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# ABB Ability™ – OPTIMAX® Energy Management & Optimization

## Optimization for Energy, Emissions and Processes

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# Agenda

01. Introduction to the OPTIMAX® platform
02. Application: OPTIMAX® for Industrials and Commercials (EMS)
03. Application: OPTIMAX® for Advanced Process Control (APC)
04. Sample Cases
05. Q&A

# Introduction to OPTIMAX®

# ABB Ability™ – Sustainability Portfolio

1 We help industry to deliver energy efficiency improvements

2 We help industry achieve Net Zero

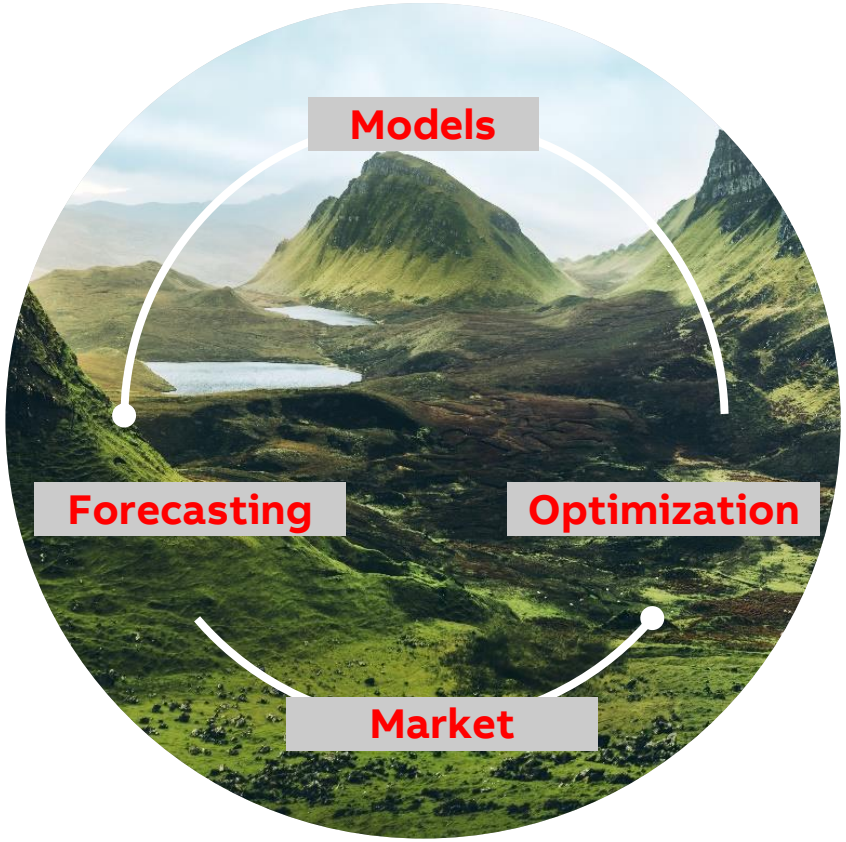
3 We help industry preserve their resources

4 We help industry to become more profitable

Increase Energy Efficiency and reduce carbon footprint with Digital solutions

# Executive Summary

OPTIMAX® as the optimization environment for industrial applications




$CO_2$

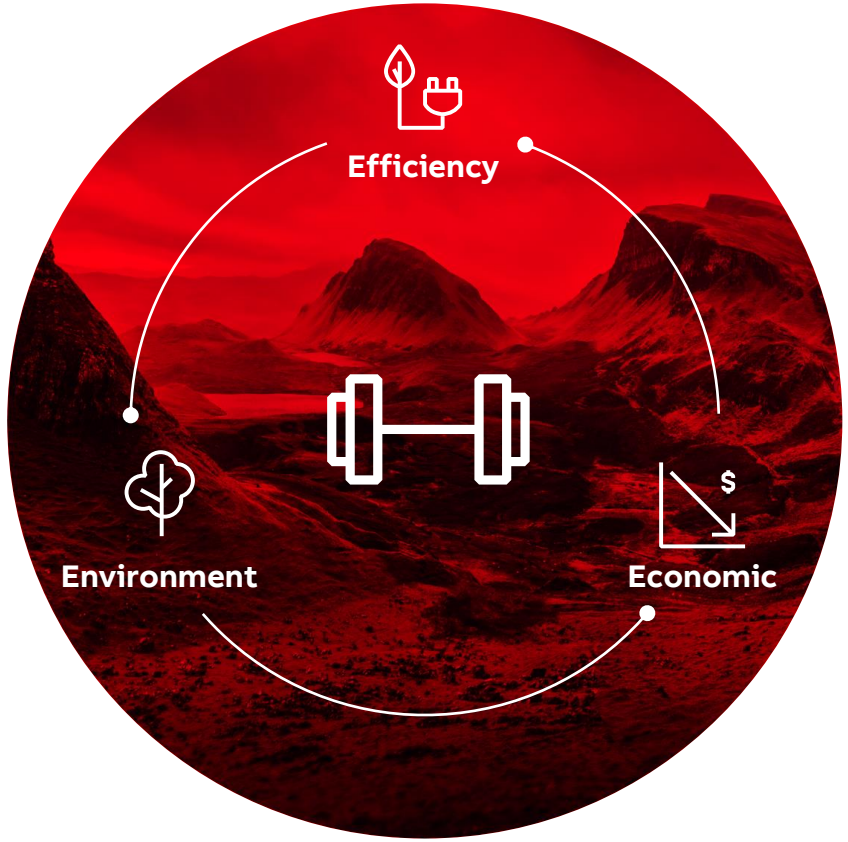
100%

Cost

10%

Production

10%



# Vertical Optimization Solutions

Where production, storage and consumption create and utilize flexibility

**Sustainability Portfolio**

**OPTIMAX - Energy Management & Optimization**

### Cross Industries

| Cross Industry |
|---|
| OPX for Industrial Sites |
| Steam & Power Optimization |
| Carbon Capture |
| Wind + H2 + Solar (HPP) * |
| Hydrogen |

### Power, Water & Renewables

| Power & Water |
|---|
| Waste Water Treatment |
| Desalination |
| Energy Eff for Smart Water |
| Virtual Power Plants/DERM |
| District Heating |
| District Cooling |
| Waste2Energy |
| Conventional Power Plants |
| Biomass |

### Chemical & Refineries

| Chemicals & Refineries |
|---|
| Chemical Plants |
| Petrochem |
| Refineries |

