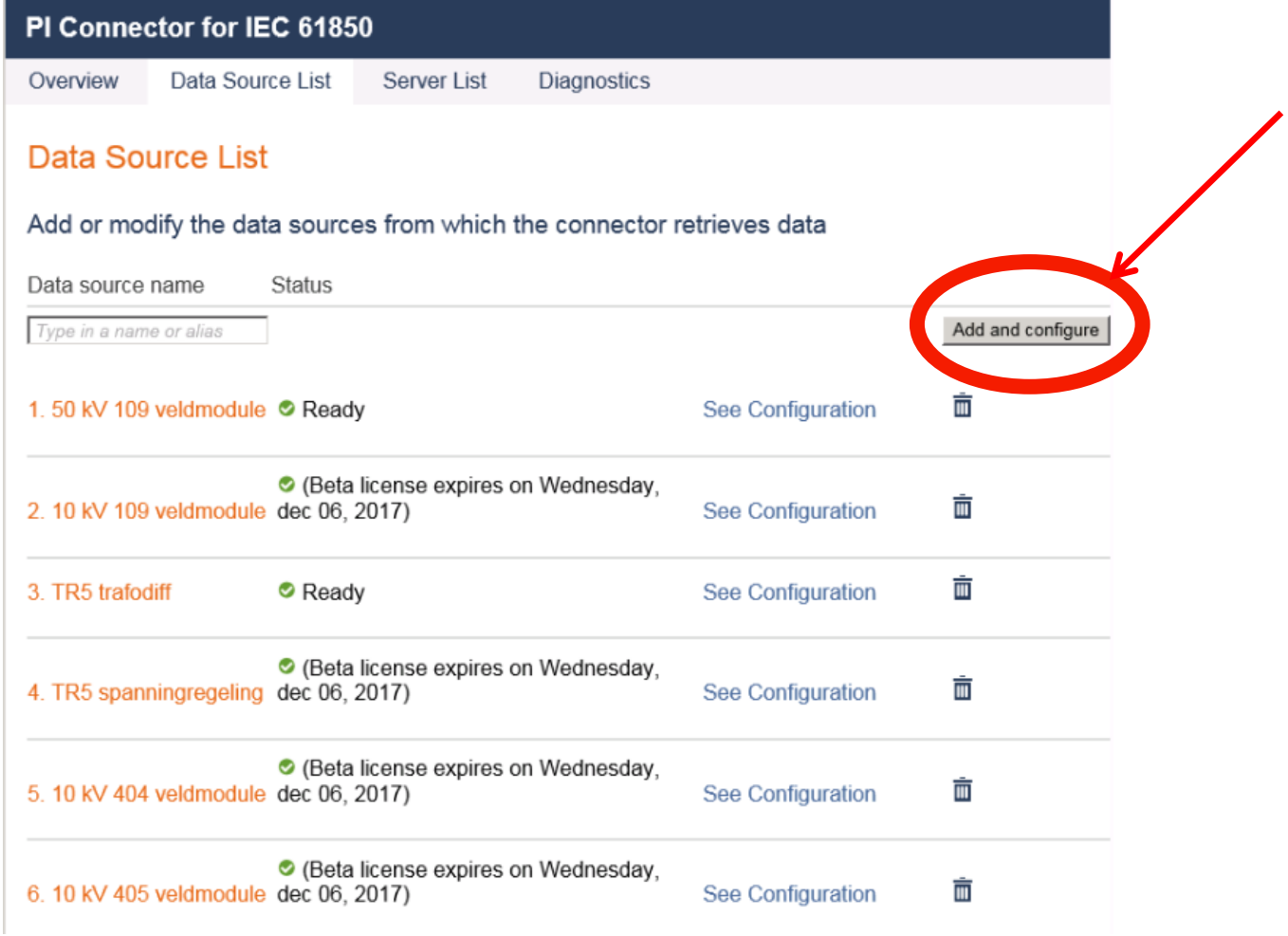
Overview | Connector List | Server List | Diagnostics

