Put a stop to energy loss

Energy Monitoring Solutions

Wes Allen – Endress + Hauser

Endress+Hauser
People for Process Automation

Why an energy monitoring solution

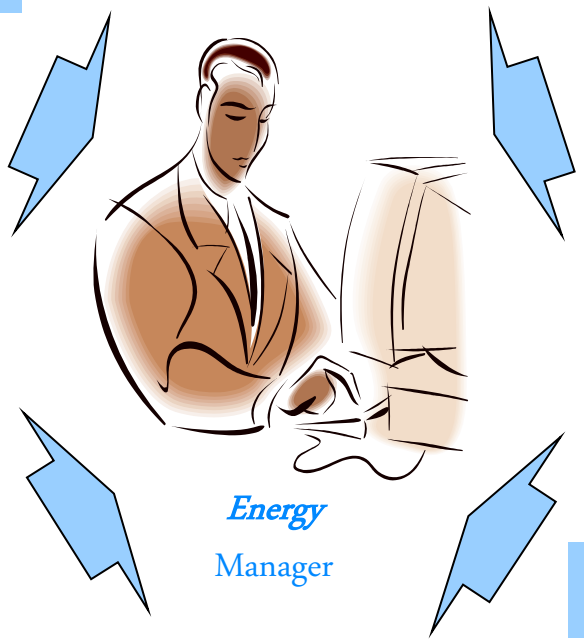
Environmental

Climate change

Global warming

Freak flooding

Extreme weather.



Financial

Increasing fuel prices year on year

Reduce manufacturing costs

Regulations

CCL

CCA

EUETS

CRC

Public perception

Show 'green' credentials.

Carbon Trust Standard

EN BS 16001

Make a business case for energy monitoring

"If you can measure that of which you speak, and can express it by a number, you know something of your subject; but if you cannot measure it, your knowledge is meager and unsatisfactory"
LORD KELVIN

If You Don't Measure it - You can't Control it!

Meters don't save energy or money!

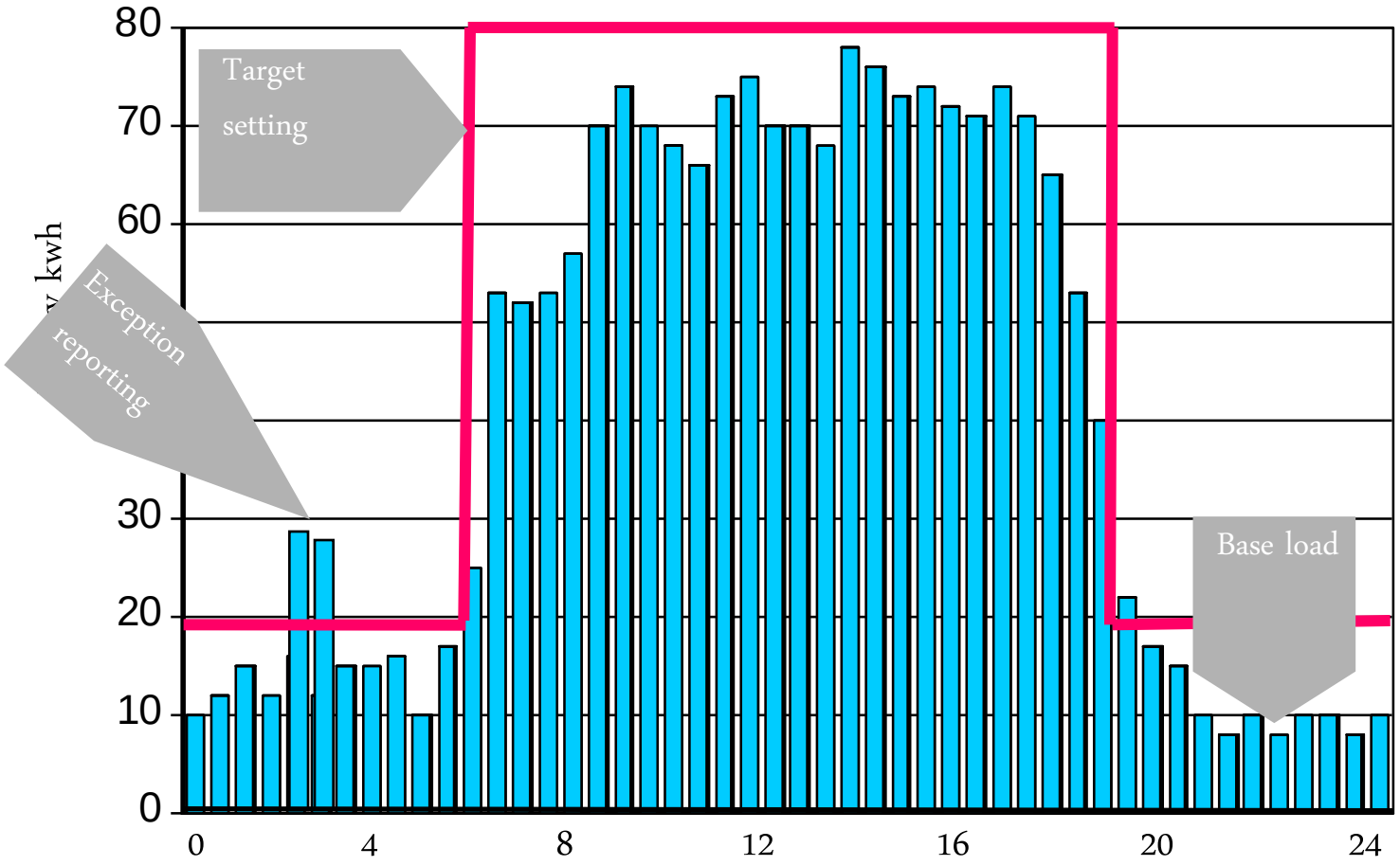
They just provide data!

It's what's done with the data that's key!

