

INDUSTRIAL ENERGY MANAGEMENT AND OPTIMIZATION WITH ABB

# How do digital champions manage energy as they drive to achieve sustainability goals? **Part 1**



## Meet ABB Process Industries's digital experts on sustainability



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Sustainability

SUSTAINABILITY  
WEBINAR SERIES

**How do digital  
champions  
manage energy  
as they drive to  
achieve  
sustainability  
goals?**

Cement

Mining

Metals

Pulp & Paper

Manufacturing



PART 1



## Recent headlines

Consumers, investors, governments and industries care about sustainability, but only few have a “credible” plan. The sustainability puzzle widely remains unsolved

GOV.UK

**Energy intensive industries given £12 million boost to cut emissions and costs**

Latest Newsletters

*The Atlantic*

### The World Is Finally Cracking Down on ‘Greenwashing’

The plan to stop companies from fudging their climate goals is fundamentally flawed.

By Emma Marris



**Forbes**

**Energy Crisis: Are Industrial Manufacturers Sustainable Enough To Tackle It?**

McKinsey  
& Company

**Consumers care about sustainability—and back it up with their wallets**

February 6, 2023 | Article

### Video: How environmental inspections unfold in Abu Dhabi, where fines can reach Dh1 million

Environment Agency Abu Dhabi held 1,089 random inspection visits in 2022

Published: February 28, 2023 18:01  
Samihah Zaman, Senior Reporter





# Industrial sustainability puzzle: don't wait for all the pieces to be there

Digital energy management is one of the key elements of sustainability strategy

*Digitalization*

**ENERGY**



# There are strong action imperatives for industries to engage in cost reduction, energy efficiency and decarbonization measures



Digitalization  
improving  
productivity



Energy &  
utilities  
price variations



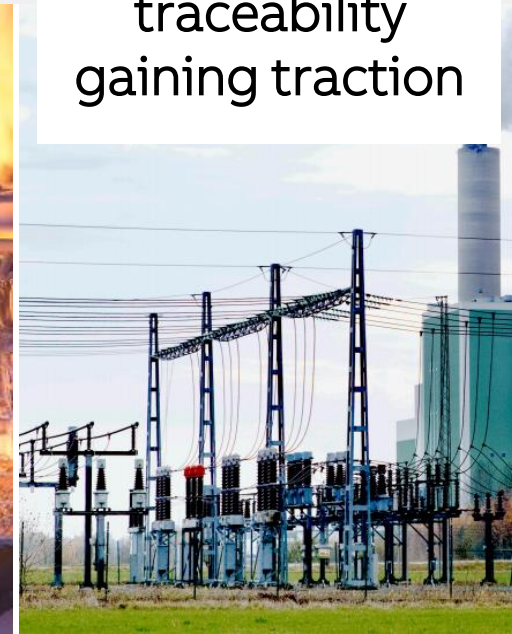
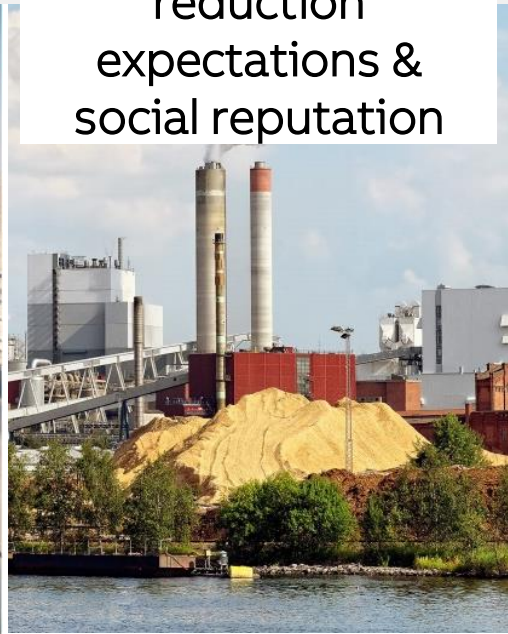
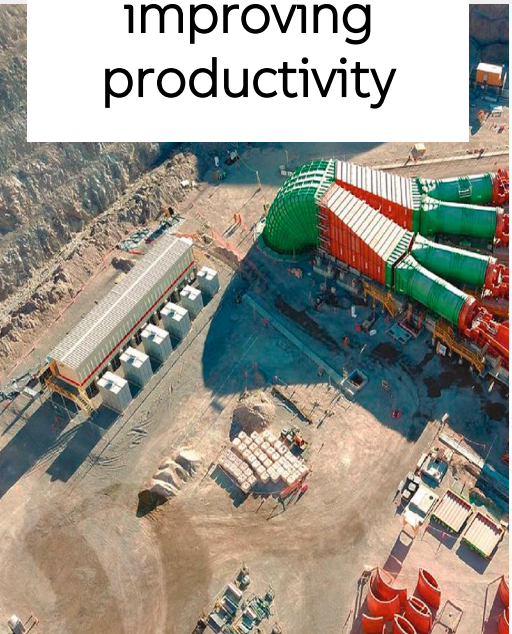
Greenhouse gas  
reduction  
expectations &  
social reputation