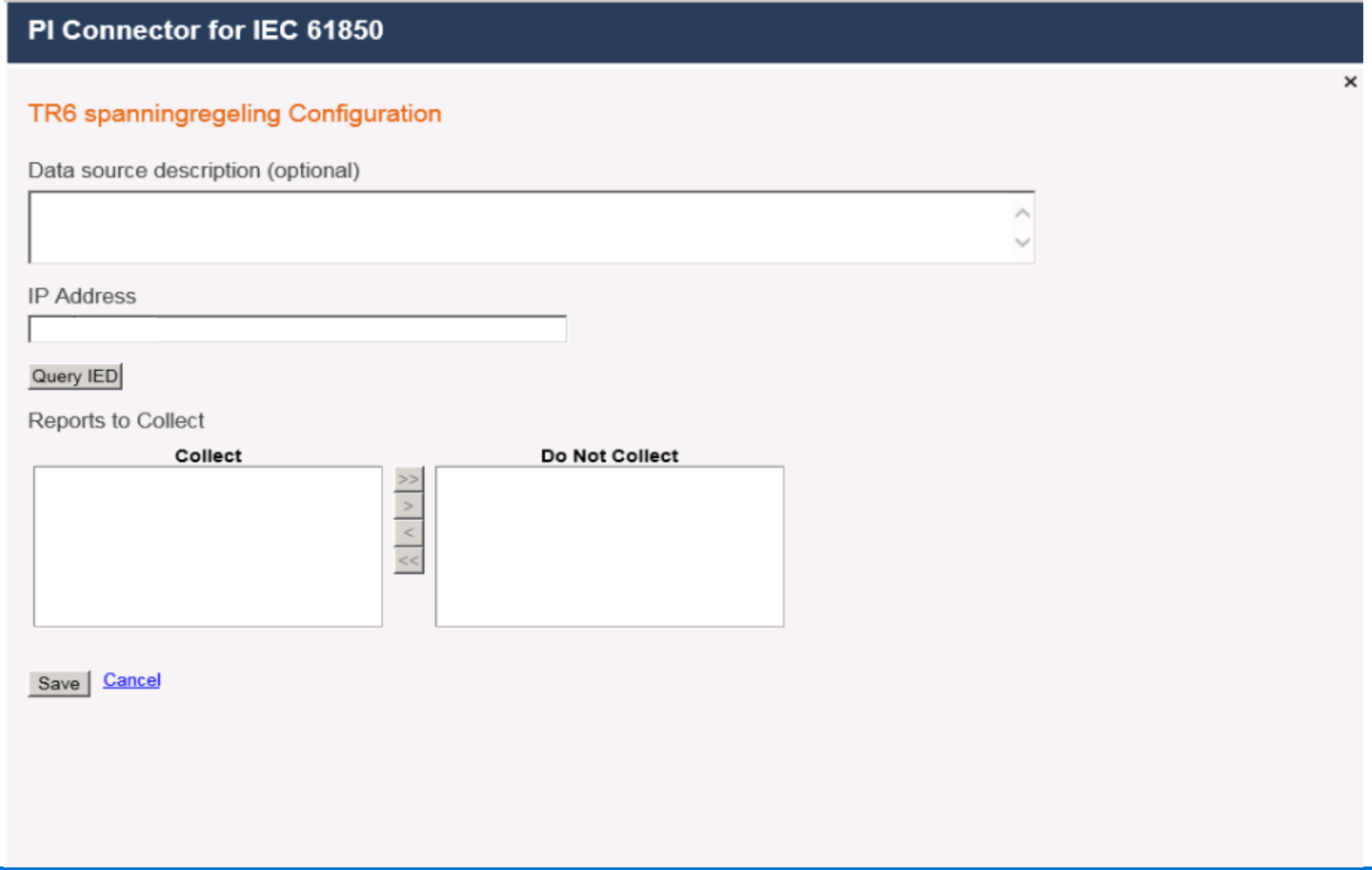
+ Add a Connector

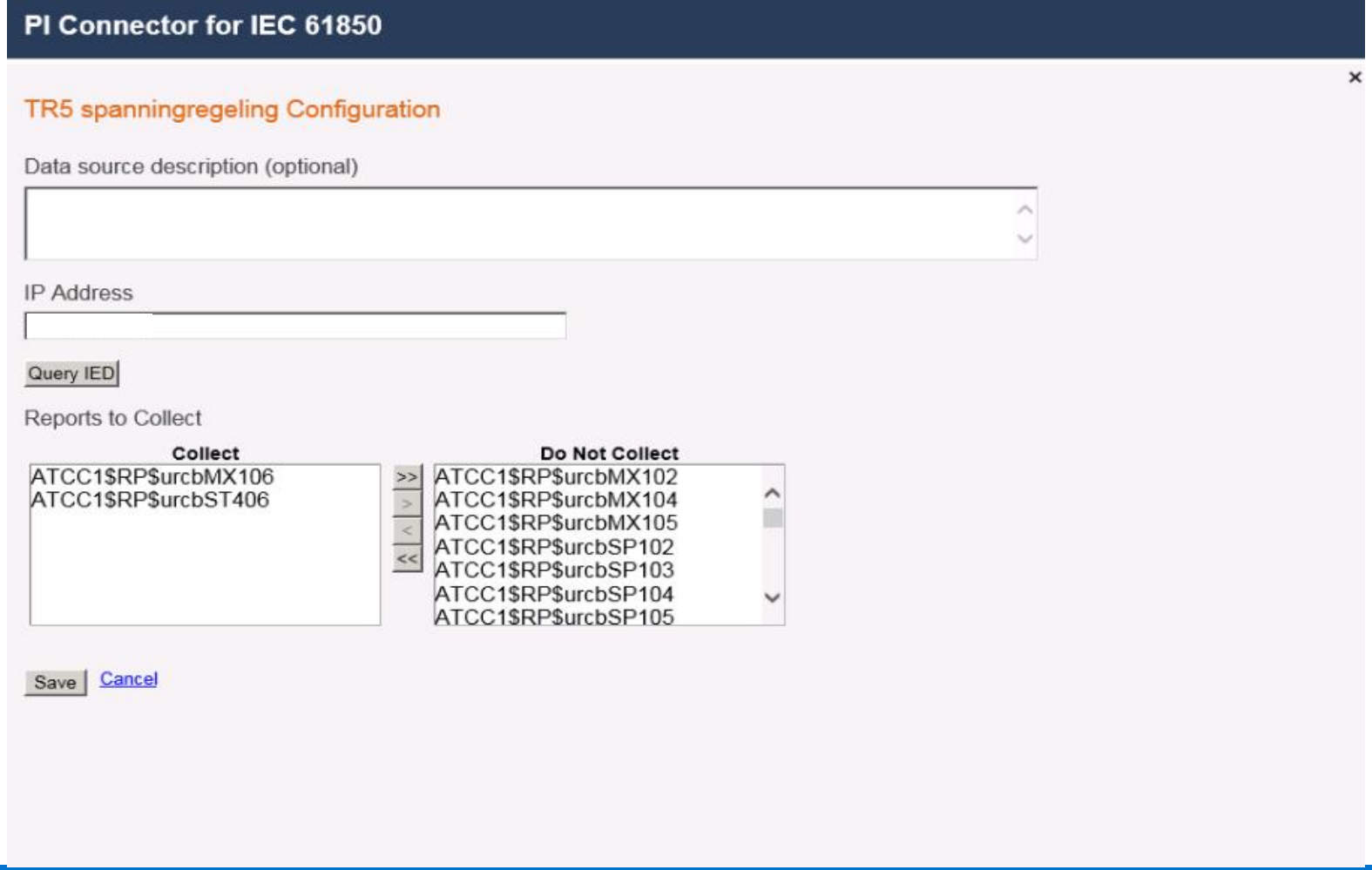
filter Showing 2 of 2. 0 1 1 0

Connector Name	Status	Connector Type	Hostname
WRDSRV2T		IEC 61850	WRDSRV2T
UMKSRV01T		IEC 61850	UMKSRV01T
50 kV 109 veldmodule		Ready	
10 kV 109 veldmodule		(Beta license expires on Wednesday, dec 06, 2017)	
TR5 trafodiff		Ready	
TR5 spanningregeling		(Beta license expires on Wednesday, dec 06, 2017)	
10 kV 404 veldmodule		(Beta license expires on Wednesday, dec 06, 2017)	
10 kV 405 veldmodule		(Beta license expires on Wednesday, dec 06, 2017)	

Connected Mon Sep 11 2017 22:50:54 GMT+0200 (W. Europe Daylight Time)

