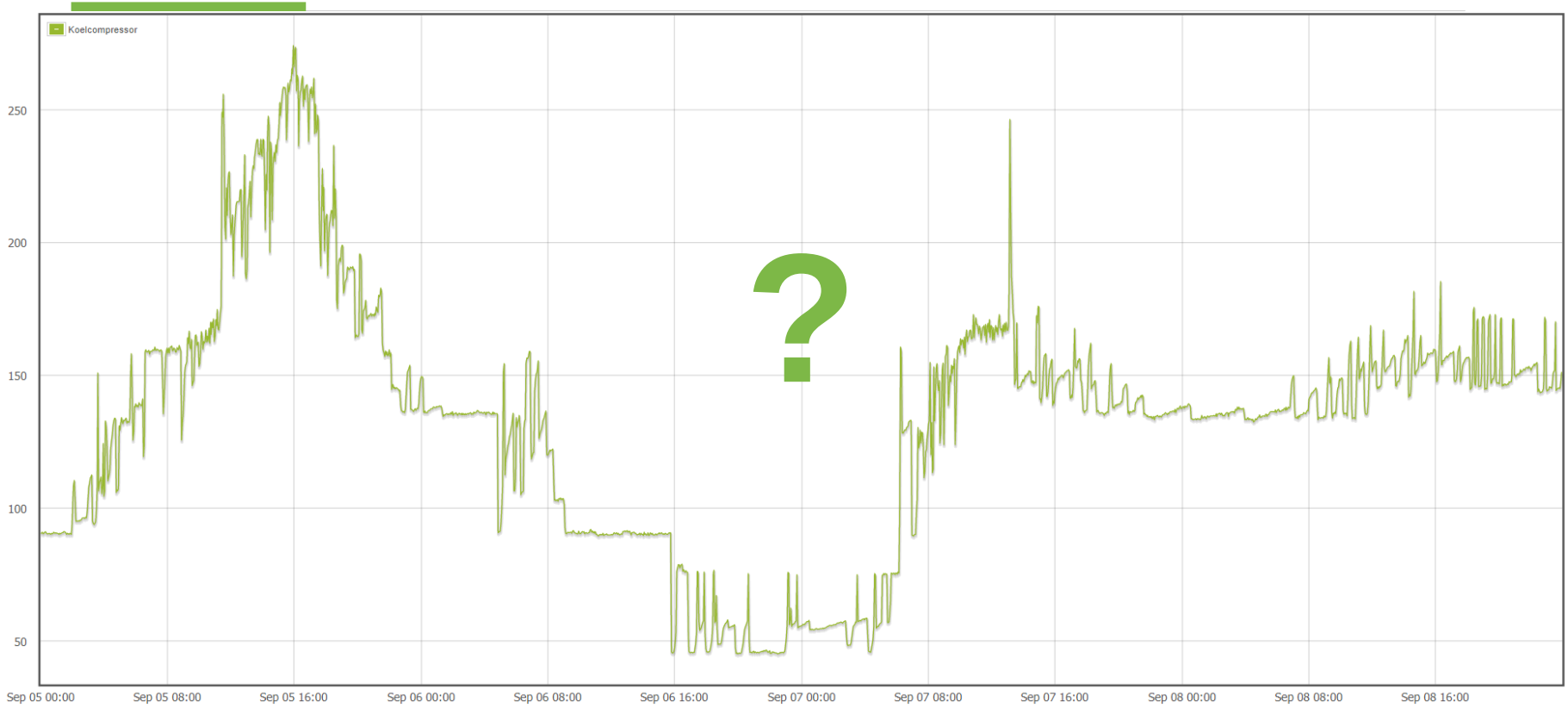
The true value of energy as the key to operational excellence