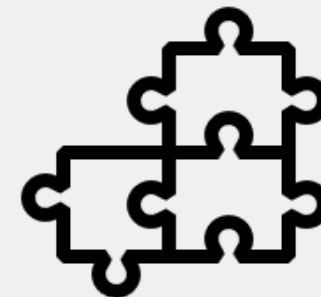
Regulations, access  
to incentives &  
capital markets  
investment



Carbon footprint  
traceability  
gaining traction



# However, many cost savings, energy efficiency and emission reduction opportunities remain untapped



Limited knowledge,  
finances



Improvement opportunities  
may be known, but not  
promoted or implemented

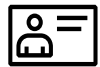


Unreliable  
measurements, no clear  
energy strategy in place



# CASE STUDY: Energy audit and EMS implementation yield significant savings

A combination of assessment, hardware updates, and software-based monitoring and targeting help optimize energy and natural gas consumption



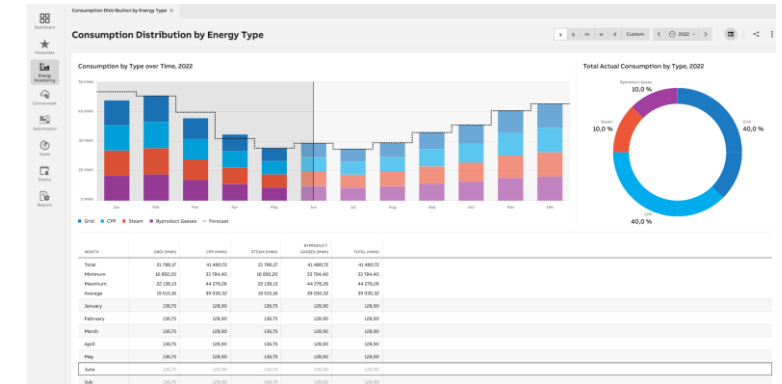
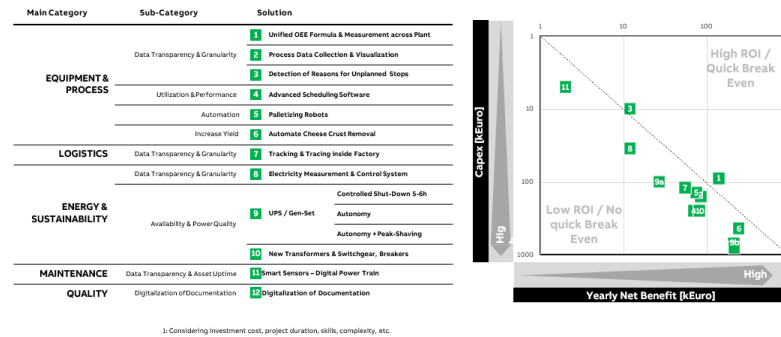
Pulp & paper mill



Spain



OpEx



## SITUATION

### High downtime caused by power consumption limits

- Problems with tripping of maxi-meters, devices for automatic blocking of power consumption on reaching pre-determined limits (critical to avoid penalty payments to local electrical utility for consuming too much energy)
- Lack of real-time visibility of limits breaches
- Age and lack of servicing identified as factors leading to maxi-meters becoming faulty

