INDUSTRIAL ENERGY MANAGEMENT AND OPTIMIZATION WITH ABB

How do digital champions manage energy as they drive to achieve sustainability goals? Part 2

Meet ABB Process Industries's digital experts on sustainability

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Sustainability

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Sustainability

SUSTAINABILITY
WEBINAR SERIES

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

PART 2

A key factor in accelerating industrial decarbonization

Well-designed government programs that are adapted for the country-specific requirements of the industry sector

INDUSTRIAL DEEP DECARBONISATION

AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL

MISSION

A global coalition designed to stimulate global demand for low carbon industrial materials. In collaboration with national governments, IDDI works to standardise carbon assessments, establish ambitious public and private sector procurement targets, incentivise investment into low-carbon product development and design industry guidelines.

GOALS

- Encourage governments and private sector to buy low carbon steel and cement: IDDI advocates for governments to set procurement targets for the purchasing of decarbonised steel and cement.
- Source and share data for common standards and targets. Develop key definitions, tools, guidelines and publicly accessible data, enable industry to conduct rigorous reporting and industry benchmarking comparisons, define common methods and understandings of what constitutes decarbonised steel and cement products.

LEAD GOVERNMENTS

COORDINATOR

UNIDO

PARTICIPANTS

Canada, Germany, United Arab Emirates

PARTNERS

Mission Possible Platform, Steel Zero Campaign, The Climate Group, The

GREEN PUBLIC PROCUREMENT

A CAMPAIGN OF THE CLEAN ENERGY MINISTERIAL

MISSION

Public procurement of steel and cement represent very high shares of domestic markets for such materials across most major economies. **The Green Public Procurement Campaign is an effort by participating members to drive the global decarbonisation of heavy industries such as steel and concrete by creating a market demand for near-zero carbon concrete and steel through public procurement.**

LEAD GOVERNMENTS

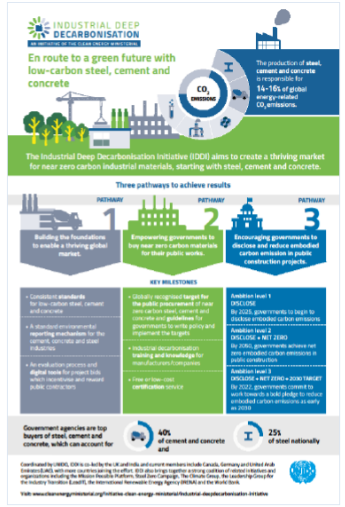
COORDINATOR

UNIDO

PARTNERS

The **Green Public Procurement Campaign** brings together a strong coalition of over 60 related initiatives and organizations across the private sector, civil society, intergovernmental organizations, trade associations, and leading experts from academia and think tanks to tackle carbon intensive construction materials such as steel and cement.

These organizations include the Mission Possible Partnership of the World Economic Forum, the Rocky Mountain Institute, the Climate Group, the Leadership Group for the Industry Transition (LeadIT), Building Transparency, and Agora Energiewende.



ISO 50’001 energy management standard makes it easier for organizations to integrate sustainability into daily operations

- Organizations decide to implement the ISO 50’001 certification for the benefits it provides and to show their decarbonization engagement to their supply chain partners and local authorities
- ISO 50’001 has seen a 9.7% increase in worldwide certificates in 2020
- Germany, China, France, Italy, UK, Hungary and India have the highest number of certified sites across all sectors

Number of ISO 50001 certificates in 2021

Country	Certificates	Sites
Germany	6166	22853
China	5369	5442
France	777	5390
Italy	1404	3568
Spain	771	4812
UK	1146	2456
Hungary	626	1189
Taiwan	413	1104
India	807	1029
Austria	249	630
Turkey	460	629
Croatia	283	574
Poland	250	544
Czech Republic	276	482
Sweden	65	339

Sector	Certificates
Mining	293
Food & Beverage	782
Pulp & Paper	216
Cement	243
Metals	1175
Machinery	346
Electrical equipment	455

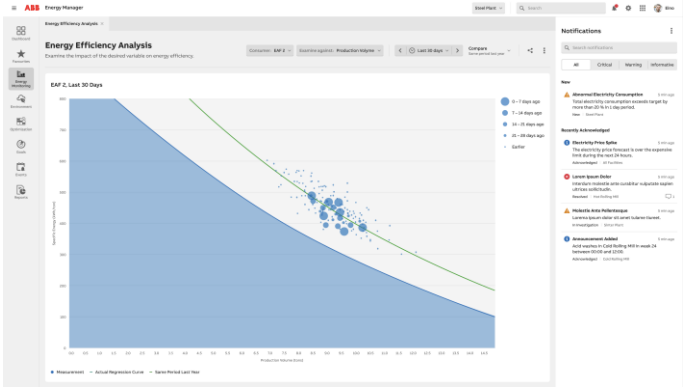
ISO 50001
ENERGY MANAGEMENT

Source: https://isotc.iso.org/livelink/livelink?func=ll&objId=18808772&objAction=browse&viewType=1

CASE STUDY: Effective energy saving methods at cement plant in China

Outstanding energy efficiency practices compared to similar enterprises driven by ISO 50’001 adoption

Cement plant **China**



OpEx

> Energy efficiency is the first energy source
>
> General Manager

SITUATION

Two 5000t/d cement clinker production lines

Own characteristics in terms of the energy purchase, storage, processing, conversion, distribution, transmission, use and statistics management.