Rob Burghard

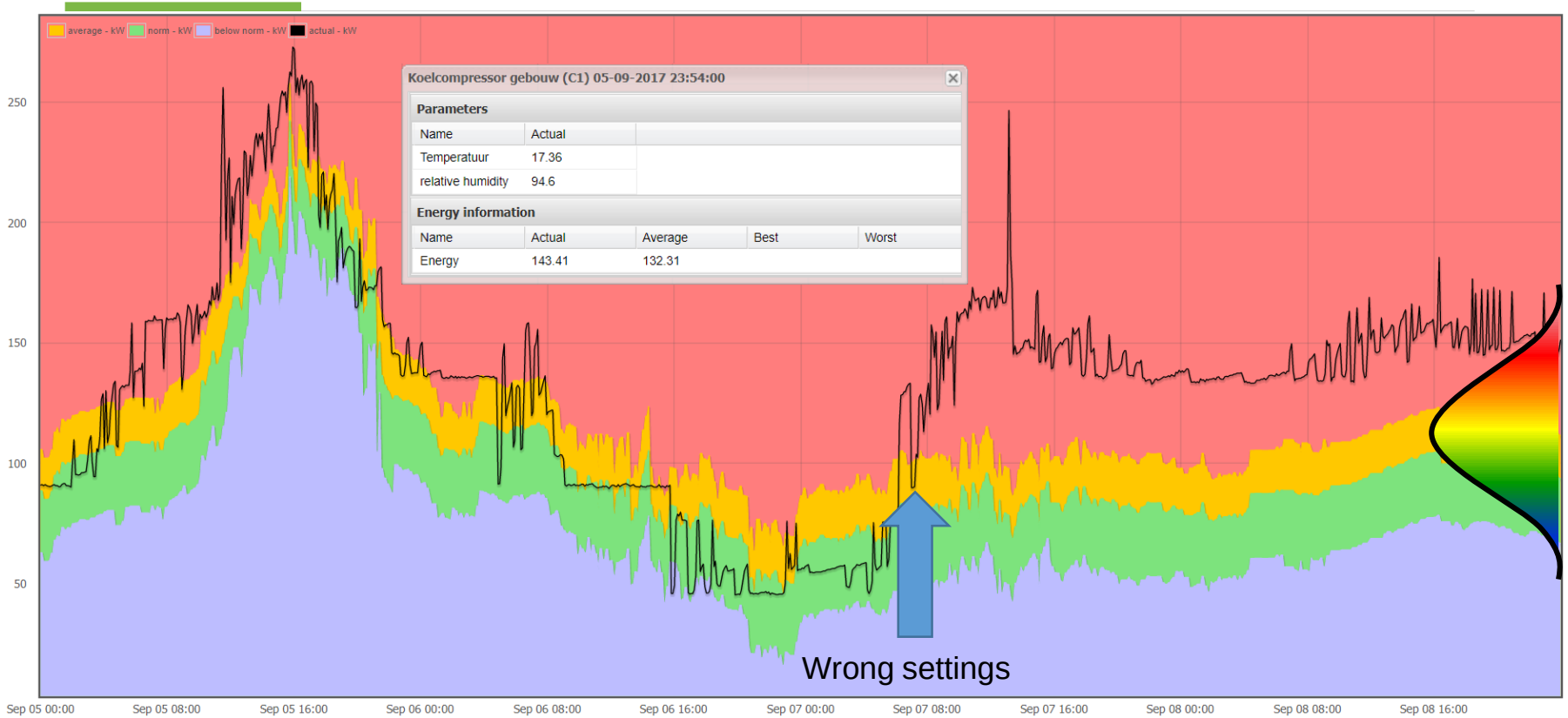
Cooling

Plain power consumption in kW without reference



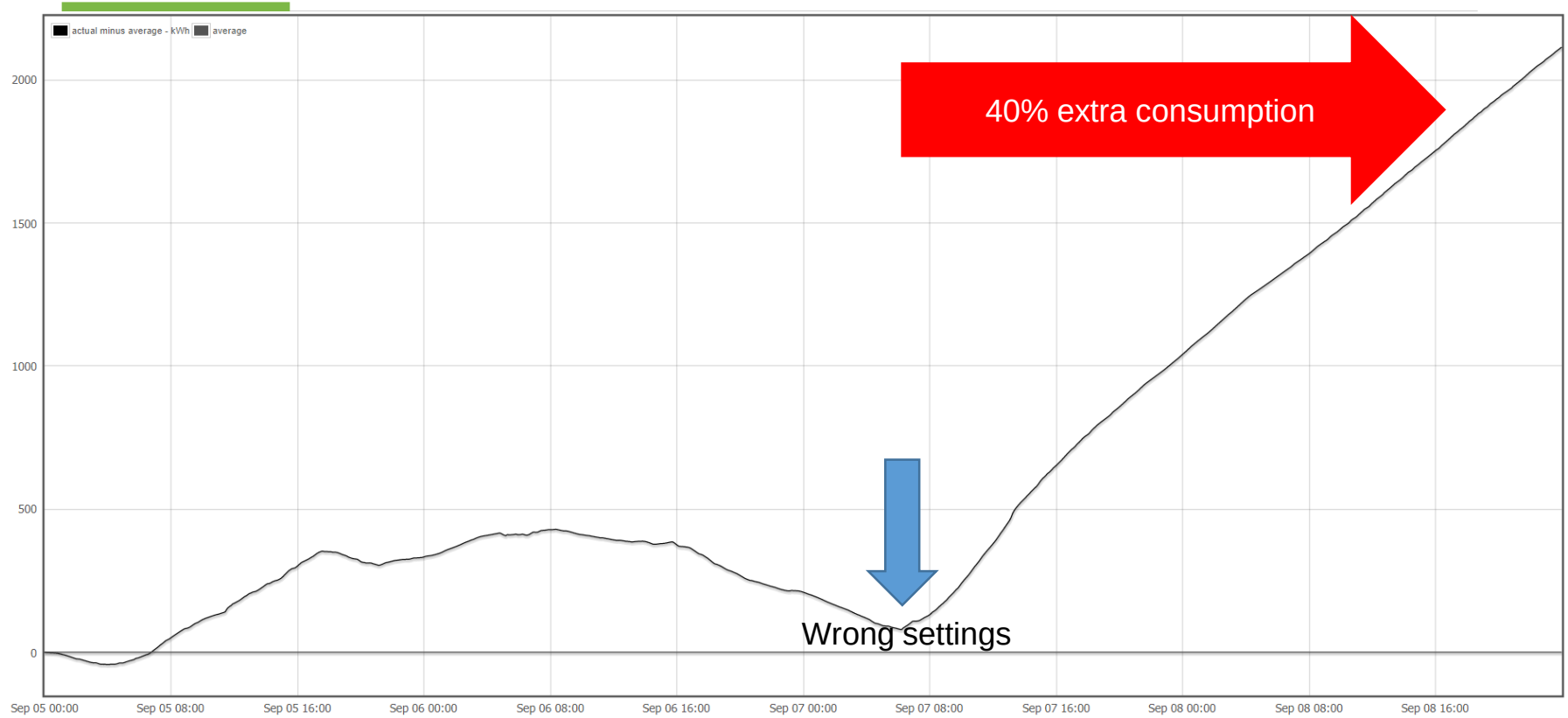
Cooling

Plain power consumption in kW with learned reference



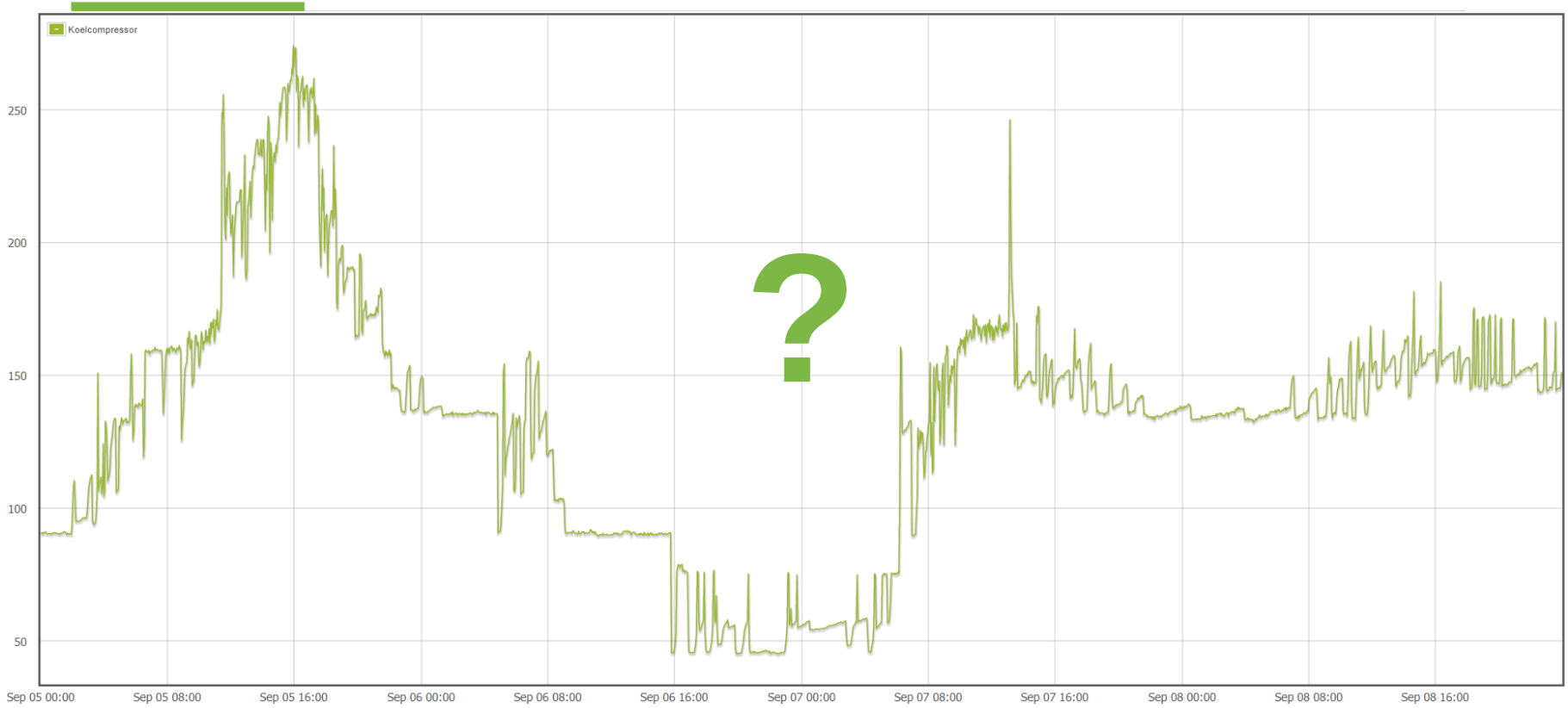
CUSUM

Cumulative sum of (power consumption – learned reference)



