



# Implementation and Usage of the PI System at ENGIE

## Business Unit Generation Europe

Presented by Bart Van Brabant and Olivier Martens



# Contents

- About us
- Our PI System story
- Functional evolution of PI System
- Q & A



# About us



153,090  
EMPLOYEES

€66.6 billion  
OF REVENUES

OPERATIONS IN

70 countries

AROUND THE WORLD

€16 billion  
OF INVESTMENTS

1,100

RESEARCHERS AND EXPERTS

no. 1

independent power  
producer (IPP) in the world

112,7 GW

OF INSTALLED POWER-PRODUCTION CAPACITY



Natural gas  
57.9%

Renewable  
energy  
19.5%

Coal  
9.4%

Nuclear  
5.7%

Other  
7.5%

no. 1

importer of liquefied gas  
in Europe

228

URBAN NETWORKS FOR HEATING AND COOLING

A natural-gas  
supply portfolio of

1,082 TWh per year  
or 105 billion m<sup>3</sup>

OPERATED IN

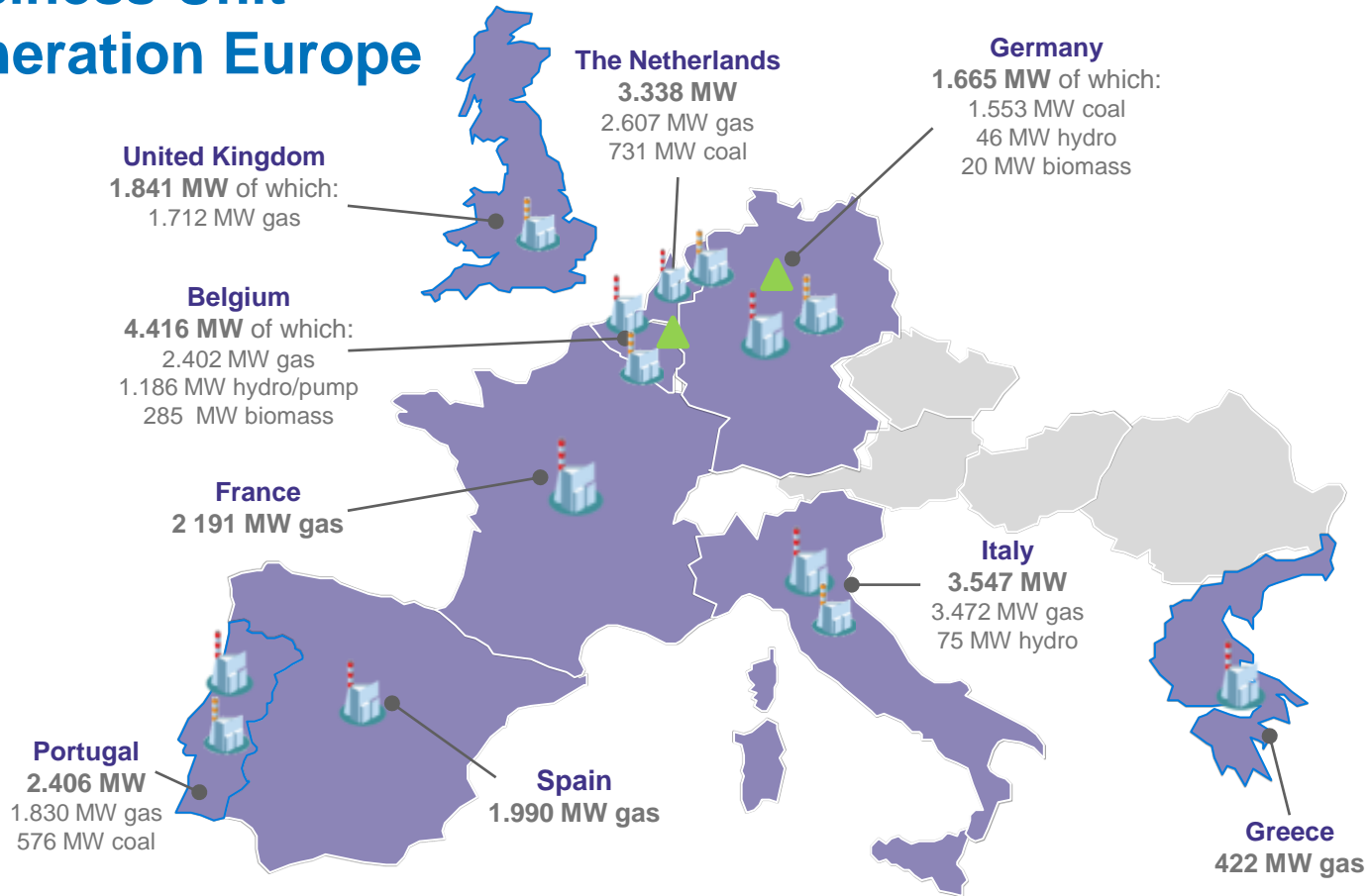
13





COUNTRIES

# 24 BUs close to clients



# Business Unit Generation Europe



|  |           |
|--|-----------|
| <b>9</b>   |           |
| Countries  |           |
| <b>1.600</b>   |           |
| Employees  |           |
| <b>21.815</b>  |           |
| MW installed capacity  |           |
| Of which:  |           |
|  Coal & Co-Combustion | 2.860 MW  |
|  Gas                  | 16.626 MW |
|  Biomass              | 305 MW    |
|  Hydro/pump           | 1.306 MW  |

# PI Competence Center (PICC)

- Dedicated OT team: PICC
  - Operational: 8 people
  - Business Analysis: 4 people
  
- Some statistics:
  - Services for 6 ENGIE Business Units
  - 19 PI Systems
  - Over 400.000 tags
  - 7 countries

# Our PI System story



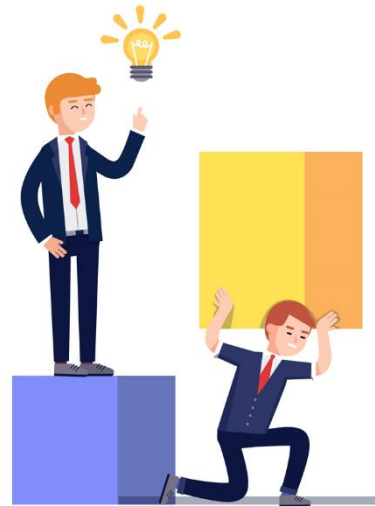
# The start

- Trigger: Opening of the energy market
- Management challenge: be ready!
- 2006: Proof of Concept with PI System



# The first big project

- 2007-2008 – project goals:
  - “Every power plant in Belgium should be connected”
  - “Keep the technical knowledge in-house”
  - “Train the users”
- Two users profiles:
  - Tag managers
  - End-users