SOLUTION

ABB energy monitoring and reporting system

Automated data collection, energy monitoring benchmarking, regression analysis

Process improvements and upgrades

Energy audit, energy-saving diagnosis, carbon emissions verification, thermal calibration, energy metering system and other hardware-related work

SUCCESS

Energy performance increased by 7.53% annually through the ISO 50’001 energy management system certification .

Savings of $316,332.87 during operation of the energy management system and $16,16066.37 for capital investment projects, resulting in total energy savings of $4,779,392.24 in 5 years.

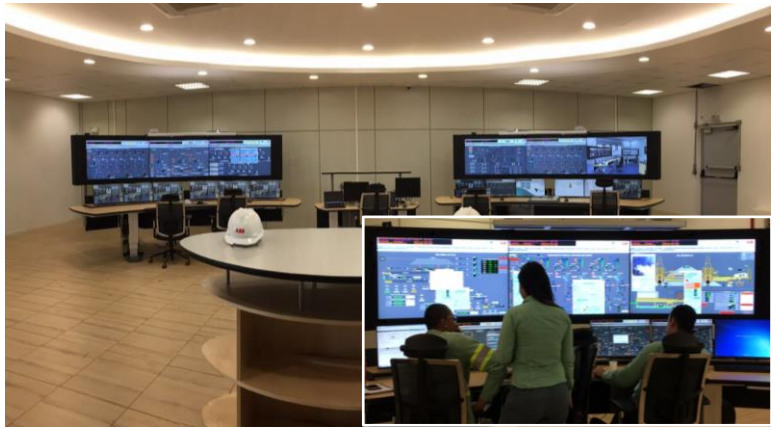
On-line article

Centralized operation of iron ore mine in South America

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

Mining | South America

OpEx | Productivity | Availability



> The project uses 93% less water, consumes 77% less fuel and emits 50% less greenhouse gases than a comparable operation based on conventional methods.

SITUATION

Mayor capacity expansion while building sustainable future mine

Lack of a central system for information exchange and plant management. Need to

- Extend the lifespan of iron ore mines
- Process low-grade ores
- Expand production capacity
- Contribute to environment preservation
- Truck-less system to transport the iron

SOLUTION

Digital solutions

- Advanced Process Control and Autonomous Stockyard Management System
- Energy Management System (EMS)
- Asset Management (>12000 Devices Integrated)

Best-case integration system – automation & electrical

- IEC 61850 standard allows for interoperability of IEDs, freedom of configuration and long-term stability in a rapidly advancing technological field

ABB Service Center with mobile workshop and parts inventory, as well as remote diagnostic for monitoring and carrying out preventive actions.

SUCCESS

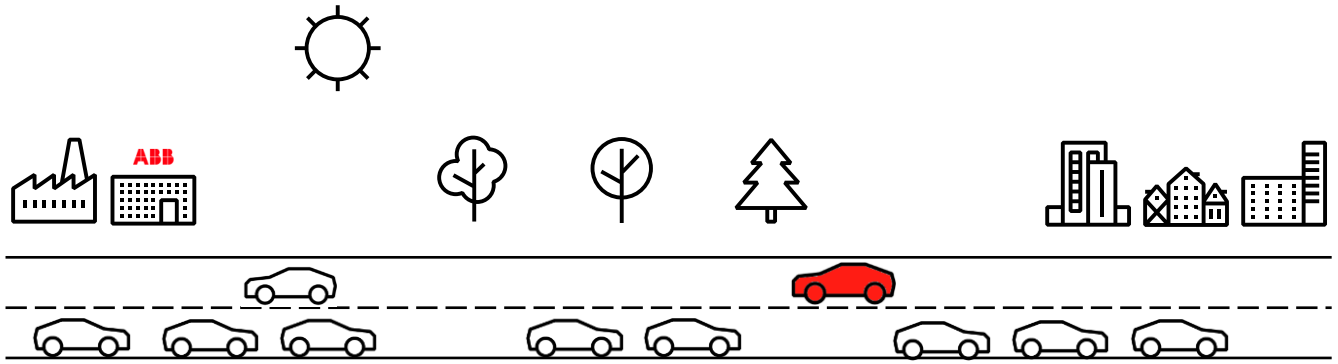
Central control room with unified interface for maintenance and other information

Lower carbon emissions, reduced operating costs (world's lowest iron ore production cost) and increased safety

- Dry processing of ore helps to almost eliminate water usage
- Installation of long-distance conveyor belt powered with electricity eliminates the need to transport ore with diesel trucks.