## SOLUTION

### Energy audit and energy management software installation

- Energy audit, including on-site assessment and off-site analysis to measure values, collect information, analyze and draw up list of opportunities – including hardware updates.
- Implementation of ABB Ability™ Energy Management System to optimize energy consumption

## SUCCESS

Total Energy Savings:  
**~290K€/year**





Global energy savings:	9.25%
Electrical savings:	9.9%
Natural gas savings:	7.9%
Savings in tons of CO <sub>2</sub> :	1.467 tons / year

Online article



# Monitoring and reporting

## Reference examples

Reference	Cement	Mining	Metals	Pulp & Paper
				
Case	Large cement producer, 50-100 MW plant with up to 10'000 TPD plants	Large and modern underground mine	Large metal plant > 1 mtpa steel production	Paper plant producing machine-glazed kraft paper
Highlights	<ul style="list-style-type: none"><li>- Energy monitoring of cement and captive power plant</li><li>- Power quality (current, frequency, voltage), losses (distribution, transformer) &amp; single line diagram</li><li>- Fuels &amp; calorific energy usage</li></ul>	<ul style="list-style-type: none"><li>- Monitoring, reporting for HQ, several mines and harbors</li><li>- Increase energy and operational efficiency</li><li>- Enable reduction of carbon dioxide and sulphur dioxide</li></ul>	<ul style="list-style-type: none"><li>- Online and automated reporting of all used energy types</li><li>- Transparency to energy consumption and cost structure</li><li>- CO-gases, process steam, district heating, Compressed Air, LNG</li></ul>	<ul style="list-style-type: none"><li>- Energy meters installation for monitoring at right granularity</li><li>- Alarms to avoid peak loads as per contract with local utility</li><li>- Enable detection of energy saving opportunities, raise efficiency</li></ul>

Energy consumption & cost structure transparency | Energy efficiency | Continuous improvement | ISO 50001



# Poll #1

Is your site certified according to ISO 50001 Energy Management standard?

- A. Yes, we are already certified
- B. We have started the certification process
- C. We would like to get certified in the coming years
- D. No plans to get certified
- E. Not aware of this standard

The ABB logo, consisting of the letters 'ABB' in a bold, red, sans-serif font, is positioned within a white square on a blue background.

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**slido.com**  
**#3357 285**

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# CASE STUDY: ABB factories & offices reduce energy costs

Transparency to energy consumption and cost structure for better forecasts & continuous improvement



ABB's own sites



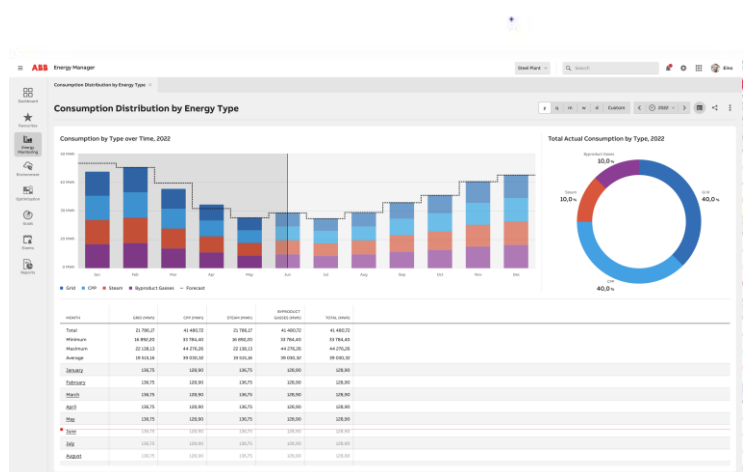
Finland



## SITUATION

14 business units with different energy types: electricity, heating, water

- Annual electricity bill ~2M€
- High electricity cost compared to Nordpool spot market price
- Price is high due to lack of reliable energy forecasts



## SOLUTION

ABB Ability™ Energy Management using specific energy consumption and production plans

- Pre-study to analyze savings potential, analyze consumption and specific energy consumption
- Energy monitoring & targeting
- Energy forecasting
- Deviation reporting as source for continuous improvement



