

EXTERNAL

SEPTEMBER, 2019

# ABB Ability™ Energy Management for Sites

OPTIMAX® for Industrials, Commercials and Virtual Power Plants

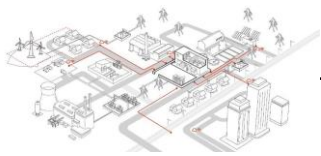
Guy Damen and Glenn Ceusters



# Content



**1** Introduction – transforming energy and business landscape



**2** Portfolio – grid edge technologies



**3** ABB Ability™ Energy Management for Sites

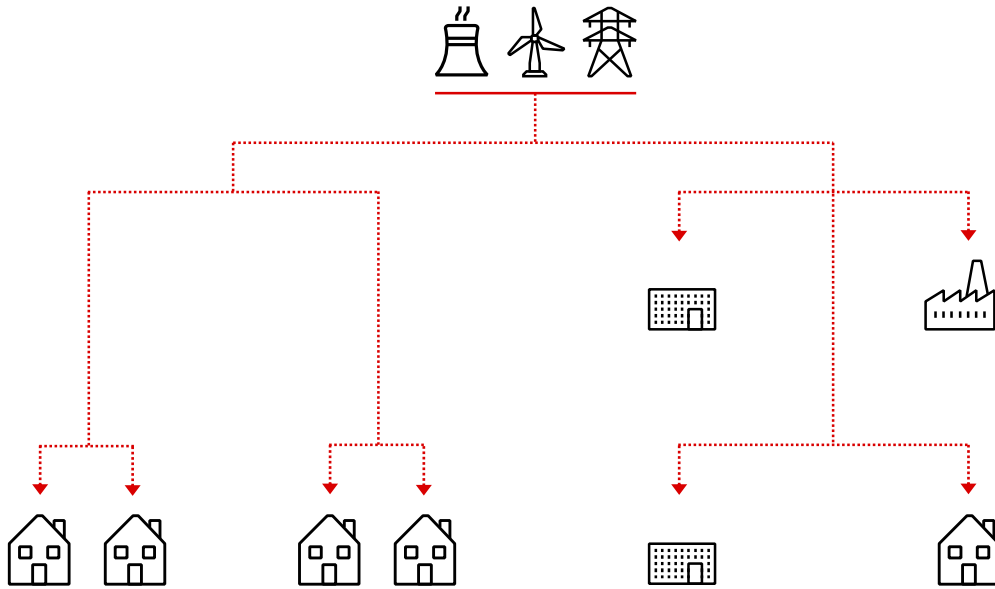


**4** Live demonstration

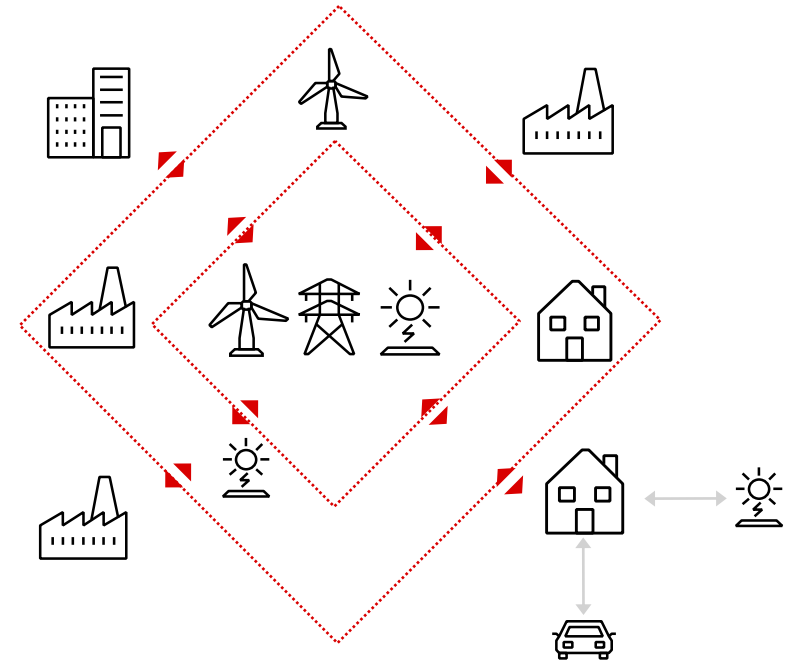
# Energy and grid transformation

Transition from a centralized to a distributed grid

## Traditional grid



## New grid



New developments are accelerating the transition

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# Energy and grid transformation