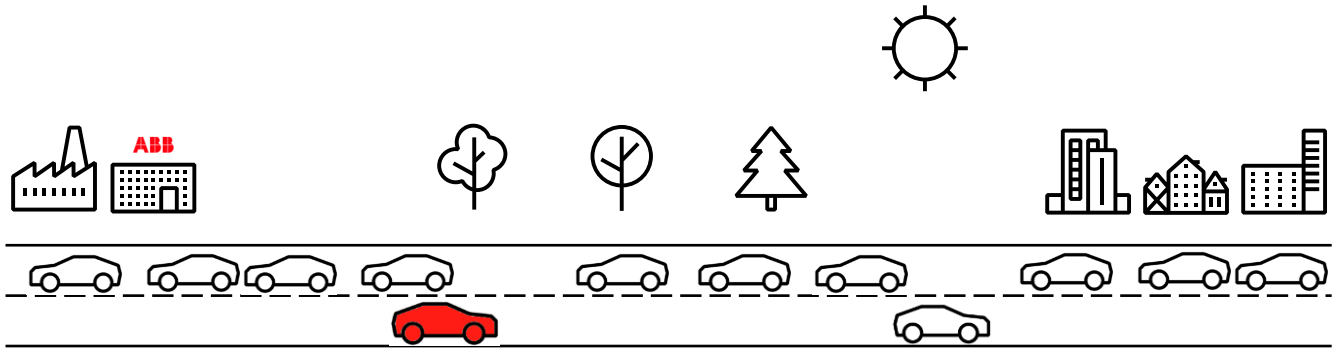
Introduction to energy demand side optimization

Utilize an asset when the demand is small and supply large



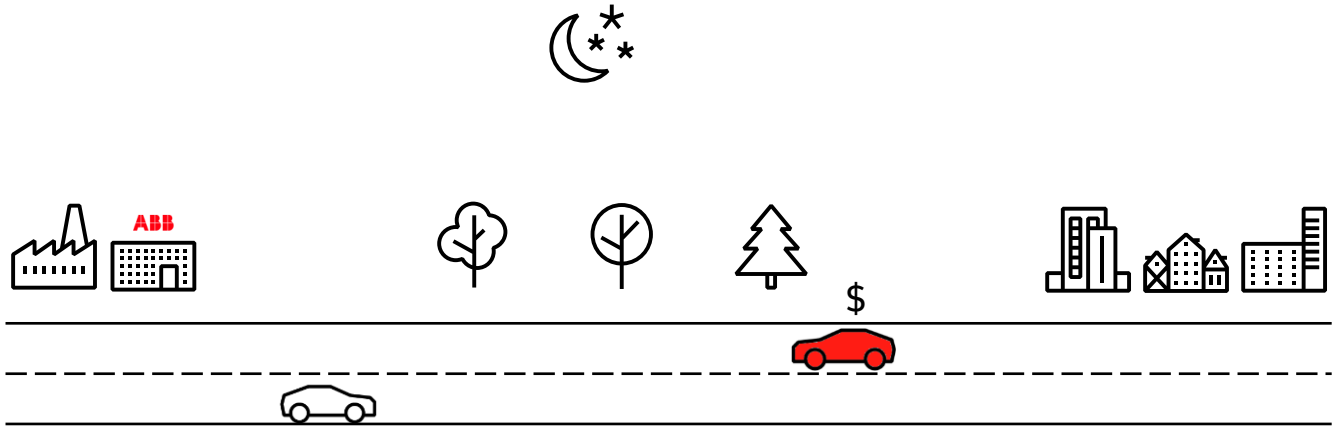
Introduction to energy demand side optimization

Utilize an asset when the demand is small and supply large



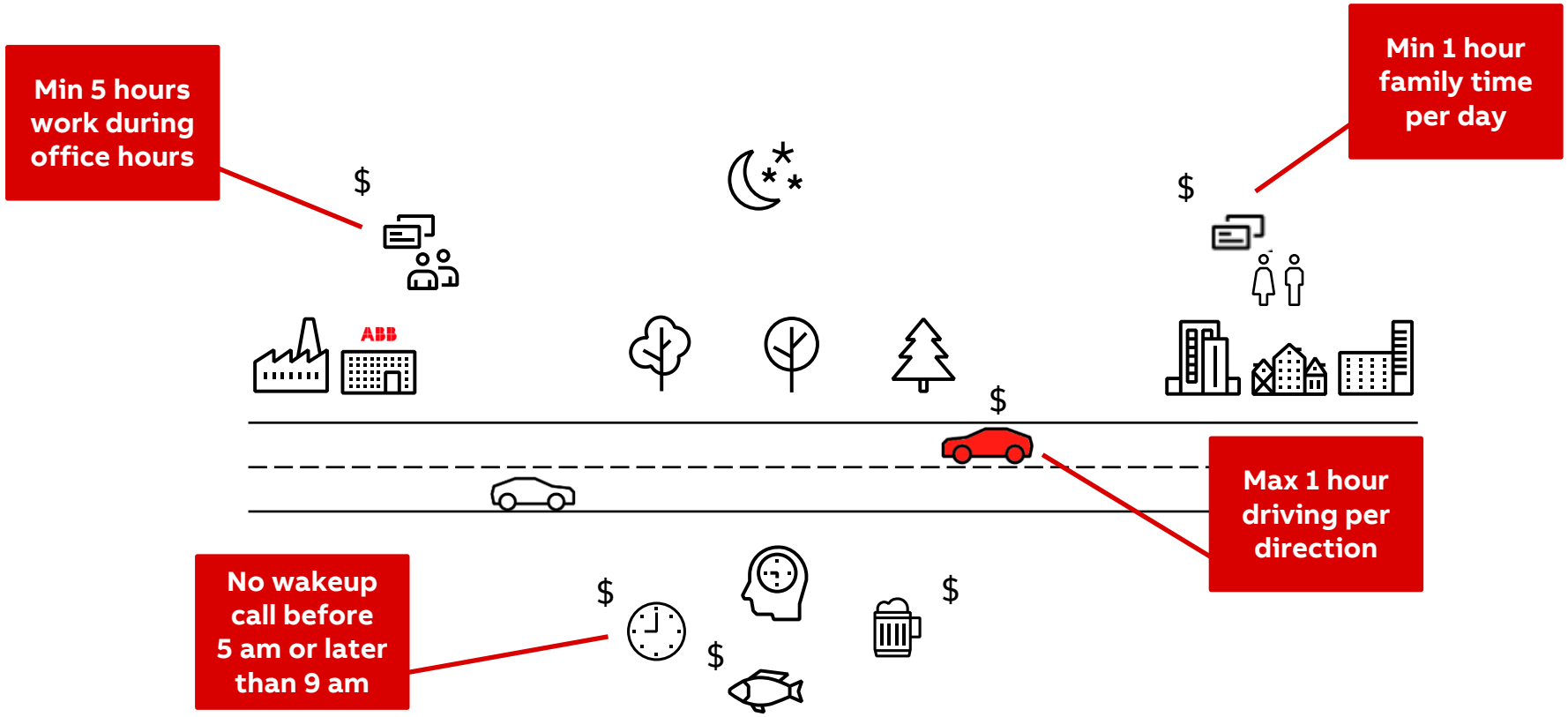
Introduction to energy demand side optimization