↓ OpEx



## SUCCESS

Reduced costs with improved consumption forecast




**300k€** total savings over first year

- Transparency to energy consumption and cost structure
- Continuous improvement



# Load planning and forecasting

Reference examples in Metals, P&P, Manufacturing

Reference	Metals	Pulp & Paper	Manufacturing
			
MW capacity	350-450 MW	100-200 MW	12-13 MW
Number of tags	3'500-4'000 tags	~4'500 tags	~5'000 tags
Main loads	<ul style="list-style-type: none"><li>- Electric Arc Furnace (EAF)</li><li>- Rolling mill</li></ul>	<ul style="list-style-type: none"><li>- Mechanical pulp plant lines</li><li>- Paper machines</li><li>- Back pressure steam production</li><li>- Internal powerhouse</li></ul>	<ul style="list-style-type: none"><li>- Three (3) main locations</li><li>- Location specific total electricity consumption</li></ul>
Forecasting method	EAF minute-wise profile	Paper grade/ production speed dependent production plans	Historical seasonality (No production plan)
Forecast time steps	30 minutes time-steps	60 minutes (one hour) time-steps	60 minutes (one hour) time-steps
Power procurement	Enabling centralized power procurement for three (3) plants	Sending outside energy demand to central procurement system	Link to 3rd party energy market company for purchased power (ongoing project)

**Enable scenario planning, provide accurate energy forecast, reduce energy procurement cost by 2-5%**

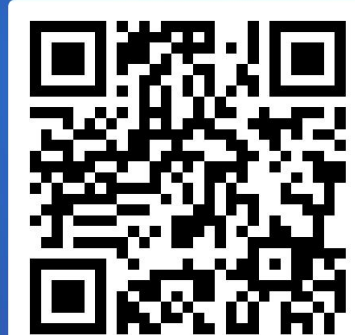
# Poll #2

How are you forecasting your energy consumption towards the vendors?

- A. Based on averages
- B. Based on the actual production plan
- C. We do not forecast

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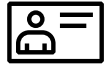
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# CASE STUDY: Reducing costs with optimal production timing at a pulp mill

Industrial demand-side energy management exploits real-time process and energy price data



Pulp plant



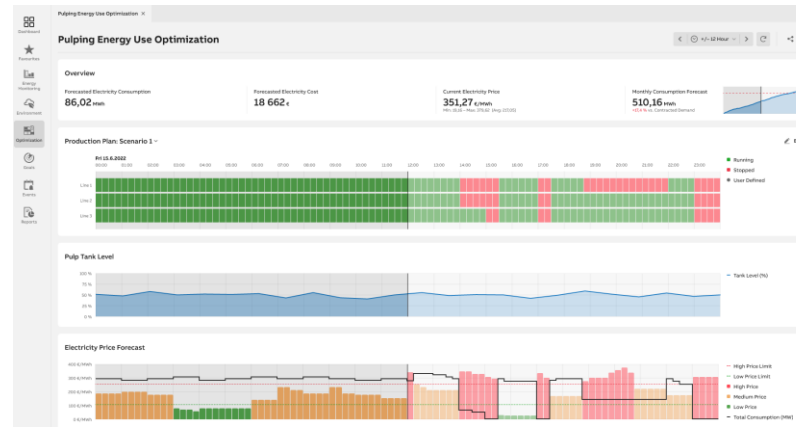
Austria



## SITUATION

### High energy costs at Refined Mechanical Pulp plant

- Significant impact of energy costs on operations
- Highly volatile electricity spot price
- About the mill:
  - Two board machines, creating 520,000 t/year
  - Refined Mechanical Pulp plant, 10 MW power, feeds board machines
  - 500 m3 / 130 000 gal storage tank between RMP plant and board machines



## SOLUTION

### ABB Ability™ Energy Management for optimal production timing

- Minimizes the electricity costs by optimizing the refined mechanical pulp (RMP) operation according to electricity spot price
- Provides accurate energy planning and power consumption forecast for electricity purchase
- System extension to new biogas power plant