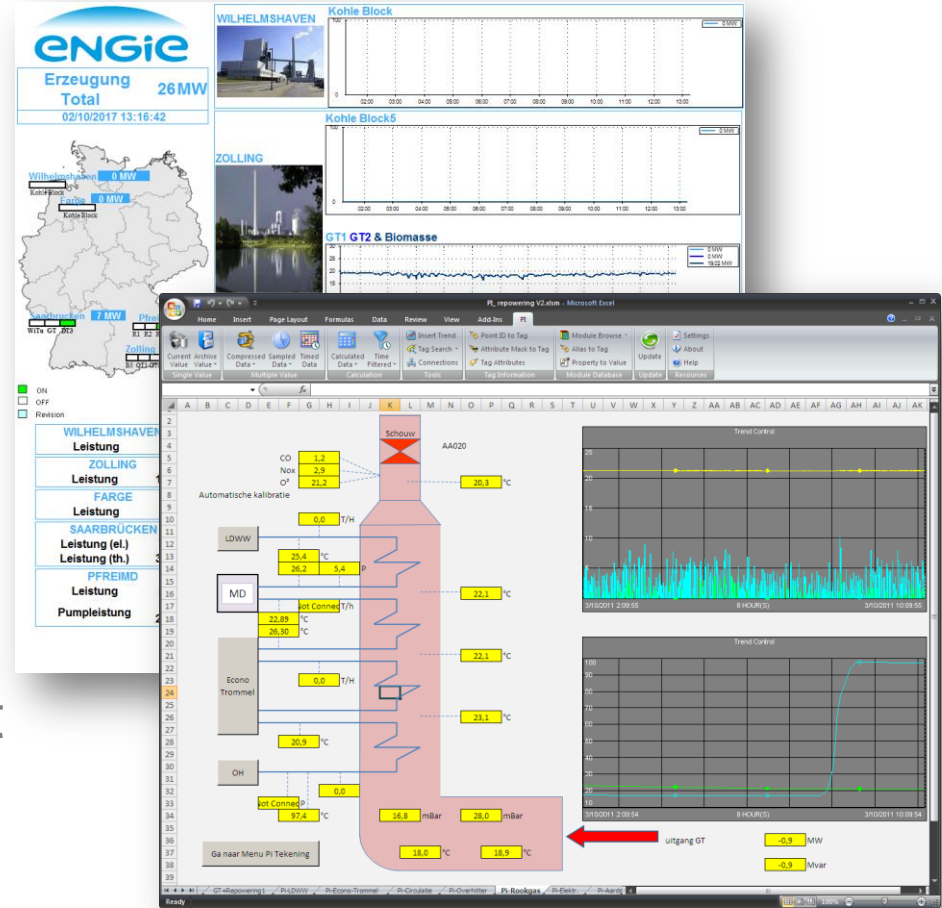
# The expansion (1/3)

- 2009-2011: PI System became default choice (e.g. new power plants)
- Replace legacy systems with PI System
- New countries, other Business Units



# The expansion (2/3)

- User adoption: high
- Users became more demanding as well:
  - Experiments
  - Improved availability
  - More functional support



# The expansion (3/3)

- Creation of PICC
  - Single mail & telephone
  - Monitoring with ACE notifications
  - 24/7 service
  - Robust backup system

**PI France - COFELY - Server Status**

**Status Server**

Sys **PI Sud - Interface Status**  
Pro

**STATUS** **Receiving Data** 2/10/2017 10:34:00

**PAM (Amercoeur)**

|  |                       |      |  |        |                          |
|--|-----------------------|------|--|--------|--------------------------|
|  | PAMSCADACEC36         | 4 ms |  | 61,00  | 2/10/2017 10:39:55,19501 |
|  | IP000030 - LVMS TV    | 5 ms |  | 29,63  | 2/10/2017 10:40:42       |
|  | IP000031 - LVMS TG    | 5 ms |  | 657,84 | 2/10/2017 10:40:40,95601 |
|  | OPC IP000102 (Eagle1) | 5 ms |  | 98,00  | 2/10/2017 10:40:01,47601 |

**PI**

**PSG (Sint-Ghislain)**

|  |                            |             |  |        |                          |
|--|----------------------------|-------------|--|--------|--------------------------|
|  | PSGSCADACEC36              | I/O Timeout |  | 189,00 | 2/10/2017 10:40:39,01901 |
|  | IP000029 - LVMS            | I/O Timeout |  | -56,91 | 2/10/2017 10:40:40,83    |
|  | OPC IP000127 (Eagle1)      | 5 ms        |  | 98,00  | 2/10/2017 10:40:31,181   |
|  | IP000167 - Indoor Tracking | 5 ms        |  | 0,00   | 21/08/2017 9:48:59,08757 |

**PAW (Les Awirs)**

|  |                           |      |  |        |                          |
|--|---------------------------|------|--|--------|--------------------------|
|  | SCADACEC46                | 1 ms |  | 892,00 | 2/10/2017 10:40:03,38301 |
|  | TP083306 - Terril Du Hena | 1 ms |  | 10,30  | 2/10/2017 10:30:10,09001 |
|  | OPC IP000104 (Eagle1)     | 2 ms |  | 91,00  | 2/10/2017 10:40:30,02901 |

# The standstill <sup>(1/2)</sup>

- 2012 – 2015: Economic reality
- Closing of plants
- IT cost saving  
→ no new investments
- Company reorganization



## The standstill (2/2)

- No new developments: no AF, no PI Coresight, ...
- But because of diversification of our services (multiple BU):
  - Core of team remained intact
  - No difference in service for users



# The relaunch (1/2)

- 2016 – 2017: New organisation, new management, new vision...
- ENGIE as a company: aiming for innovation
- Market: Big data, industry 4.0, cloud, ...





## The relaunch (2/2)

- Still cost savings, but in other areas (e.g. hosting of server infrastructure)
- “We do not need to invest in a new Big Data platform, because we already have one...”
- New PI System projects on Business Unit level: additional server, HA, PI Vision, ...



# Take away: 3 drivers for success

**1**

## **Users**

---

- Own their data – no black box
- Teach them and let them experiment

**2**

## **Management**

---

- Have a vision and use the momentum

**3**

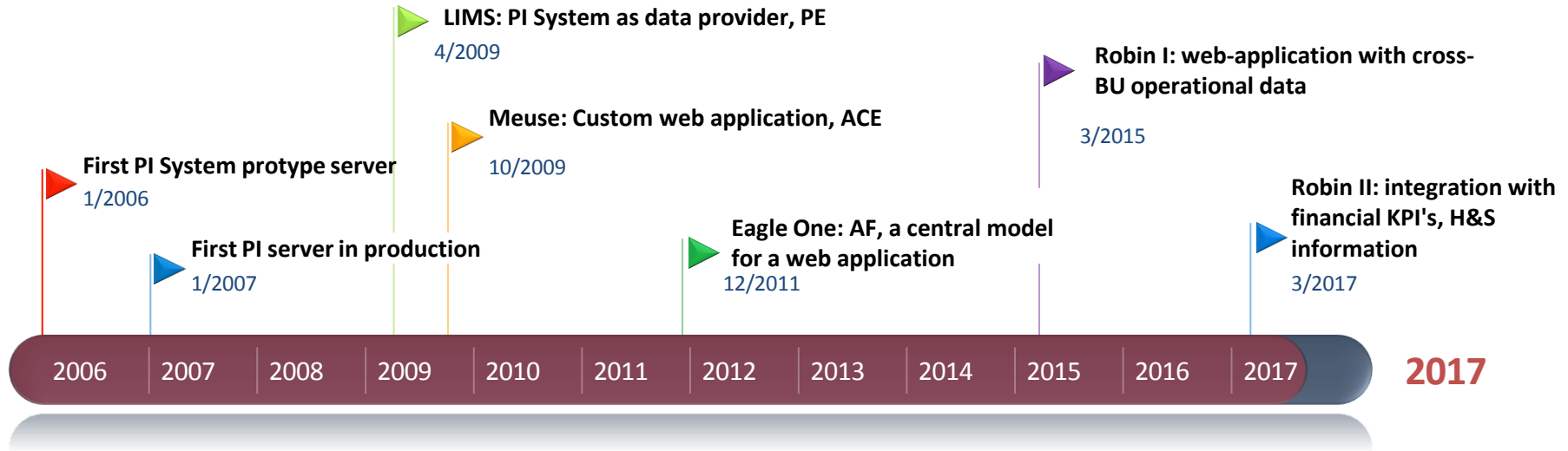
## **OT team**

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- Stay close to the users
- Keep the knowledge in-house