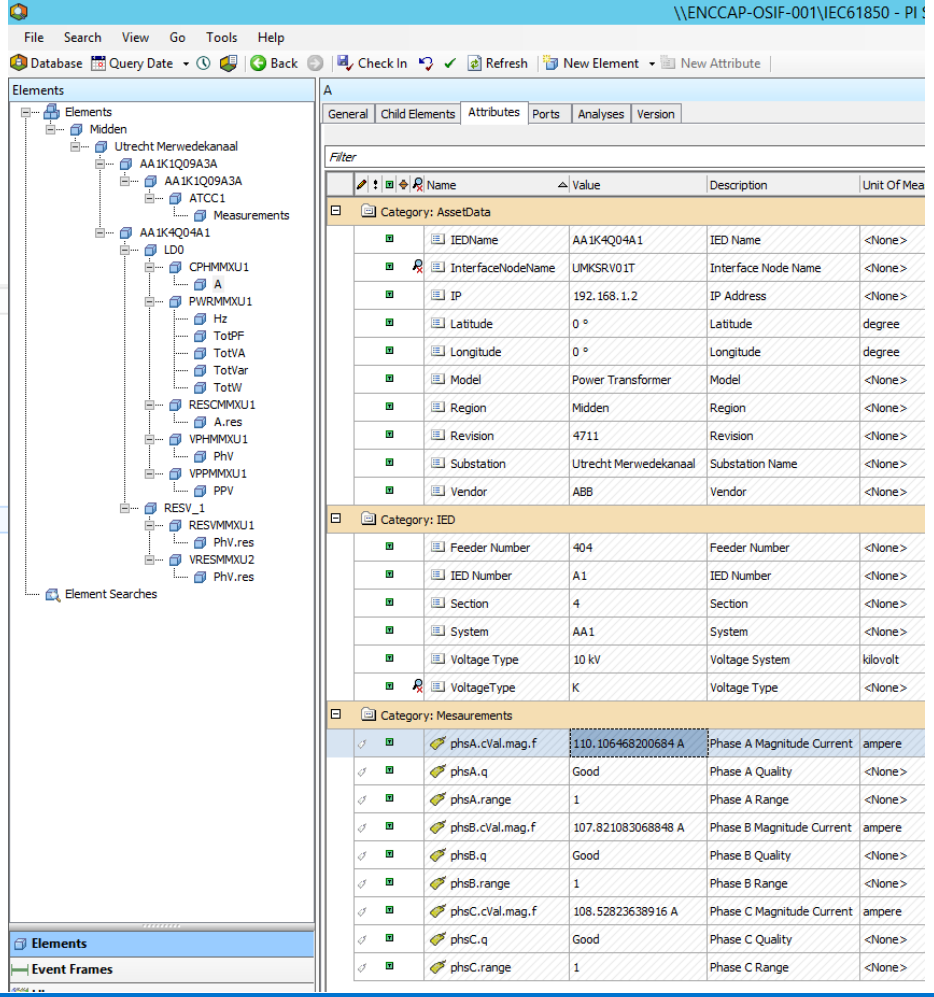






IEC61850 CONNECTOR FOR PI
SCREENSHOTS

Tag Name	Server	Collective	Timestamp	Value
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsA.cVal.mag.f	ENCCAP-OSIA-001		9/19/2017 9:37:47 AM	21.692
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsA.q	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	Good
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsA.range	ENCCAP-OSIA-001		9/19/2017 9:37:47 AM	1
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsB.cVal.mag.f	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	19.699
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsB.q	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	Good
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsB.range	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	1
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsC.cVal.mag.f	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	19.837
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsC.q	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	Good
UMKSRV01T.AA1K4Q04A1LD0.CPHMMXU1.MX.A.phsC.range	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	1
UMKSRV01T.AA1K4Q04A1LD0.PWRMMXU1.MX.Hz.mag.f	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	50
UMKSRV01T.AA1K4Q04A1LD0.PWRMMXU1.MX.Hz.q	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	Good
UMKSRV01T.AA1K4Q04A1LD0.PWRMMXU1.MX.Hz.range	ENCCAP-OSIA-001		9/19/2017 9:37:44 AM	0
UMKSRV01T.AA1K4Q04A1LD0.PWRMMXU1.MX.TotPF.mag.f	ENCCAP-OSIA-001		9/19/2017 9:37:47 AM	0.9984