Optimize asset usage



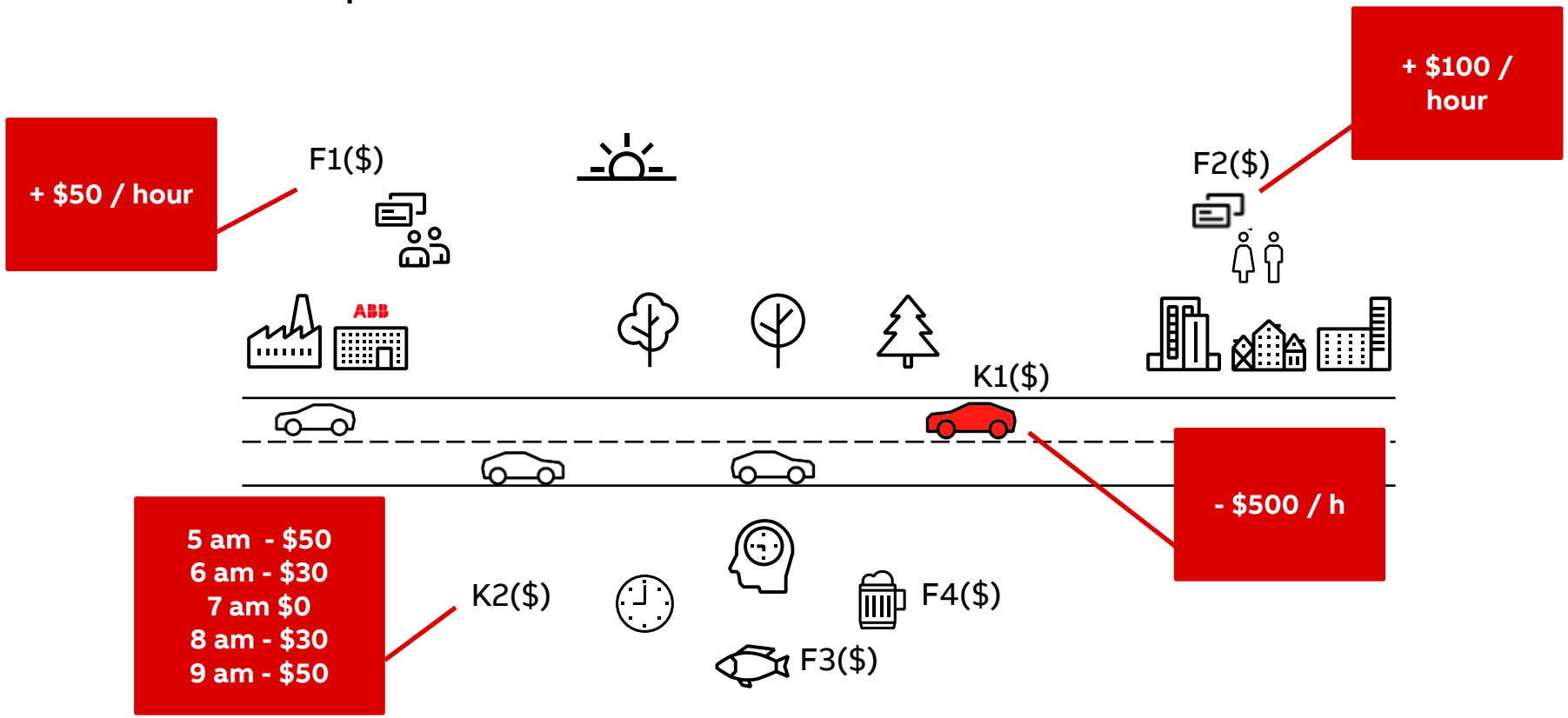
Introduction to energy demand side optimization