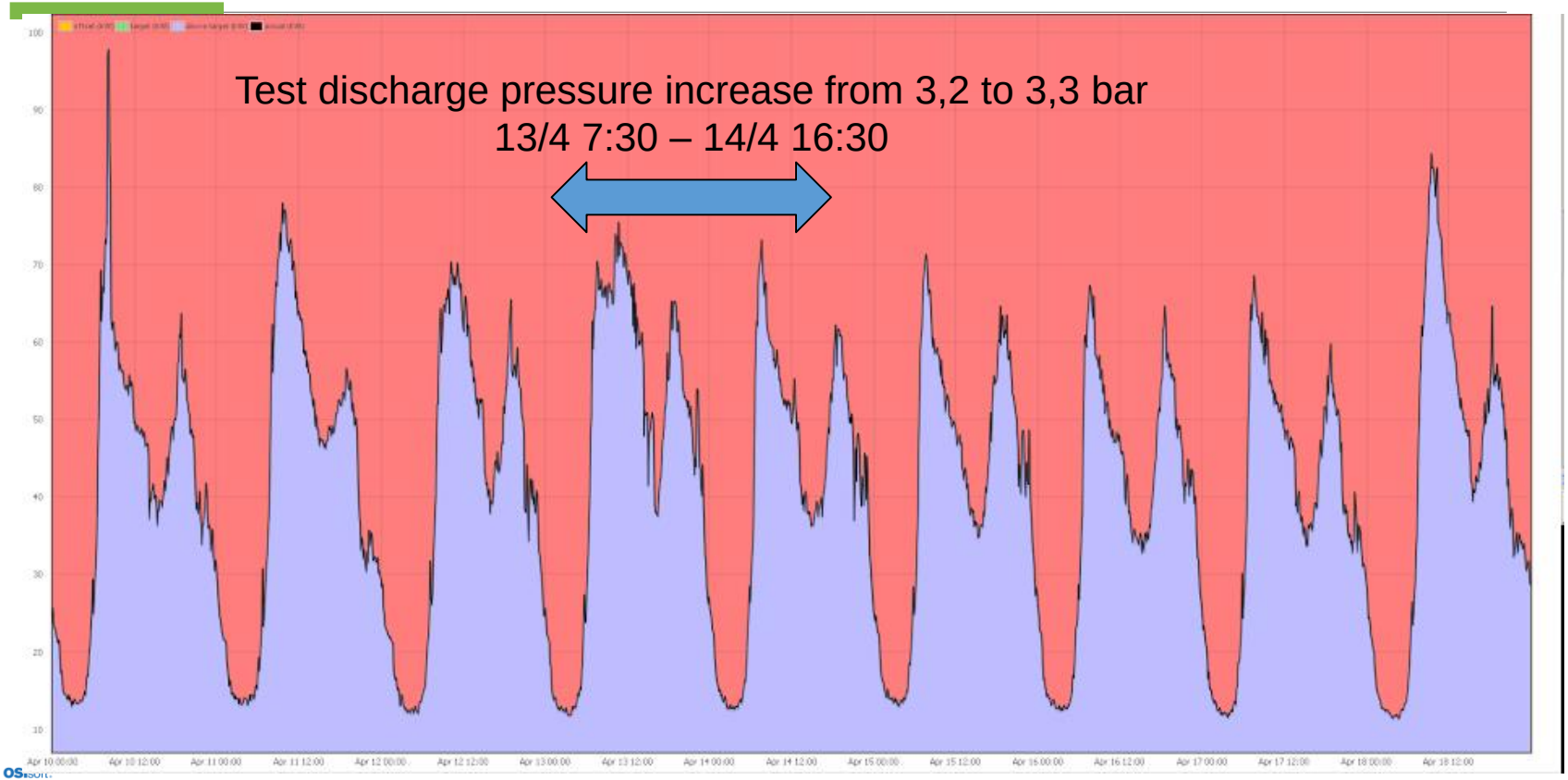
Cooling

Plain power consumption in kW without reference



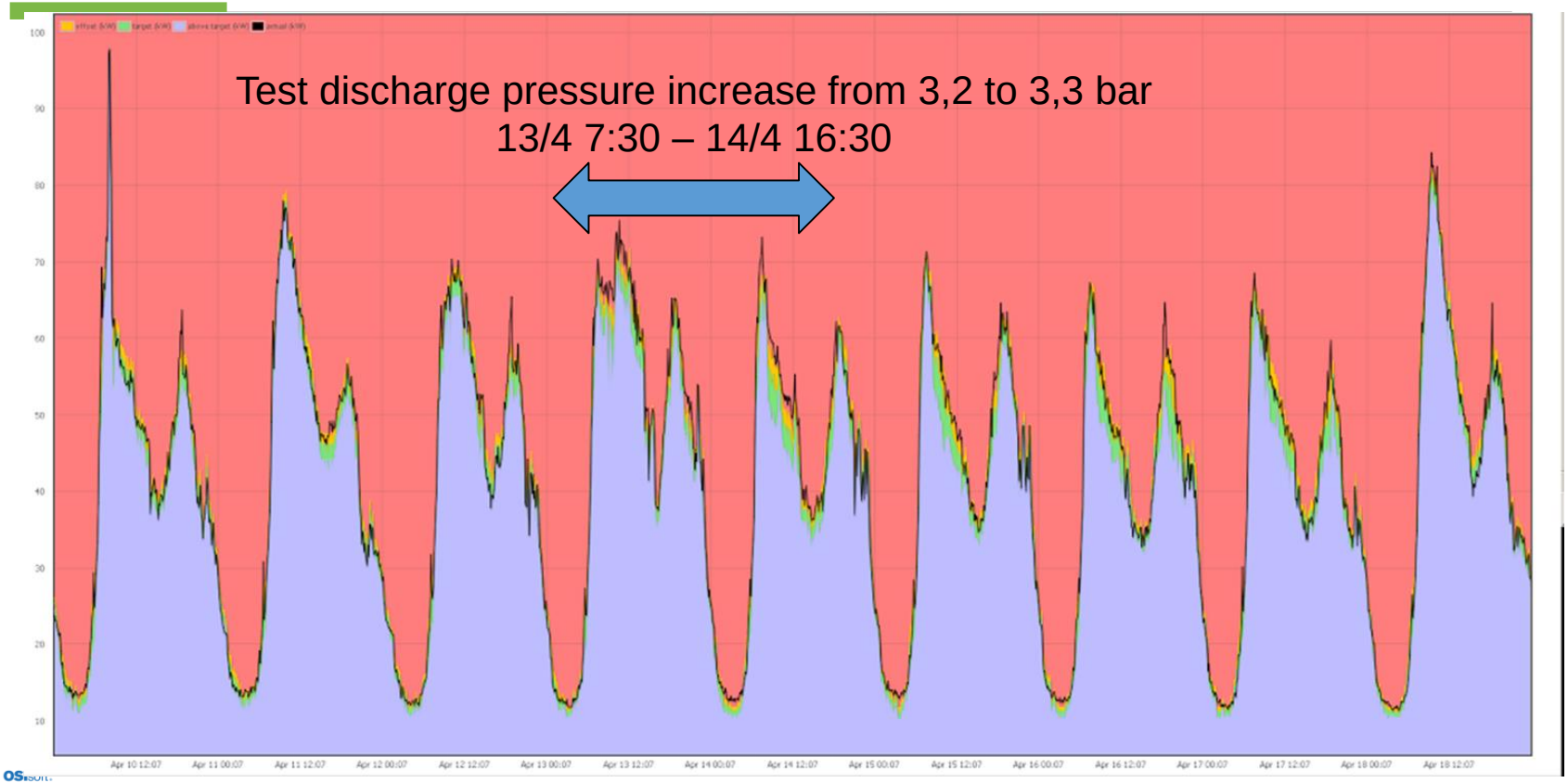
Oasen

Searching for energy saving opportunities and monitoring of assets



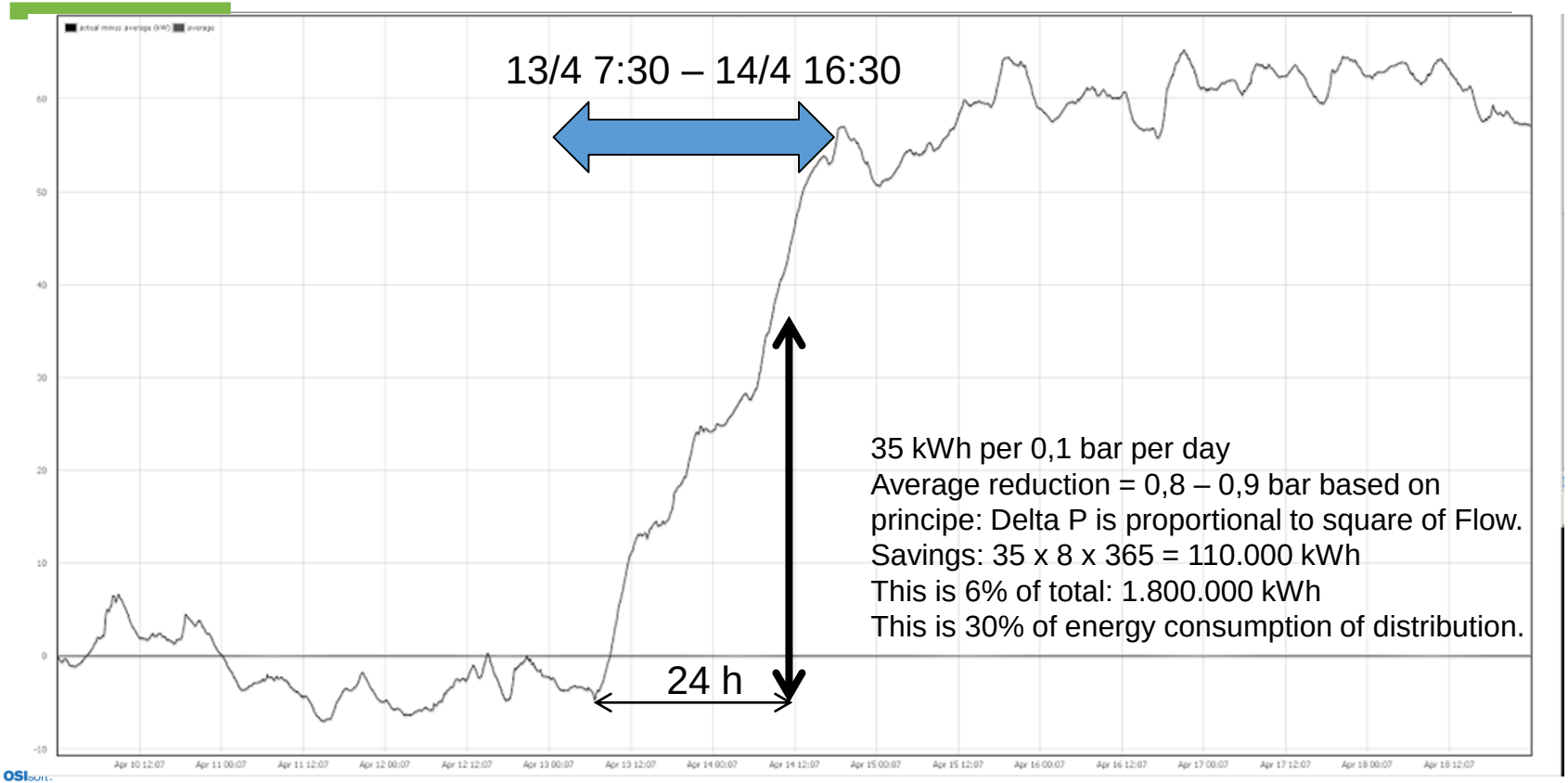
Oasen