# Functional evolution of the PI System

# Functional evolution: from pure data archive to OT/IT integration



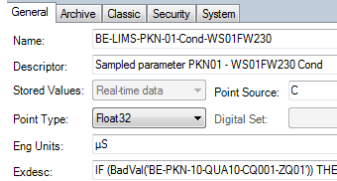
# LIMS: Integrating PI with domain applications



LIMS: Laboratory Information Management System

Monitoring of chemical parameters of water-steam circuits in the power plants.

Domain experts start to use PI System



## BUSINESS CHALLENGES

- Third party LIMS application
- Processing of manual measurements

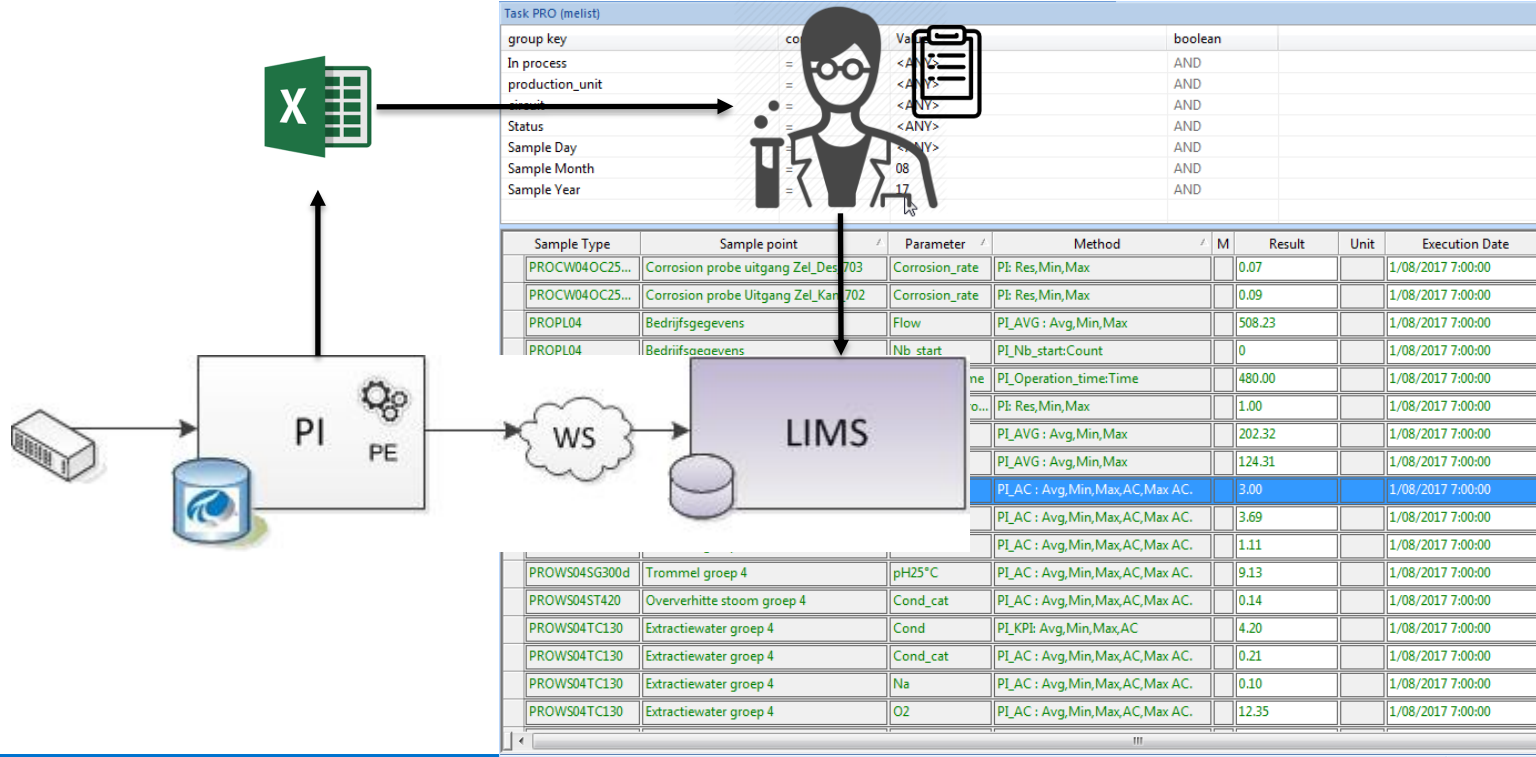
## SOLUTION

- Online chemical data available in PI System
- Custom build web service for PI System
- Business logic in PE

## RESULTS AND BENEFITS

- Manual samples verified by online data
- Continuous follow up

# LIMS: Integrating PI System with domain applications



# Meuse: PI System takes over legacy applications

Legacy applications are being replaced by PI System-based **web applications**

Use of **Analytics Engine** calculations to implement business logic



## BUSINESS CHALLENGES

- Environmental permit temperature limits & flow
- Multiple power plants along the river.

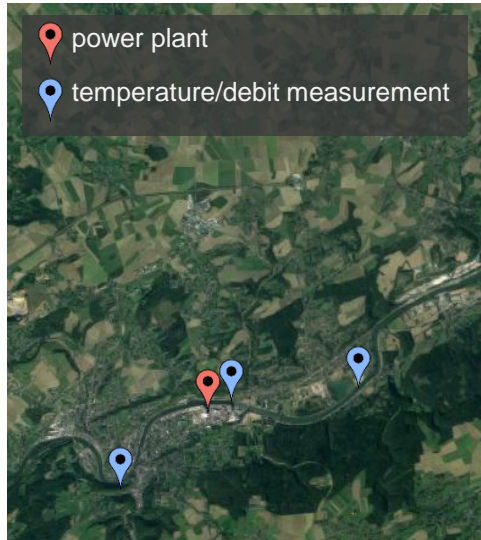
## SOLUTION

- RT data through GPRS
- Calculations in Analytics Engine
- Web Visualization
- Validation by user

## RESULTS AND BENEFITS

- Data available in PI System
- Easy rollout (browser)
- Stable, business critical application.