Our business is changing

## Utility

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## Industry

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## Commercial

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## Water

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## Mobility

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**WE ADAPT.**

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# Our businesses

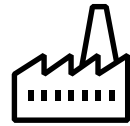
4 + 1



Electrification



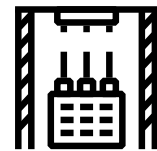
Robotics and Discrete  
Automation



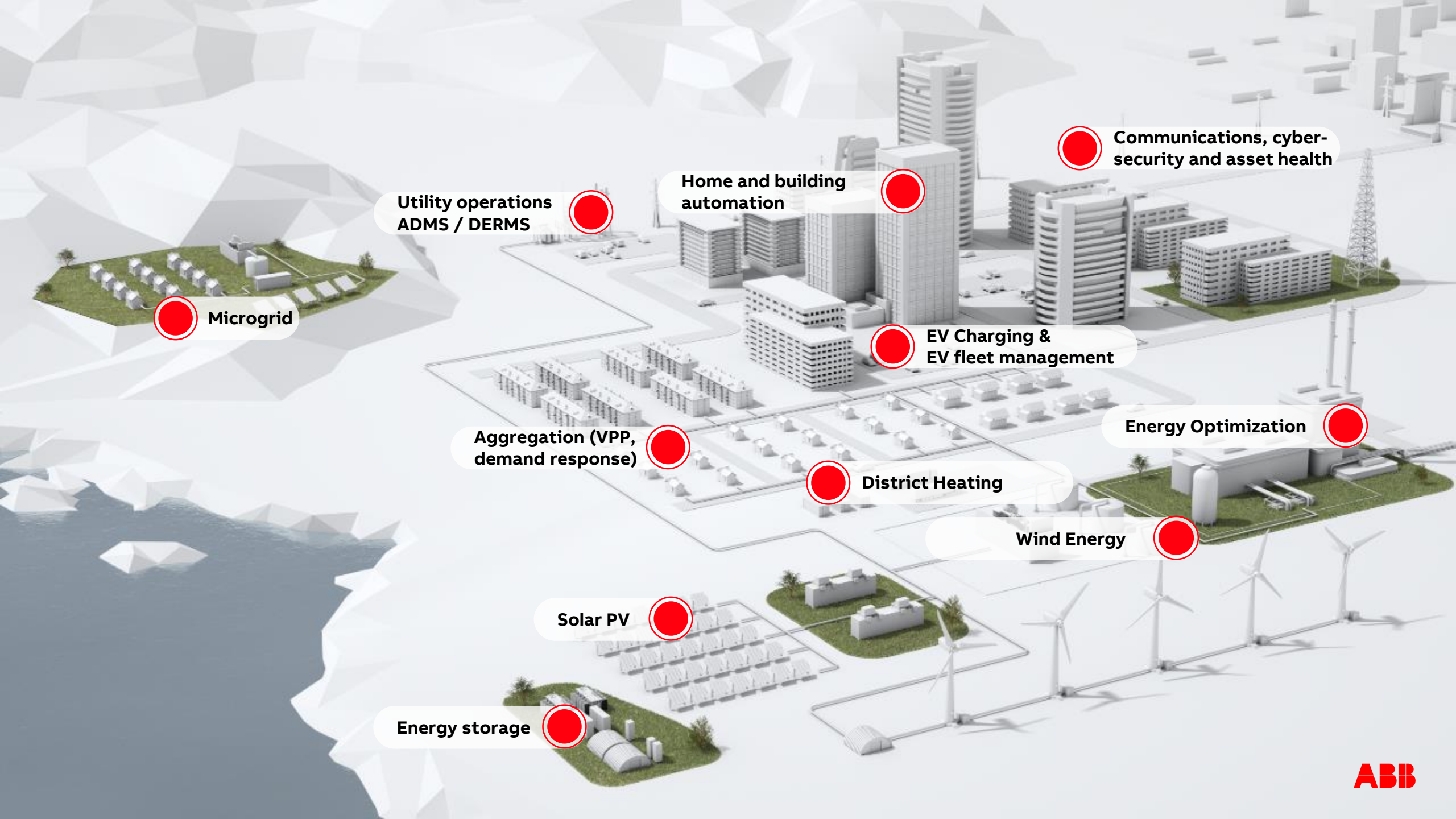
Industrial Automation



Motion



Power Grids



Microgrid

Utility operations  
ADMS / DERMS

Home and building  
automation

Communications, cyber-  
security and asset health

EV Charging &  
EV fleet management

Aggregation (VPP,  
demand response)

Energy Optimization

District Heating

Wind Energy

Solar PV

Energy storage

Optimize up to

# 15%

Operating Expenditure





A man in a white shirt is seen from the back, looking out a window at a city skyline. A bright light source, possibly the sun, is positioned behind a tall skyscraper, creating a lens flare effect. The man's hands are raised, with fingers pointing towards the light source. The overall scene is bright and professional.

Optimize up to

**30%**

Capital Expenditure

**ABB**

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# **OPTIMAX<sup>®</sup> for Industrials, Commercials and Virtual Power Plants**

As power networks increasingly depend on renewables and distributed energy systems, controlling and optimizing those systems -- reliably and profitably -- is now a priority.

**With OPTIMAX<sup>®</sup>, customers can reduce energy cost and emissions by optimizing the collection and dispatch of distributed energy resources (DERs).**

# OPTIMAX® for Industrials, Commercials and Virtual Power Plants

## Value

### Reduce energy costs and site emissions

- **Costs:** Enables industrial and commercial sites to cut energy costs by 5-10% without impacting operations.
- **Emissions:** Enables industrial and commercial sites to integrate more renewables and minimize use of costly, CO2-emitting fossil fuel without risking reliability or grid stability.



### Enable participation in wholesale energy markets

- **Integrate small-scale generators:** Enables distributed providers to seamlessly integrate, optimize & trade production from 1000s of small-scale generators across large areas.
- **Create Virtual Power Plants:** Enables multi-unit power plants to optimize production and respond quickly & flexibly to changing markets by operating as a virtual power plant.
- **Balance production and consumption:** Enables utilities to balance production and consumption in multi-source systems (CHP, Water, HVAC) through day-ahead and intra-day planning.