Searching for energy saving oppotunities and monitoring of assets

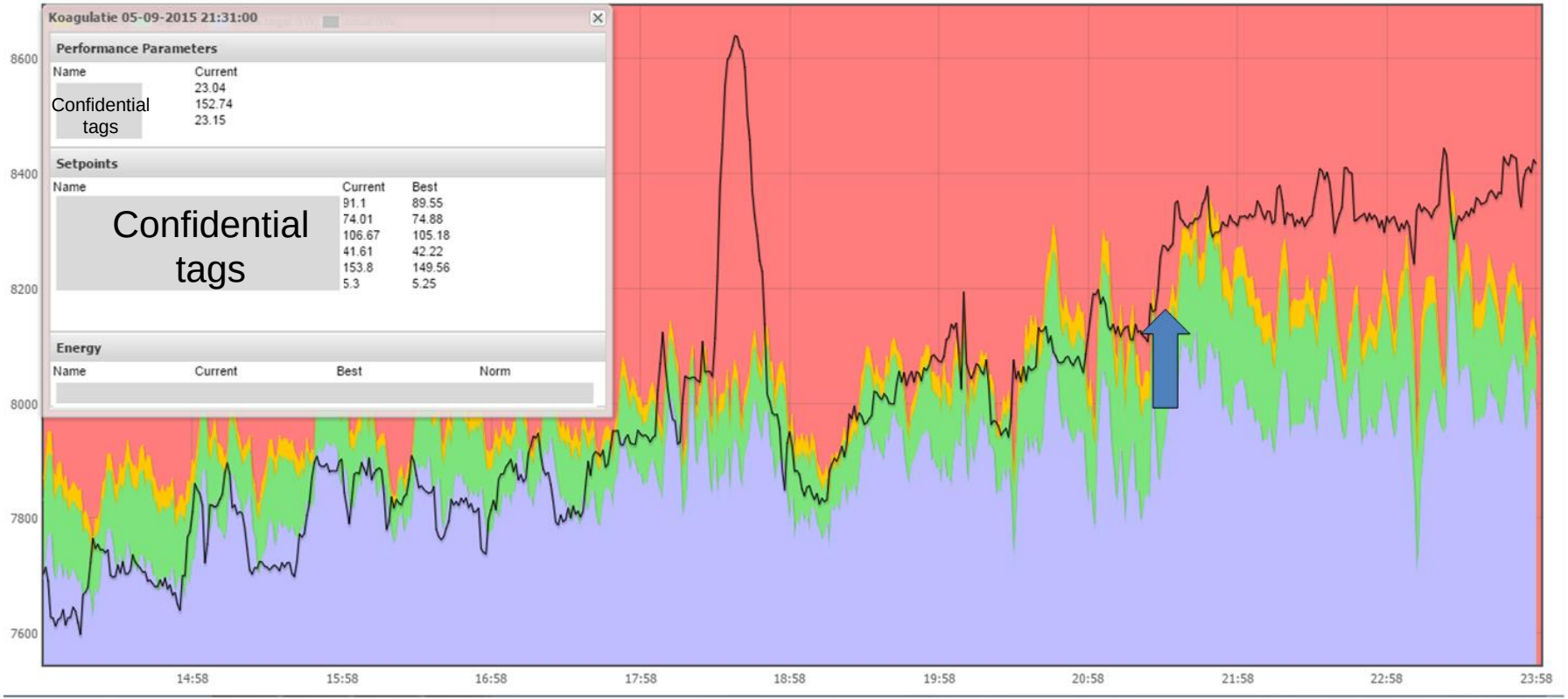


Oasen

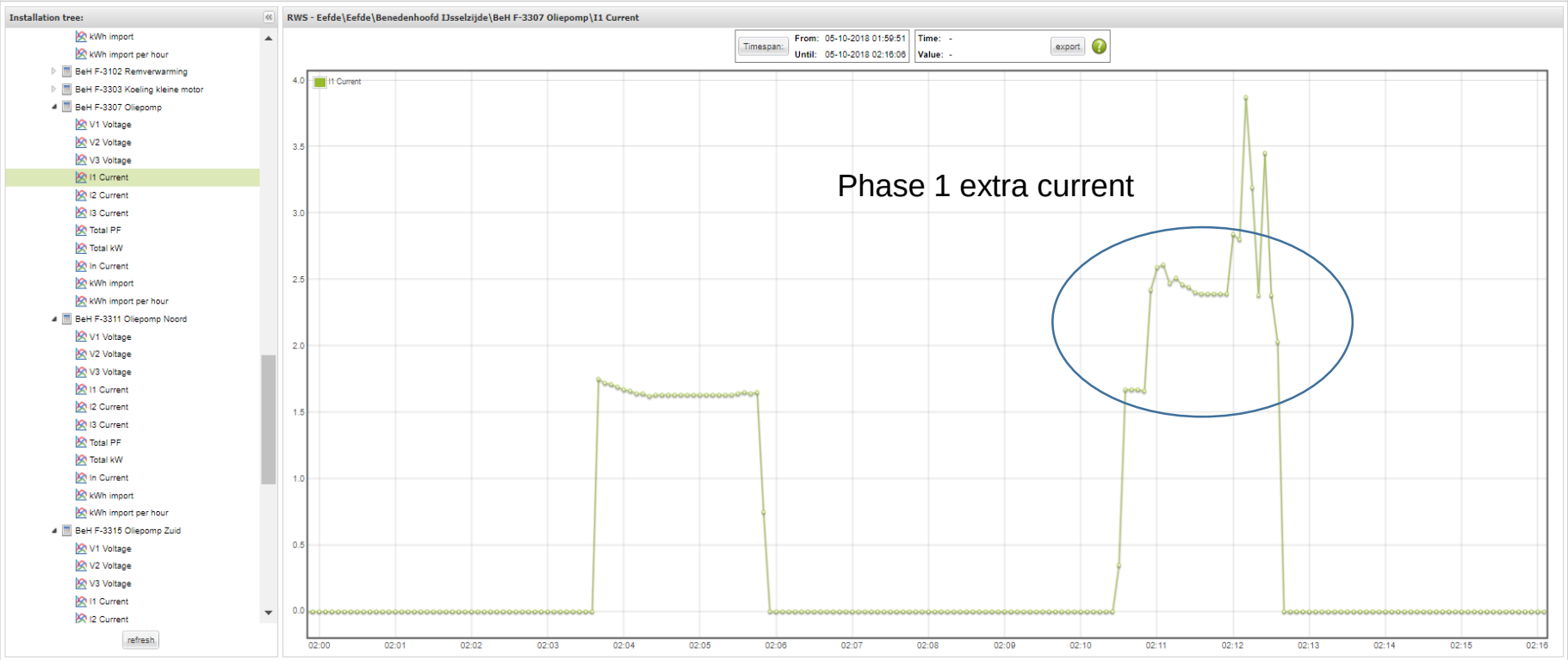
Searching for energy saving oppotunities and monitoring of assets



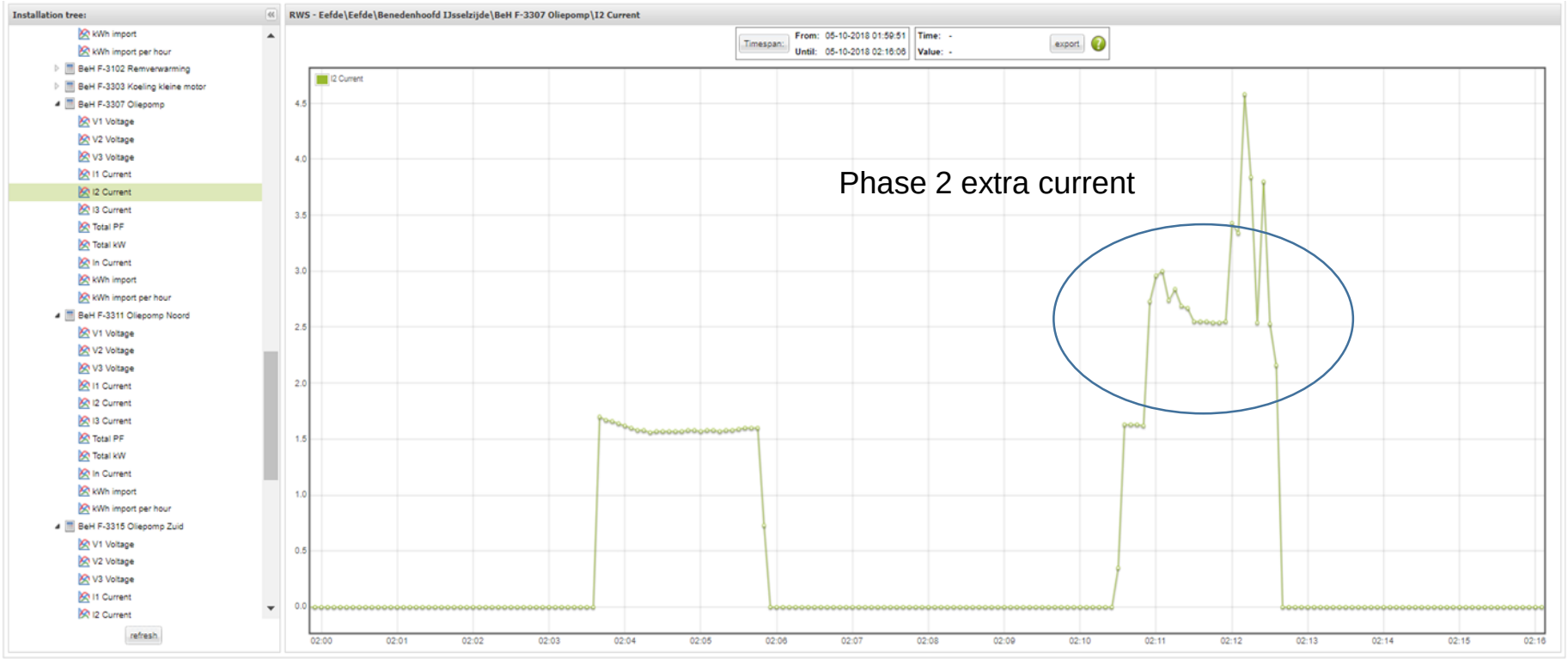
Recommendation of settings towards best setpoints