### Oil & Gas

| Oil & Gas |
|---|
| Offshore & Onshore |
| LNG |
| Offshore Wind |

*) HPP … Hybrid Power Plant

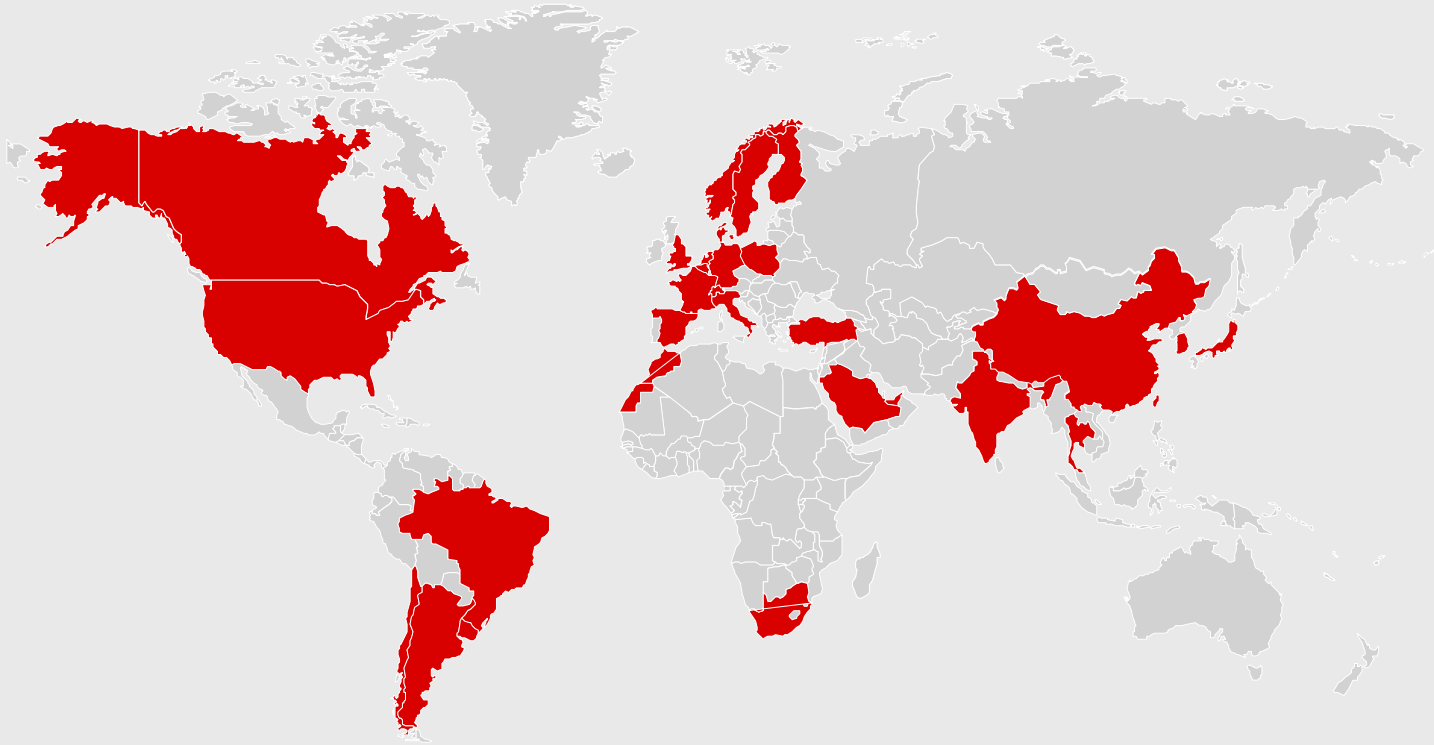
# References around the globe

**>200** installations

in

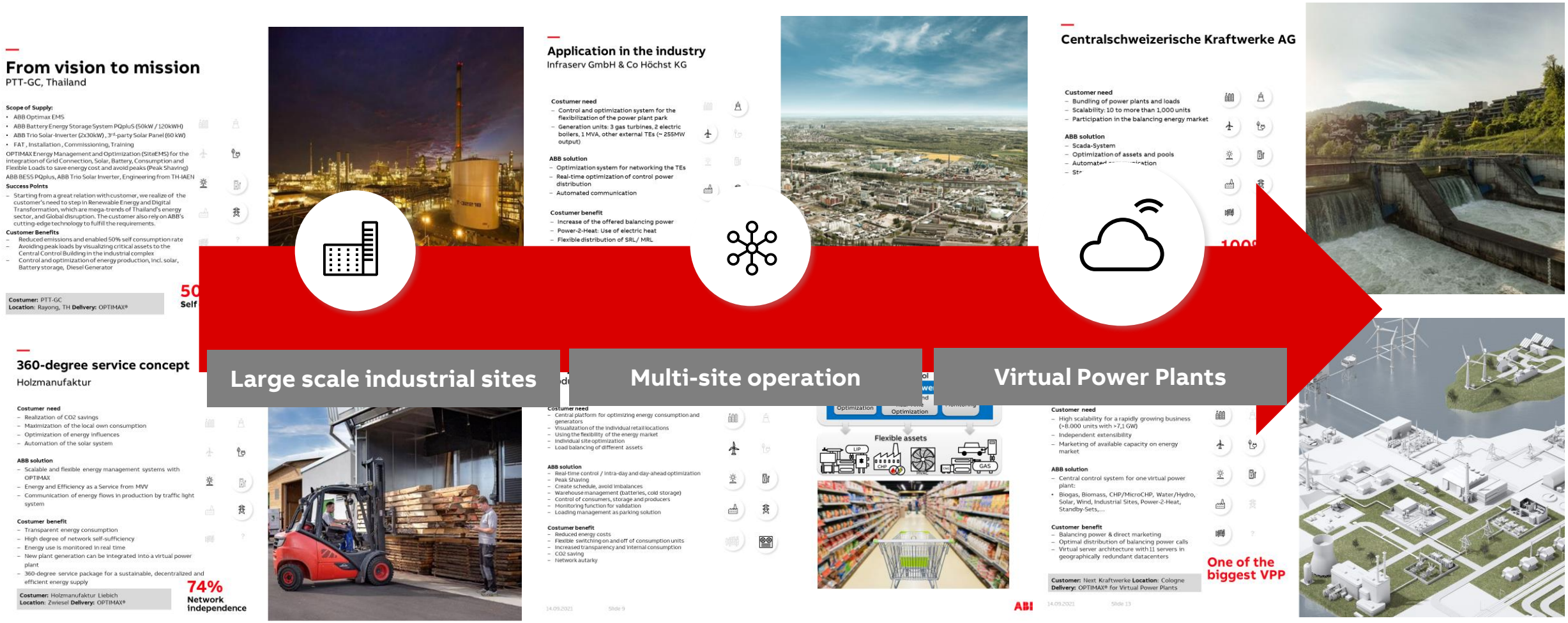
**5** Continents

**29** Countries



# References

## Scalable applications across all energy industries

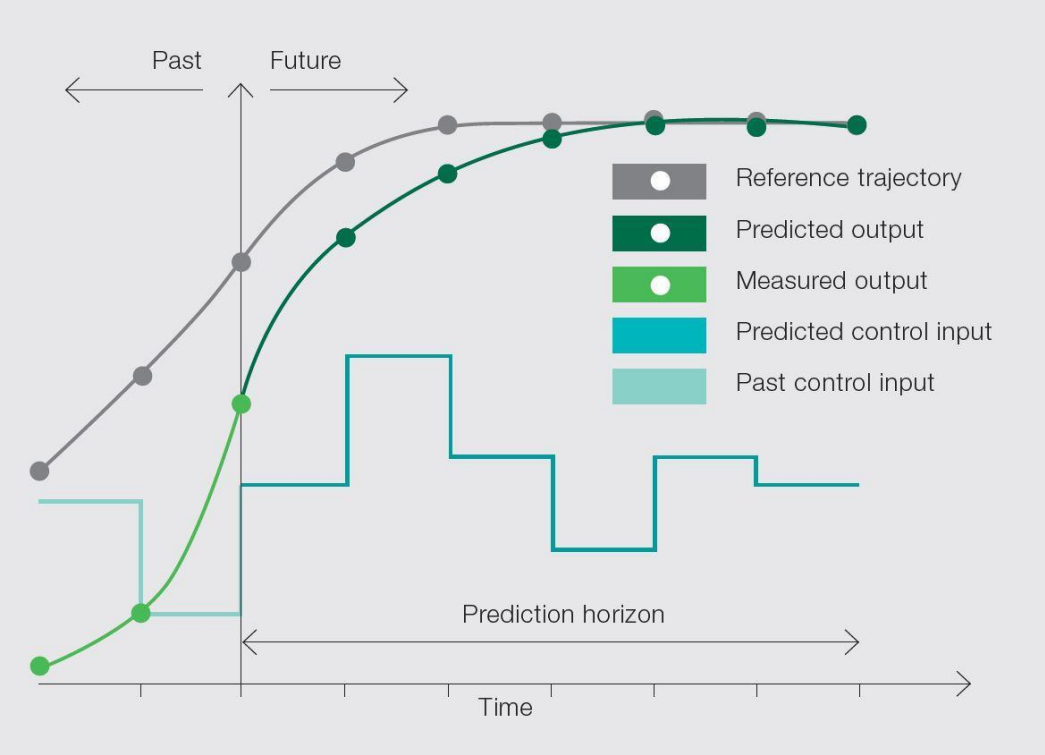


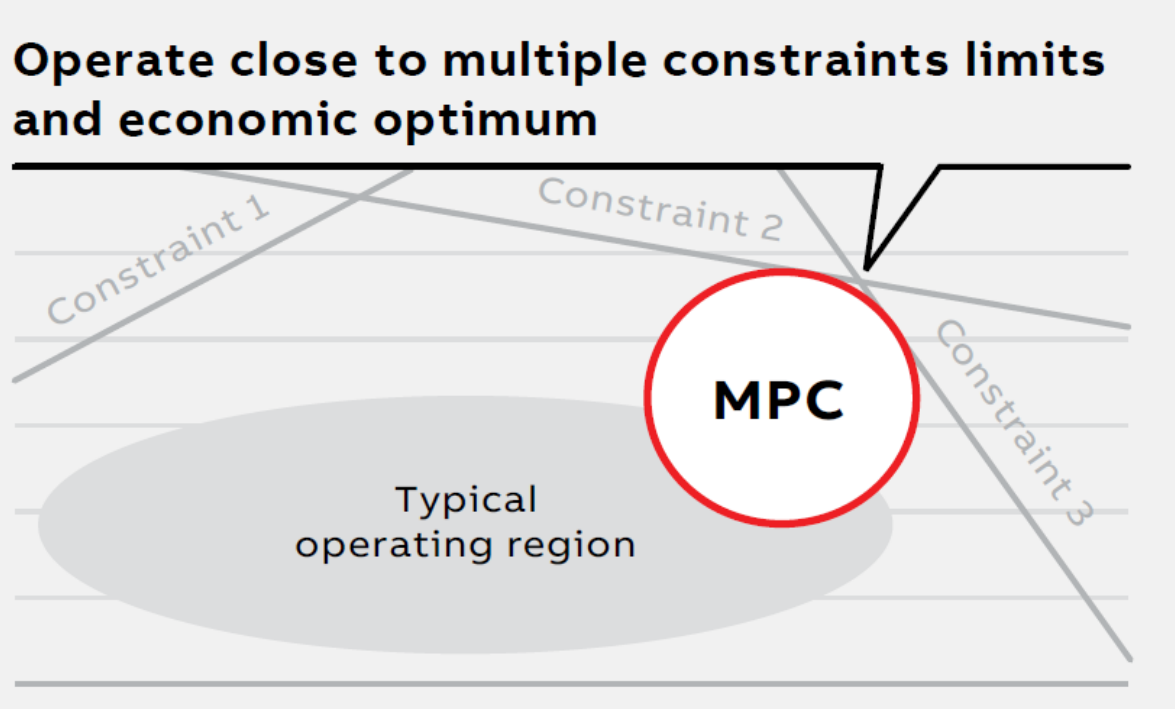
# Technology introduction

# Optimization calculations over predicted time horizons

Model Predictive Control (MPC)

## Graphical introduction

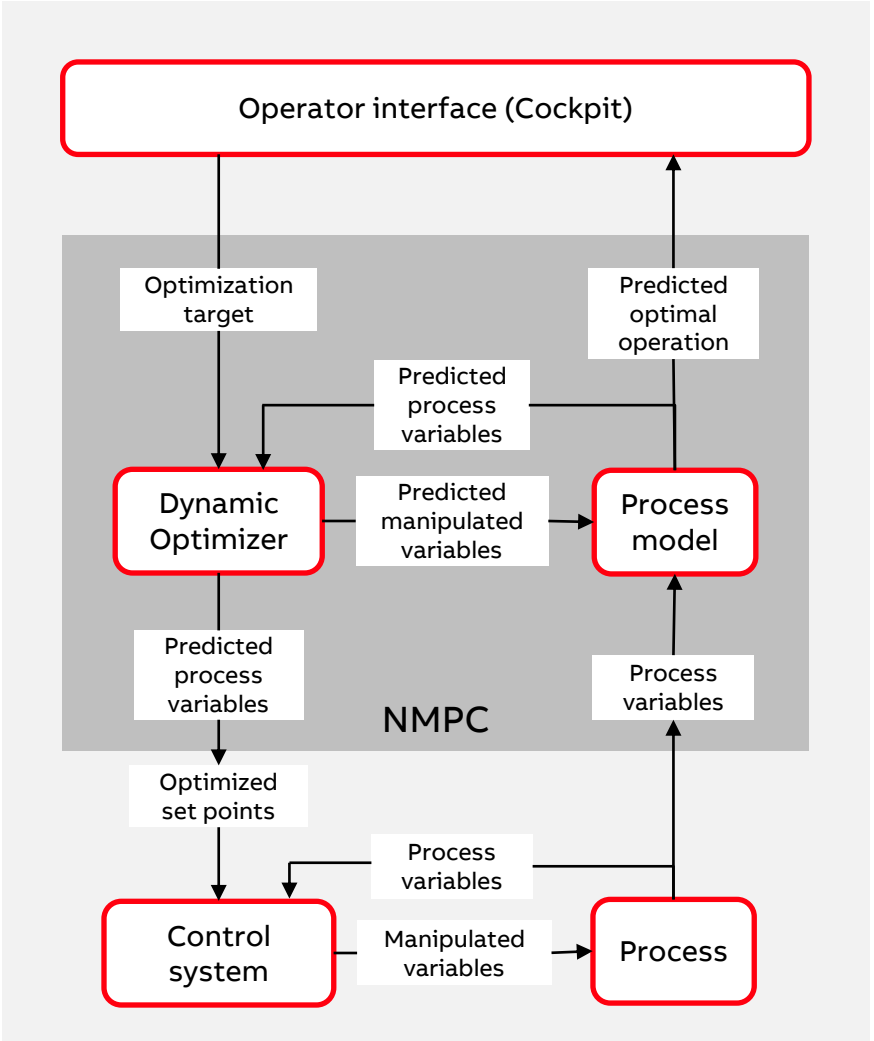