Add constraints



Introduction to energy demand side optimization

Add cost functions and optimize



Optimization task: Maximize F1($) + F2($) + F3($) + F4($) + K1($) + K2($) → Drive to work at 6 am, drive home at 3 pm

CASE STUDY: Reducing costs with optimal energy demand scheduling in the steelmaking process

Automatically and optimally create a new schedule, or manually update an existing one

Steel plant **Italy** **OpEx**

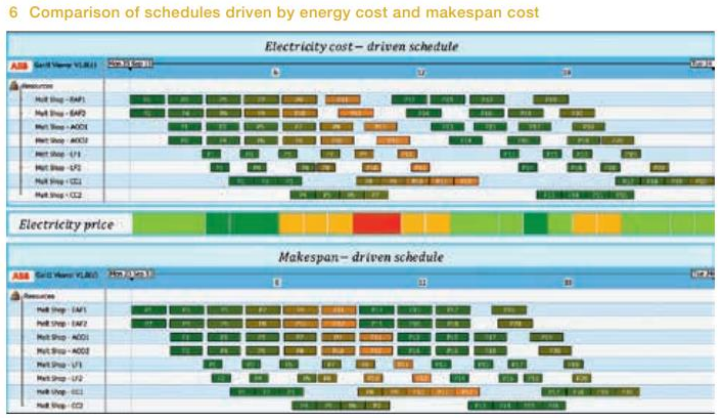
SITUATION

A complex melt shop

Significant impact of energy costs on operations

Highly volatile electricity spot price

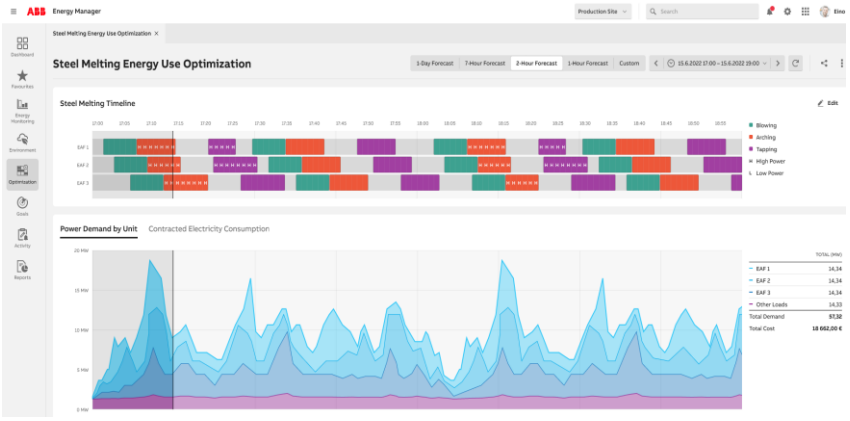
Too many parameters in the play, difficult to make the right decisions



SOLUTION

ABB Energy Management System leverages flexibilities associated to the batch-oriented nature of steel process, to adapt production according to energy cost

- The system is flexible enough to support different melt shop configurations, and steel product portfolio
- The system includes all necessary information:
  - External day-ahead electricity market
  - Processing, transportation, setup and cleanup times
  - Maintenance plans, and availability of equipment



SUCCESS

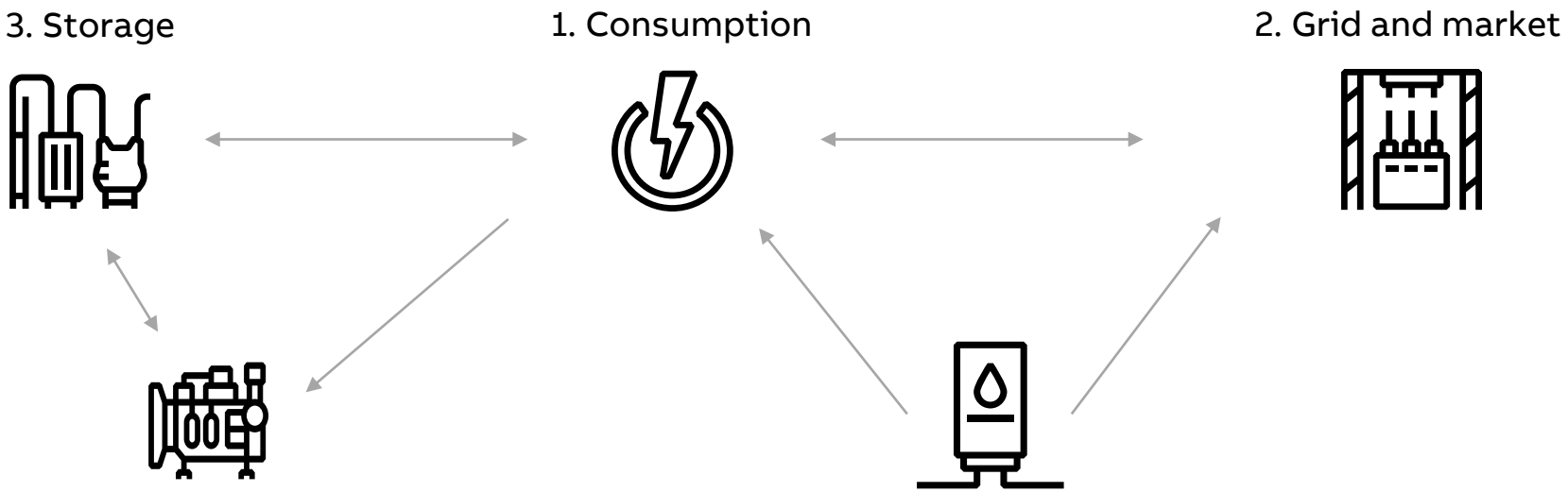
The benefits are estimated to be in the range of 2 to 5 percent