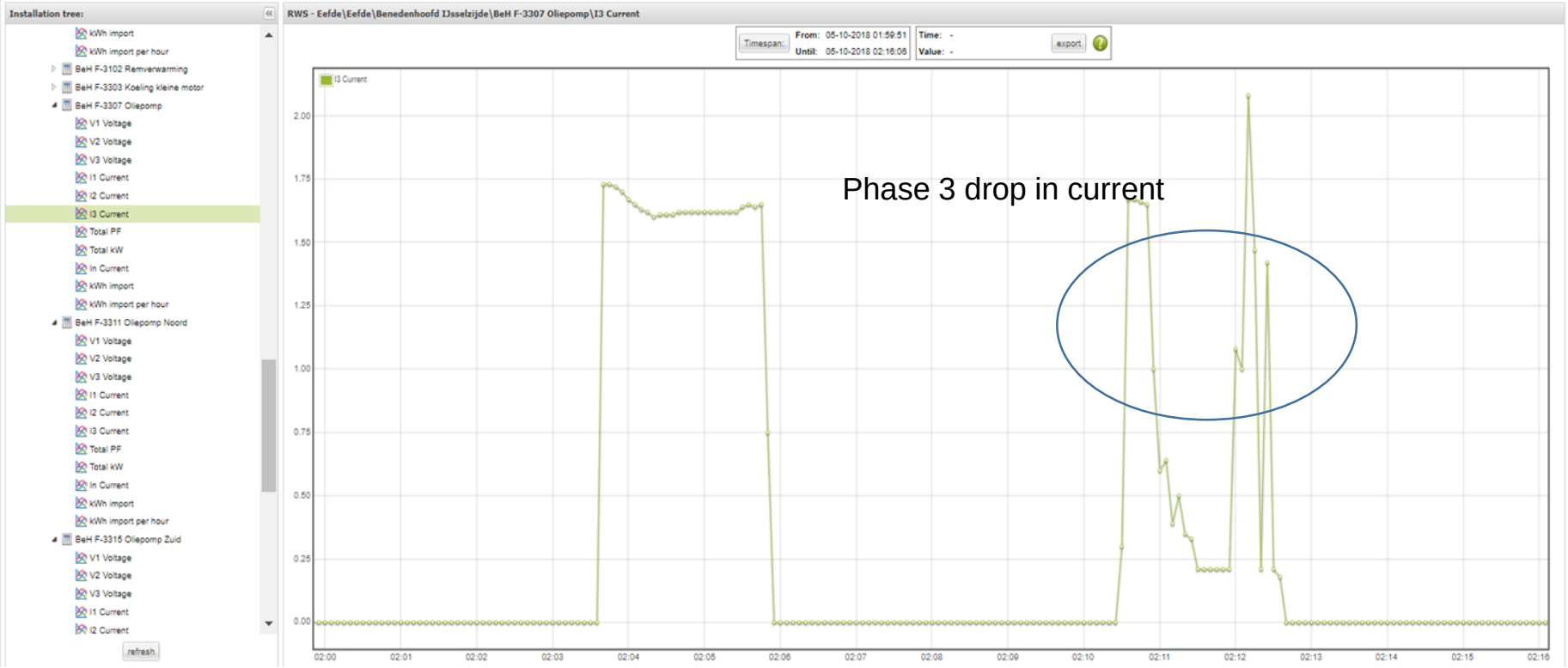
Early warning Relay failure



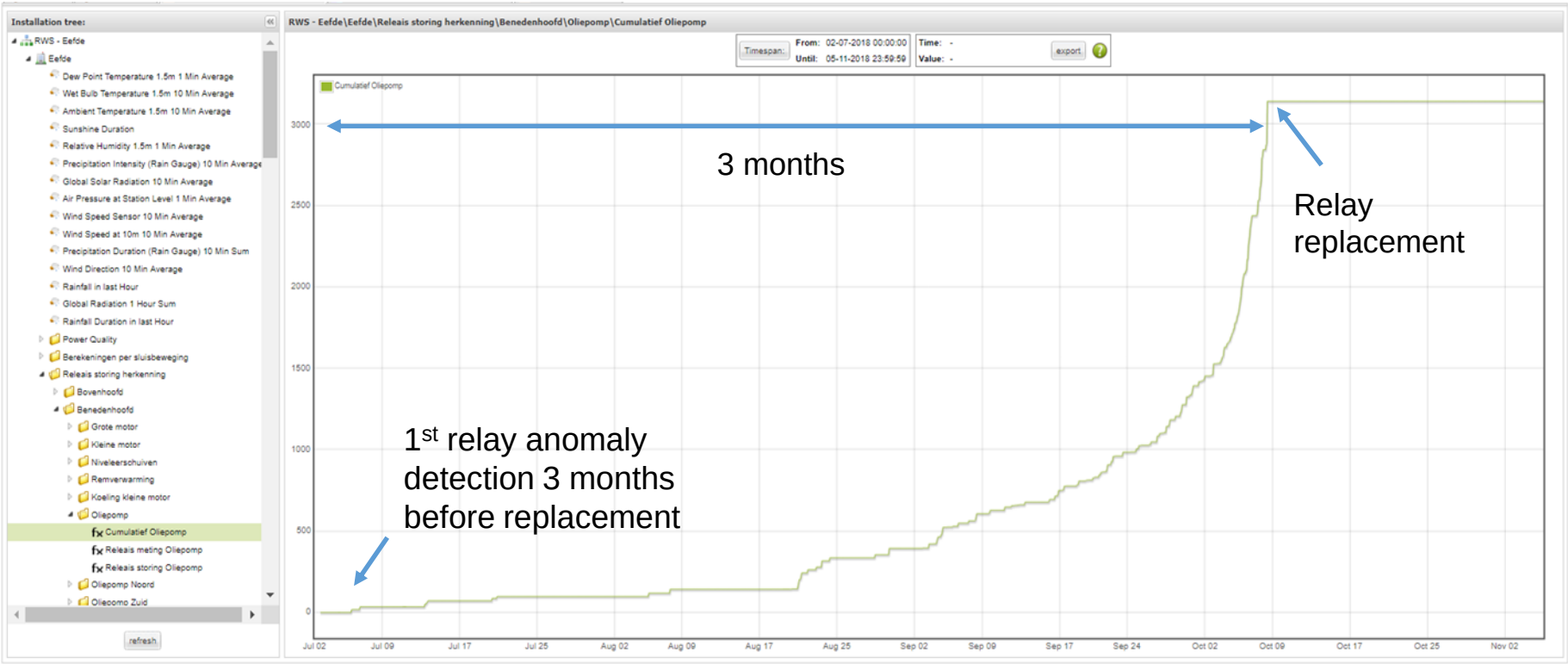
Early warning Relay failure



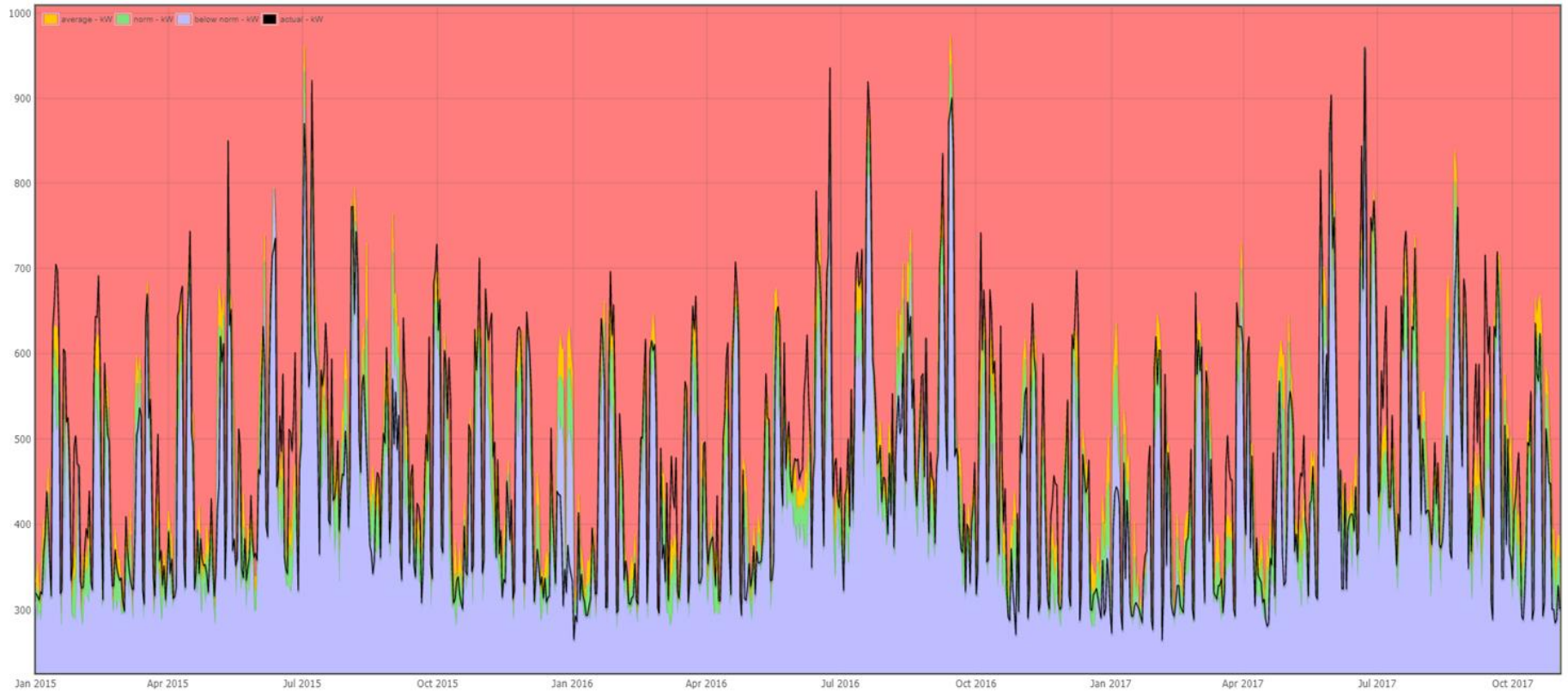
Early warning Relay failure



Early warning Relay failure

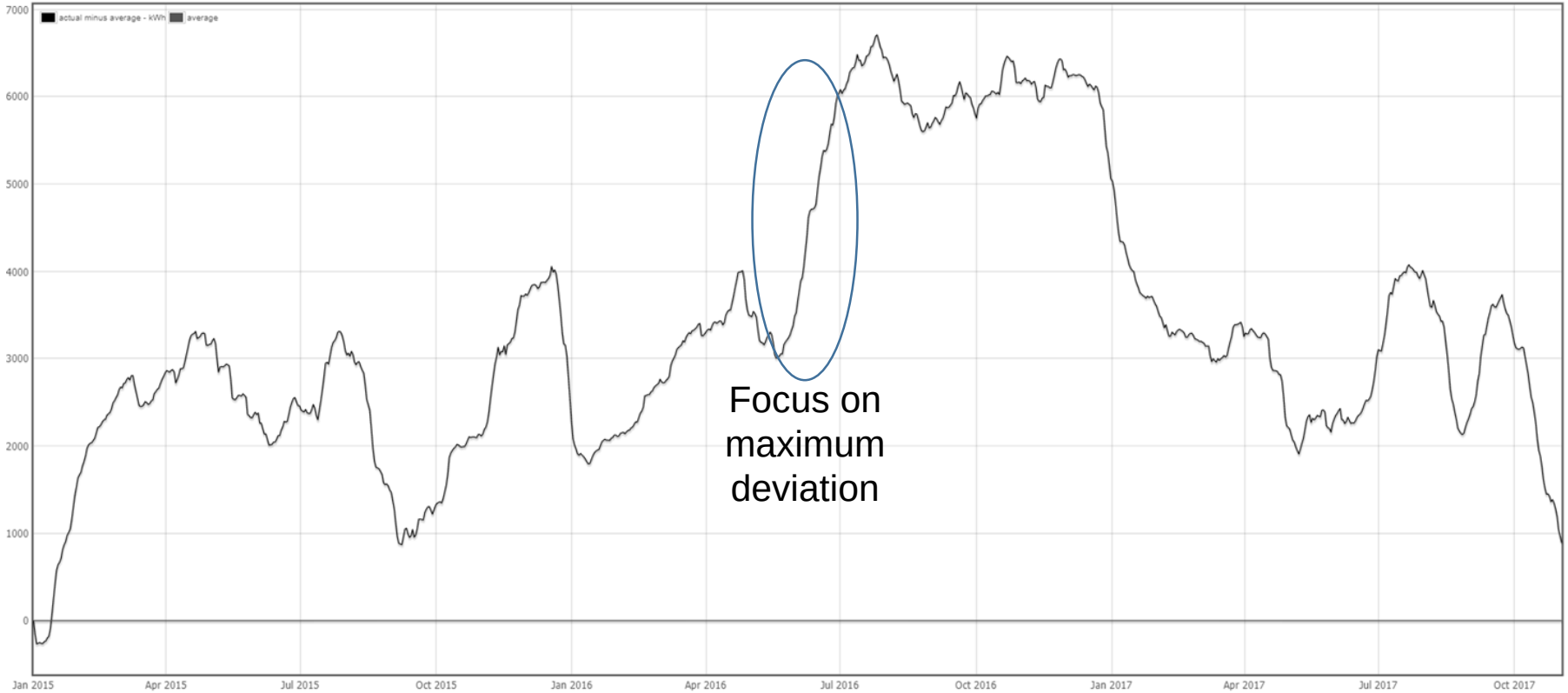


Accuracy of the AEI example data period: jan 2015 – nov 2017



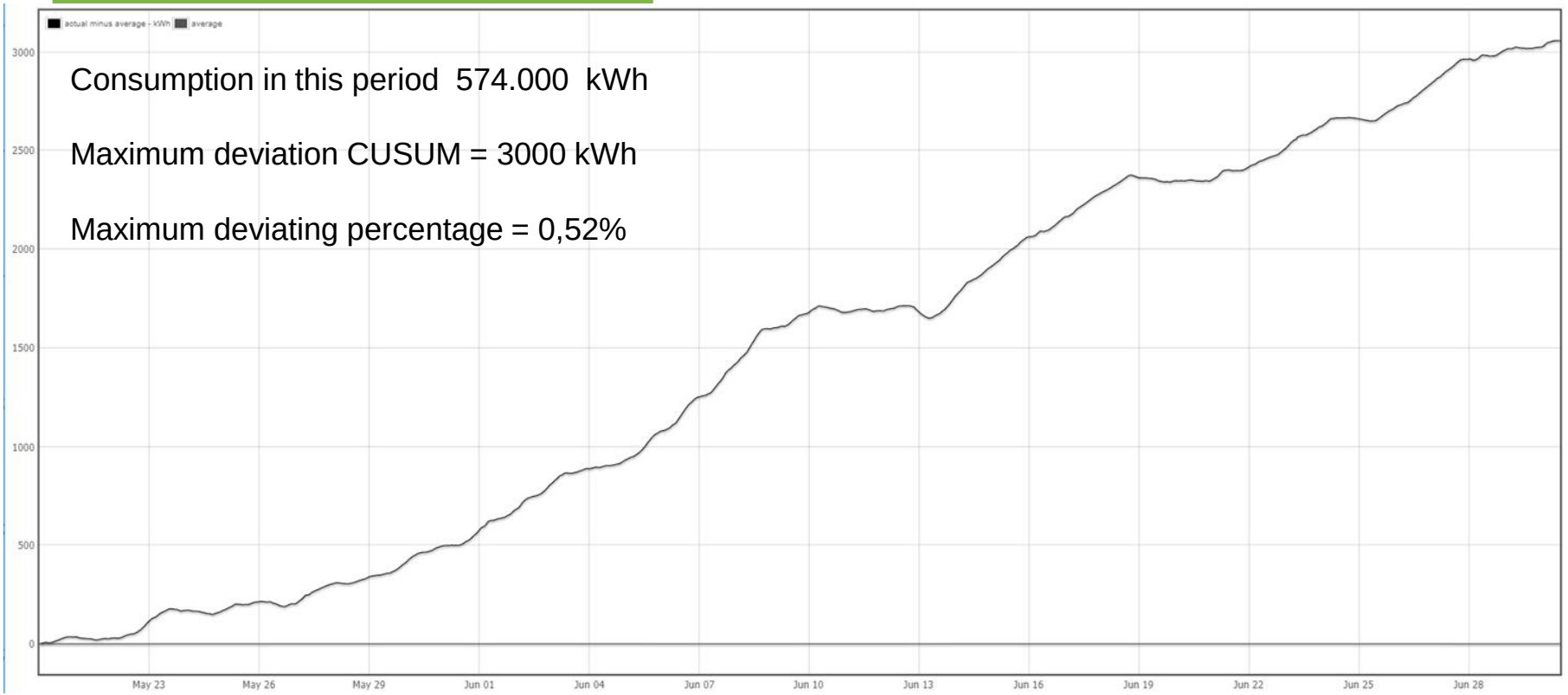
Accuracy of the AEI

example data period: jan 2015 – nov 2017. CUSUM



Accuracy of the AEI

Focus on maximum deviation. CUSUM