# Iterating Optimization Process

Operation, optimization, monitoring and control go hand-in-hand

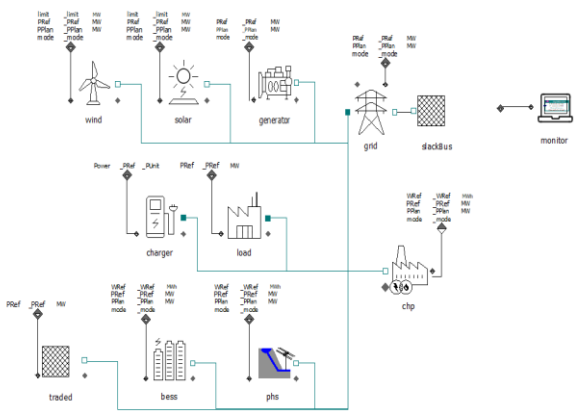
- **Modelica:**
  - Modelling language to build process models
  - Standard FMU export for runtime execution
- **Dynamic Optimizer (DO):**
  - optimizes target values according to objective function
  - Executes the FMU process model based on Modelica
  - Sends and receives real time values
- **Control System**:
  - adjusts process accordingly & regulates overall process according to setpoints
- **Process**:
  - Physical process, such as solar plant, CHP etc
- **Operator Interface**:
  - Monitor and modify the optimization processes