The production scheduler can automatically and optimally create a new schedule, or update an existing one to optimize energy costs

The system is a useful tool for running various simulations and what-if analyses

Industrial demand and supply optimization

Sources of optimization potential

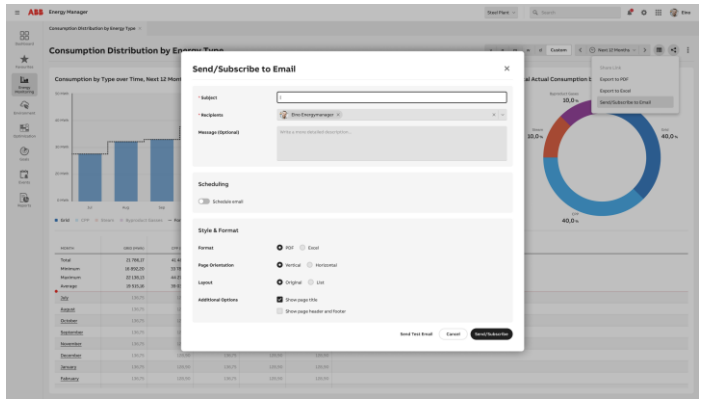


Task: Deliver customer orders on time at minimized energy cost

Enterprise-wide electricity procurement, energy forecasting & optimization

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

Pulp & Paper **Europe** **OpEx**



> The initial system payback time was only a few months

SITUATION

20 TWh/y electricity procurement, 14 mills

- Own generation and shares in various power plants
- Purchase and sales to and from external partners and market operators
- Need to manage energy assets centrally on an enterprise level to fully leverage energy assets

SOLUTION

ABB Ability™ Energy Management: 14 mill systems and 2 enterprise control rooms

- Realtime monitoring and reporting
- Energy balance management
- Energy forecasting
- Energy cost optimization based on generation, consumption and market.
- Hydro power stations control

SUCCESS

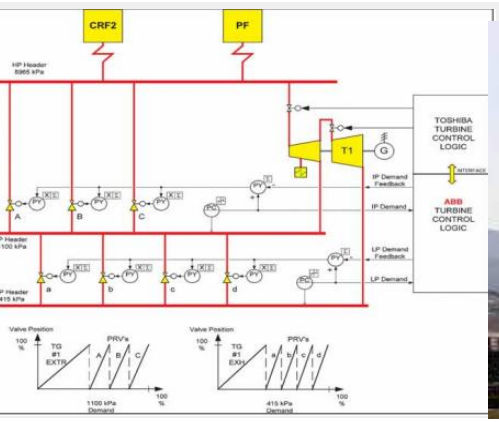
Real-time decision support helps reduce costs, payback within months

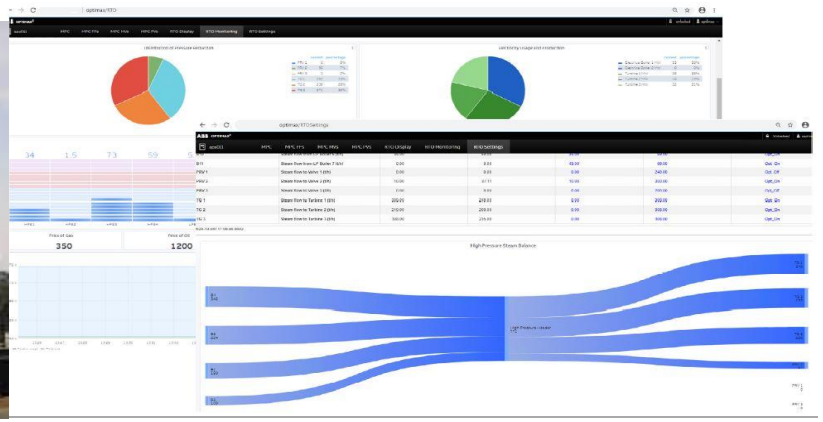
- Managing energy balances in real time
- Energy demand planning and procurement optimization
- Energy cost optimization, taking into account the available resources, their prices and operational constraints
- Additional profits from effective use of energy reserves and hydro-power

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

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

Pulp & Paper | South Africa | Solution category | Availability | OpEx | Productivity





> Take advantage of asset flexibility to reduce production costs while at the same time improving steam supply reliability. Achieve 3 % to 5% savings in Steam Costs with ROI below 1 year by applying APC technology

SITUATION

P&P boilers - a complex optimization problem

- not only is the steam needed at different, very specific pressures and temperatures, but its consumption rate is also highly variable due to the variability of the process conditions, trips and/or starts of steam consumers, etc.
- steam network stability and reliable power output are difficult to attain, further complexity is added by energy market variables, prices, and local rules for energy markets.