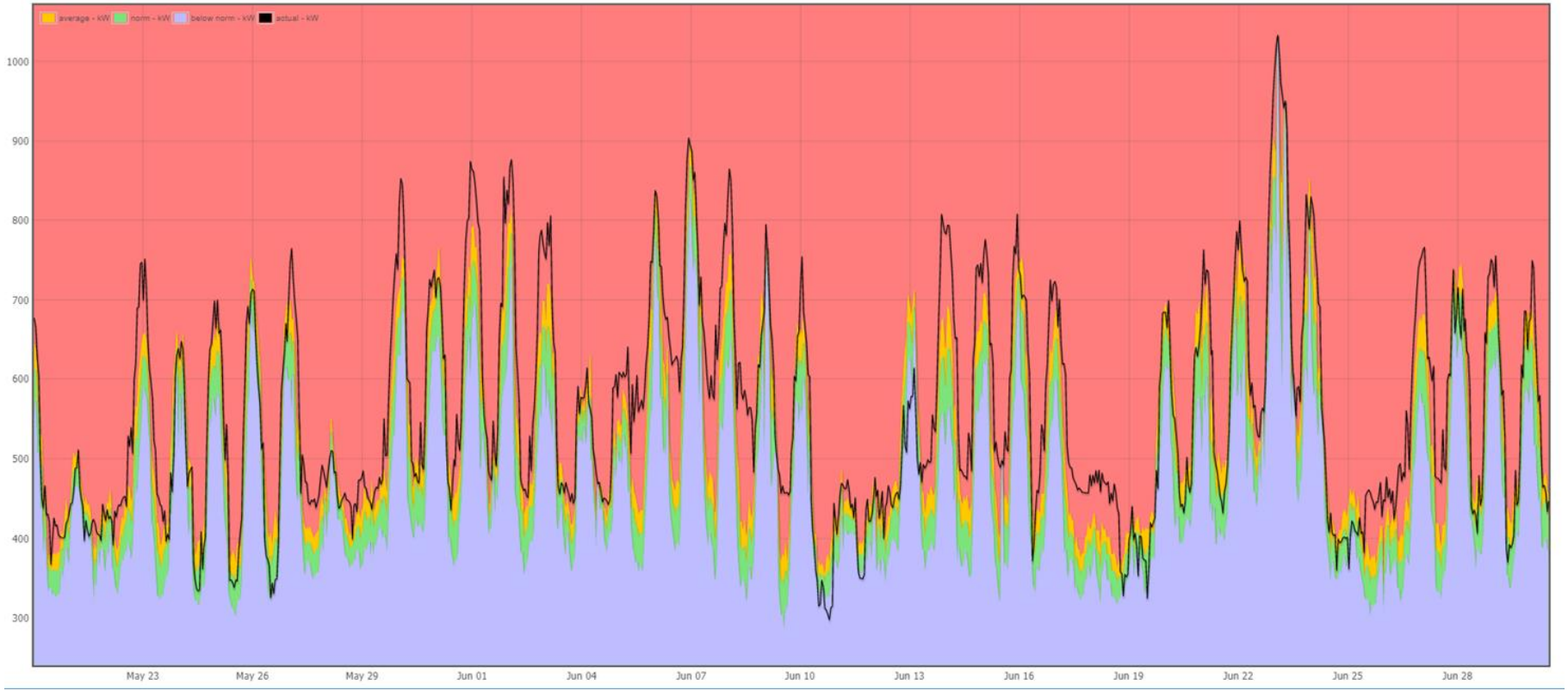
Consumption in this period 574.000 kWh

Maximum deviation CUSUM = 3000 kWh

Maximum deviating percentage = 0,52%

Accuracy of the AEI

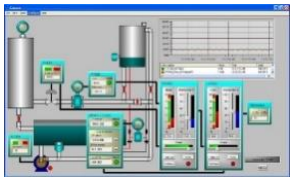
Focus on maximum deviation

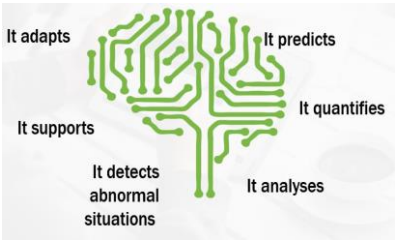


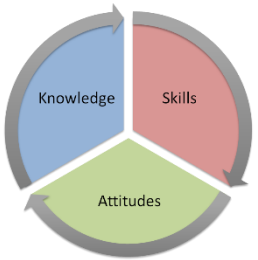
Technology artificial *energy* intelligence (AEI)

PROCESS DATA & EXISTING KNOWLEDGE + **ENERGY & WEATHER DATA** + **ARTIFICIAL *ENERGY* INTELLIGENCE (AEI)** = **INSIGHTS & NEW KNOWLEDGE**