# OPTIMAX for Virtual and Hybrid Power Plants

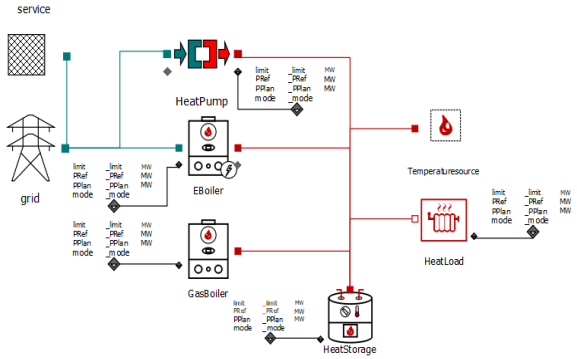
Sector coupling with multiple domains

## Electrical



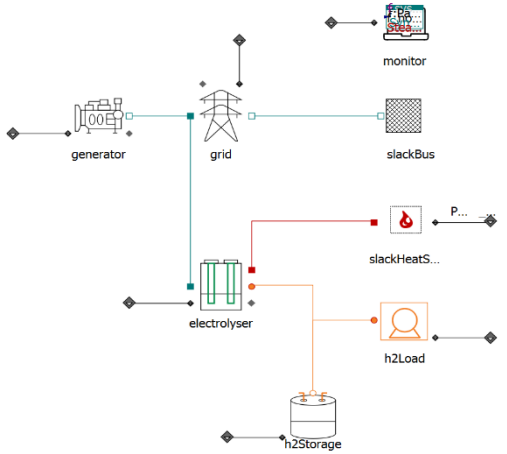

- Renewable power
- Grid connection
- Compensation

## Thermal



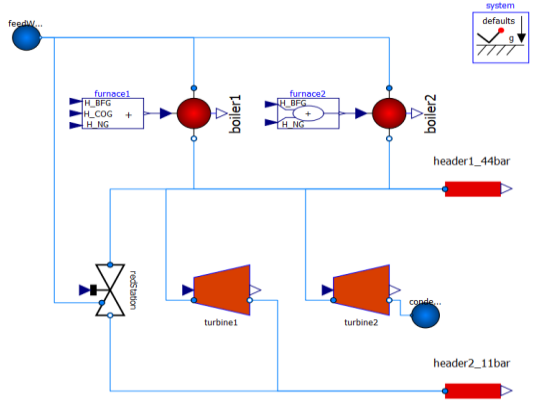

- Exploitation of waste heat
- Heat pumps

## Hydrogen




- Enable circular systems

## Steam/Water



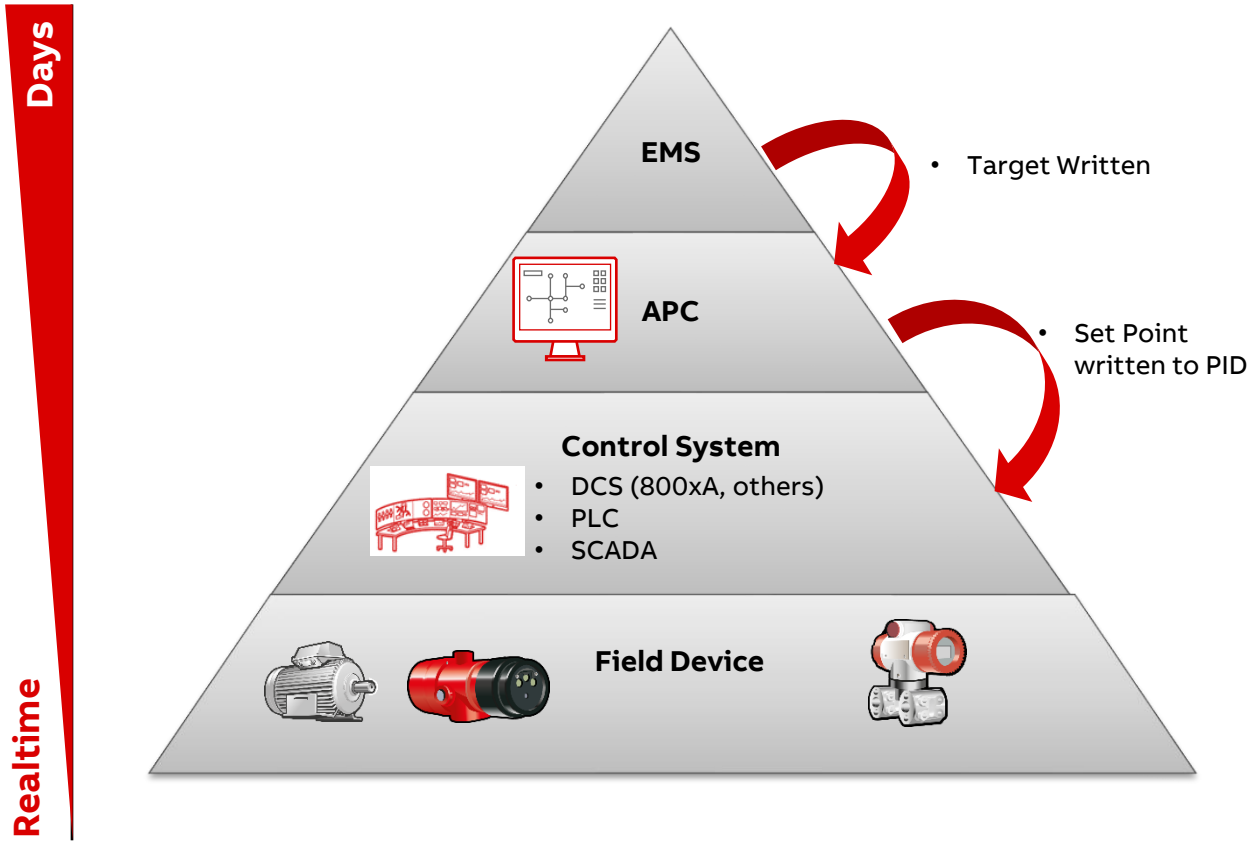

- Process steam
- WWTP

**Integrated Energy Systems**

# Advanced Process Control and Energy Management System

## Hierarchical approach

- Coordinated control of plant production using a standard software solution
- Energy Management System (EMS) computes the optimal operating point considering non-linear, first principle models
- Advanced Process Control (APC) drive the plant to optimum operating conditions.
- Allows more flexible strategies – multi objective with explicit priorities



# OPTIMAX® for Industrials and Commercials (EMS)

# Optimization for Energy, Emissions and Processes

Monitoring & Reporting + Control & Optimization = Energy Management

**OPTIMAX Energy Management**

Energy Efficiency for Industrial Sites

| Monitoring & Reporting | Control & Optimization |
|---|---|
| Save time on reporting | Reduce cost and emissions |
| Comply to ISO 50001 | Avoid peak loads |
| Identify areas of improvement | Allow optimal sector coupling |

**Achieving energy savings by increasing the efficiency of operations. Key to helping enterprises reach their sustainability goals, reduce emission and cost.**


**ABB Ability™ – OPTIMAX Energy Management** provides customers with insights to take better decisions and run smarter operations while reducing risk, emissions and cost.