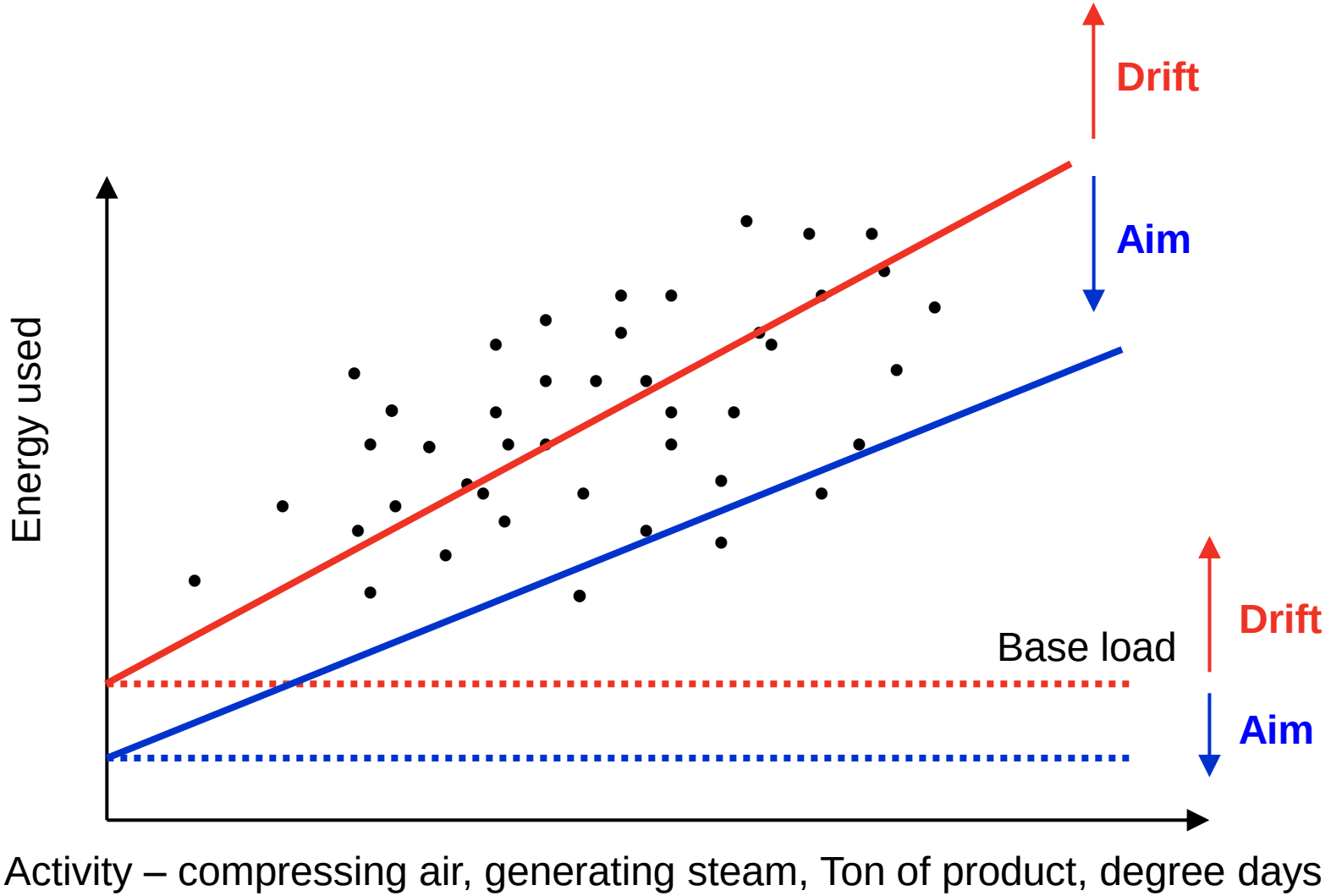
Data analysis, reporting & management is the key

- Data is not knowledge, knowledge is information learned from patterns in data – EMIS Handbook, CIPEC
- "We are drowning in information but starved for knowledge." – John Naisbitt author Megatrends
- "We have for the first time an economy based on a key resource [Information] that is not only renewable, but self-generating. Running out of it is not a problem, but drowning in it is." – John Naisbitt author Megatrends
- "Computer Technology is to the information age what mechanization was to the industrial revolution" – John Naisbitt author Megatrends

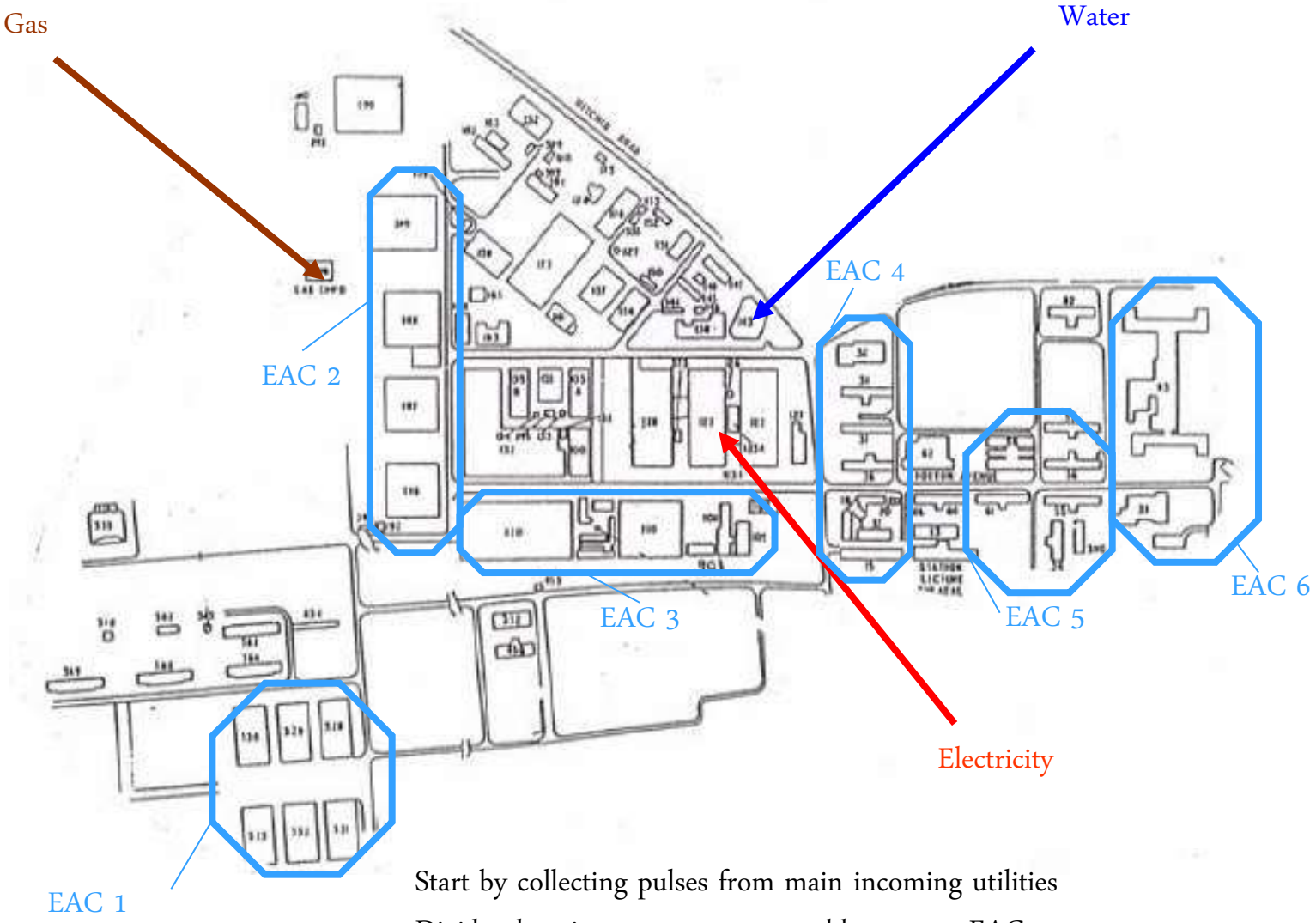
Simple energy profile analysis



More powerful analysis tools determine relationships



Energy monitoring approach



Start by collecting pulses from main incoming utilities

Divide plant in to energy accountable centres, EAC

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Components of ***an energy monitoring*** system

Utility metering

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Wide range of utility meters available

Thermal mass

DP (Differential Pressure)