OpEx



## SUCCESS

### Reduced costs

**14.5%** total savings over two sample periods (when optimization was possible and results were utilized by operators)

On-line article

# CASE STUDY: Cement production goes digital

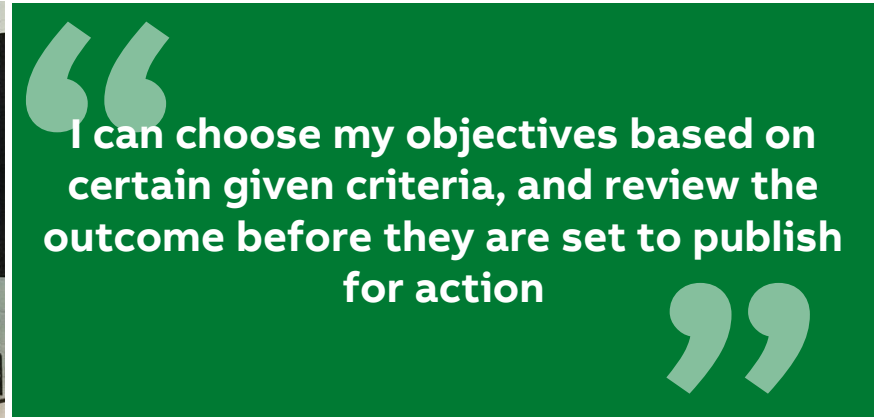
Optimal production schedule to minimize energy costs



Cement



Multiple sites



## SITUATION

### Ad hoc reactive schedules > higher energy costs

- Cement plants' objectives and operational constraints vary depending on restrictions in material transport and storage, planned and unexpected maintenance, complex energy tariff schemes, equipment power start-up curves, etc.
- One day, optimizing your **energy tariffs** may be the main goal, and the next it's the reduction of **carbon emissions**.

## SOLUTION

### Energy Optimization for Cement

- Information about energy tariffs and equipment availability is made available
- Online Information about product demand and silo inventory is acquired
- Schedule is calculated that satisfies product demands while minimizing the costs
- Operators can easily adapt to changing goals, assess "what if" situations and consequences





## SUCCESS

- Savings in energy bills
- Minimized deviations from emissions limits
- Consistent and systematic planning procedures



# Energy Optimization

## Reference examples

Reference	Cement	Metals	Pulp & Paper	Pulp & Paper
				
Case	Large cement producer with ad hoc reactive schedules leading to higher energy costs	Complex distribution networks: electricity, steam, byproduct gases, fuels	Need for enterprise-wide real-time decision support to reduce costs across 14 mills	Complex optimization problem at digester, bleach & pulverized fuel boiler plants

Join our next webinars on May 4<sup>th</sup> and May 18<sup>th</sup> to learn more

Holistic optimization of demand and supply

# Poll #3

How flexible are your processes and energy mix?

- A. We can reschedule production without interrupting the rest of the process
- B. We can switch between several energy sources when one is cheaper than the other
- C. I am not sure about the flexibility of our operations