# Meuse: monitoring river temperature



Electrabel GDF SUEZ | Meuse | Rapport journalier: Valeurs validées

Meuse2ndWay 28/08/2017

[Valeurs brutes](#) | 
 [Valeurs validées](#) | 
 [Valeurs moyennes 3 heures](#) | 
 [Valeurs d'échauffement](#) | 
 [Bilan du jour](#) | 
 [Hebdomadaires](#) | 
 [Mensuels](#) | 
 [Annuels](#) | 
 [Manual Invalidation](#)

| ↓<br>Date Heure     | Huy               |   | Ampsîn            |   | Amay              |   | Seraing           |   | Angleur           |   | Meuse Débit         |   |               |
|---------------------|-------------------|---|-------------------|---|-------------------|---|-------------------|---|-------------------|---|---------------------|---|---------------|
|                     | Valeur Validée °C | ? | Valeur Validée °C | ? | Valeur Validée °C | ? | Valeur Validée °C | ? | Valeur Validée °C | ? | Valeur Validée m³/s | ? | Origine Débit |
| 0 28/08/2017 00:15  | 22,906            |   | 24,434            |   | 24,752            |   | 25,252            |   | 24,662            |   | 34,615              |   | A             |
| 1 28/08/2017 00:30  | 22,880            |   | 24,417            |   | 24,732            |   | 25,236            |   | 24,661            |   | 40,930              |   | A             |
| 2 28/08/2017 00:45  | 22,823            |   | 24,431            |   | 24,707            |   | 25,226            |   | 24,664            |   | 40,340              |   | A             |
| 3 28/08/2017 01:00  | 22,797            |   | 24,433            |   | 24,676            |   | 25,200            |   | 24,653            |   | 42,110              |   | A             |
| 4 28/08/2017 01:15  | 22,745            |   | 24,518            |   | 24,620            |   | 25,228            |   | 24,643            |   | 32,214              |   | A             |
| 5 28/08/2017 01:30  | 22,699            |   | 24,555            |   | 24,590            |   | 25,195            |   | 24,619            |   | 36,879              |   | A             |
| 6 28/08/2017 01:45  | 22,656            |   | 24,546            |   | 24,577            |   | 25,203            |   | 24,625            |   | 39,773              |   | A             |
| 7 28/08/2017 02:00  | 22,630            |   | 24,535            |   | 24,561            |   | 25,203            |   | 24,607            |   | 39,080              |   | A             |
| 8 28/08/2017 02:15  | 22,601            |   | 24,551            |   | 24,544            |   | 25,198            |   | 24,632            |   | 39,636              |   | A             |
| 9 28/08/2017 02:30  | 22,546            |   | 24,561            |   | 24,511            |   | 25,166            |   | 24,631            |   | 29,993              |   | A             |
| 10 28/08/2017 02:45 | 22,531            |   | 24,589            |   | 24,510            |   | 25,165            |   | 24,598            |   | 35,916              |   | A             |
| 11 28/08/2017 03:00 | 22,471            |   | 24,594            |   | 24,456            |   | 25,161            |   | 24,588            |   | 40,130              |   | A             |
| 12 28/08/2017 03:15 | 22,433            |   | 24,571            |   | 24,418            |   | 25,155            |   | 24,586            |   | 39,966              |   | A             |
| 13 28/08/2017 03:30 | 22,344            |   | 24,567            |   | 24,379            |   | 25,145            |   | 24,591            |   | 40,278              |   | A             |
| 14 28/08/2017 03:45 | 22,334            |   | 24,554            |   | 24,363            |   | 25,179            |   | 24,581            |   | 34,428              |   | A             |
| 15 28/08/2017 04:00 | 22,299            |   | 24,582            |   | 24,344            |   | 25,155            |   | 24,588            |   | 38,787              |   | A             |
| 16 28/08/2017 04:15 | 22,267            |   | 24,623            |   | 24,343            |   | 25,150            |   | 24,572            |   | 39,164              |   | A             |
| 17 28/08/2017 04:30 | 22,291            |   | 24,628            |   | 24,296            |   | 25,184            |   | 24,567            |   | 40,038              |   | A             |
| 18 28/08/2017 04:45 | 22,745            |   | 24,634            |   | 24,285            |   | 25,163            |   | 24,571            |   | 39,035              |   | A             |
| 19 28/08/2017 05:00 | 22,912            |   | 24,614            |   | 24,260            |   | 25,143            |   | 24,570            |   | 35,254              |   | A             |
| 20 28/08/2017 05:15 | 22,960            |   | 24,652            |   | 24,240            |   | 25,123            |   | 24,553            |   | 39,064              |   | A             |
| 21 28/08/2017 05:30 | 23,053            |   | 24,710            |   | 24,215            |   | 25,148            |   | 24,566            |   | 39,012              |   | A             |



# Eagle One: To a central CEMS modeled by AF

A model-centric view on power plant emissions

Visualization, calculations, alerting & configuration is managed from within a central AF model



## BUSINESS CHALLENGES

- EU regulations and aging required an update of the CEMS
- Local implementations in each plant
- Integration with PI System