ingredients — technology — added values

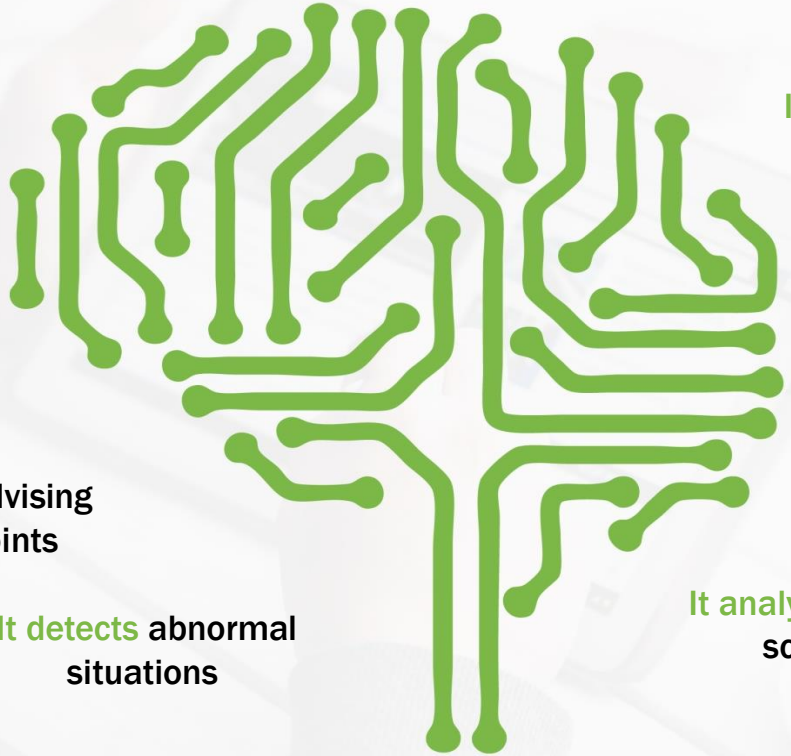






AEI Added Values

Self Learning Technology



It determines the potential of energy that can be saved

It predicts the energy consumption

It quantifies the energy saved

It supports by advising the best setpoints

It adapts to a better or best performance

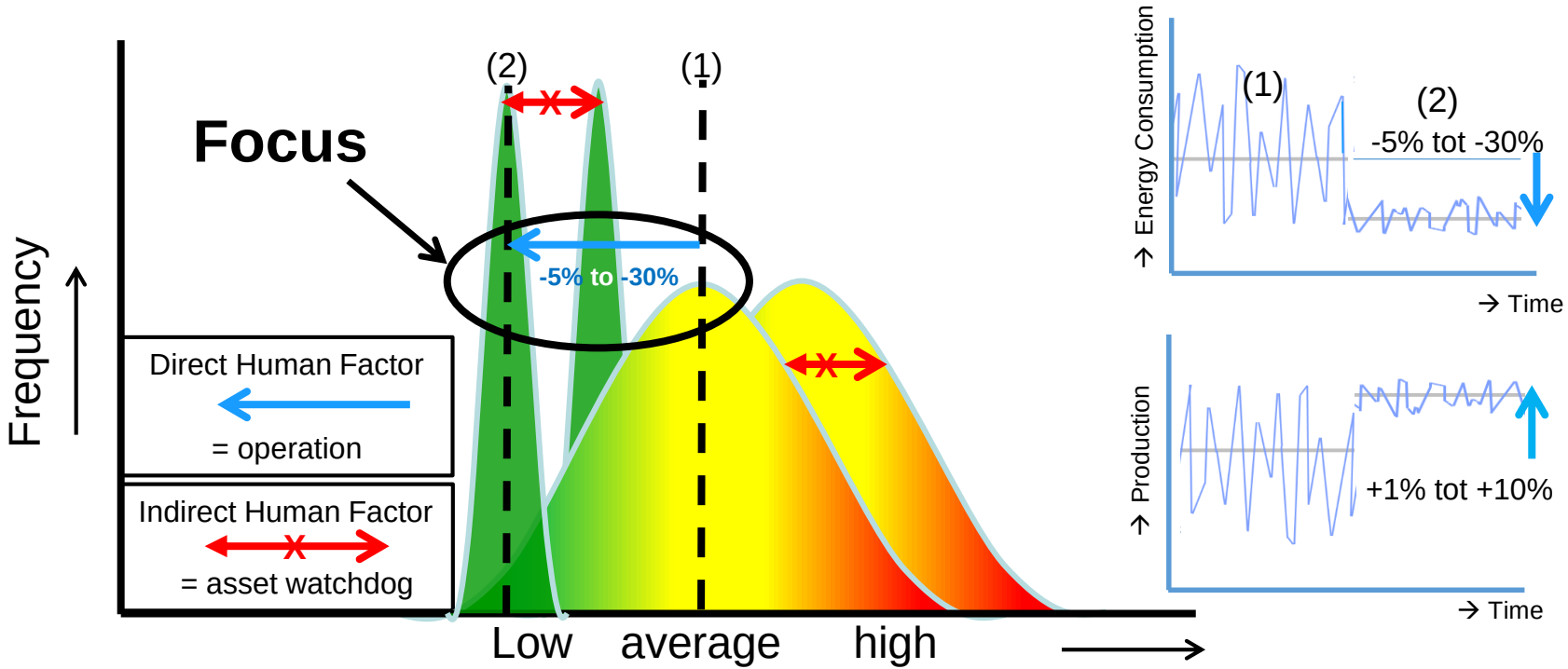
It supports by advising the best setpoints

It analyses different scenarios

It detects abnormal situations

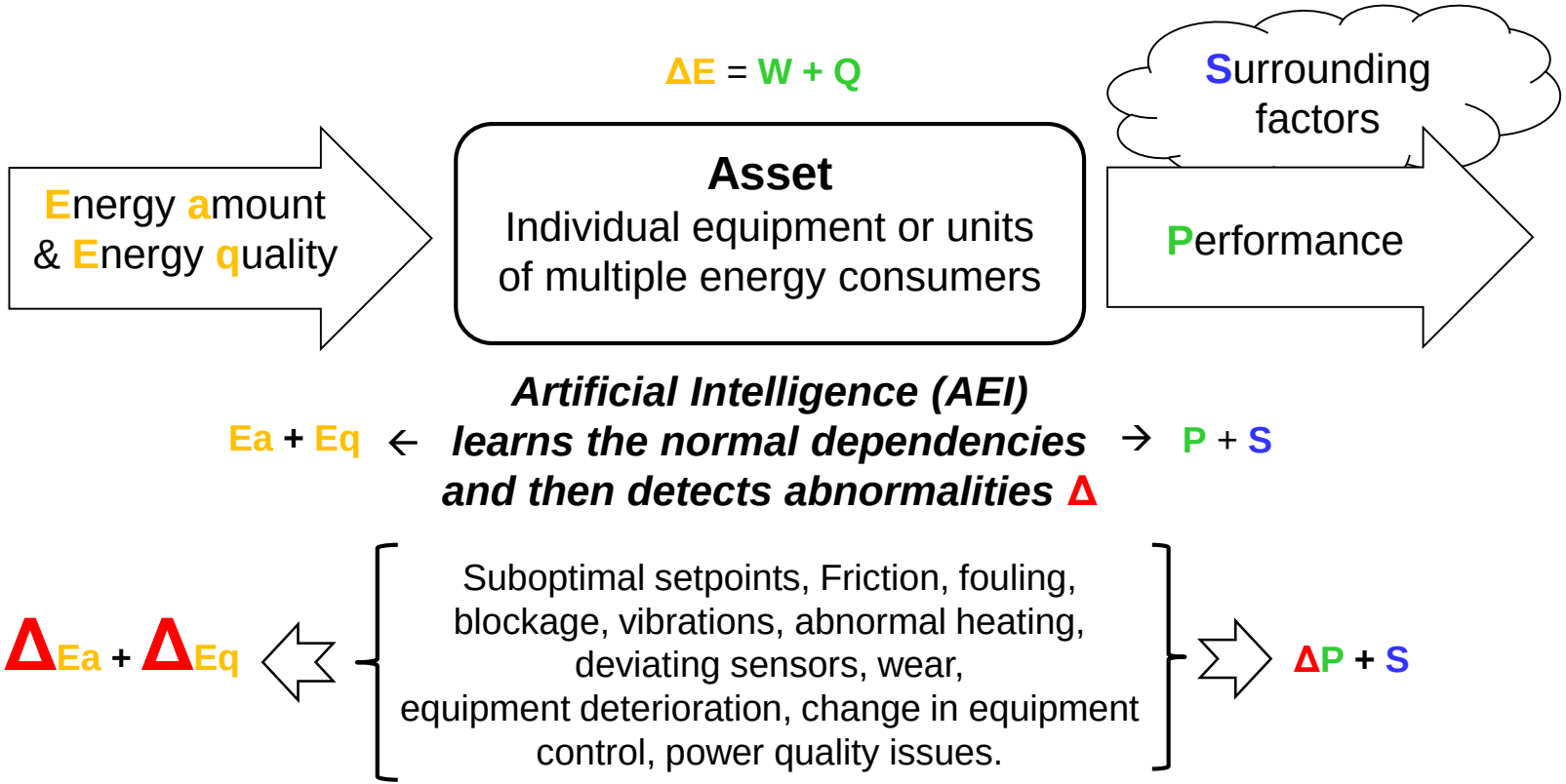
The Opportunity

Early warnings of anomalies and operational energy saving



Energy consumption per unit of time related to a specific performance

Learning the normal detecting the abnormal Δ



Artificial Energy Intelligence What drives it?

1. Energy consumption is ***the holistic*** parameter for every process that relates somehow to both asset and process *performance*. The same applies to power quality.

2. Tons of process data available but little or no energy data… high accuracy monitoring can usually be added at low cost.

3. Process performance and asset monitoring and management are much closer to core business than energy saving → → → Simply better business cases.

4. New technologies available:
   - state-of-the-art **high accuracy** sub-metering and power quality monitoring technology
   - Deep Learning, LSTM for highly dynamic processes.
   - High performance streaming data base technology (OSIsoft)

New generation energy monitoring, advanced big data processing and machine learning based analysis gives new generation AEI solutions

Our mission:
Enable each organization to maximize the ***value*** created by energy and to contribute to a sustainable future.

Energy is the capacity to do ***work***, to create **tangible value**, and is therefore the carrier of the real economy. Everything we touch, use and produce comes about with an energy flow. (***ΔE = W + Q)***

enerGQ's ***Artificial Energy Intelligence (AEI)*** uses the deviation energy flow to a system as the holistic performance indicator of that system.

Our vision:
Organizations use AEI as the plug & play technology to ***reduce*** carbon footprint, to ***optimize*** maintenance, ***maximize*** production and ***avoid*** unplanned downtime.

A brief history of enerGQ and what the future holds

2009	- Founded as an energy monitoring company with a focus on operational energy saving. First clients in buildings and utilities sector.
2010-13	- First industrial clients.
2014	- Partnership with RUG for artificial intelligence and pilot in aviation.
2015-16	- First clients in the water sector.
2016-18	- First clients in wet-infrastructure sector for asset monitoring & power quality monitoring.
2019	- CSA with OSIsoft to secure fast scale-up. Focus on extending AEI technology. First client in ICT-sector.
2020-23	- Fast scale-up. Local and global in cooperation with OSIsoft and other partners.

The Problem and the Transition

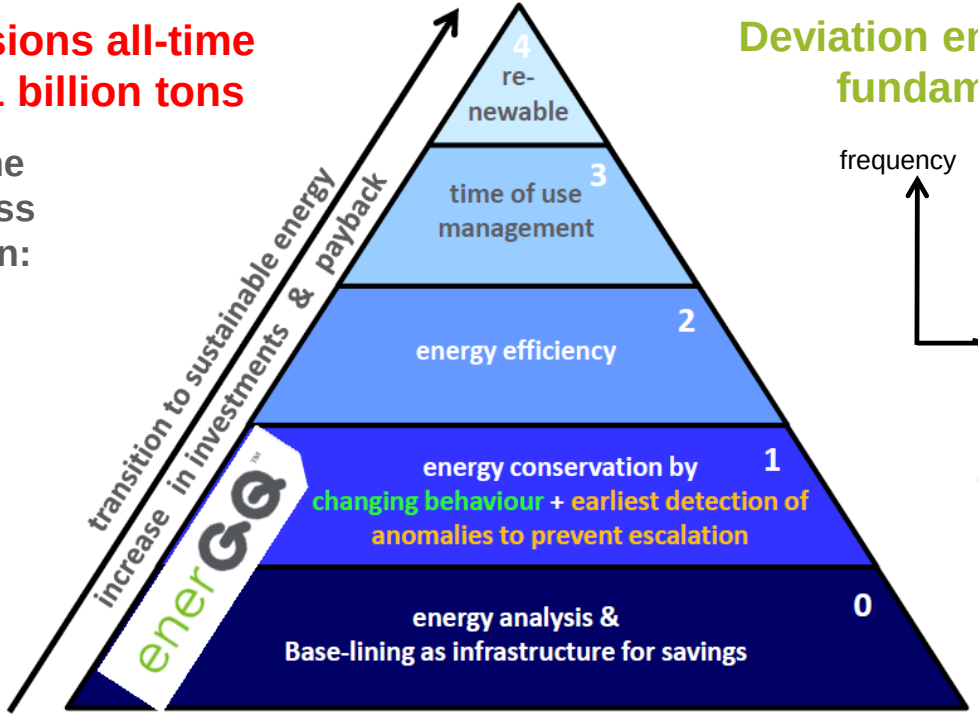
Global CO_2 emissions all-time high in 2017: 37.1 billion tons

Human activity is the main cause of excess energy consumption:

- **Operation**
- **Housekeeping**
- **Maintenance**

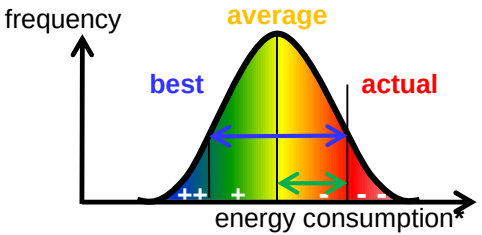
Due to lack of

- **Self efficacy**
- **Knowledge**
- **Awareness**



Based on Energy Pyramid from EnSave Inc.