● Reduced energy costs ● Fewer emissions ● Lower production costs ● Higher efficiency ● Profits

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# OPTIMAX® for Industrials, Commercials and Virtual Power Plants

## Unique Selling Points

### Control and optimization system for autonomous control of generation units, storage and controllable loads

- SCALABLE from few technical units to many thousand
- SPEED world-leading optimization engine – mathematical optimization – parallel computing power
- FLEXIBLE Modelling your business case – standardized open interfaces – include any energy vector
- AUTOMATION Automated communication across all levels

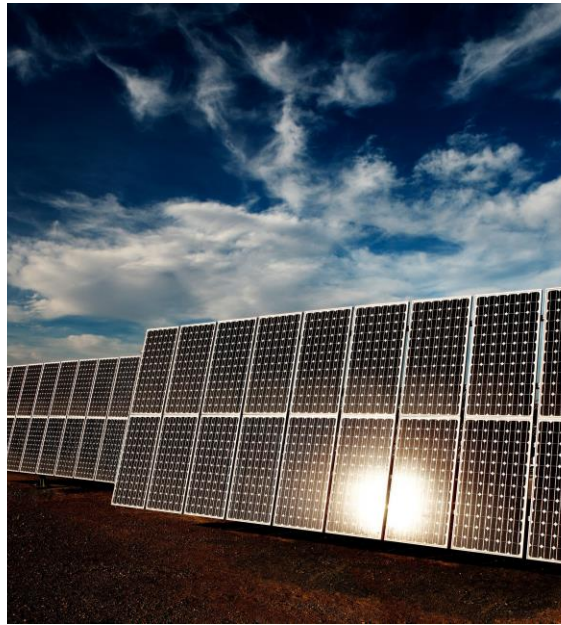


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# OPTIMAX<sup>®</sup> for Industrials, Commercials and Virtual Power Plants

## Application Area Overview\*

### Electrical



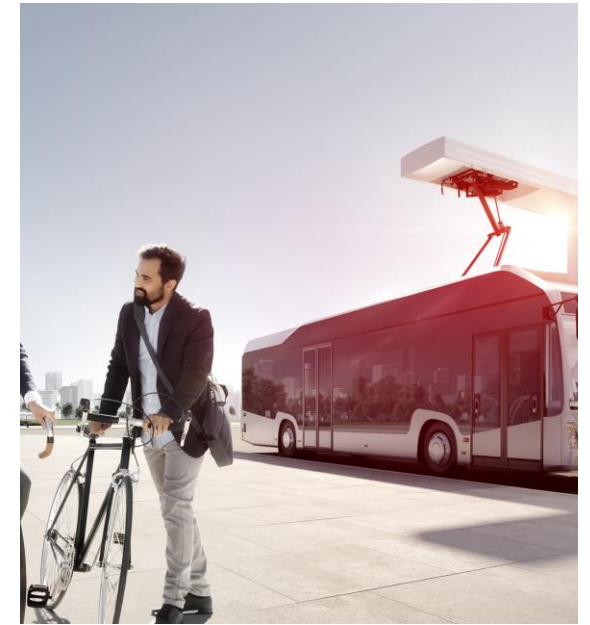
### Thermal



### Water



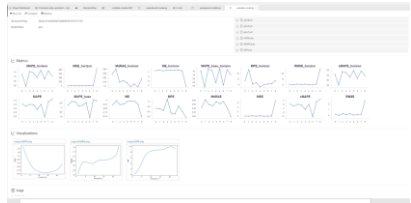
### Mobility



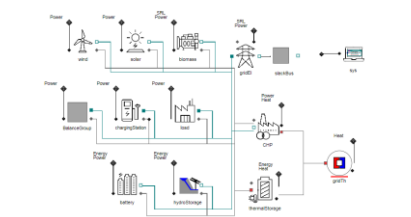
Holistic energy management within and across any vector

# OPTIMAX<sup>®</sup> for Industrials, Commercials and Virtual Power Plants

How



**Predictions** of the utility **demand** (electricity, heat, water, mobility, ...), relevant **environmental** factors (local outdoor temperature, sun, wind, ...) and market **prices** (EEX, EPEX day-ahead, EPEX intra-day, ...). Simultaneously addressing several **time scales**.



Piece-wise **linear approximation** of non-linear **Modelica** asset models, to maintain mixed-integer linear program (due to scalability). Here, all hard and soft constraints are configured to calculate the optimal **setpoints** with the given **multi-objective** cost function;