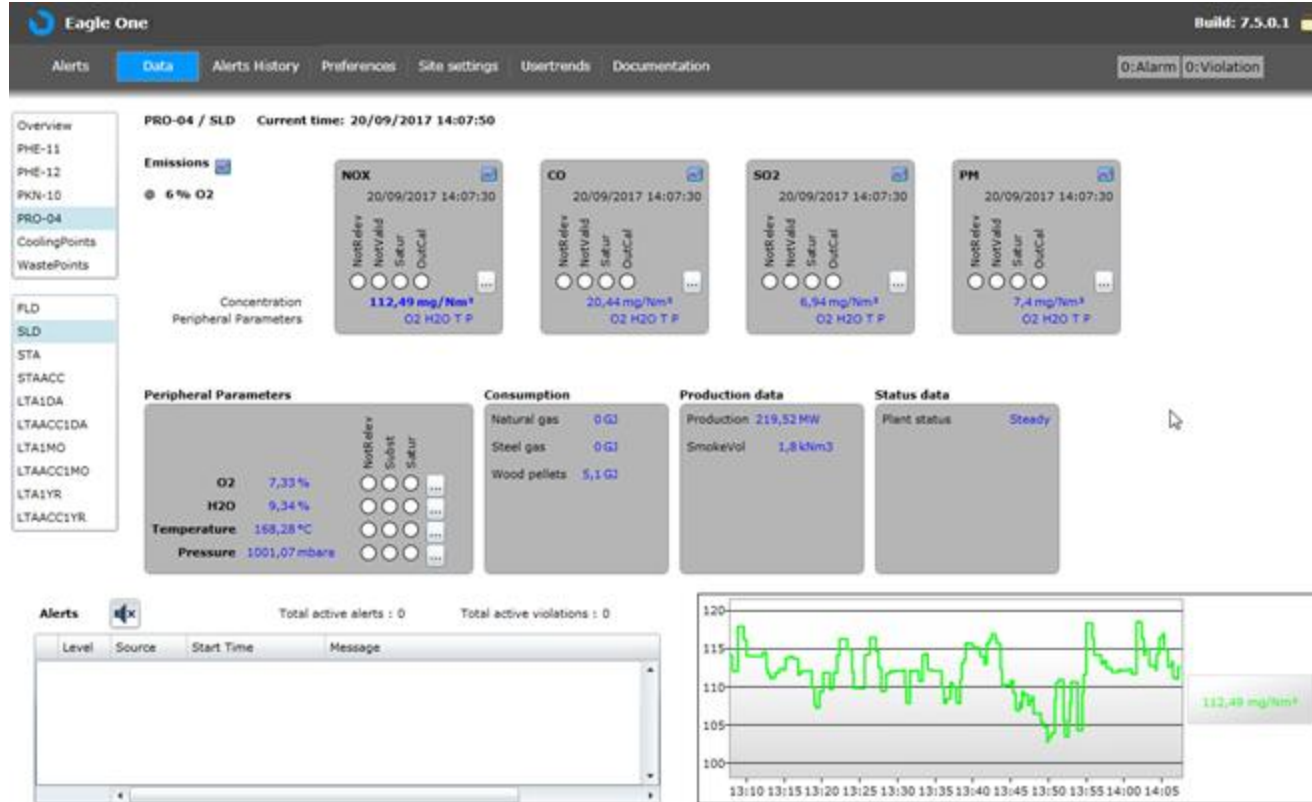
## SOLUTION

- Centralized web application
- Build on top of PI & AF
- AF provides the core model

## RESULTS AND BENEFITS

- Dynamic & standard dashboards based on AF model
- Standardized calculations
- Lower maintenance costs

# Eagle One: Centralized Emission Monitoring System



# Eagle One: AF Integrated Dynamic HMI

The image displays the Eagle One software interface. On the left, a tree view shows the project structure under 'Elements', including 'BE' and various site codes like PAA, PAM, PAW, etc. The main window shows a table of elements with columns for Name, Description, Type, and Template. A blue arrow points from the 'PAM' row in the table to the 'Site settings' tab in the configuration window.

| Name          | Description    | Type | Template |
|---------------|----------------|------|----------|
| Category: Air |                |      |          |
| PAA           | Aalst          | None | EIP1site |
| PAM           | Amercoeur      | None | EIP1site |
| PAW           | Awirs          | None | EIP1site |
| PBY           | Lanxess Bayer  | None | EIP1site |
| PDR           | Drogenbos      | None | EIP1site |
| PHE           | Herdersbrug    | None | EIP1site |
| PJE           | Solvay         | None | EIP1site |
| PKN           | Knippegroen    | None | EIP1site |
| PLR           | Lanxess Rubber | None | EIP1site |
| PRO           | Rodenhuize     | None | EIP1site |
| PSG           | Saint-Ghislain | None | EIP1site |
| PSK           | Schaarbeek     | None | EIP1site |
| PXX           | Testsite       | None | EIP1site |
| PYY           | Testsite       | None | EIP1site |
| PZB           | Zeebrugge      | None | EIP1site |
| PZN           | Zandvliet      | None | EIP1site |

The configuration window shows the 'Site settings' tab with a 'Selection screen' for 'Air (Max. 6)', 'Cooling water (Max. 10)', 'Waste Water (Max. 10)', and 'Site alerts'. Each section contains a list of elements with checkboxes for selection.

**Air (Max. 6)**

- PAM-01 - Amercoeur
- PAW-04 - Les Awirs
- PBY-01 - Lanxess Bayer
- PDR-21 - Drogenbos
- PDR-22 - Drogenbos
- PHE-11 - Herdersbrug
- PHE-12 - Herdersbrug
- PJE-04 - Solvay
- PJE-51 - Solvay
- PJE-52 - Solvay
- PKN-10 - Knippegroen
- PLR-01 - Lanxess Rubber
- PRO-04 - Rodenhuize
- PSG-02 - Saint-Ghislain
- PZB-01 - Zeebrugge
- PZN-10 - Zandvliet

**Cooling water (Max. 10)**

- PAW-00-IP01 - Les Awirs
- PAW-00-RP01 - Les Awirs
- PAW-00-TL - Les Awirs
- PDR-00-EV01 - Drogenbos
- PDR-00-IP01 - Drogenbos
- PDR-00-RP01 - Drogenbos
- PDR-00-TL - Drogenbos
- PKN-00-EV01 - Knippegroen
- PKN-00-IP01 - Knippegroen
- PKN-00-RP01 - Knippegroen
- PKN-00-TL - Knippegroen
- PRO-00-EV04 - Rodenhuize
- PRO-00-IP04 - Rodenhuize
- PRO-00-RP04 - Rodenhuize
- PRO-00-TL - Rodenhuize
- PSK-00-IP01 - Schaarbeek
- PSK-00-RP01 - Schaarbeek
- PZN-00-EV10 - Zandvliet
- PZN-00-IP10 - Zandvliet
- PZN-00-RP10 - Zandvliet

**Waste Water (Max. 10)**

- PAM-00-DP01 - Amercoeur
- PAM-00-DP02 - Amercoeur
- PAM-00-DP03 - Amercoeur
- PAM-00-RP01 - Amercoeur
- PAM-00-RP02 - Amercoeur
- PAW-00-DP01 - Les Awirs
- PDR-00-DP01 - Drogenbos
- PHE-00-DP01 - Herdersbrug
- PKN-00-DP01 - Knippegroen
- PLR-00-DP01 - Lanxess Rubber
- PRO-00-DP01 - Rodenhuize
- PSG-00-DP01 - Saint-Ghislain
- PSK-00-DP01 - Schaarbeek
- PZN-00-DP01 - Zandvliet

**Site alerts**

- PAM - Amercoeur
- PAW - Les Awirs
- PBY - Lanxess Bayer
- PDR - Drogenbos
- PHE - Herdersbrug
- PJE - Solvay
- PKN - Knippegroen
- PLR - Lanxess Rubber
- PRO - Rodenhuize
- PSG - Saint-Ghislain
- PSK - Schaarbeek
- PZB - Zeebrugge
- PZN - Zandvliet

# Eagle One: AF Integrated Dynamic HMI


Category: Peripherals

- T
- P
- O2
- H2O


Category: Pollutants

- SO2
- PM
- NOX
- CO

PRO-04 / SLD    Current time: 06/09/2017 13:45:41

Emissions   
@ 6% O2


Concentration  
Peripheral Parameters

**NOX** 

06/09/2017 13:45:20

NotRelev  
NotValid  
Satur  
OutCal


138,44 mg/Nm<sup>3</sup>  
O2 H2O T P

**CO** 

06/09/2017 13:45:30

NotRelev  
NotValid  
Satur  
OutCal


20,61 mg/Nm<sup>3</sup>  
O2 H2O T P

**SO2** 

06/09/2017 13:45:20

NotRelev  
NotValid  
Satur  
OutCal


4,69 mg/Nm<sup>3</sup>  
O2 H2O T P

**PM** 

06/09/2017 13:45:20

NotRelev  
NotValid  
Satur  
OutCal

11,29 mg/Nm<sup>3</sup>  
O2 H2O T P



# Eagle One: plant specific configurations

| Category: DataStream |             |  |
|----------------------|-------------|--|
| CO                   |             |  |
| CO-A                 |             |  |
| Acq                  |             |  |
| Input1               | 2,197265625 |  |
| Cal                  |             |  |
| Input1               | 0           |  |
| Fail                 |             |  |
| Input1               | 0           |  |
| Input2               | 0           |  |
| H2O                  |             |  |
| NOX                  |             |  |
| NO-A                 |             |  |
| Acq                  |             |  |
| Input1               | 29,4140625  |  |
| Cal                  |             |  |
| Input1               | 0           |  |
| Fail                 |             |  |
| Input1               | 0           |  |