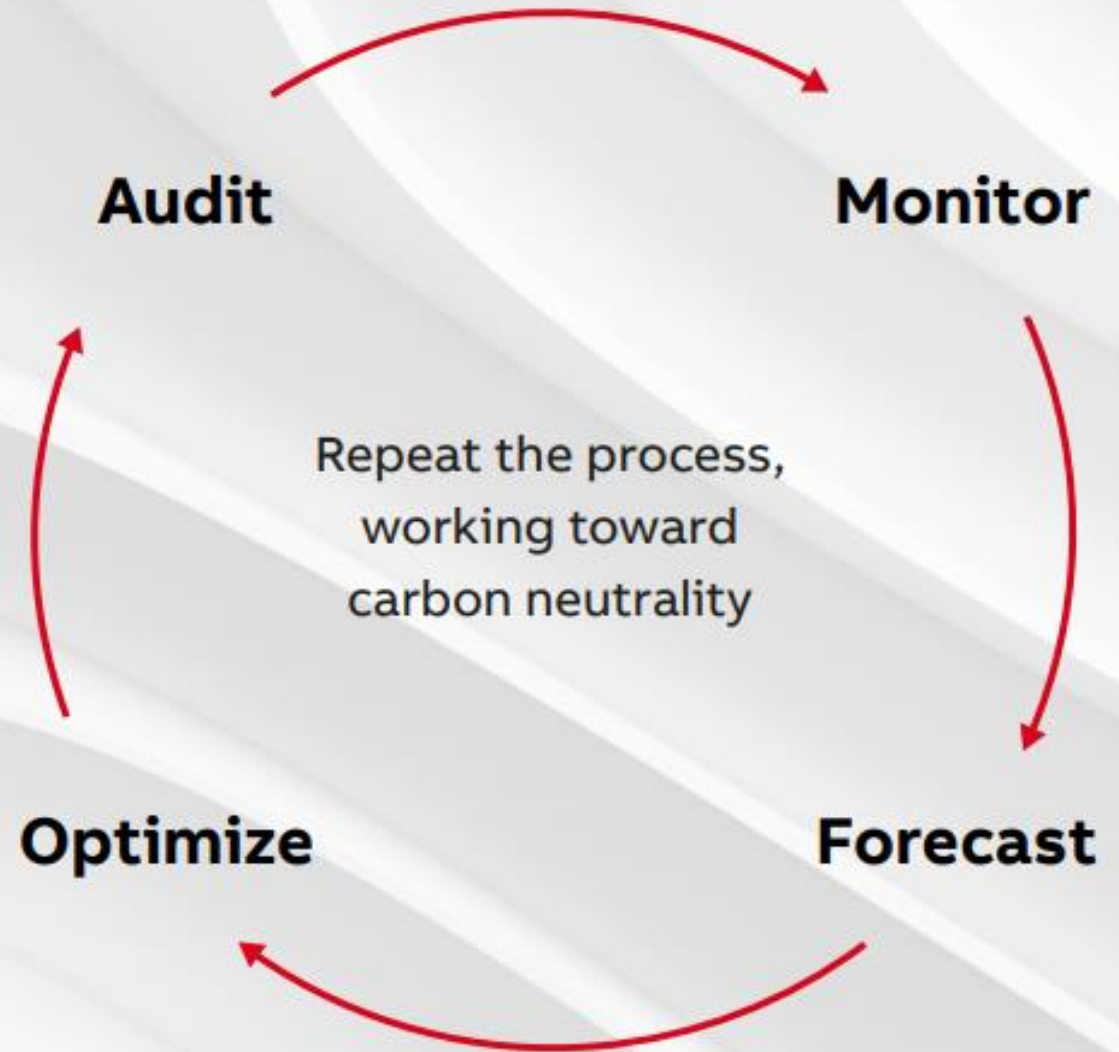


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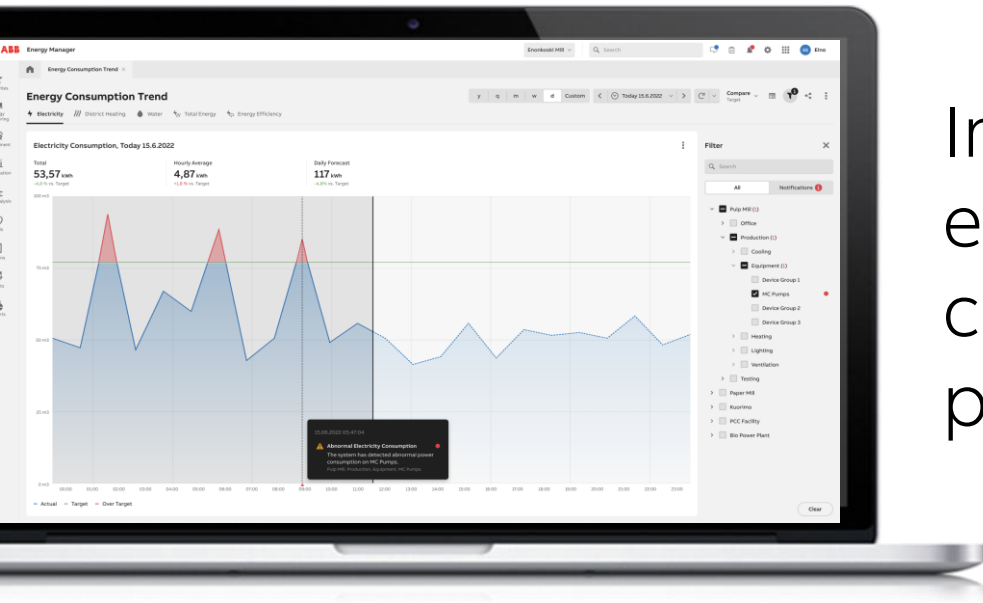