Deviation energy monitoring is fundamental for transition



Added Values: Low Cost, payback: <1 year
5% - 30% savings

Development of awareness, knowledge, self-efficacy

The Problem and the Transition

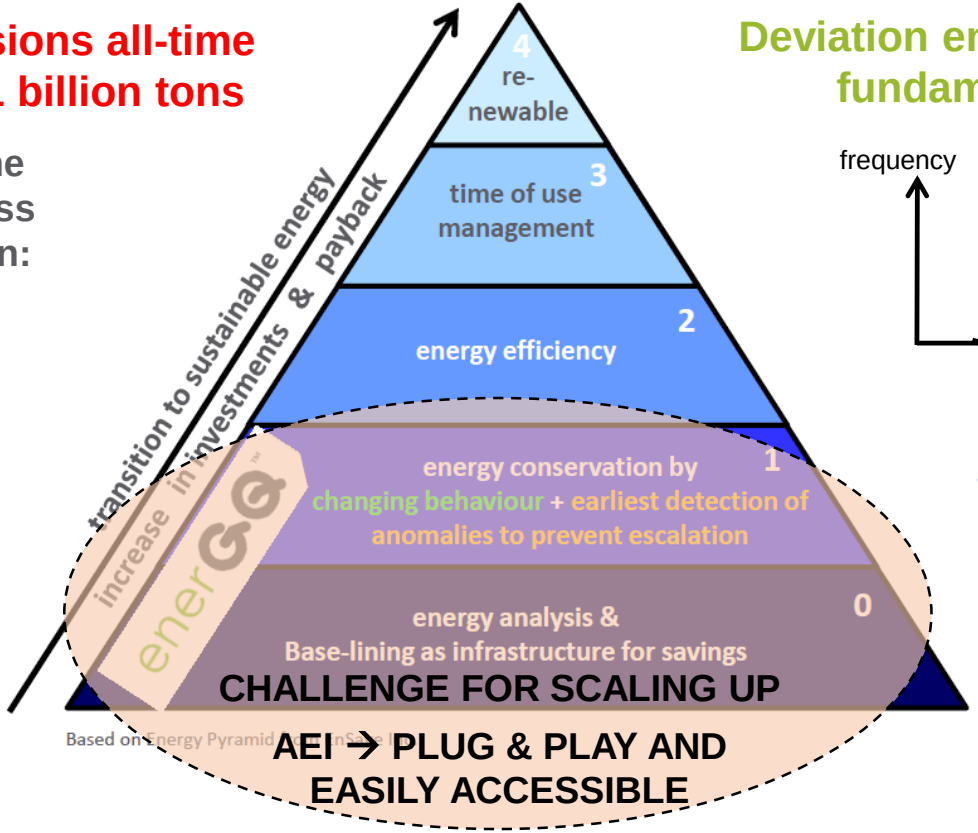
Global CO_2 emissions all-time high in 2017: 37.1 billion tons

Human activity is the main cause of excess energy consumption:

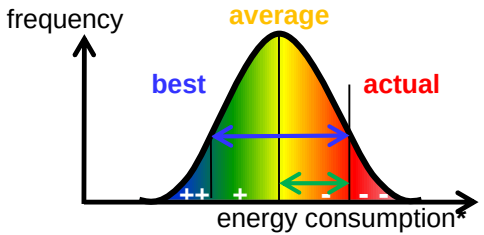
- Operation
- Housekeeping
- Maintenance

Due to lack of

- Self efficacy
- Knowledge
- Awareness



Deviation energy monitoring is fundamental for transition



Added Values: Low Cost, payback: <1 year
5% - 30% savings

Development of awareness, knowledge, self-efficacy

Integrated building blocks able to act (in)dependent of other systems

CT's: 0-40 mA secondary. Include a built-in automatic protection circuit for maximum safety, eliminating the need to use shorting bars. Maximum cable length extendable to 650 ft / 200 meters. Accuracy 0,5S (0,5%).

Split Current Transformers

V1
V2
V3
Vn

Multimeters
(max 12x3ph / 36x1ph)
Measures active, reactive, apparent power and energy and basic power quality

Split Current Transformers

ETH RJ45

3G/4G & ETH gateway

3G/4G

Interval ≥ 1 sec

Data storage, Processing & Machine Learning, Visualisation, Reporting and Alarming

Data & Information export to customer/3rd party

WebPortal

Optional: other sensor data via API/webportal

Public data such as weather data and water levels

super user

Integrated building blocks able to act (in)dependent of other systems

CT's: 0-40 mA secondary. Include a built-in automatic protection circuit for maximum safety, eliminating the need to use shorting bars. Maximum cable length extendable to 650 ft / 200 meters. Accuracy 0,5S (0,5%).

Split Current Transformers

V1
V2
V3
Vn

Multimeters
(max 12x3ph / 36x1ph)
Measures active, reactive, apparent power and energy and basic power quality

Split Current Transformers

ETH RJ45

3G/4G & ETH gateway

3G/4G

Interval ≥ 1 sec

Plug & Play

Data & Information export to customer/3rd party

Optional: other sensor data via API/webportal

enerGQ™ WebPortal

enerGQ™

Data storage, Processing & Machine Learning, Visualisation, Reporting and Alarming

CHALLENGE FOR SCALING UP

AEI → PLUG & PLAY AND EASILY ACCESSIBLE

Public data such as weather data and water levels

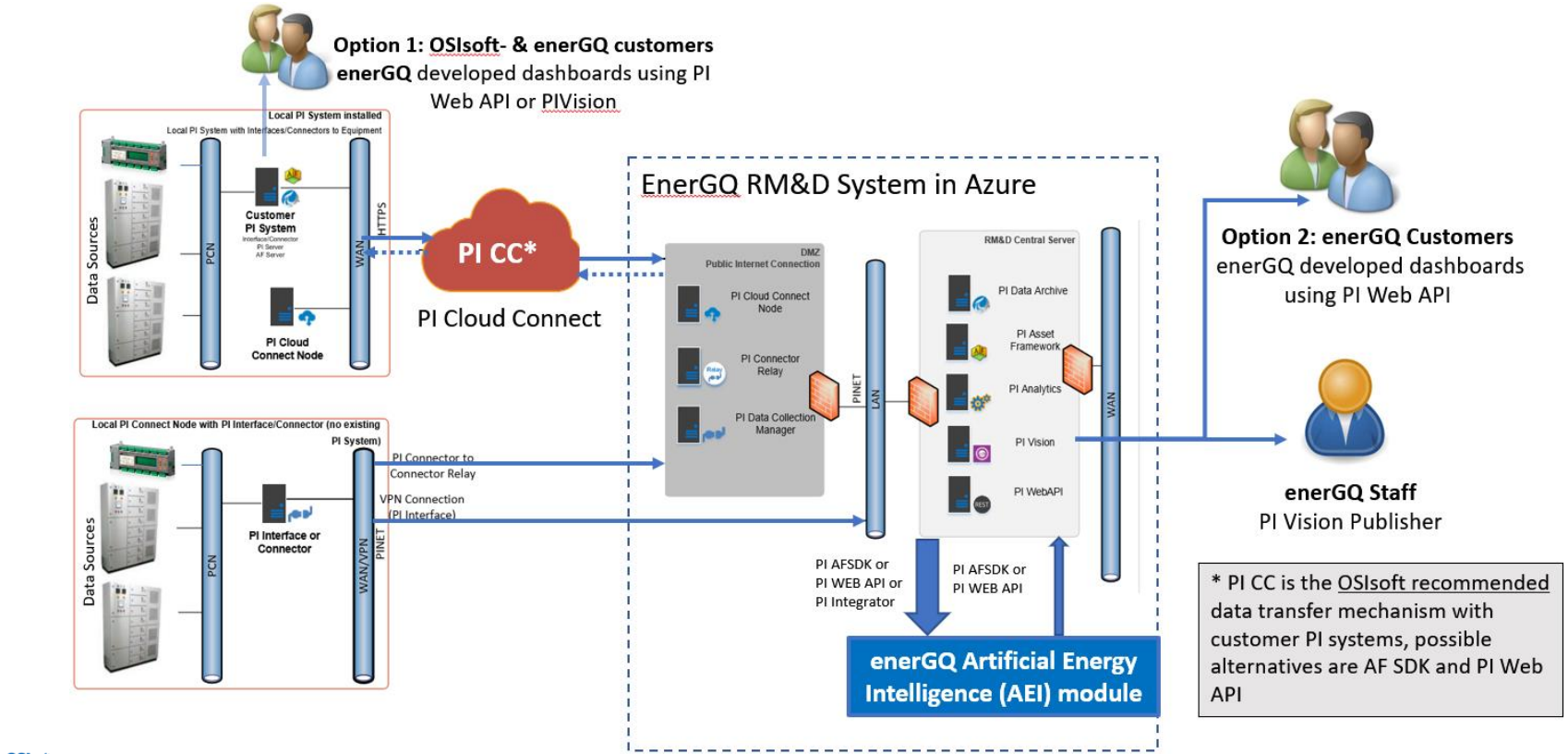
Plug & Play

Remote support

super user

The answer to scaling up

OSIsoft enerGQ architecture enabling P&P AEI



Food for thought when travelling home

If anything changes in the operation or condition of assets for good or for bad, it will result in a change in energy consumption. Why?

Energy is the capacity to do work or to produce heat. ($\Delta E = W + Q$) Everything we touch, use and produce (value created) comes about with an energy flow.

YES...it is possible to use energy as an holistic performance indicator IF ...we can use energy to distinguish between normal and abnormal changes, we can use it as an holistic performance indicator that opens up lots of opportunities to maximise performance and value creation from every asset that consumes energy. IMAGINE...!

to detect and harvest the opportunities to maximise value creation. Among them are the earliest detection of abnormalities preventing value loss and the generation of optimized setpoints that save energy & raw materials and maximise the production.

Contact details

- Rob Burghard
- Managing Director
- enerGQ BV
- rburghard@enerGQ.com
- +31 6 1091 3693

Questions?

Please wait for the **microphone**

State your **name & company**

Please remember to…

Complete Survey!

Navigate to this session in mobile agenda for survey