**Eagle One**

Alerts **Data** Alerts History Preferences Site settings Usertrends Documentation

PRO-04 / FLD Current time: 06/09/2017 13:27:22

**Emissions**

**NOX**

NO-A 28,24 mg/m<sup>3</sup>

Fail Fail Cal

**CO**

CO-A 0,49 mg/m<sup>3</sup>

Fail Fail Cal

**Peripheral Parameters**

O2-A 6,32%

H2O-A 9,56%

T-A 170,2 °C

P-A 1000,98 mbara

Fail Fail Cal

**Production data**

BRUTO VERMOGEN 219,52 MW

D1 HOOFDSCHAKELAAR 1

UNABATED FLAG 0

UNABATED UURTELLER 51 h

F NH3 INLAAT VERDAMPER A 0,041/h

F NH3 INLAAT VERDAMPER B 0,041/h

**Debits**

NG

NG DEBIET G

SG

MAX GREEN:

WP

MAX GREEN:

MAX GREEN:

MAX GREEN:

# Eagle One: AF based calculations

|                      |  |                   |                    |
|----------------------|--|-------------------|--------------------|
|                      |  | TemperatureFactor | 170,04716491699219 |
| Category: DataStream |  |                   |                    |
|                      |  | acqVal            | 29,84375           |
|                      |  | FLCValue          | 48,76469           |
|                      |  | FLNValue          | 93,66466           |
|                      |  | FLPValue          | 29,84375           |
|                      |  | OffFLNValue       | 95,71244           |
|                      |  | OffSLDValue       | 146,63145883178711 |
|                      |  | SLDValue          | 143,49425543212891 |

PECalculationConfig

PIServer: EagleOne.gdfsuez.net EagleOne.gdfsuez.net

Output.Tag: %..\\..\\..\\Element%-%.\\..\\..\\ BE-PRO-04-ENV-EP-FLN-NO-A

Performance Equation

PEPIServer: EagleOne.gdfsuez.net EagleOne.gdfsuez.net

Expression: (%@nomFactor%)\*(%@homogFactor%)\*(%@FLCValue%)

Substitute

Evaluate

Result: 91.6167561680607 6/09/2017 13:23:31

Use this expression always in a substitution

Priority: 2

OK Cancel

Version: 1.4.5466

# Eagle One: AF for

# Applications

**Data Reference**

Data server: eagleone.gdfsuez.net

Tag name: BE-PRO-Q4-CG002-28-XC002

Attribute:  Attribute  Measure

Source Units: <None>

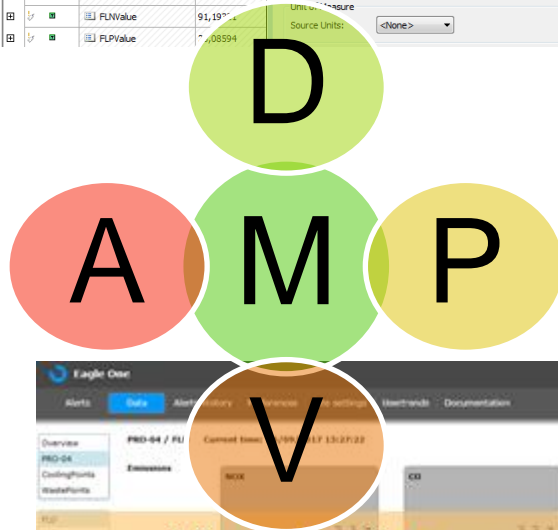
| Category          | Parameter | Value      |
|-------------------|-----------|------------|
| DataCalibration   | caMax     | 202        |
|                   | caMin     | 0          |
|                   | caOffset  | 0          |
|                   | caSlope   | 1.634      |
| DataNormalisation | meadMax   | 160        |
|                   | meadMin   | 0          |
| DataStream        | ecoVal    | 28,0859375 |
|                   | FLCValue  | 45,89242   |
|                   | FLNValue  | 91,19784   |
|                   | FLPValue  | 1,08594    |
|                   | FLRValue  | 1,08594    |

## Selection screen

Air (Max. 6)

- PAM-01 - Amercoeur
- PAW-04 - Les Awirs
- PBY-01 - Lanxess Bayer
- PDR-21 - Drogenbos
- PDR-22 - Drogenbos
- PHE-11 - Herdersbrug
- PHE-12 - Herdersbrug
- PJE-S1 - Solvay
- PJE-S2 - Solvay
- PKN-10 - Knippegroen
- PLR-01 - Lanxess Rubber
- PRO-04 - Rodenhuize
- PSG-02 - Saint-Ghislain
- PZB-01 - Zeebrugge
- PZN-10 - Zandvliet

## Administration



## Visualization

**Eagle One**

PRO-04 / FLI

Connected time: 13:27:22

Overview

PRO-04

CoolingPoints

HeatPoints

Process Data

Peripheral Parameters

Production data

Details

| Parameter               | Value        | Unit |
|-------------------------|--------------|------|
| OP-A                    | 4.22%        |      |
| OP-B                    | 8.95%        |      |
| F-A                     | 175.7°C      |      |
| F-A                     | 160.36 m/min |      |
| BRUTO VERBODEN          | 229.32 MW    |      |
| DE HOOGSCHAKELBAAR      |              |      |
| UNBANKED FLAG           |              |      |
| UNBANKED LUKTELLE       | 5.5%         |      |
| F IN3 INLAAT VERSCHEP A | 0.040%       |      |
| F IN3 INLAAT VERSCHEP B | 0.041%       |      |

**PE Calculation Config**

PI Server: EagleOne.gdfsuez.net

Output Tag: %ELEMENT% BE-PRO-04-ENV-EP-FLN-N0-A

Performance Equation

PEPI Server: EagleOne.gdfsuez.net

Expression:  $(\%{\text{HomFactor}}\%)\%{\text{HomogFactor}}\%(\%{\text{FLCValue}}\%)$

Substitute

Evaluate

Result: 91.6167561680607

6/09/2017 13:23:31

Priority: 2

OK Cancel

Version: 1.4.5466

## Processing

# Robin: Consolidation and vertical integration of PI into all levels of the organisation.

Real Time Online Business Information Network

AF unifies all European operational data of local PI servers.

## BUSINESS CHALLENGES

- A new organisation brought the power plants in several locations together.
- There was a demand for digital initiatives from the management.

## SOLUTION

- Central web application
- Access not restricted to company network
- Mobile ready
- Build on top of PI Server & AF

## RESULTS AND BENEFITS

- Visualize anything
- Unified the BU
- Intended for topex initially, now hundreds of users across the organisation.