Vortex

Ultrasonic

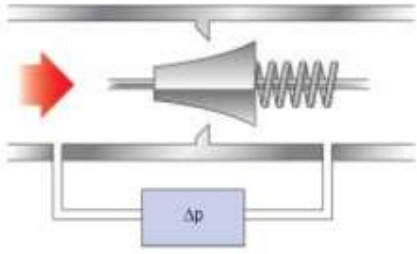
Magnetic

Coriolis

Electricity meters

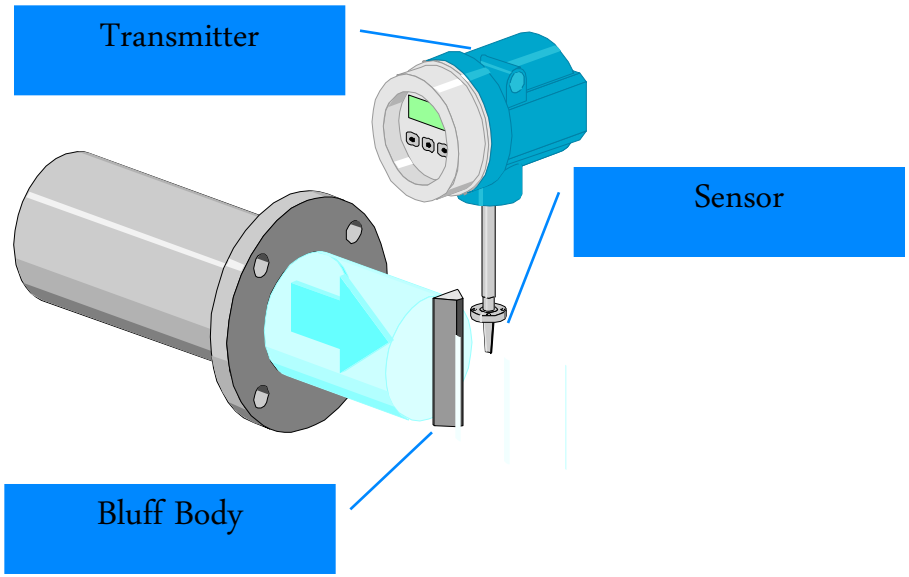
Turbine

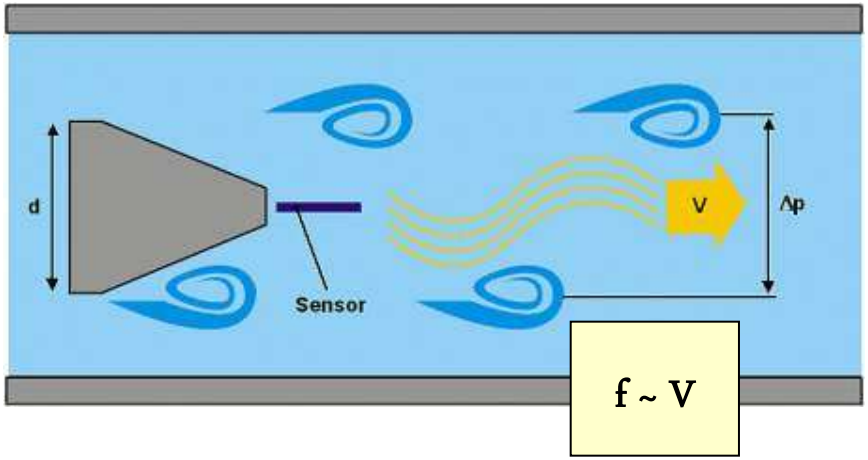
PD (Positive Displacement)



Spring loaded VA meter

Some technologies are developed for specific utilities





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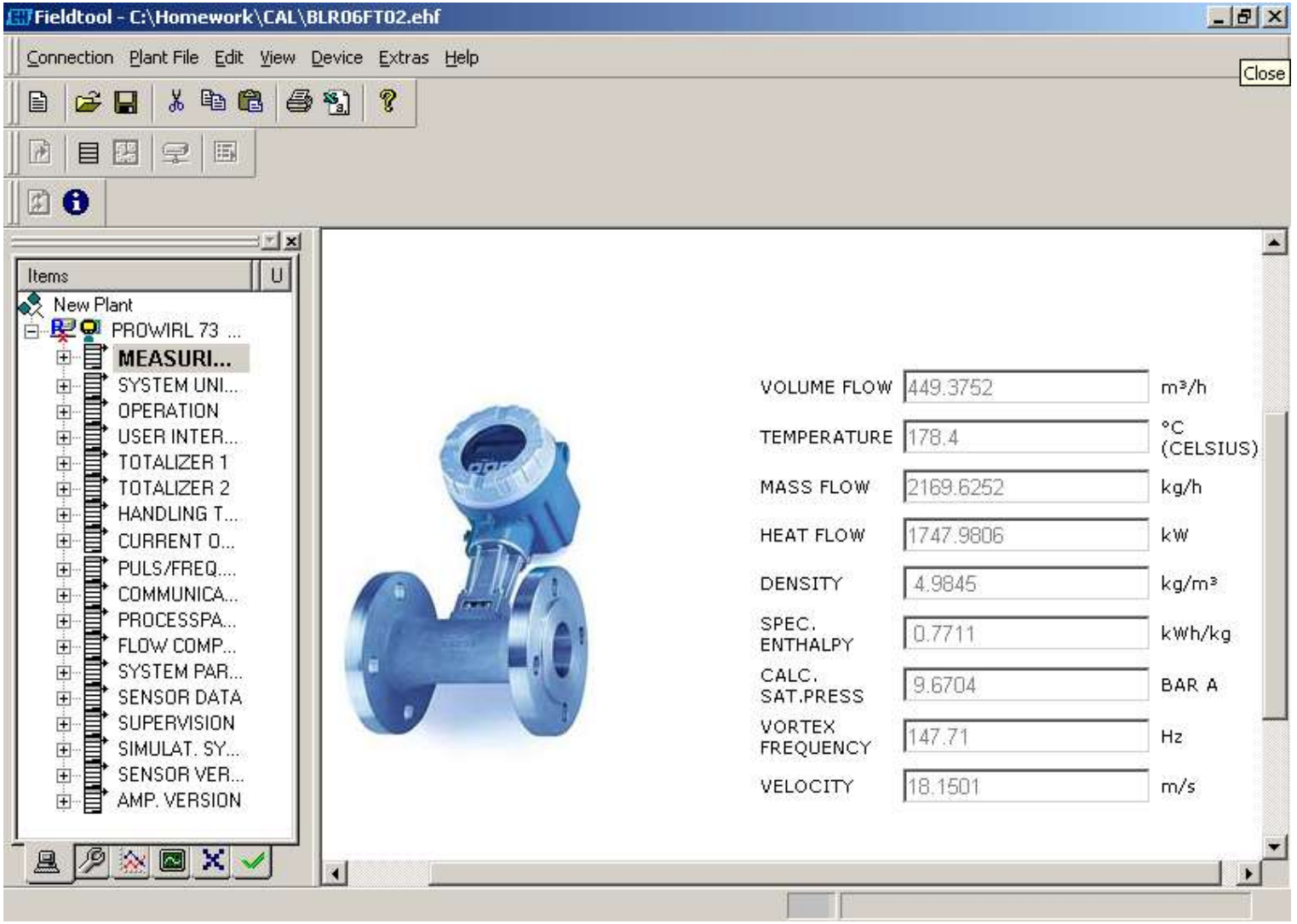
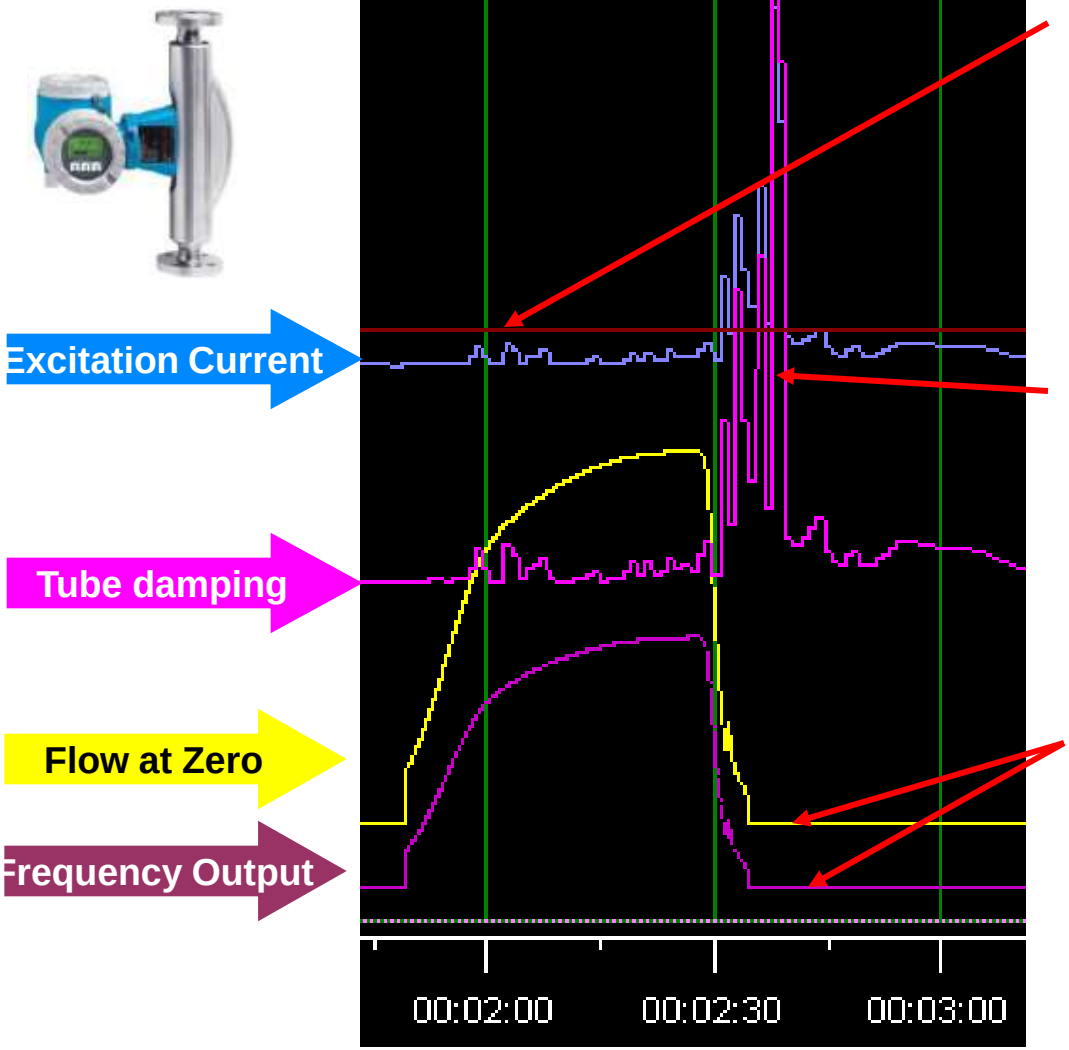
Multi-variable Profibus meters