# ABB Ability™ Energy Management for Sites - OPTIMAX for Industrials and Commercials

Powerful, user-friendly, state-of-the art energy management and optimization system for all applications

## Our core solution

### Monitoring & Reporting

- Enhanced user experience and visibility of your energy usage on-site
- PDF reports
- Excel export

### Real Time Operation

- Real-time control and optimization
- Coordinated control at site level

### Intra-Day- / Day-Ahead-Opt

- Intra-Day and Day-Ahead Optimization
- Optimal schedules based on forecasts, loads and prices + updated during day

## Option

### Forecasting & Simulation

- ML Forecasting
- AI Enhanced Forecasting
- Digital Twin
- Steam and power

## Option

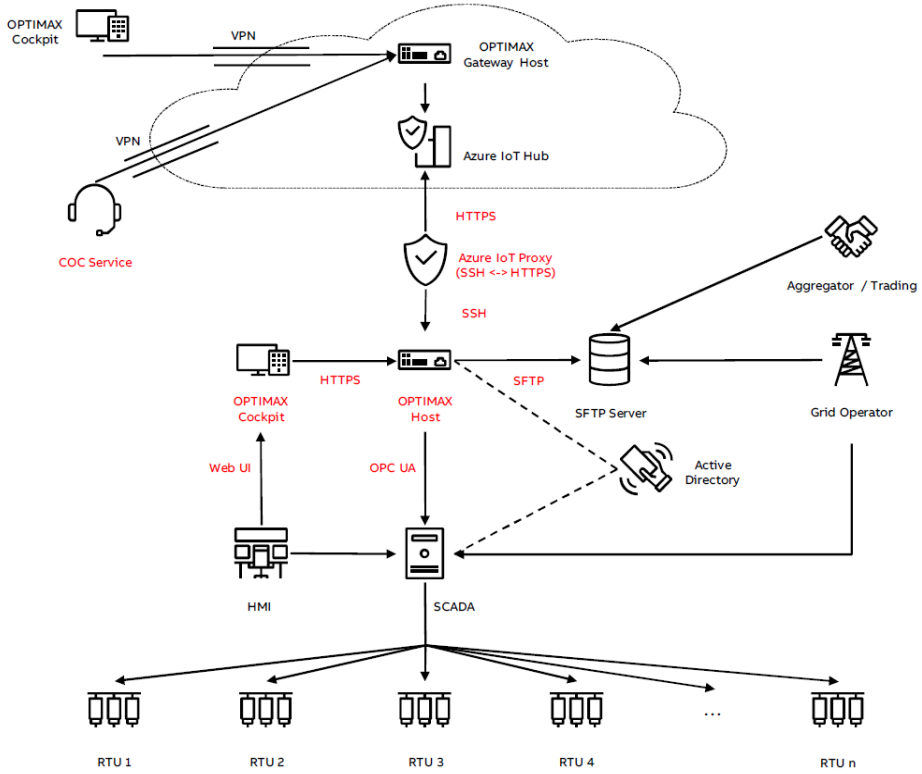

### Multi-Site Operation

- Benchmarking sites
- Enterprise wide energy optimization

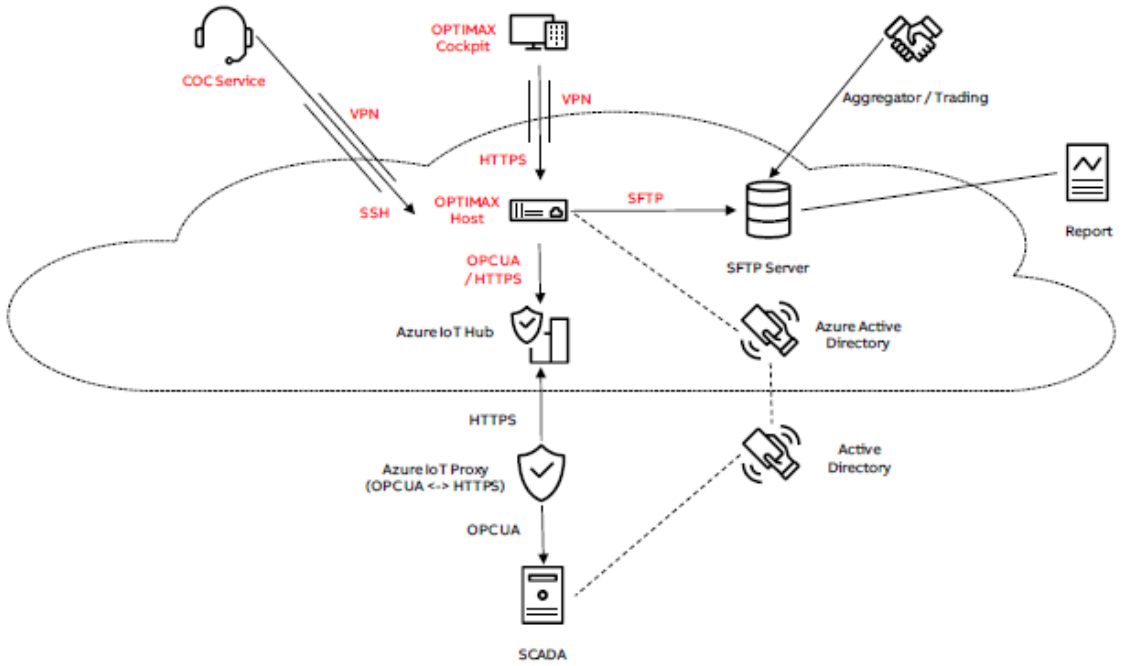
# ABB Ability™ Energy Management - OPTIMAX® for Industrials and Commercials

System Architecture: edge or cloud deployment

## Edge Deployment – on premise (with SCADA)




## Cloud Deployment



# ABB Ability™ Energy Management for Sites

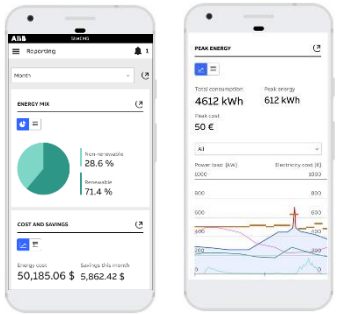
Take Away – Unique Selling Points

## Stepwise Approach

1. Create Visibility
2. Automate Control
3. Optimize Operation

Single site

Multiple site for enterprise wide optimization




## Why ABB – Unique Selling Points

Not only energy management for control and monitoring

1. **Optimal operation**
   by planning and scheduling ahead without impacting production processes
2. **System Integration**
   Easily add new on-site generation, EV-chargers, batteries
   Energy Management for Sites is your control system to integrate all assets
3. **Enterprise wide energy optimization**
   Benchmarking sites against each other
   Central Participation at energy markets