# Robin: Demo

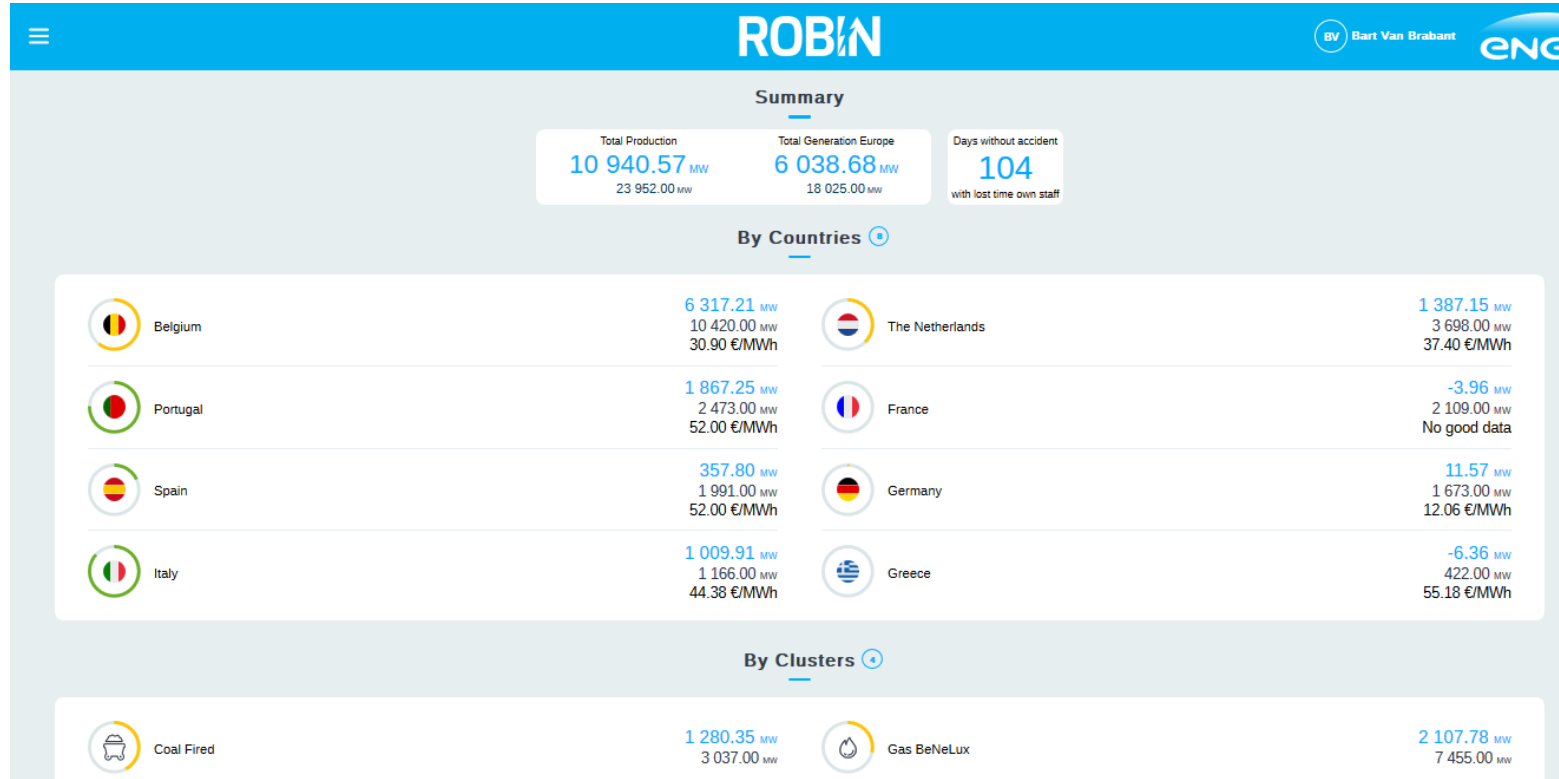


LIVE DEMO 😊

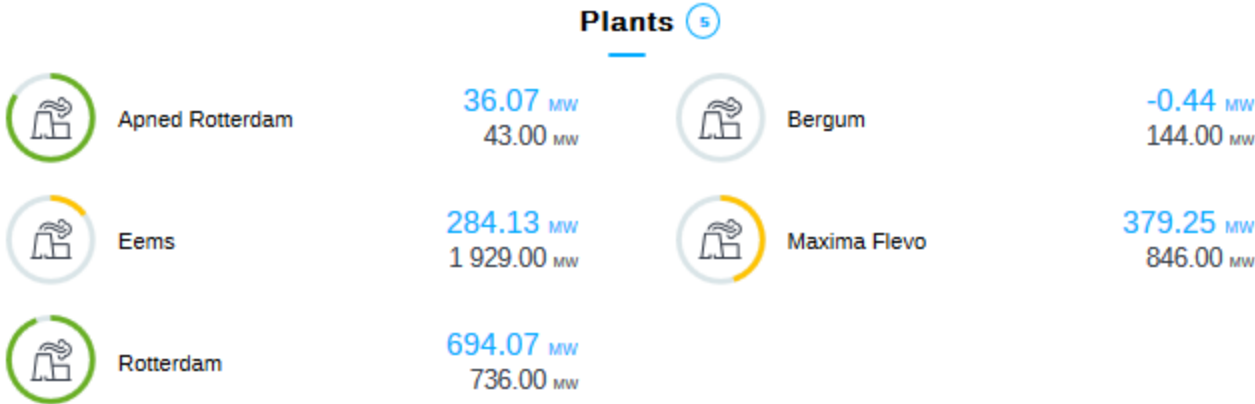


BACKUP SLIDES ☹️

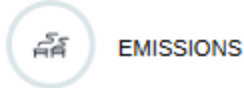
# Robin: Main view



# Robin: Plant view



# Robin: Equipment group view



EMISSIONS



GRID



PERFORMANCE



TURBINES

## Equipment Groups 8



FUEL



LIMS



STEAMCYCLE



WATERCYCLE

# Robin: Graphical elements kept simple

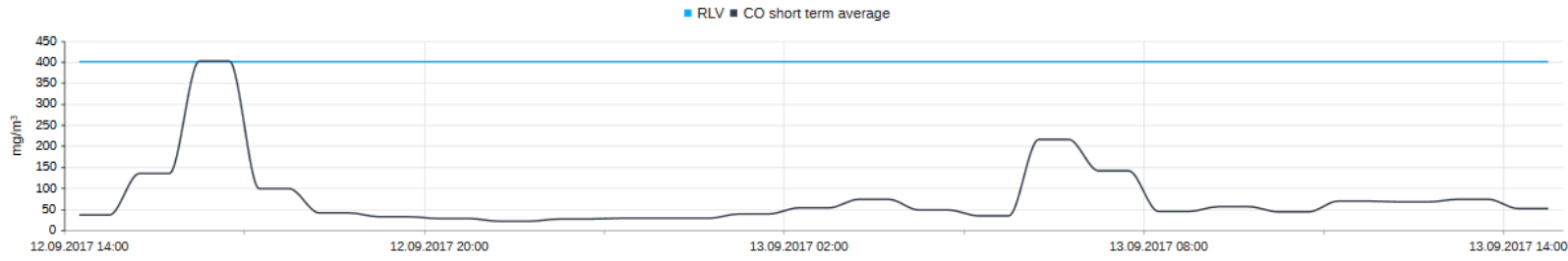
## EMISSIONS

### KPIs

CO STA      51.71 mg/m<sup>3</sup>      NOX STA      99.35 mg/m<sup>3</sup>

### CO evolution

^ HIDE



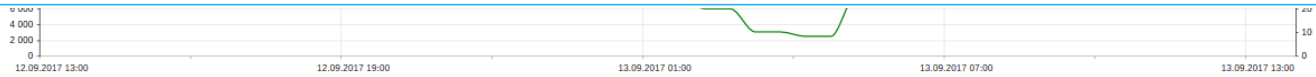
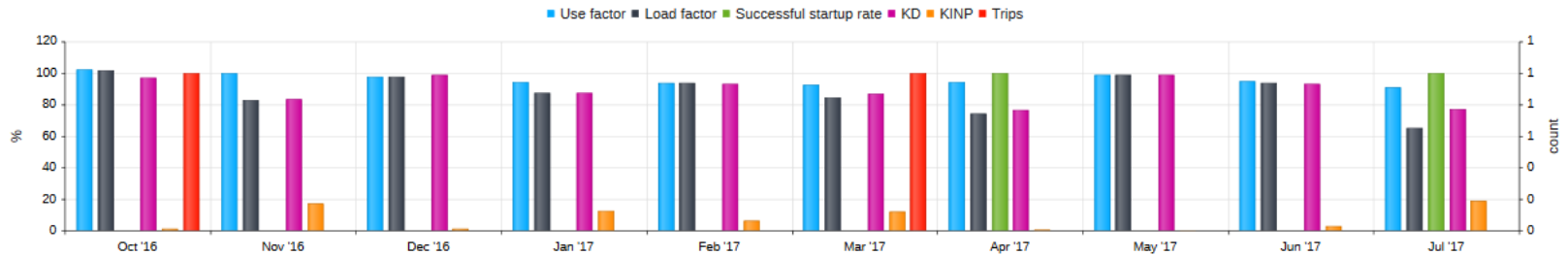
# Robin: Content is not limited to process data

Navigation bar with menu icon, **ROBIN** logo, user profile (BV Bart Van Brabant), and ENGI logo. Includes a **< BACK** button and breadcrumb text: HOME / THE NETHERLANDS. Utility icons for mail, home, and search are also present.

The Netherlands 1 393.08 kw  
3 698.00 ...

Navigation bar with **< BACK** button, breadcrumb text: HOME / BELGIUM / RODENHUIZE / RODENHUIZE 4, and home/favorites icons.

## Efficiency and availability KPI



# Robin: Interface is shaped dynamically based on AF

Diagram illustrating the dynamic shaping of the Robin interface based on the Active Function (AF). The interface displays a list of components (TURBINES) and a detailed view of a specific component (ST). The configuration table below shows the properties of the visualization, including the data type, display title, units, format string, order, precision, tag name, and value.

| Property     | Value                   |
|--------------|-------------------------|
| dataType     | Double                  |
| displayTitle | SP Open %               |
| engunits     | %                       |
| formatString | [value][engunits]       |
| order        | 8                       |
| piserver     | piatlas.myengie.com     |
| precision    | 2                       |
| tagname      | BE-PRO-A4-TTDU100B-XR37 |
| value        | 77,682807922363281      |

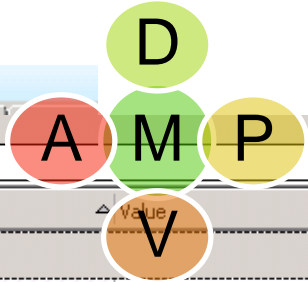
  

| KPI                  | Value     |
|----------------------|-----------|
| Expansion bearing 1  | 30.36 mm  |
| SP Open %            | 78.08 %   |
| Steam temperature p4 | 286.94 °C |
| Steam temperature p6 | 444.00 °C |

# Robin: A generic model allows for visualizing anything

The screenshot displays the Robin software interface, which is a hierarchical tree structure of elements. The tree is organized into levels: Elements, CalculationEngine, Cluster, Country, Europe, BE, data, DE, ES, FR, GR, IT, MW, Mwbar, NL, PT, Plant, Root, and Element Searches. The data table shows various parameters like mobileUUID, needSnapshot, precision, samplingfrequency, samplingperiod, trendtype, description, engunits, name, and span with their corresponding values.

| Category         | Name              | Value             |
|------------------|-------------------|-------------------|
| Category: <None> | mobileUUID        | 6                 |
| Category: <None> | needSnapshot      | 1                 |