Software tools to visualize diagnostic data

Promass 83 during out-gassing



- At normal flow – excitation current and tube damping are lower
- During upset conditions at valve closure, the values escalate by a factor of 4 times in this example
- The flow reported on the display and output stays stable during this period

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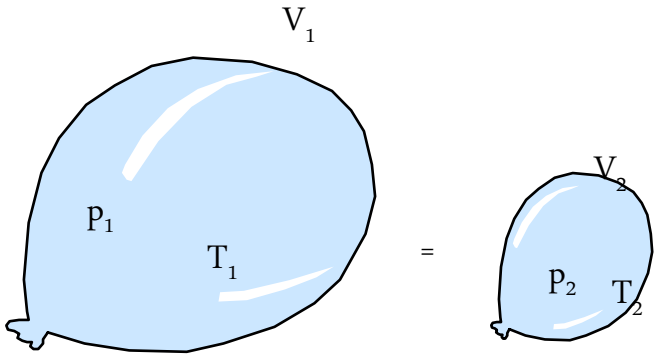
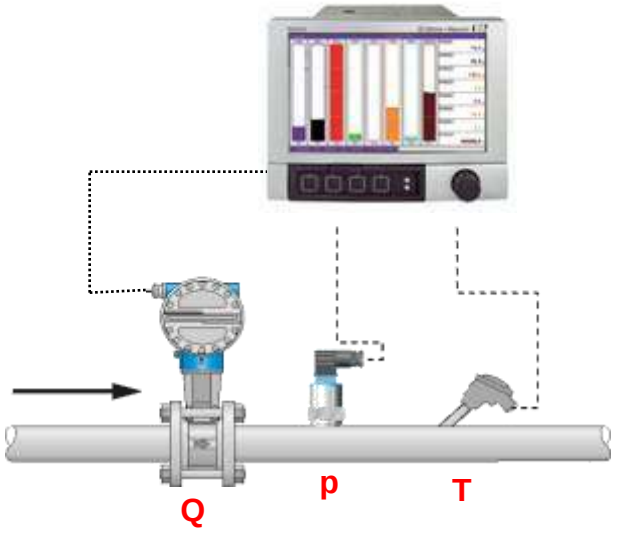
National Grid gas meter with Volume corrector

Why use corrected volume?



$$\frac{p_1 \cdot V_1}{T_1} = \frac{p_2 \cdot V_2}{T_2}$$



Normal volume, Nm^3/h (Q_{ref})

is volume at p_{ref} = 1.013 Bara
and T_{ref} = 273 K or 0°C

Standard volume, Scfm (Q_{ref})

is volume at p_{ref} = 1.013 Bara
and T_{ref} = 288 K or 15°C

$$Q_{ref} = Q \cdot \frac{p}{p_{ref}} \cdot \frac{T_{ref}}{T} \cdot \frac{Z_{ref}}{Z}$$

If P is measured in Barg

Then Barometric Pressure must be known

Barometric Pressure could be 0.925 to 1.053Bara

Even if Flow computers are used

The change in Density, Mass & Energy due

To Barometric Pressure could be +/-6%

Interval data collection

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Types of Data Collection - Examples