## Proven Benefits

**Reduce cost and site emissions**

Manage peak consumption — **Up to 10 %**

Increase ratio of self-generated energy & reduce energy purchase

**Save time** — **20 – 100 h/m**

Create operational visibility

Automate manual engineering processes

Generating accurate and easy-to understand reports and visualizations

**Increase revenues** — **2 – 5 %**

Participate at energy markets

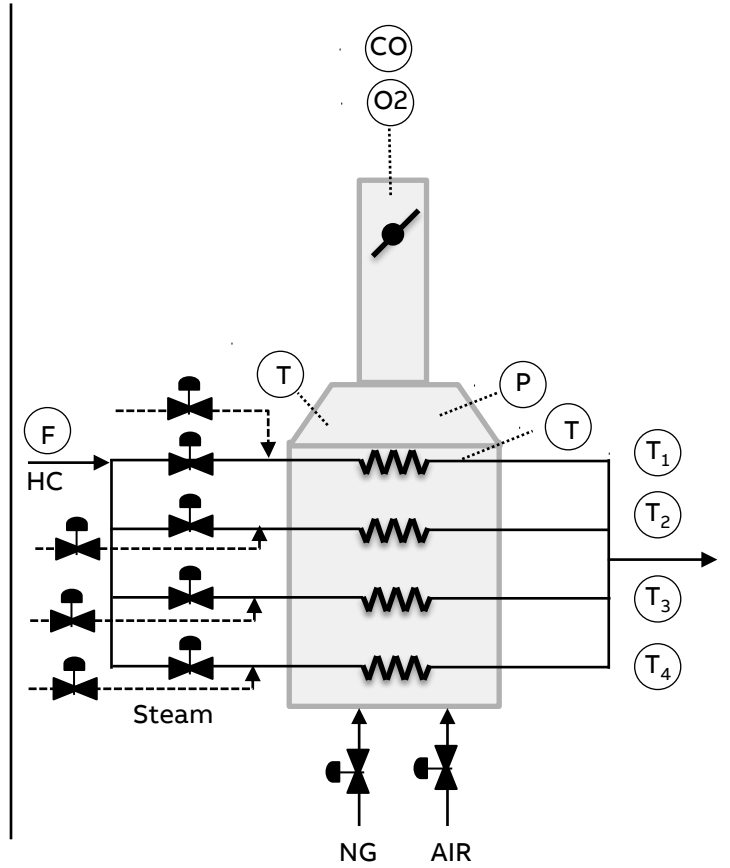
Use dynamic pricing schemes from your EaaS provider

# OPTIMAX® for Advanced Process Control (APC)

# Can automation help improve Energy Efficiency?

## Process units are complex

- Simple, decoupled single control loops based on P&ID do not necessarily provide optimal performance in many cases
- Each control loop pursues a local optimization with the same priority, missing a global optimization based on priorities
- Example: let us consider a Steam Cracking Furnace
  - Many actuators
  - Many objectives
  - Priorities e.g. CO more important than O2
  - How do I handle this with uncoordinated simple control loops?
- Even if I use a complex DCS strategy, how can I handle priorities and interactions?

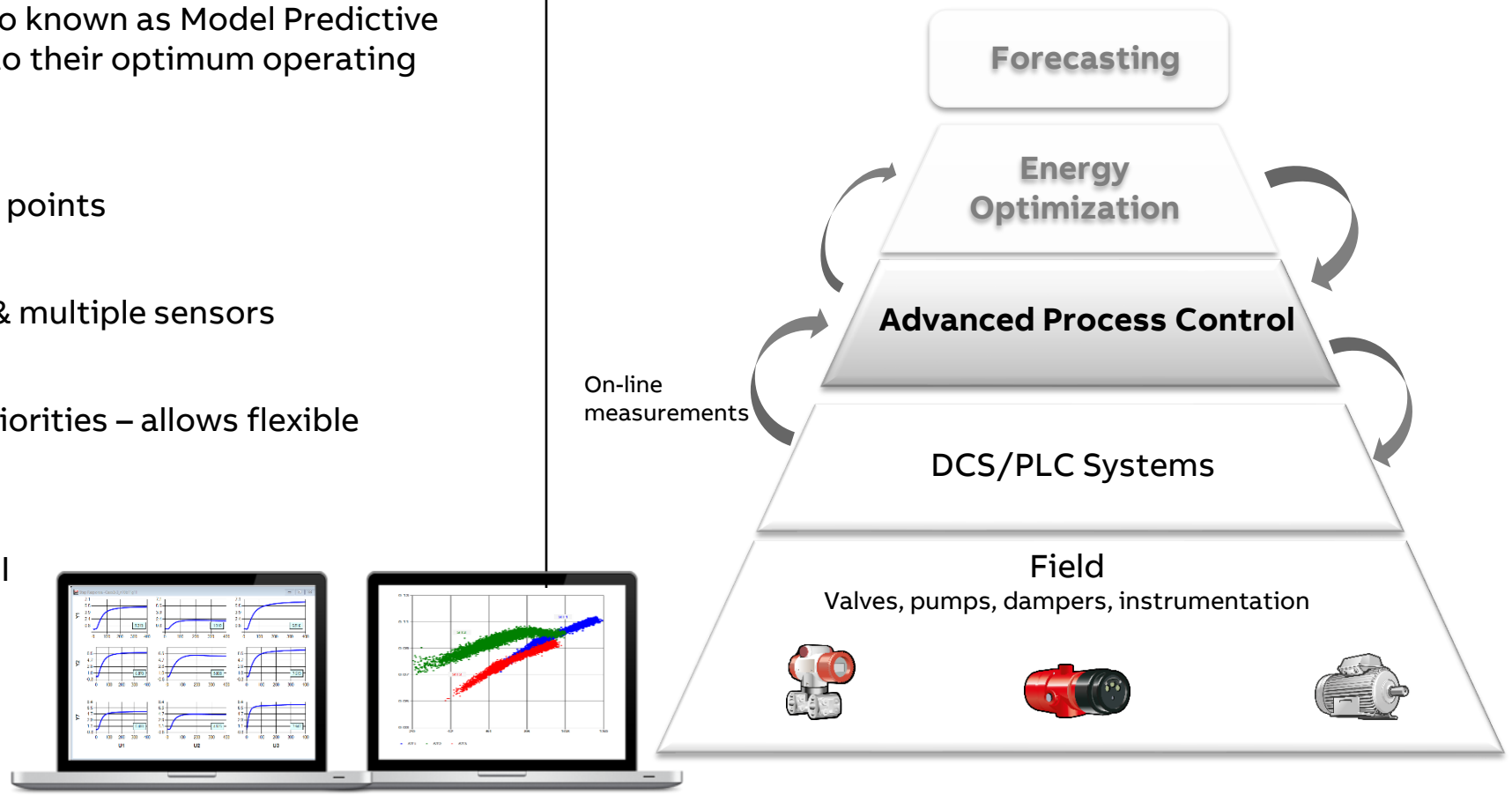



- Keep COTs at target - conversion
- Keep skin temps below max
- Keep furnace temps below limit
- Maximize Flow
- Keep CO below limit
- Minimize O2
- Preserve stoich. Ratio
- Keep HC/Steam ratio at target based on conversion

# Moving one step further: Advanced Process Control technology

## OPTIMAX - Predict & Control Basics

- Advanced Process Control, also known as Model Predictive Control, helps drive the plant to their optimum operating conditions
- Automatically changes the set points
- Considers multiple actuators & multiple sensors
- Multi objective with explicit priorities – allows flexible strategies
- Uses an explicit process model



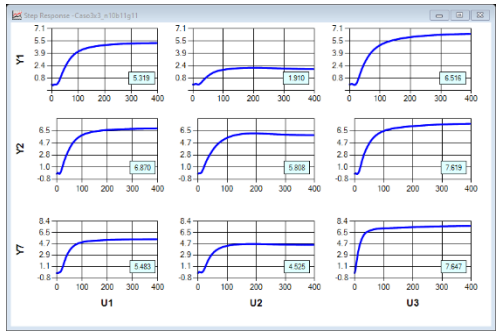
# Advanced Process Control Technology

Some key Advantages

## Interactions

Handle interactions between variables using an explicit process model.