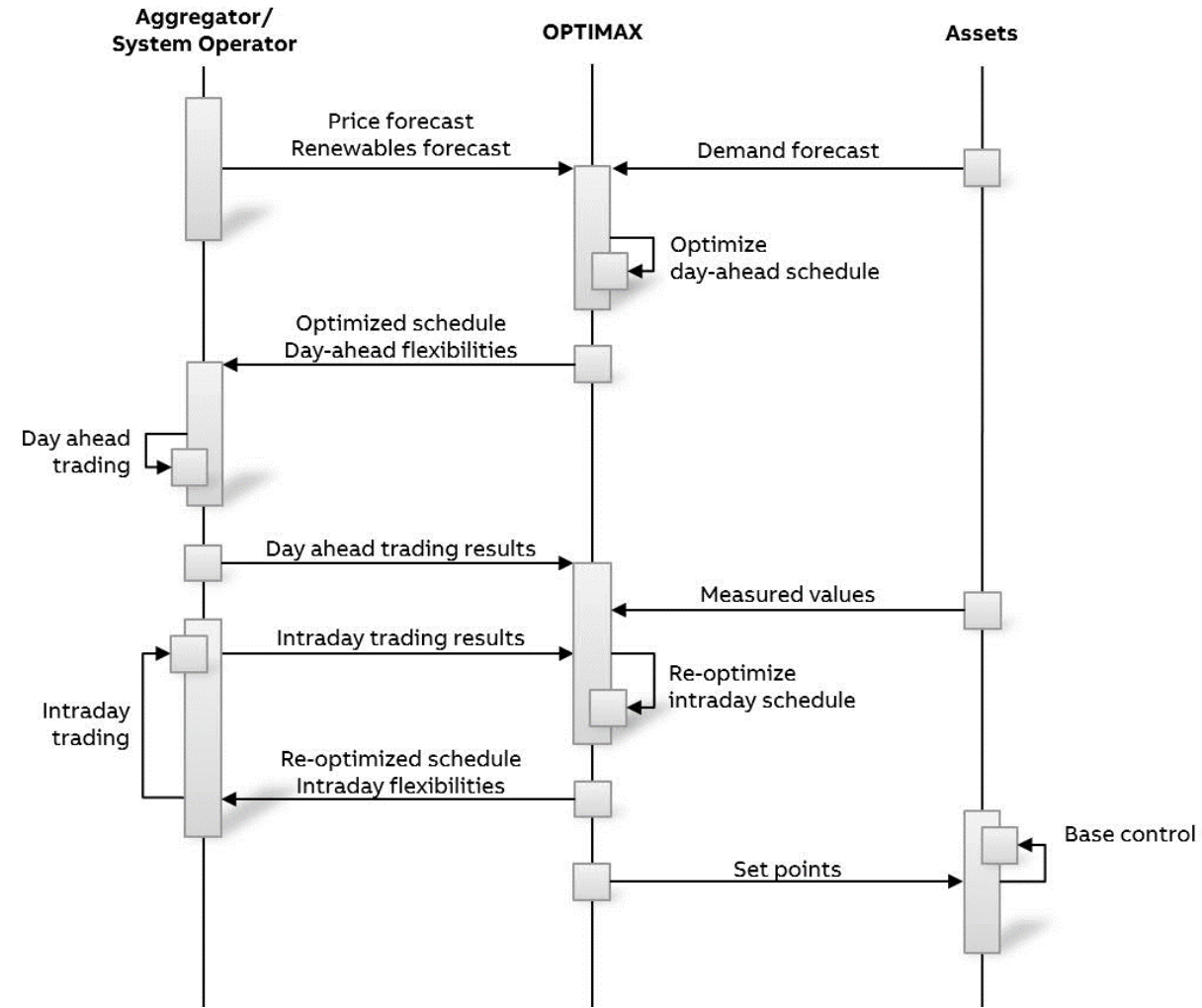
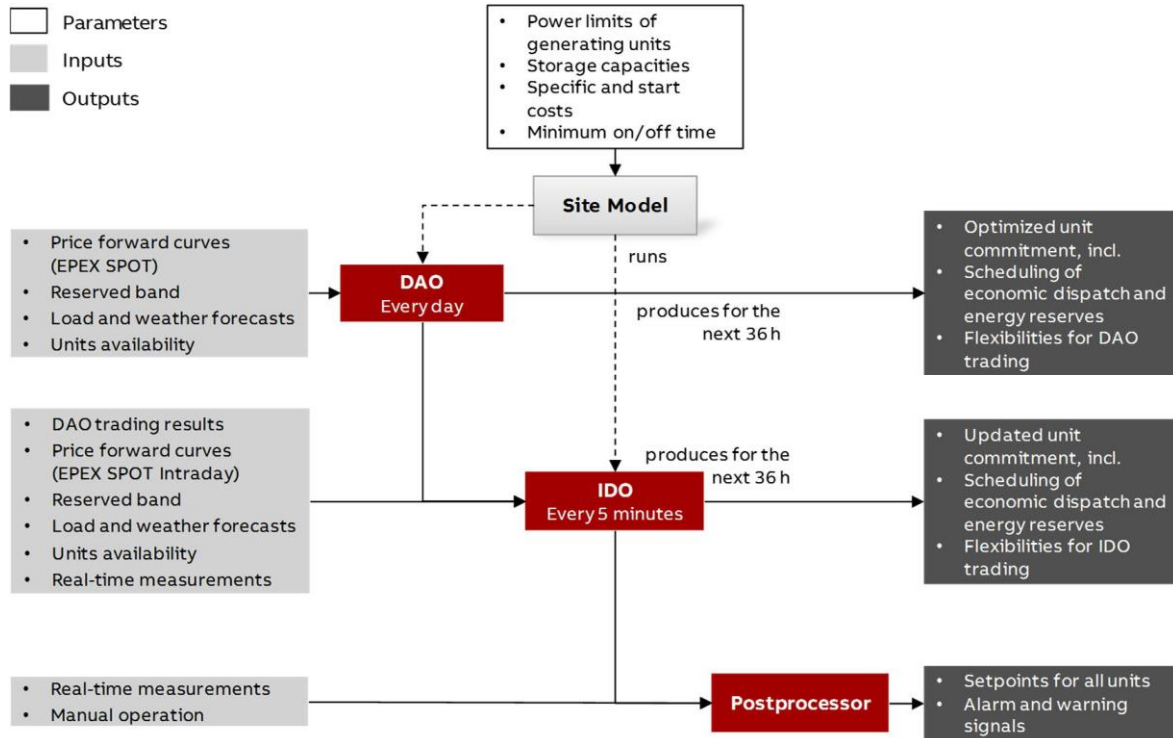


Optimal setpoints (from **production**, **storage** and **controllable loads**) are sent to the overarching **control system** (or to assets directly), where the classic PI loops continue to do their job. These set-points are of course also **cycled** and even **real-time** optimized (eg. discrete market volumes vs. continuous behavior of the assets, forecast uncertainties).