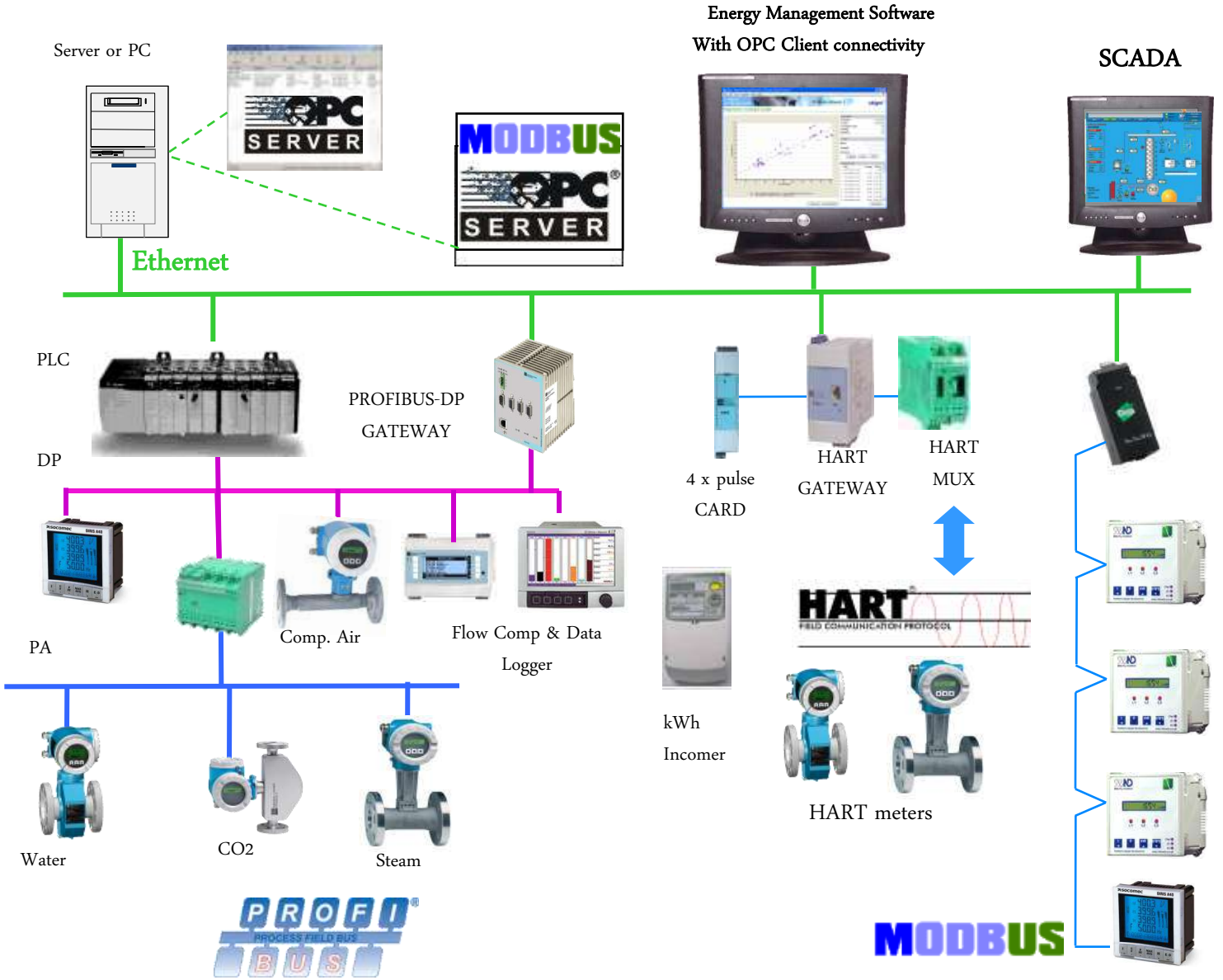
Manual reading of meters

Semi-automatic
collection using
Data logger & USB stick

Automatic data collection
using a Profibus Gateway

Automatic data collection
Using SCADA

Incorporating legacy devices on to network



Gateways provide remote data access and maintenance

- Open data format
- Local time stamp

- Configuration tool
- Diagnostics tool

Remote monitoring

- Primary variable
- 2nd, 3rd, 4th variable
- Measurement integrity status
- e-mailed interval data
- e-mailed fault notification

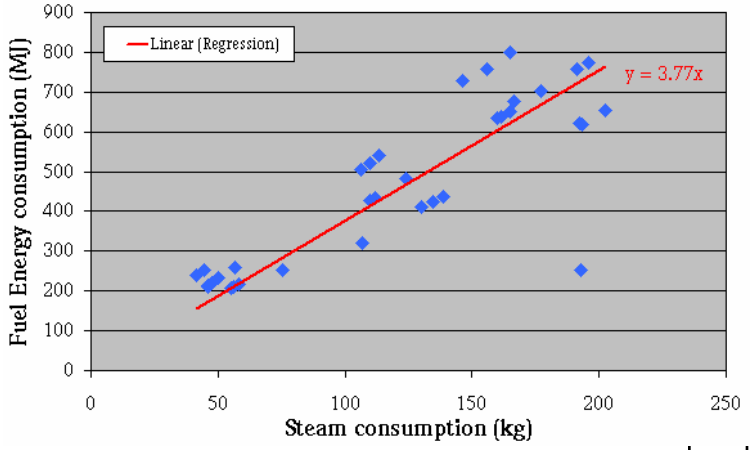
- Ethernet connectivity
- Profibus communication

Remote maintenance

- Remote configuration
- Remote analysis
- Fast response time
- Reduced downtime
- Mobilise only if necessary
- Reduced carbon footprint