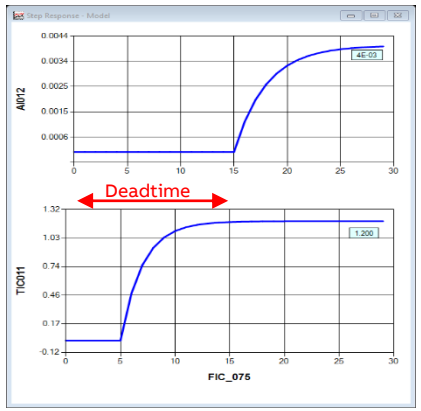
The APC controller takes into account the interactions when performing calculations




## Long Delays/Settling Times

Handle long dynamics that PID controllers fail to control with adequate performance.

The APC controller takes into account the long dynamics when performing calculations




## Priorities

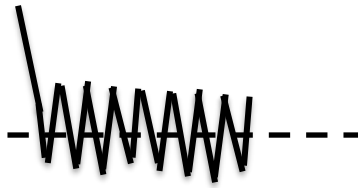
Handles an explicit list of priorities.

The APC controller will consider the priorities in case of conflict in the objectives

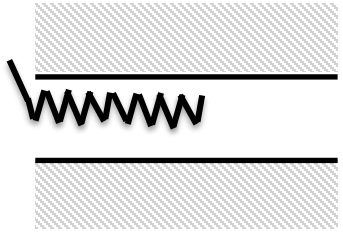
Hierarchy:

1. Safety
2. Process Constraints
3. Specifications
4. Economics

## Range Control



Pure Setpoint. Actuator always working to bring process variable to setpoint

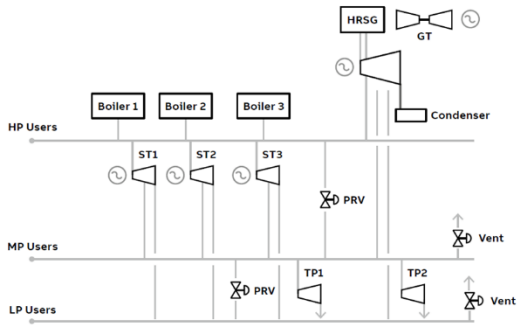


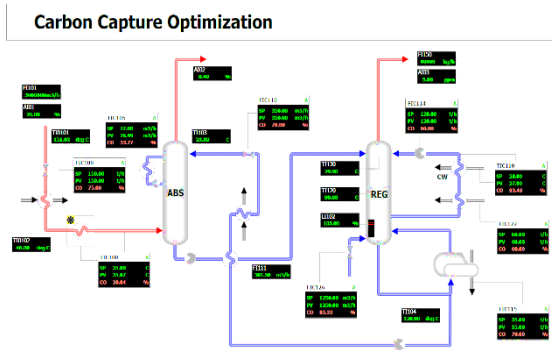
Range control. Actuator working only when predictions show process variable will go outside the limit

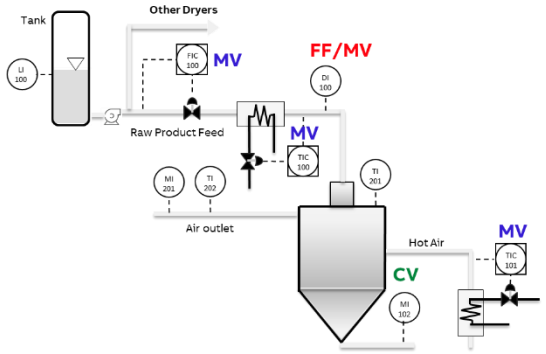
# OPTIMAX®
# Sample cases

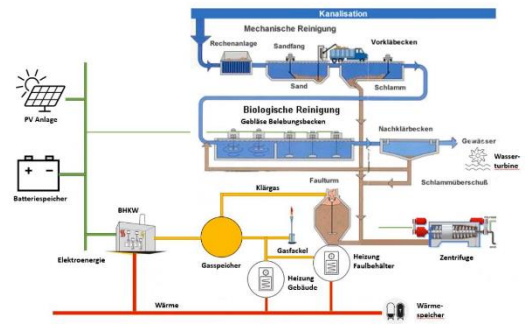
# Sample cases of OPTIMAX®

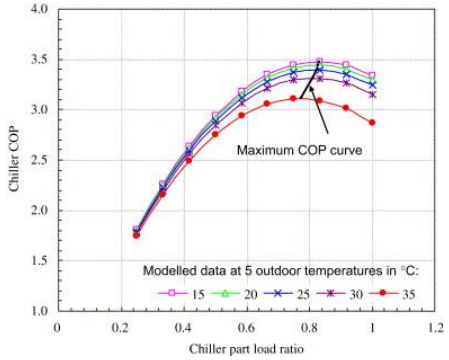
## Advanced Process Control and Energy Management System

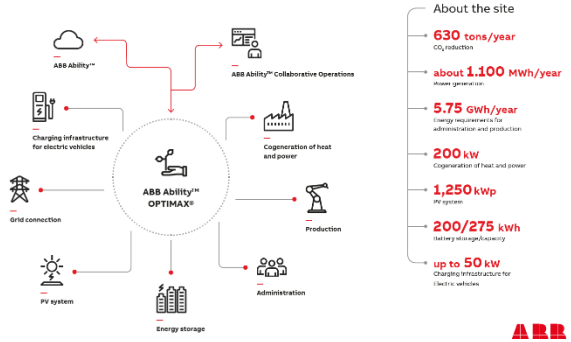


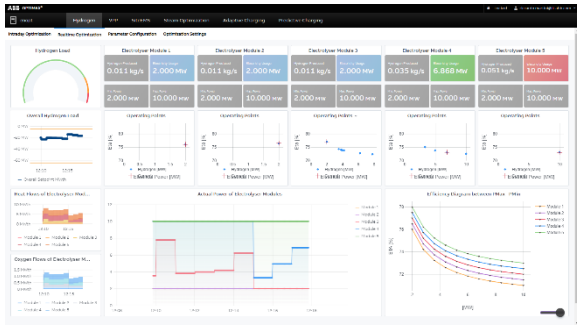









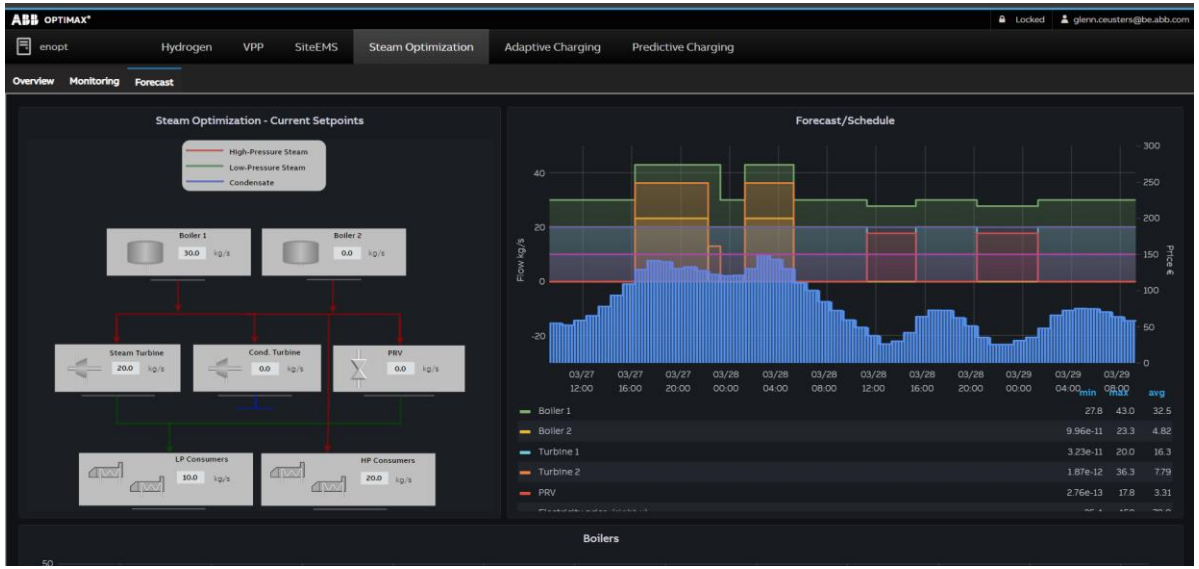
**Various applications across all industries**