**How do the digital tools help achieve energy efficiency, cost reduction, decarbonization and compliance targets?**



# ABB Ability™ Energy Management System for industry

## Module 1: Monitoring and reporting



Improve energy efficiency, ESG compliance and productivity

### An online platform for monitoring, automated reporting against targets and decision support

- bring transparency over **energy consumption** and **sustainability** performance
- influence organization and routines around **continuous improvement of energy efficiency**
- achieve and maintain **ISO 50'001 certification**

1

Monitoring  
& reporting

Forecasting  
& planning

Energy  
optimization

Covers multiple energy types and emission monitoring

Sets benchmarks following your process areas & asset hierarchies

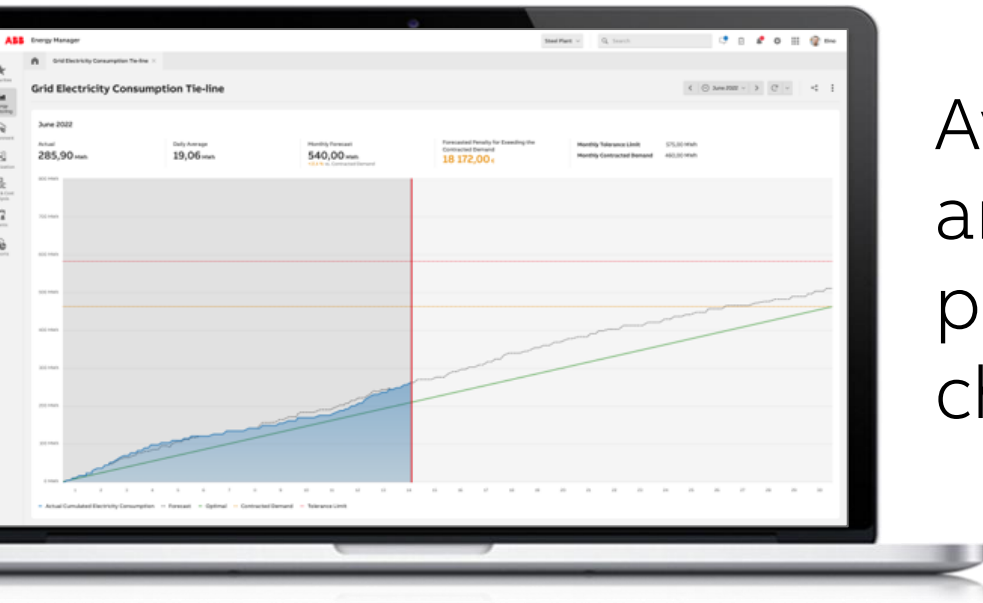
Triggers alarms for non-intuitive consumption patterns (AI/ML)

Makes improvement potential visible in real time



# ABB Ability™ Energy Management System for industry

## Module 2: Forecasting and planning



Avoid energy demand and supply risks, price peaks, and penalty charges

**Planning tools that forecast energy consumption & calculate the corresponding energy supply schedule to**

- purchase the **right level of power** in **liberalized power market** and minimize costs
- predict **complex/variable energy demand** with temporary peaks more accurately
- design the most **effective production plan** given power/energy constraints