SOLUTION

Ability™ Advanced process Control based on MPC

The MPC makes use of soft and hard constraints.

- Soft constraints are settings determined by the operational staff. The MPC then optimizes the controls without violating these constraints.
- The hard constraints are fixed and are determined on the boiler design and safety of the equipment. The MPC will sacrifice optimum control to prevent violation of any of the hard constraints

SUCCESS

APC predicted vs actual - performance test.

	Predicted	Actual (50)% APC operation)
MW additional generation	4,5 MW	8,1 Mw
Anticipated savings/annum	R1,17m	R2,12m

Base control vs APC control - performance test

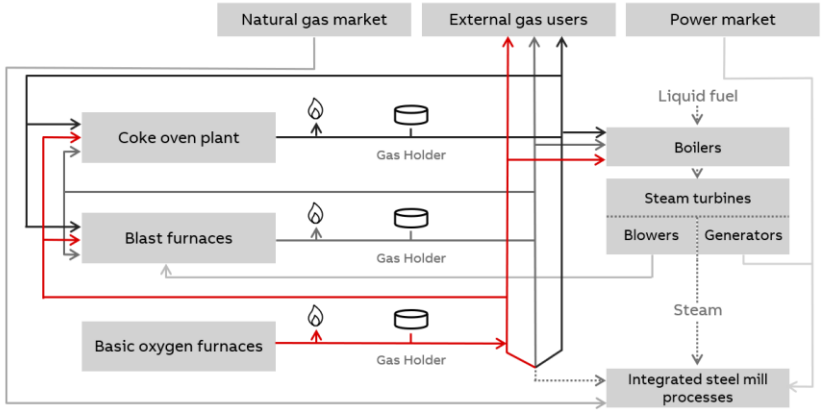
	Std deviation base control	Std deviation APC control
Steam temperature	8°C	0,8°C
Steam flow Avg	51 t/h	22 t/h
Steam pressure	88 kPa	18 kPa
Estimations based on APC in operation for 50% of boiler turbine operating time.		

Case study

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

Managing energy purchase and production including site power plants and turbines

Steelmaker **France** **OpEx**



> There is no other supplier with an equivalent industrial-scale product

SITUATION

2nd largest industrial site in France

- Annual capacity 4,5 million tons of steel
- Complex distribution networks for electricity, steam, by-product gases and imported fuels make up 20% of production cost

SOLUTION

ABB Ability™ Energy Management with integrated by-product gas network

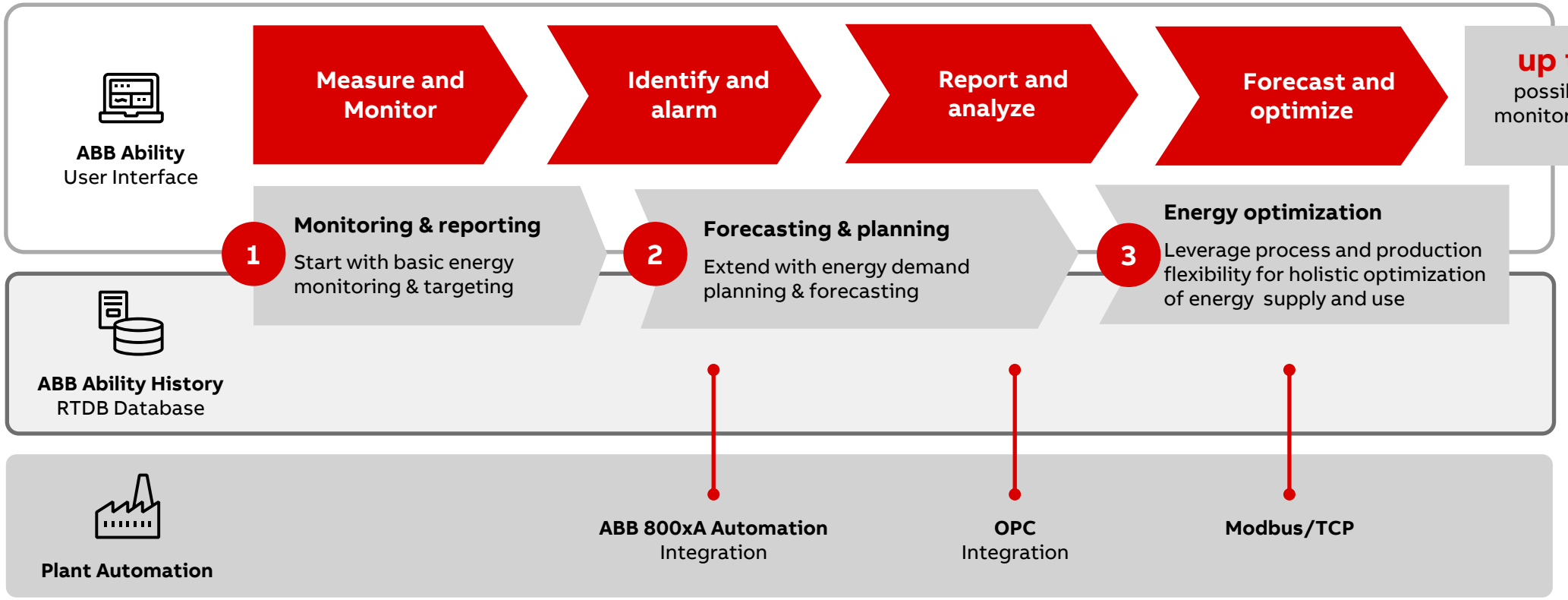
- assists gas dispatching, calculates optimal power production based on real-time data and adapted to power market
- optimizes energy consumption and secures energy availability considering steam yield, consumption of by-product gases, energy purchase and production including site power plants and turbines