# Sample cases of OPTIMAX®

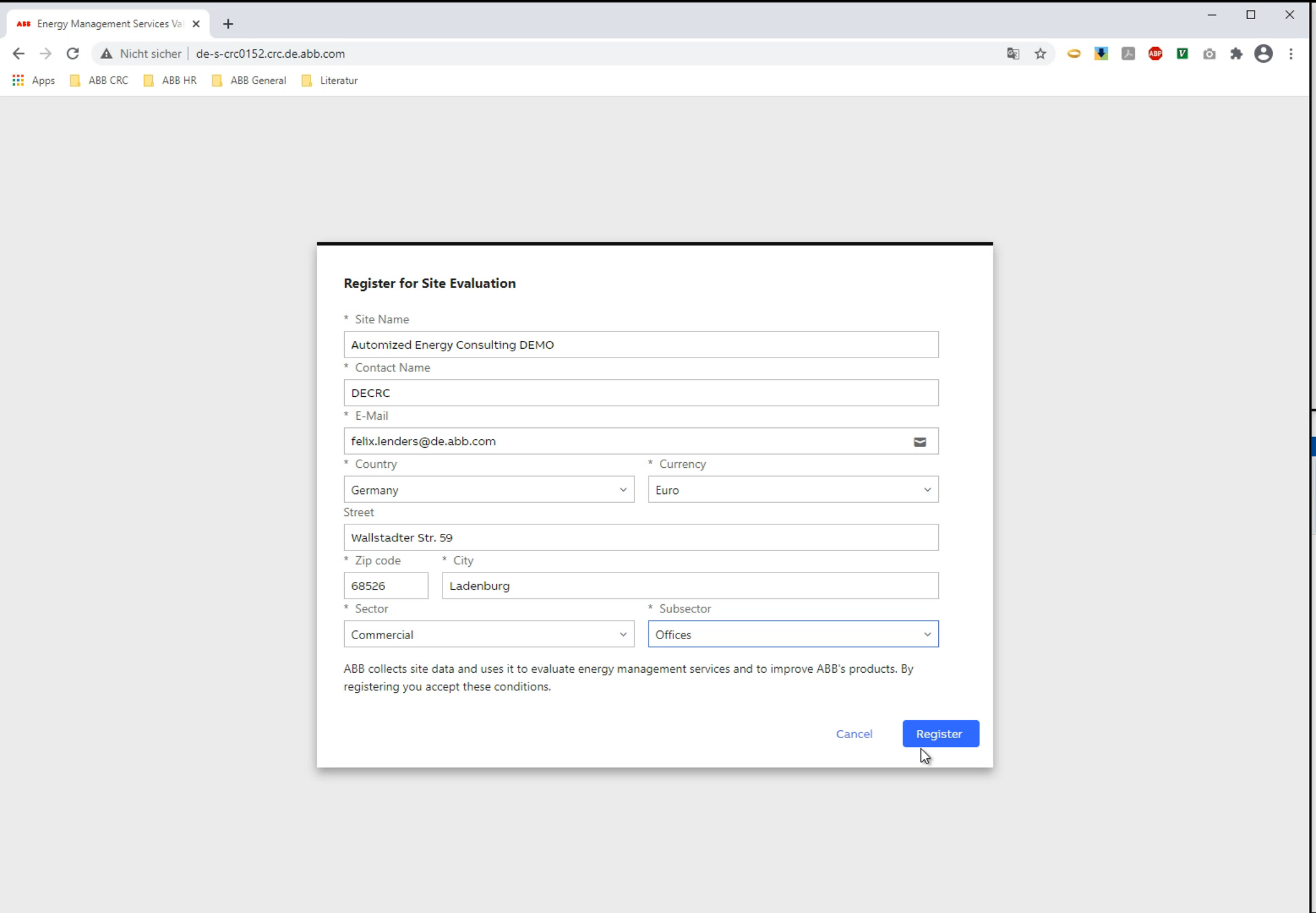
Some screenshots

## EMS example


## APC example




**Various applications across all industries**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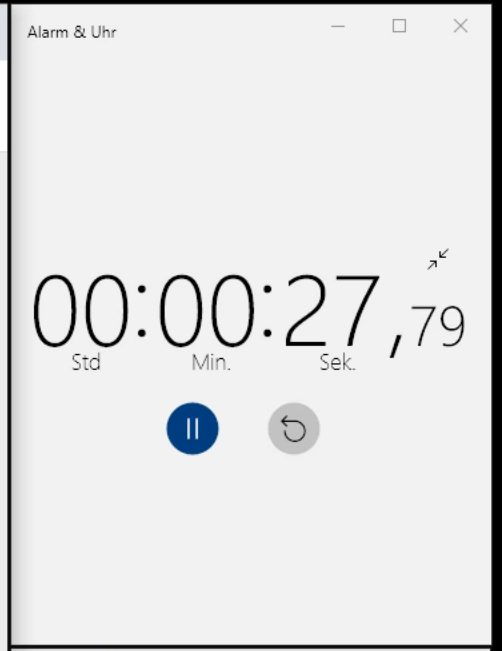
Offices
ABB collects site data and uses it to evaluate energy management services and to improve ABB's products. By registering you accept these conditions.
Cancel
Register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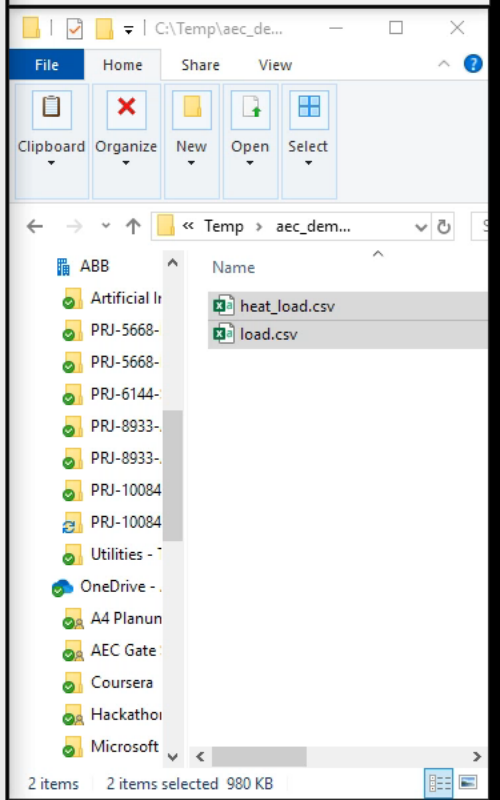
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# Key Takeaways

1. Optimax® – Solid offering from Energy Monitoring to APC, Energy Management to Energy Markets interaction
2. Energy Monitoring – start with a KISS
3. Build on with APC and Energy Optimization
4. Coordinated management of assets delivers tangible benefits
5. Optimization benefits can pay for the project but also, automation upgrades

# Q&A

# CONTACT DETAILS

Let’s get in touch!


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