Utrecht Merwedekanaal

Phase A Magnitude Voltage
6,068.7 V

Phase A Magnitude Current
9.2711 A

Phase B Magnitude Voltage
6,114.4 V

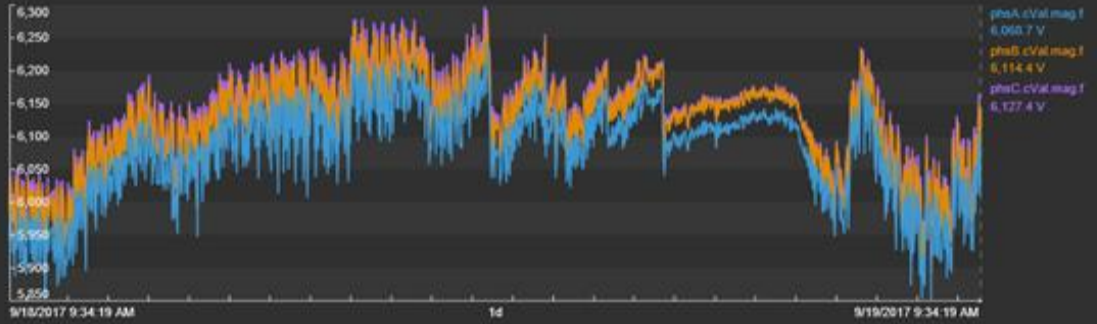
Phase B Magnitude Current
9.2702 A

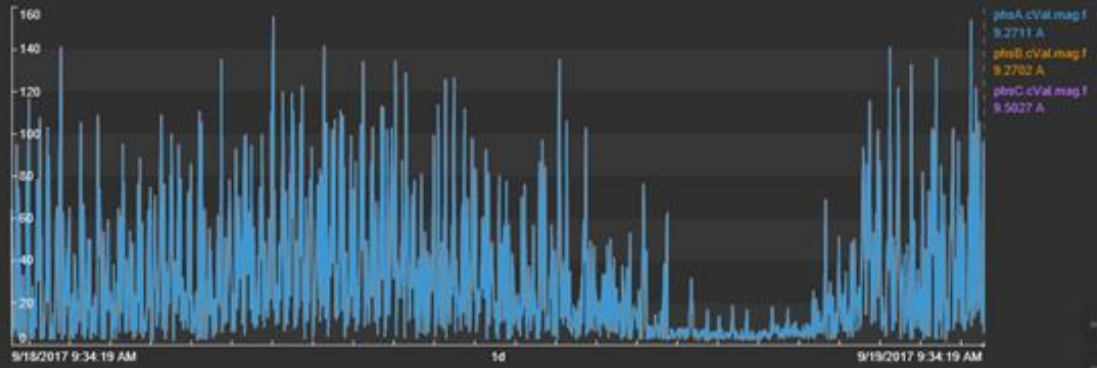
Phase C Magnitude Voltage
6,127.4 V

Phase C Magnitude Current
9.5027 A

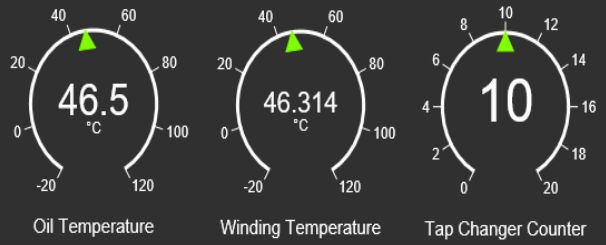
Frequency
49.995 Hz

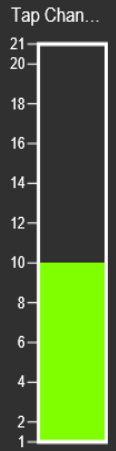
Power Factor





Utrecht Merwedekanaal





Tap Changer
10

Regulator Voltage
108.72 kV

Totaal aantal stappen
580

Verbr. levensduur wikkeling
0.63311 d

Summary

COMPANY and GOAL

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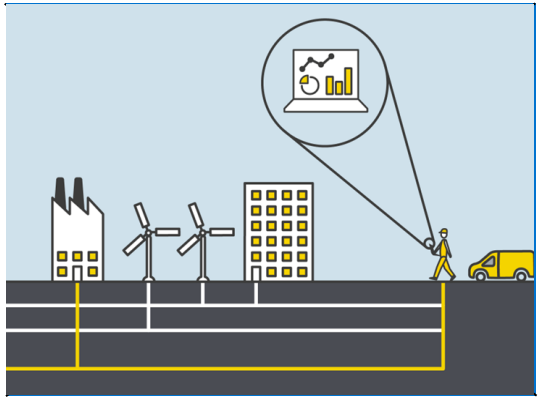

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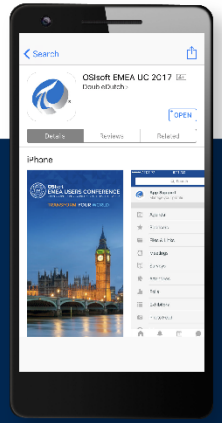
Questions

Please wait for the **microphone** before asking your questions

State your **name & company**

Please remember to…

Complete the Online Survey for this session



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Danke

谢谢

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado