# Predict. Optimize. Profit.

Precise Load and Generation Forecasting and Intelligent Battery Dispatch for Profitable Industrial and Utility-Scale Energy Management.

reasonance

# The Energy Paradox

## Rising Opportunity Meets Operational Complexity

### Volatility

**Fluctuations in energy prices** - including negative pricing hours and sudden peaks

**Grid instability** from local overloads, reactive balancing, and frequent system events

### Market Complexity

**Multiple, interrelated market segments**, such as day-ahead, intraday, balancing, and ancillary services, each with its own regulations, timings, and pricing mechanisms

### Renewables Integration

Managing **intermittent generation** is challenging, as power output often misaligns with consumption patterns and market conditions

### Asset Optimization Needs

**Static operation** of flexible assets

No/limited ability to **adapt dynamically** to changing load, weather, or market conditions.

BESS often operated **as backup** rather than a value-generating asset

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### The Consequence

Balancing energy supply and generation is increasingly challenging, resulting in financial risk and operational strain for market participants.

# Challenges

Grid & market participant vertical vs. Industrial & commercial vertical

**8-15%+**
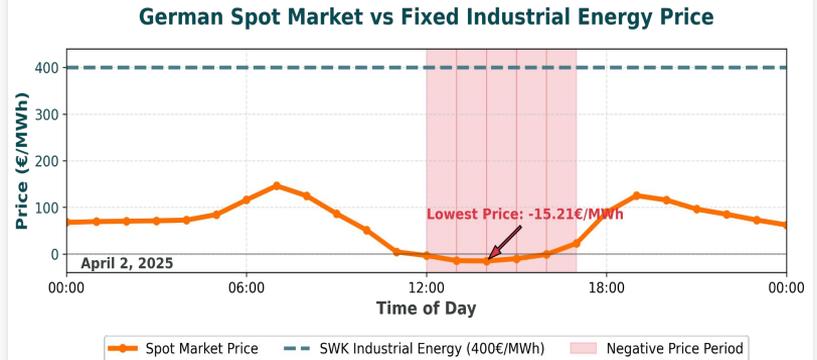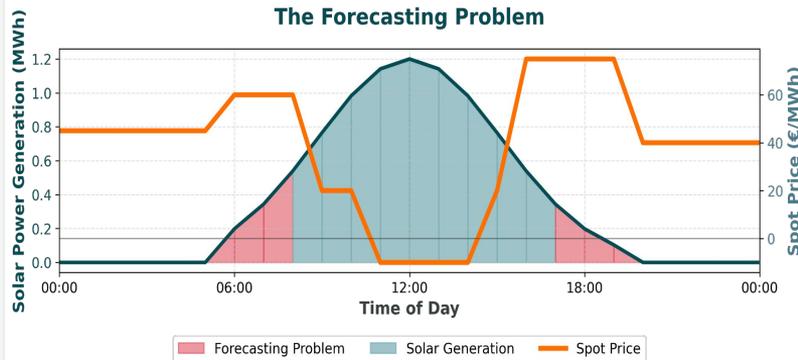Typical PV Forecast **Error**
(Competition)

**15-30%+**
Unrealized BESS **Revenue**
(Siloed Operation)

**~€350+/MWh**
Average Industrial **Cost**
(vs. Low / Negative Spotmarkt Price)

Grid & market participants

Industrial & commercial



**The Forecasting Problem**

Solar Power Generation (MWh) / Spot Price (€/MWh) vs Time of Day

Legend: Forecasting Problem | Solar Generation | Spot Price



**German Spot Market vs Fixed Industrial Energy Price**

Price (€/MWh) vs Time of Day

Lowest Price: -15.21€/MWh

April 2, 2025

Legend: Spot Market Price | SWK Industrial Energy (400€/MWh) | Negative Price Period

**Timing** and **precision** are critical
in navigating the dynamics and complexity of energy generation, storage, and trading.

# Problem Statement

Financial and operational cost across verticals

## Vertical 1: Grid & Market Participant

**Revenue leakage**

Failure to co-optimize BESS operations across stacked markets - day-ahead, intraday, and ancillary reduces BESS profitability significantly.

**Imbalance penalties**

Inaccurate load and PV generation forecasts increase the risk of grid imbalances, resulting in costly penalties for market participants.

**Trading risk**

Limited forecasting precision during volatile periods, especially in shoulder hours, hinders effective trading and reduces arbitrage gains.

**Main Objective**

Enable grid operators, aggregators, and market traders to minimize **reserve dispatch costs**, avoid **imbalance penalties**, and seize **arbitrage opportunities** across day-ahead, intraday, and ancillary markets.

## Vertical 2: Industrial & Commercial

**Inflated costs**

Paying high average prices and missing opportunities to consume during low or even negative price periods

**Peak-charge exposure**

Unreliable load forecasts leading to unexpected demand peaks and elevated demand-charge tiers

**Asset underutilization**

Lack of co-optimization between PV generation, battery storage, and site load resulting in low self-consumption and missed grid-fee savings

**Main Objective**

Optimize **total energy spend** and **on-site PV power utilization** for energy-intensive facilities by aligning operations and storage dispatch with precise short- and medium-term load and PV forecasts

# Offering

## Energy management solutions

Delivering **analytics**, **forecasting**, and **optimization solutions** to enhance operational efficiency, optimize trading and storage strategies, and maximize return on investment.

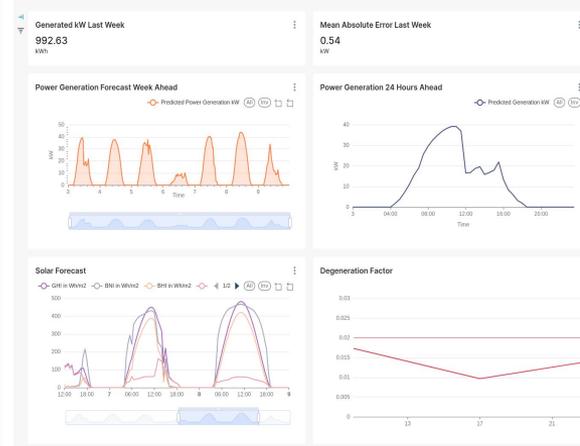| Load Forecasting | Photovoltaics (PV) Power Generation Forecasting |
|---|---|
| Simulation, System Configuration, and Financial Analysis for BESS/PV Investments | PV Asset Monitoring & Analytics |

| Intelligent Battery Energy Storage System (BESS) Scheduling & Operation |
|---|

**Award-winning solutions:**

AI Champions
Baden-Württemberg

EUPD RESEARCH
TOP INNOVATION
AI SOLUTIONS
GERMANY
2025



**Selected Solution:** PV Generation Forecasting & Analytics
Interactive Dashboard View

Generated kW Last Week
992.63
kWh

Mean Absolute Error Last Week
0.54
kW

Power Generation Forecast Week Ahead

Power Generation 24 Hours Ahead

Solar Forecast

Degeneration Factor

# Value Proposition

Delivering measurable results

## Industrial & Commercial

### 60-80%

**Reduction in Energy Costs**

+ Accelerated **uptime** during grid outages
+ Reduce **CO2 emissions**

Drives Profitability & Sustainability

## Grid & Market Participants

### 15-30%

**Increase in Revenue**

+ Reduced **risk** exposure
+ Optimize **renewables** integration

Maximizes ROI & Sustainability

# Concrete

Integrated forecasting and co-optimization for industrial applications

## Scenario Context

Industrial production site with **continuous** or **high-load** energy demand

➜ **Energy infrastructure installed**

☑ 0.7 MWp of rooftop or ground-mounted Photovoltaics (PV) *(onsite solar generation)*
☑ 1 MWh Battery Energy Storage System (BESS) *(onsite energy shifting and backup)*

### Key Challenge

Balancing **loads** with
**on-site PV power generation**

### Primary Goals

➜ Reduce **electricity costs**

➜ Maximize **self-consumption** of renewable energy and reduce **grid dependency**

➜ Enhance **resilience** against price volatility
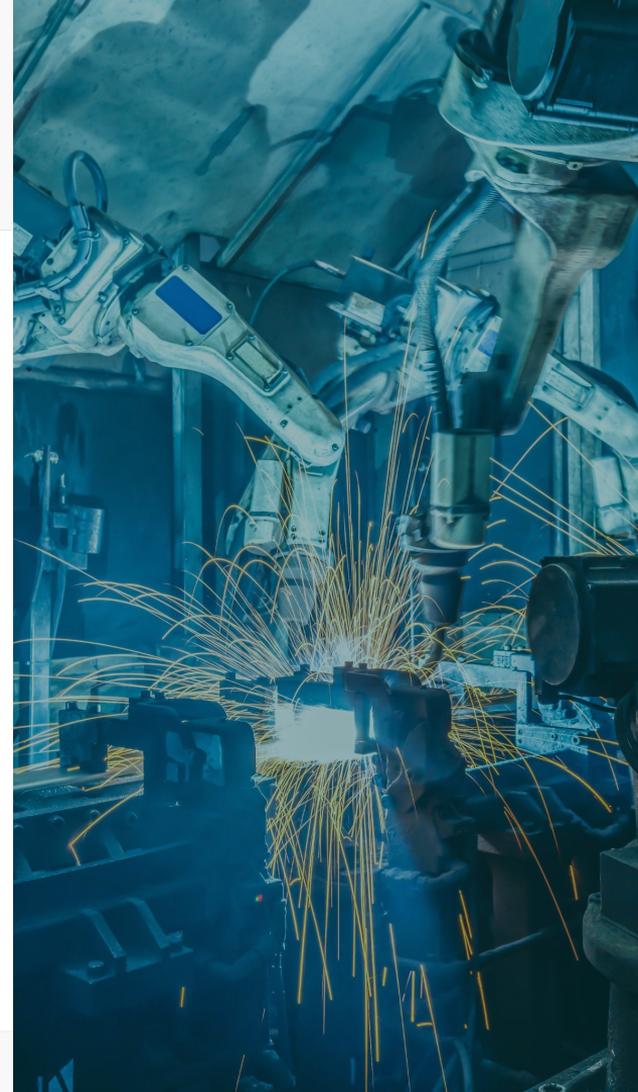
# Solution Overview

Integrated forecasting and co-optimization for industrial applications
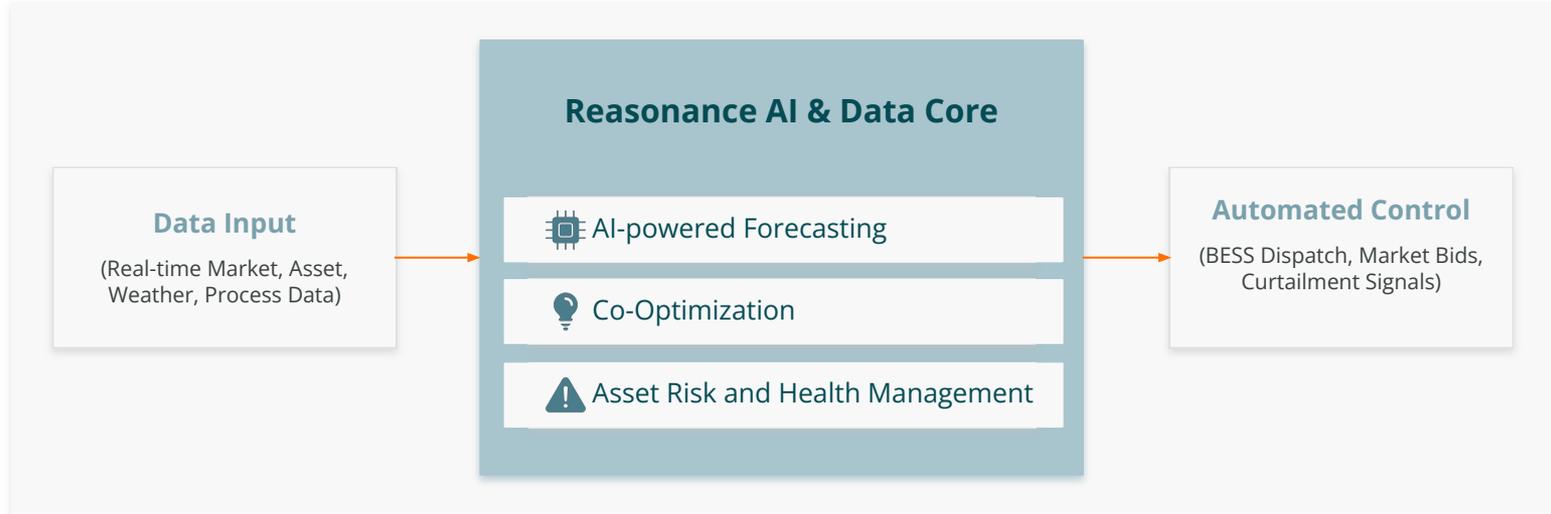


**AI-Powered Forecasting Foundation**

Industry-leading accuracy minimizes risk and enables proactive optimization.

**Co-Optimization Engine**

Maximizes total value across stacked revenue streams while managing constraints and asset health.

# Interactive dashboard view

Integrated forecasting and co-optimization for industrial applications

# Outcomes

Integrated forecasting and co-optimization for industrial applications

**Stadtwerke Case**

**337k €/Year**
Energy Expenses
(Normal Operation)

**Spot Case**

**90k €/Year**
Energy Expenses
(Normal Operation)

**Spot +PV Case**

**43k €/Year**
Energy Expenses
(Normal Operation)

**Spot + PV + BESS Case**

**19k €/Year** Energy Expenses
(Reasonance Optimized Operation)

☑ **Load Forecasts**

- ❑ From **15 minutes to 2 weeks** in advance
- ❑ **Updated** at 15 minute-intervals
- ❑ With an error margin of **<4%**

☑ **PV Power Generation Forecasts**

- ❑ From **15 minute to 1 week** in advance
- ❑ **Updated** at 15 minute-intervals
- ❑ With an error margin of **<2%**

☑ **BESS Optimization**

- ❑ **Intraday to day-ahead** schedules
- ❑ **Updated** at 15 minute-intervals
- ❑ (Semi-) automated execution

**≈ 94%**
Energy Cost Savings

**≈ 42%**
Lower $CO_2$ Emissions