Monitoring  
& reporting

2

Forecasting  
& planning

Energy  
optimization

Predicts energy consumption patterns for each consumer

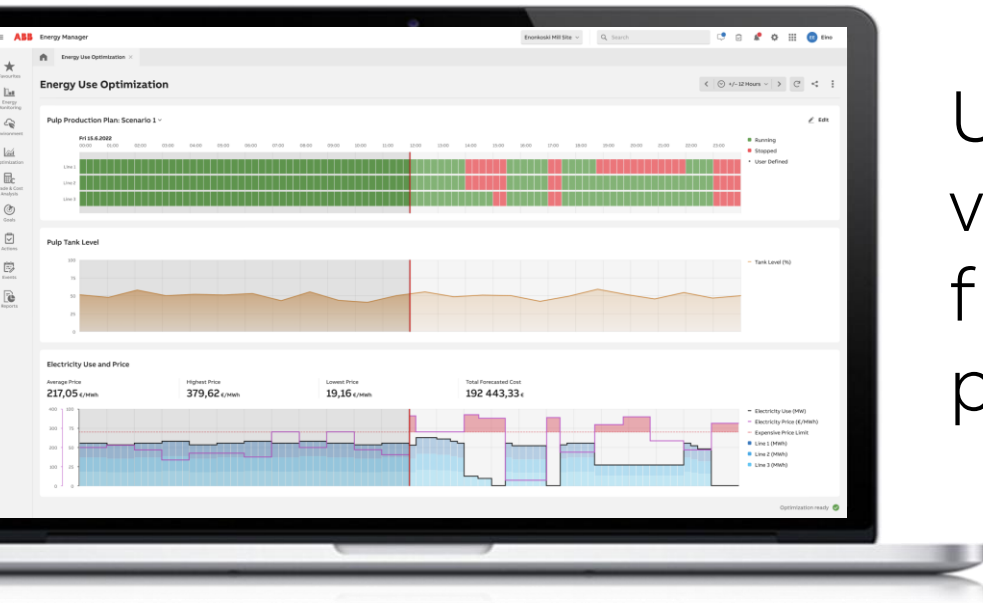
Supports multiple energy types & forecasting methods

Adapts to grade / rate / cyclical profiles, rule-based

15-30-60 min or day-ahead balancing, strategic planning over months/years

# ABB Ability™ Energy Management System for industry

## Module 3: Energy optimization



Utilize energy price volatility and process flexibility for optimal production scenarios

### Holistic energy supply & demand optimization depending on your business objectives:

- minimize the total energy cost, reduce emission levels or maximize the total profit of the operations
- leverage process flexibility for **peak shaving, load shedding, shifting production when energy is cheaper**
- leverage flexibility in energy sources to enable effective **energy procurement strategy**

Monitoring  
& reporting

Forecasting  
& planning

3 Energy  
optimization

Supports multiple energy types and optimization scenarios

Optimizes energy generation, procurement, trading

Shifts consumption to off-peak hours

Provides decision support & APC set points for optimal startup / operation



# A successful industrial energy management strategy

A comprehensive energy management solution to deliver on sustainability targets and energy cost savings



## Established targets

for energy usage



## Monitoring, alarms & reporting

of real-time energy usage,  
performance against targets



## Load planning & forecasting

to predict energy demand  
based on production plan



## Balancing energy usage

Against purchase  
commitment



## Optimization

of energy usage, production  
& procurement



# Join our next webinar on **May 4, 2023** to learn more

## **Effective energy saving methods at cement plant in China**

Outstanding energy efficiency practices compared to similar enterprises

## **Integrating sustainability into centralized mining operations**

Central control room brings together the lessons learned from mining automation and digital

## **Enterprise-wide electricity procurement, energy forecasting & optimization for 14 P&P mills**

Real-time decision support on how to use, generate, purchase or sell energy and emission rights

## **Paper mill ensures more stable and reliable energy supply while reducing operating costs**

Advanced Process control in the digester, bleach & pulverized fuel boiler plants

## **Site-wide optimization of byproduct gas and other energy assets for steelmaking process**

Managing energy purchase and production including site power plants and turbines

**DEMO**

SUSTAINABILITY  
WEBINAR SERIES

**How do digital  
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Cement

Mining

Metals

Pulp & Paper

Manufacturing



PART 2



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Would you like ABB to assess your energy performance and improvement potential?

Type “YES” in the chat now

and we will contact you by email

You can also use the “Contact Us” form on our website any time

Industrial Energy Management and Optimization