> 10 years of research and development

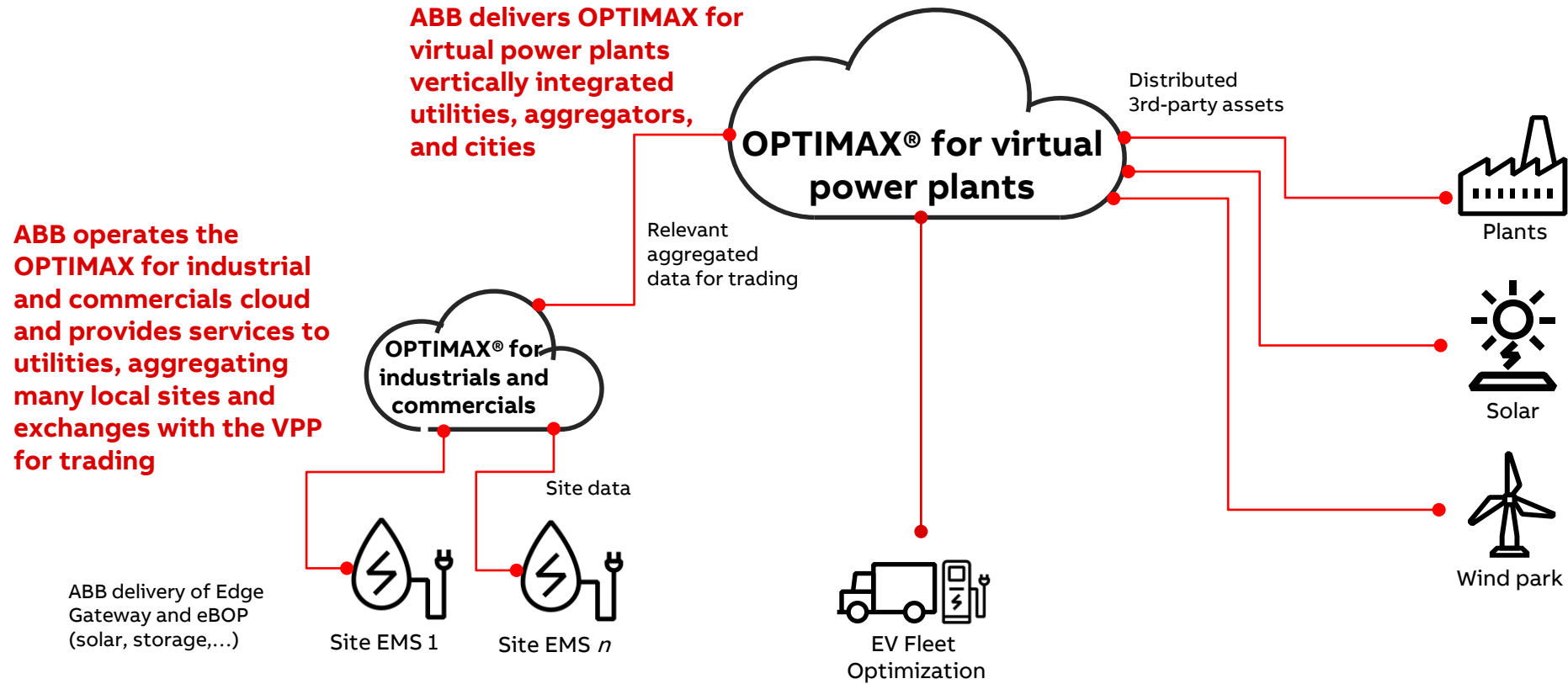
# OPTIMAX<sup>®</sup> for Industrials, Commercials and Virtual Power Plants