| Category: <None> | precision         | 2                 |
| Category: <None> | samplingfrequency | h                 |
| Category: <None> | samplingperiod    | 24h               |
| Category: <None> | trendtype         | line              |
| Category: config | description       | Spotprice per MWh |
| Category: config | engunits          | €/MWh             |
| Category: config | name              | Spotprice per MWh |
| Category: config | span              | 200               |





# Robin: AF configuration examples

The screenshot displays the Robin AF configuration interface, showing a hierarchical tree of elements on the left and a detailed view of the NL element on the right.

**Elements Panel (Left):**

- Elements
  - CalculationEngine
  - Cluster
  - Country
    - Layers
      - Europe
        - BE
        - DE
        - ES
        - FR
        - GR
        - IT
        - MW
          - NL
            - APNED
            - BERGU
            - EEMS\_
            - FLEVO
            - MARKET

NL

General Child Elements Attributes Po

Filter

| Name                         | Description |
|------------------------------|-------------|
| Template: Node_Market        |             |
| Template: Node_Site          |             |
| ROTTE                        | power plant |
| FLEVO                        | power plant |
| EEMS_                        | power plant |
| BERGU                        | power plant |
| APNED                        | power plant |
| Template: NodeProperty_Refer |             |

Elements

- CARTA
- CASTE
- COO\_
- DOEL\_
- DROGE
- DUNKE
- EEMS\_
- FARGE
- FLEVO
- FSUR2
- FSUR3
- HBRUG
- LEINI
- MONTO
- PEGO1
- PEGO2
- RODEN
- 4
  - AVAIL
  - data
  - EMISSIONS
  - FUEL
  - GRID
  - LIMS
  - MW
  - MWtrend
  - PERFORMANCE
  - PERFORMDATA
  - STEAMCYCLE
  - TURBINES
  - WATERCYCLE

4

General Child Elements Attributes Ports

Filter

| Name                           |
|--------------------------------|
| Template: dataTemplate         |
| Template: Node_EqGroup         |
| EMISSIONS                      |
| FUEL                           |
| GRID                           |
| LIMS                           |
| PERFORMANCE                    |
| STEAMCYCLE                     |
| TURBINES                       |
| WATERCYCLE                     |
| Template: snapShotAVAIL        |
| Template: snapShotReferencedMW |
| Template: trend                |
| Template: trendKPI             |

# Functional evolution of PI: Concluding thoughts

- From **pure historian over integration platform to big data platform**
  - **Analytics** e.g. for predictive maintenance, DIY reporting
- **Web-based** interfaces
  - Future use of **PI vision**
- Principle of **AF-modelled dynamic applications.**
  - **integration** of other applications

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## Questions

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



State your **name & company**

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감사합니다

Danke

谢谢

Merci

Gracias

**Thank You**

ありがとう

Спасибо

Obrigado

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