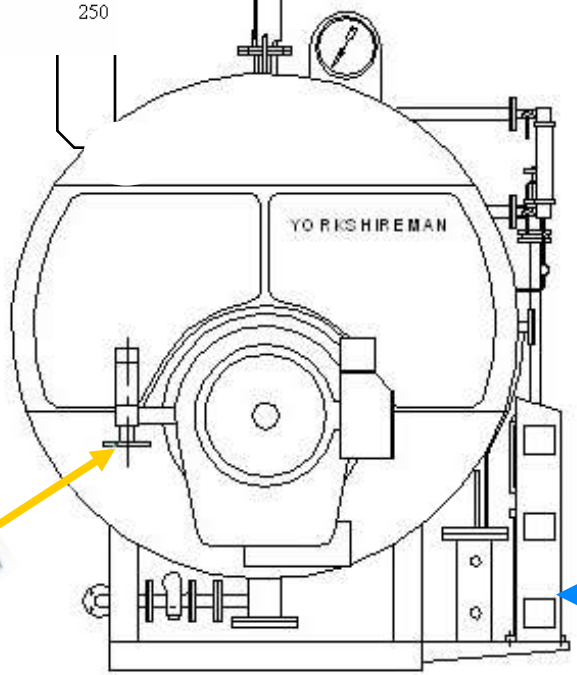
PROFIBUS PROCESS FIELD BUS

Simple boiler performance monitoring solution



MASS
ENTHALPY

Steam



Make-up
water

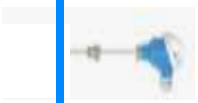
Condensate
return

ENERGY

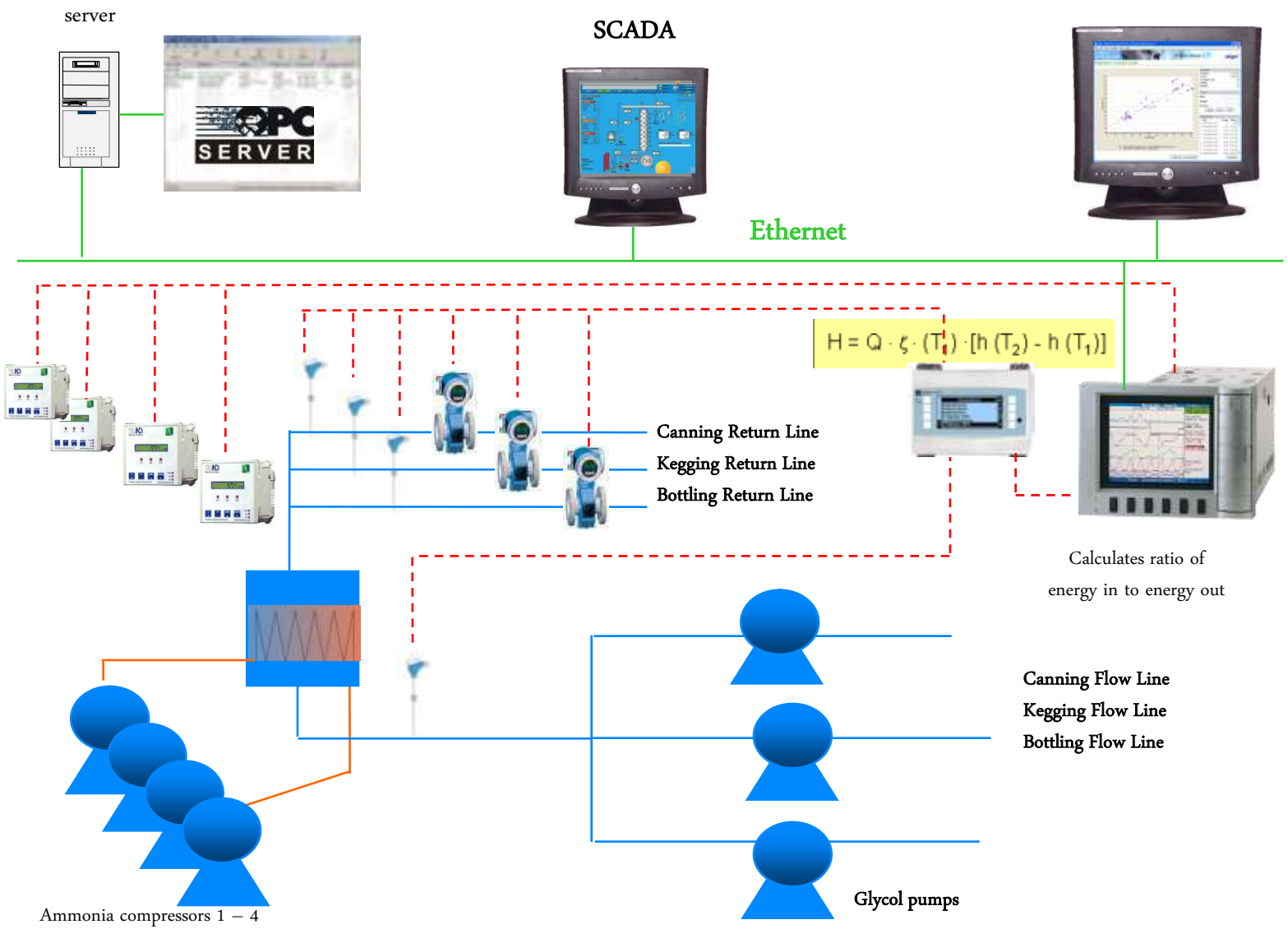
Nat gas

Feed
water

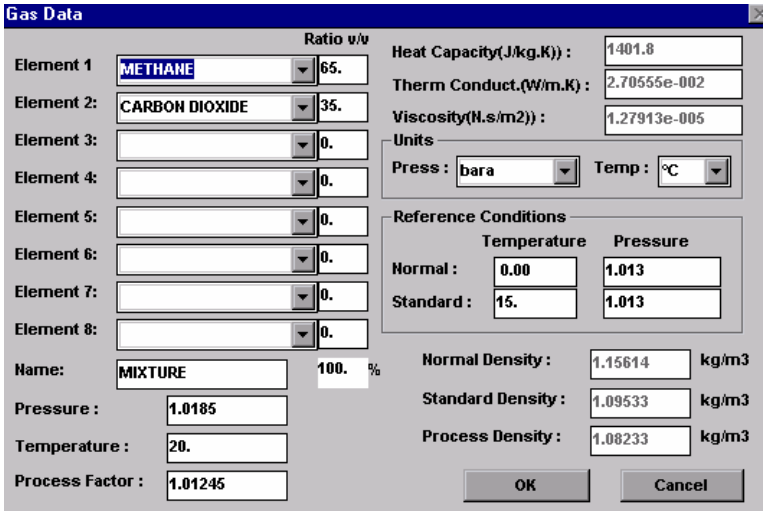
TEMPERATURE
ENTHALPY