## Optimization overview and communication flow



# OPTIMAX® for Industrials, Commercials and Virtual Power Plants

## System topology

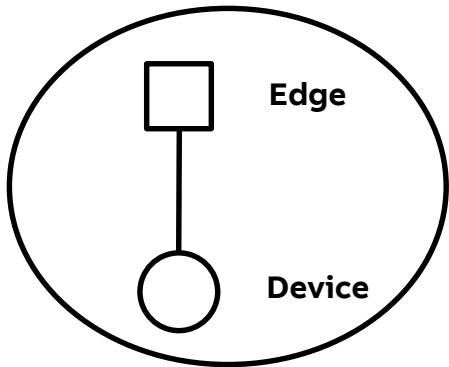




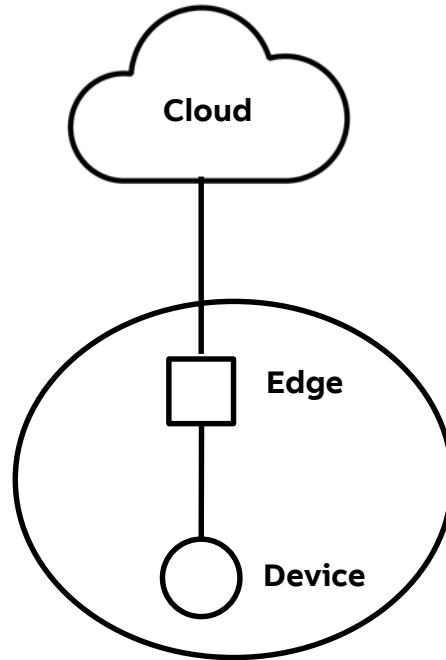
# Multiple deployment models possible

Secure digital solutions on-premise, in the cloud, and in an ecosystem