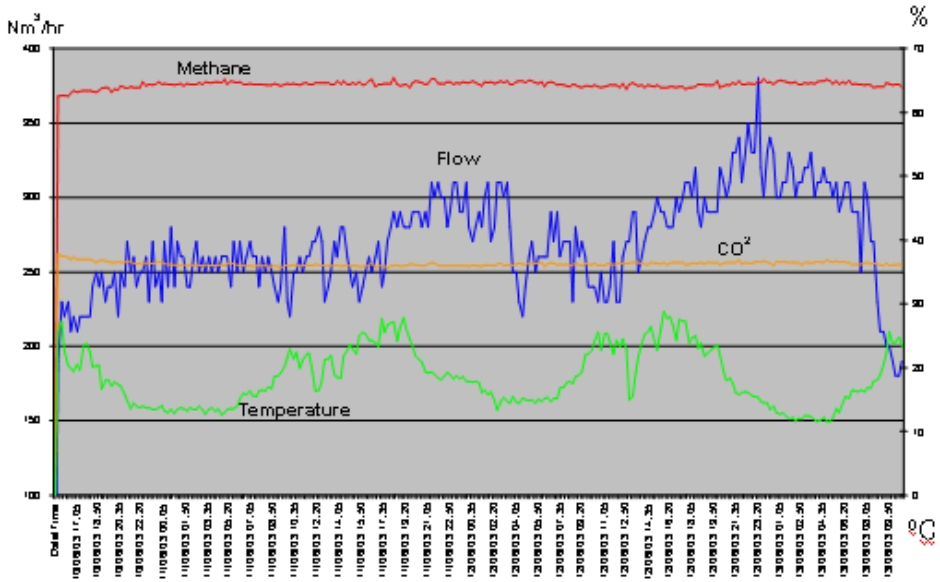


Performance monitoring of chiller plant



Monitoring CHP engine performance on biogas





Data Analysis

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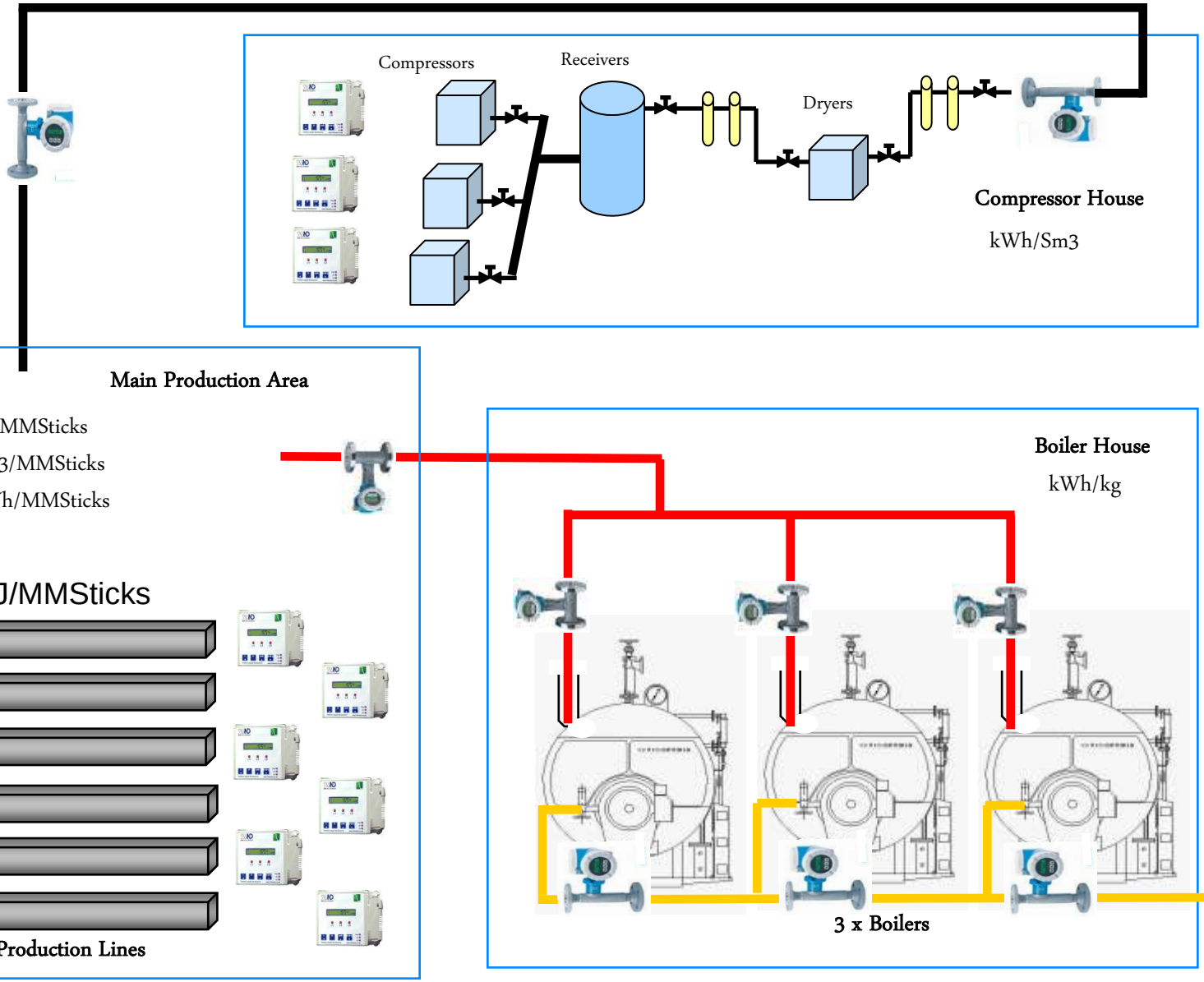
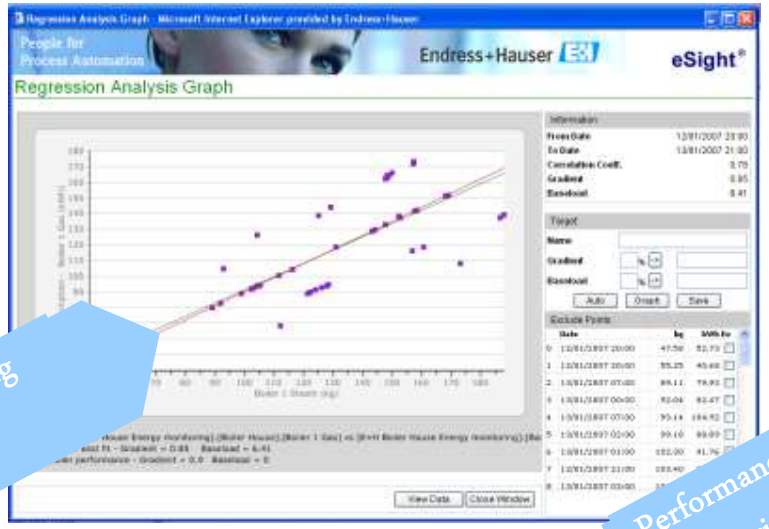
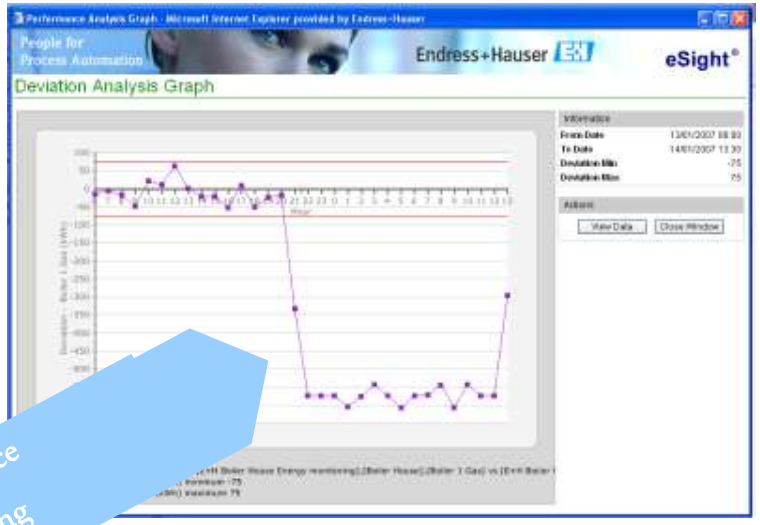
Obtaining KPI's in a Production Area