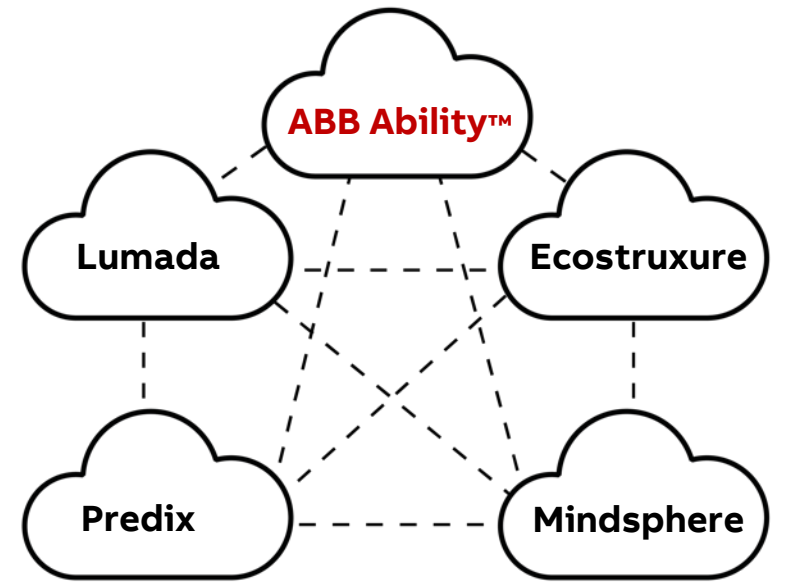
## Fog



## Cloud

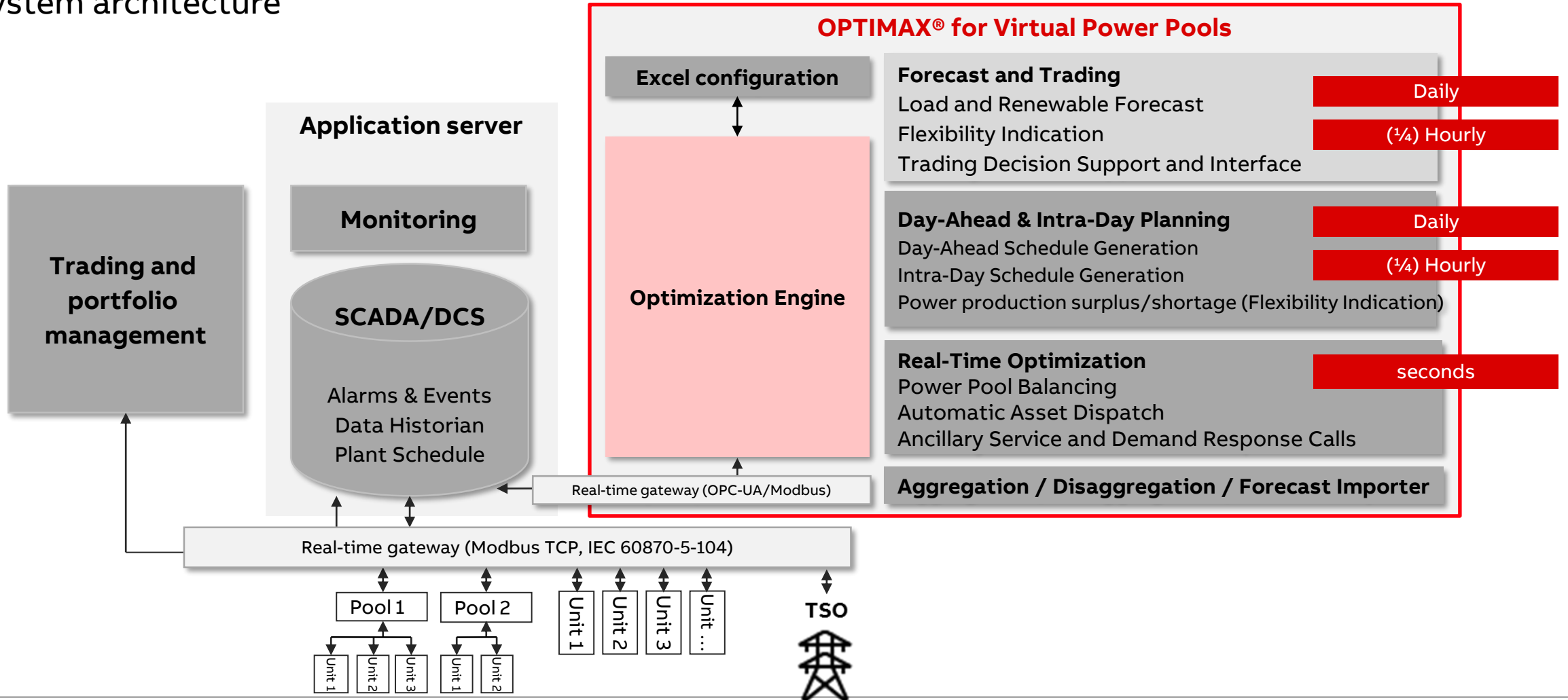


## Intercloud



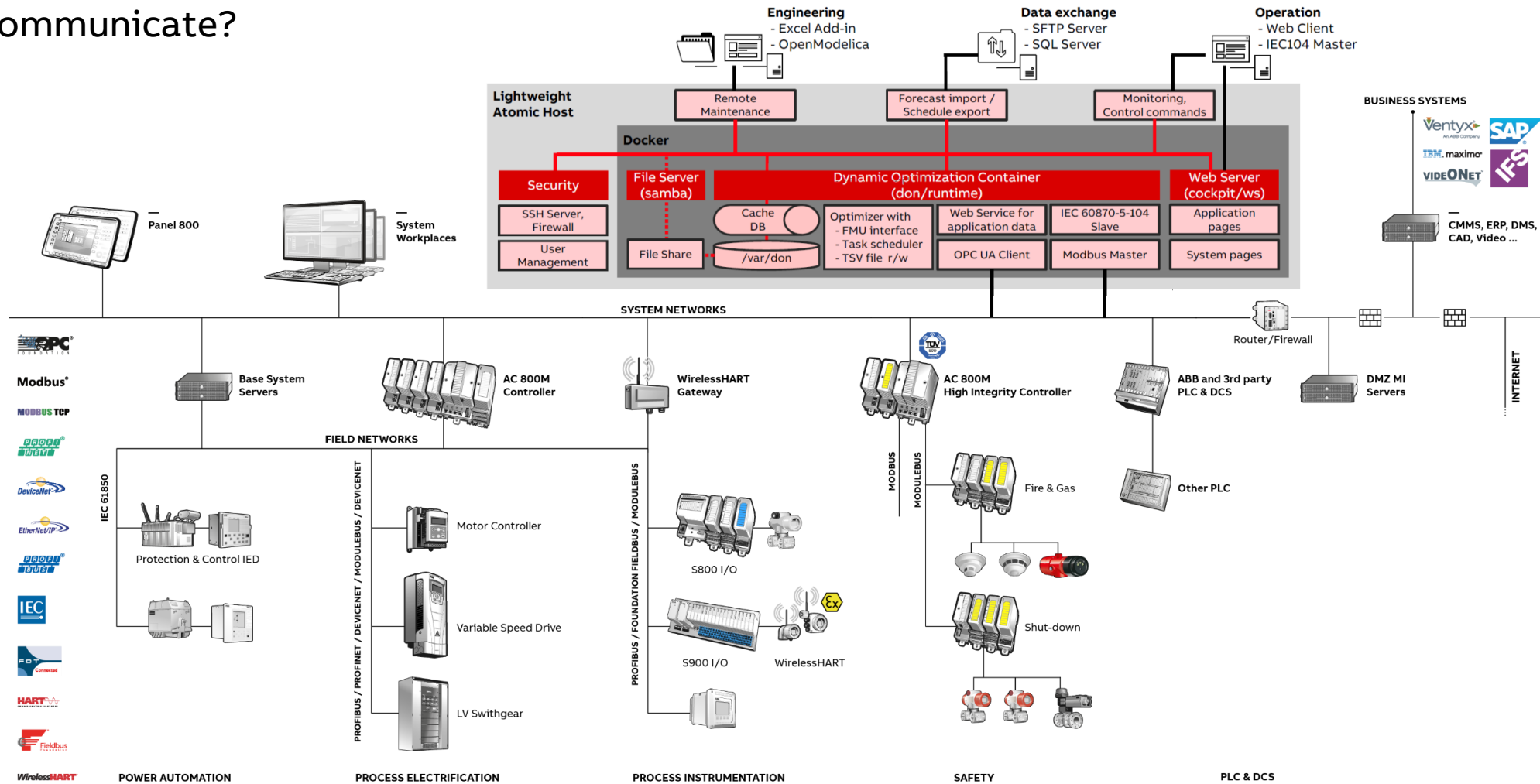
# OPTIMAX® for Virtual Power Plants

## System architecture



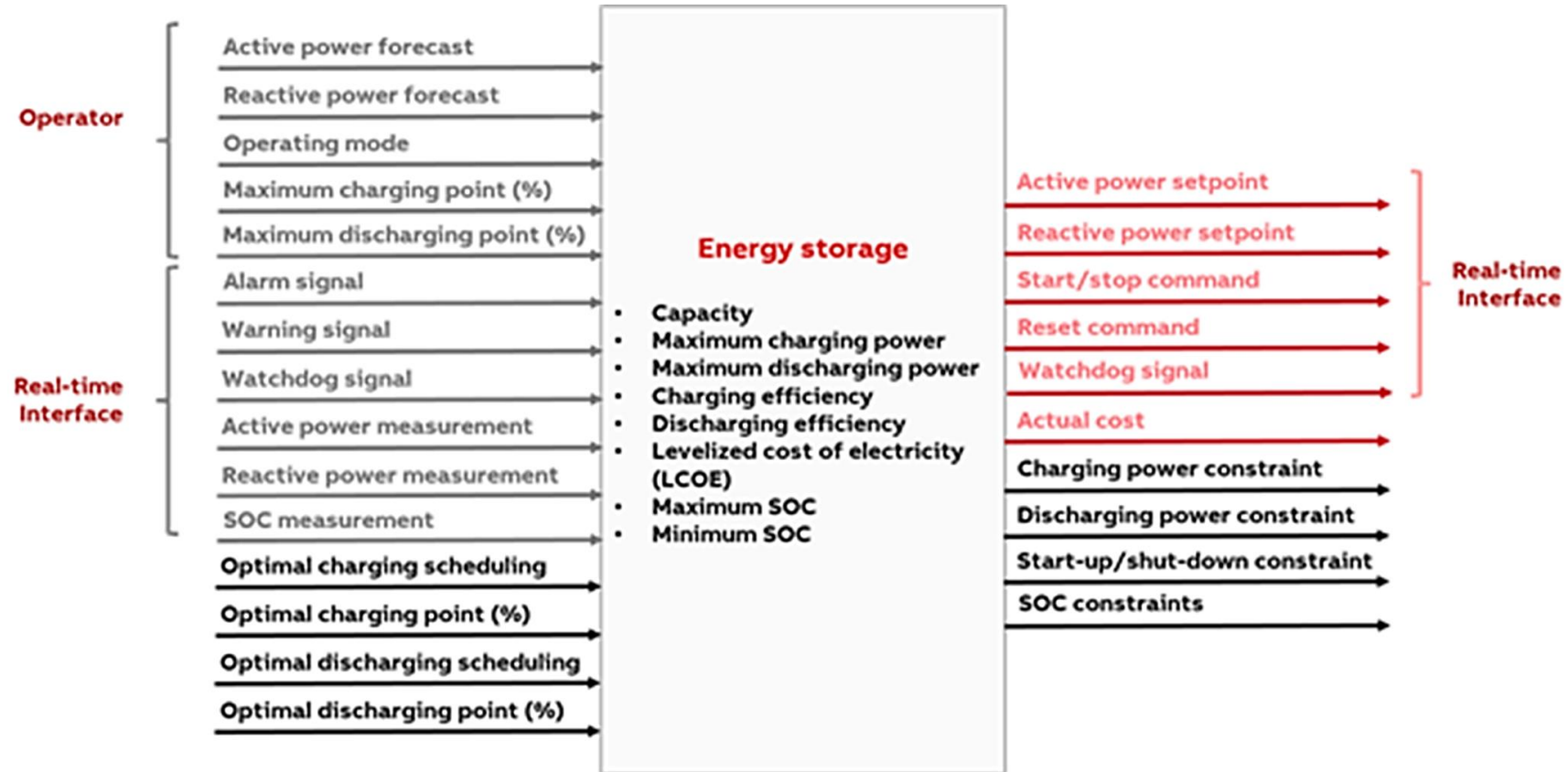
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How to communicate?