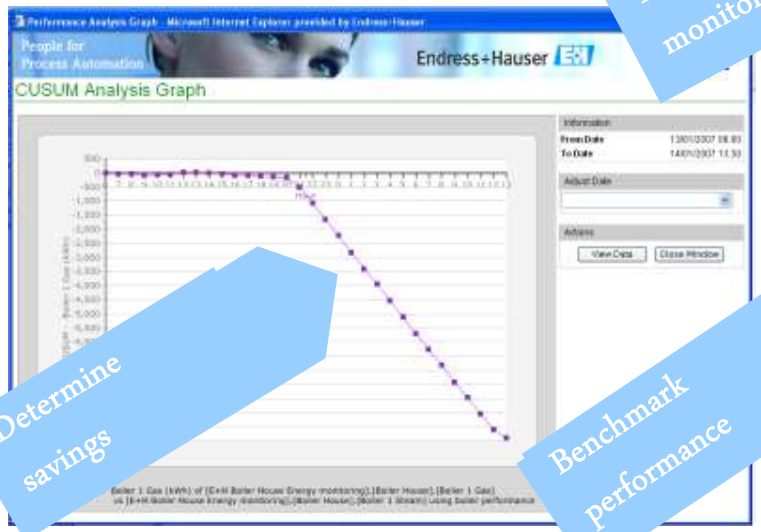
Energy analysis reports



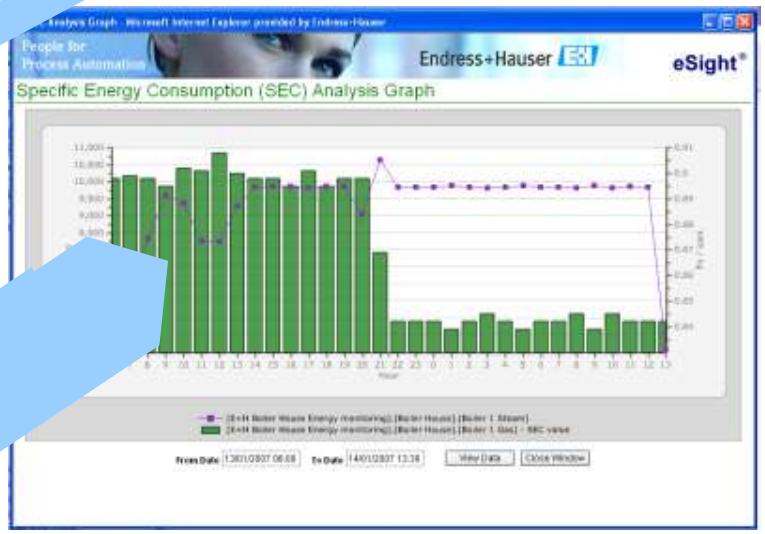
Target setting



Performance monitoring



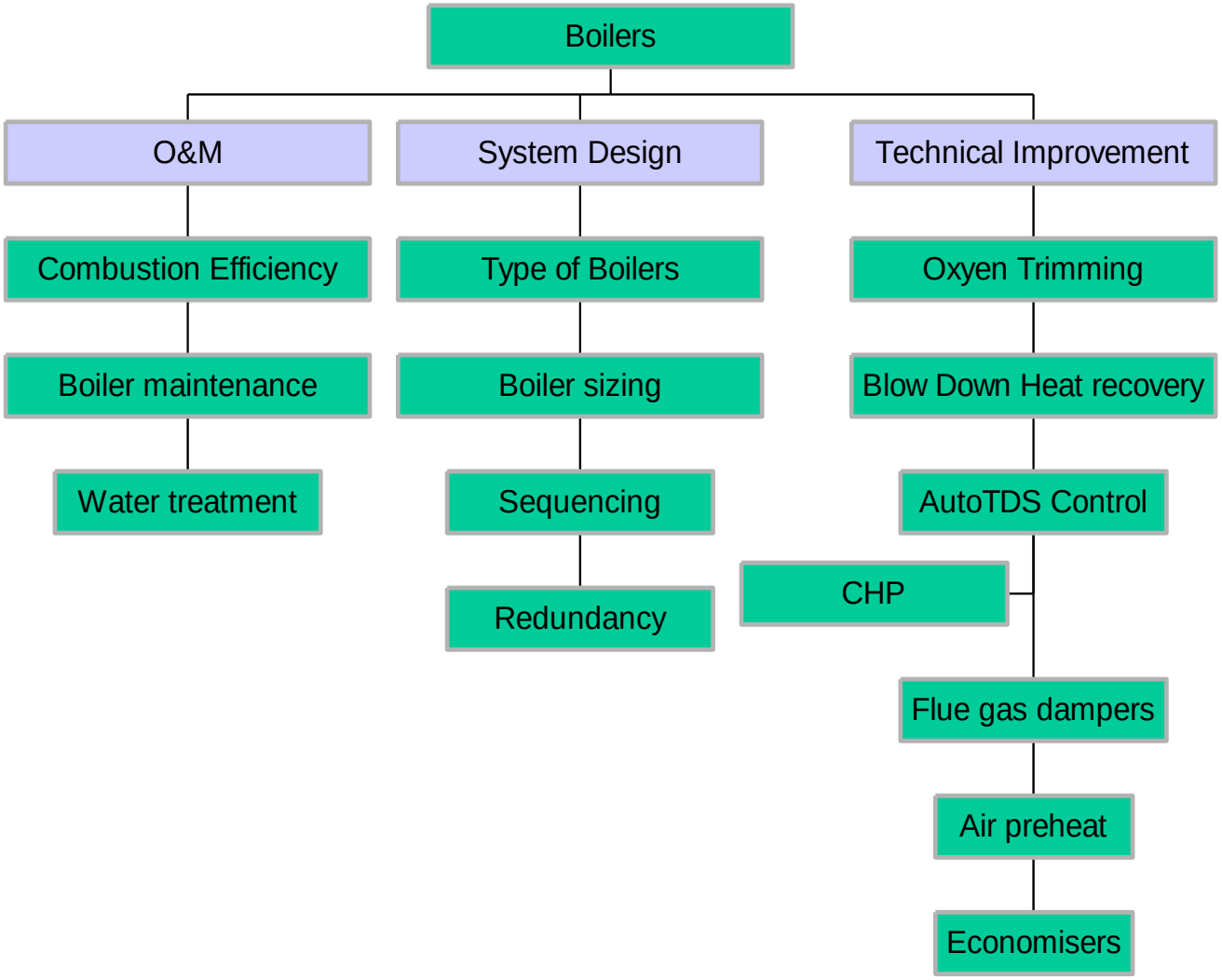
Determine savings



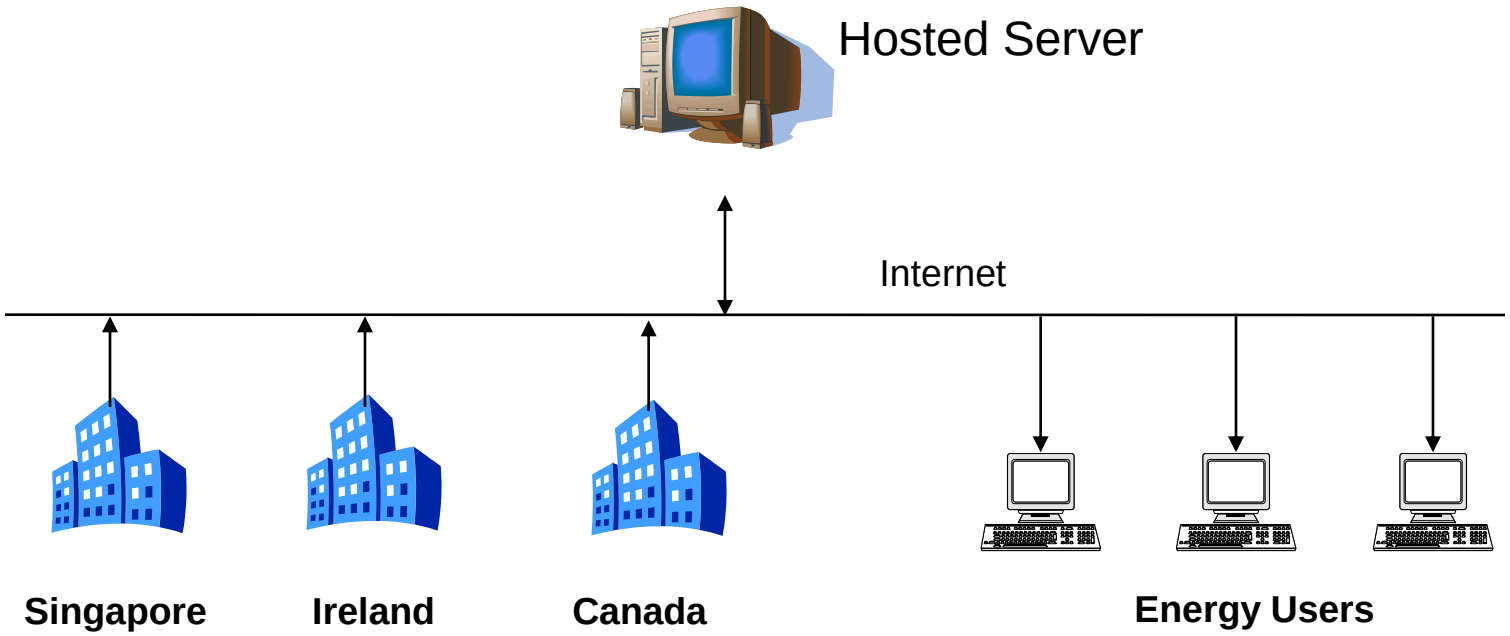
Benchmark performance

Knowledge justifies investment in improvements

example of some of the common improvements associated with boiler plant



Global energy monitoring solutions



Metering data at each site is collected using SCADA/OPC/XML/email

Users access energy monitoring software with internet explorer

Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Questions?

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Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Thank You

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