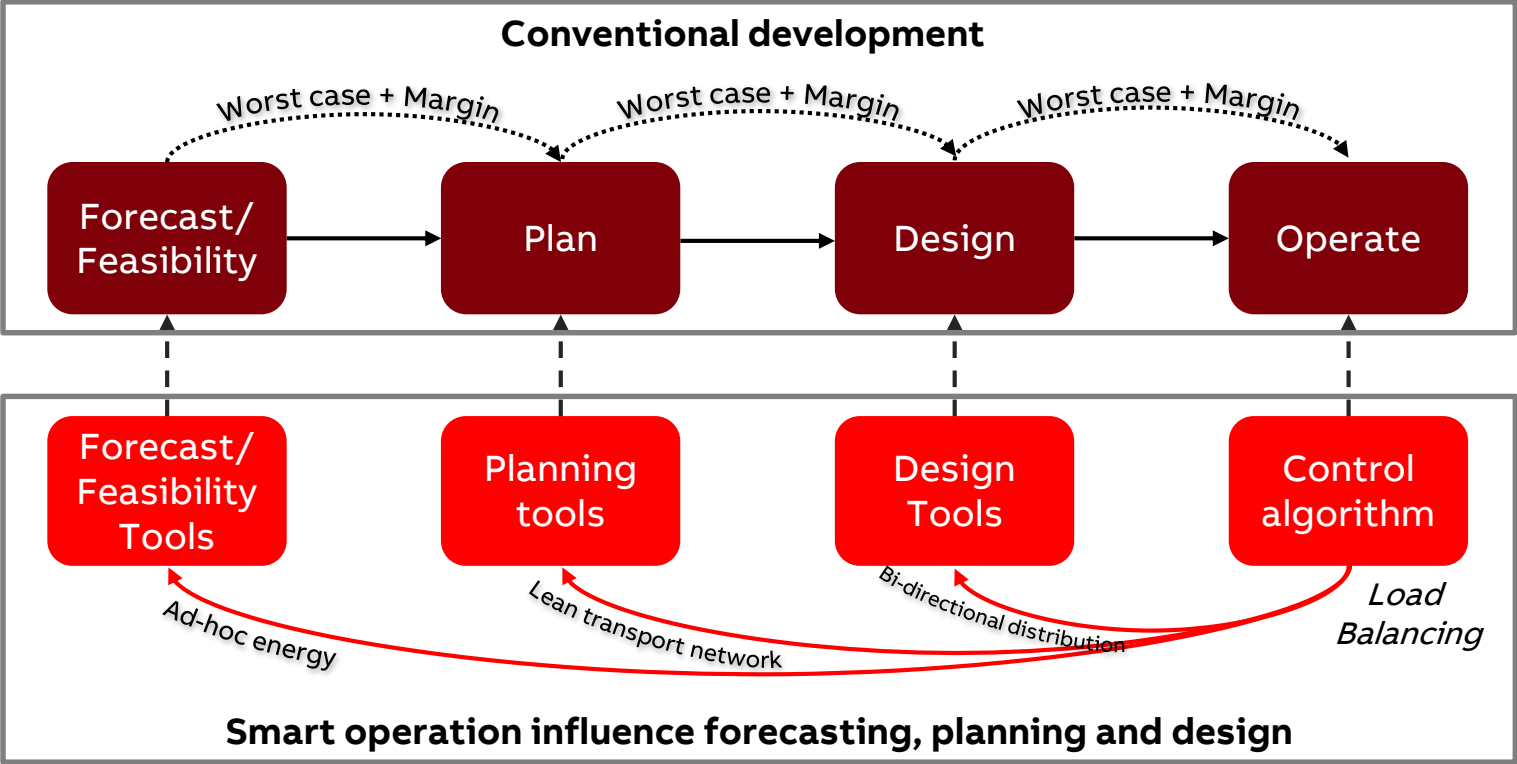
# OPTIMAX® for Industrials, Commercials and Virtual Power Plants

What to communicate? I/O example



# ABB Ability™ Energy Management for Sites

## Site Assessments



# Machine learning for real-time Advanced Multi-Energy Trading (MAMuET)

Green Energy Park (Zellik, Belgium)



CO-2 NEUTRAAL MICROGRID



BATTERY TO GRID



VEHICLE TO GRID



GREEN DATACENTER



THERMISCH GRID



EXPERIMENTEEL OPERATIEKWARTIER



# MISSION TO ZERO





**Live demo**



An aerial photograph of a city at sunset. The sun is low on the horizon, creating a warm, golden glow over the city. A prominent blue glass skyscraper stands out in the center-left. The city is densely packed with buildings, and a large railway yard is visible on the left. The sky is filled with soft, wispy clouds.

Let's write the future. **Together.**

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## CONTACT DETAILS

Let's get in touch!



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**ABB**