SUCCESS

Improved operations and considerable savings

- **10%** less flaring of gases thanks to data and optimization model
- **15%** accuracy improvement of electricity procurement forecasts
- **15 k€** per month saved (yearly average)

Typical steps and modular approach for deploying a digital solution for industrial energy management and optimization

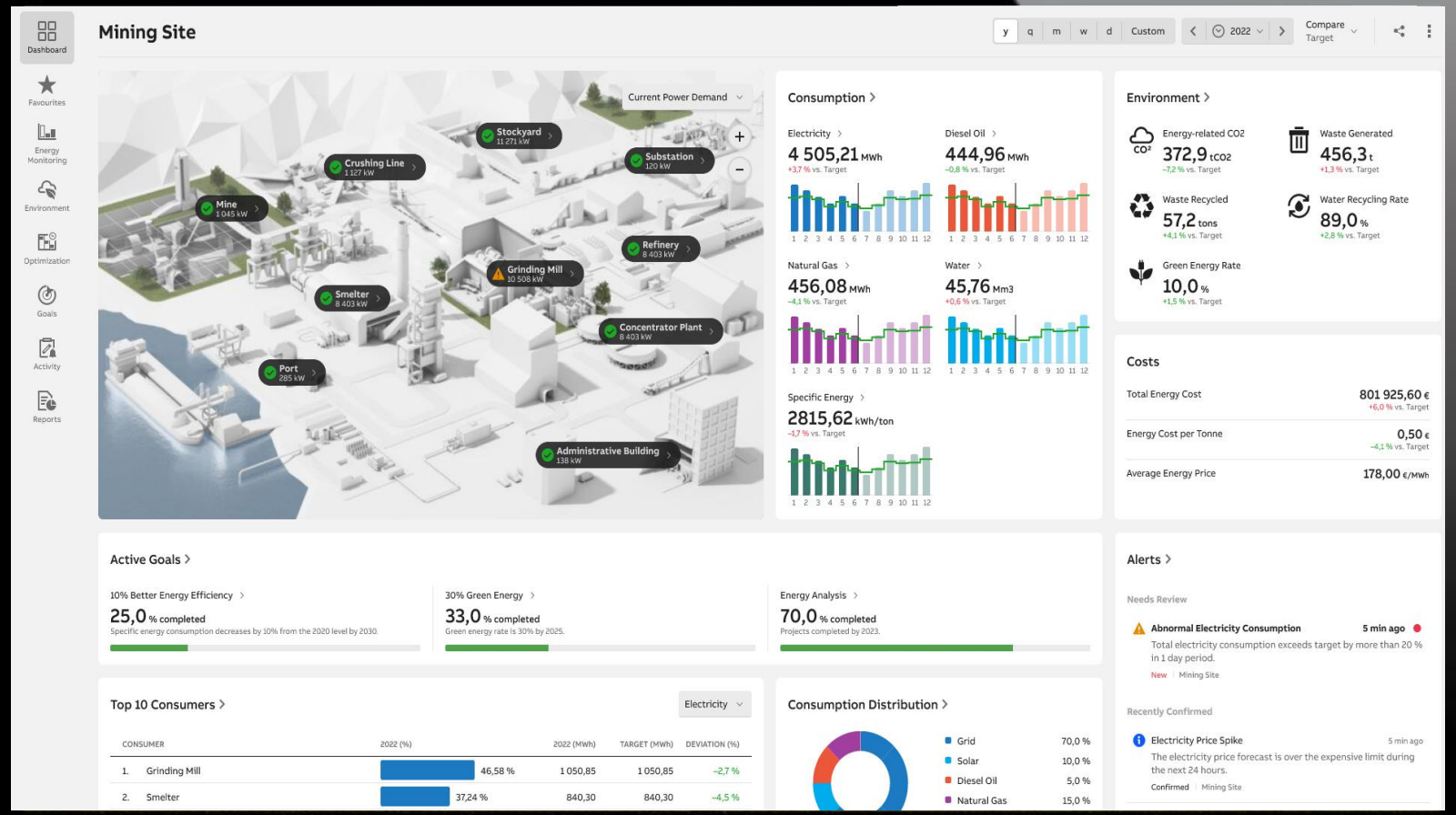


ISO 50001:2018 International Standard for Energy Management Systems conformity assessed by

Establish an integrated system for all data related to regulatory compliance, emission monitoring, energy mix planning, consumption, conversion, and trading — including electricity, gases, water, waste, carbon, and more.

ABB Ability™ Energy Management System for industries

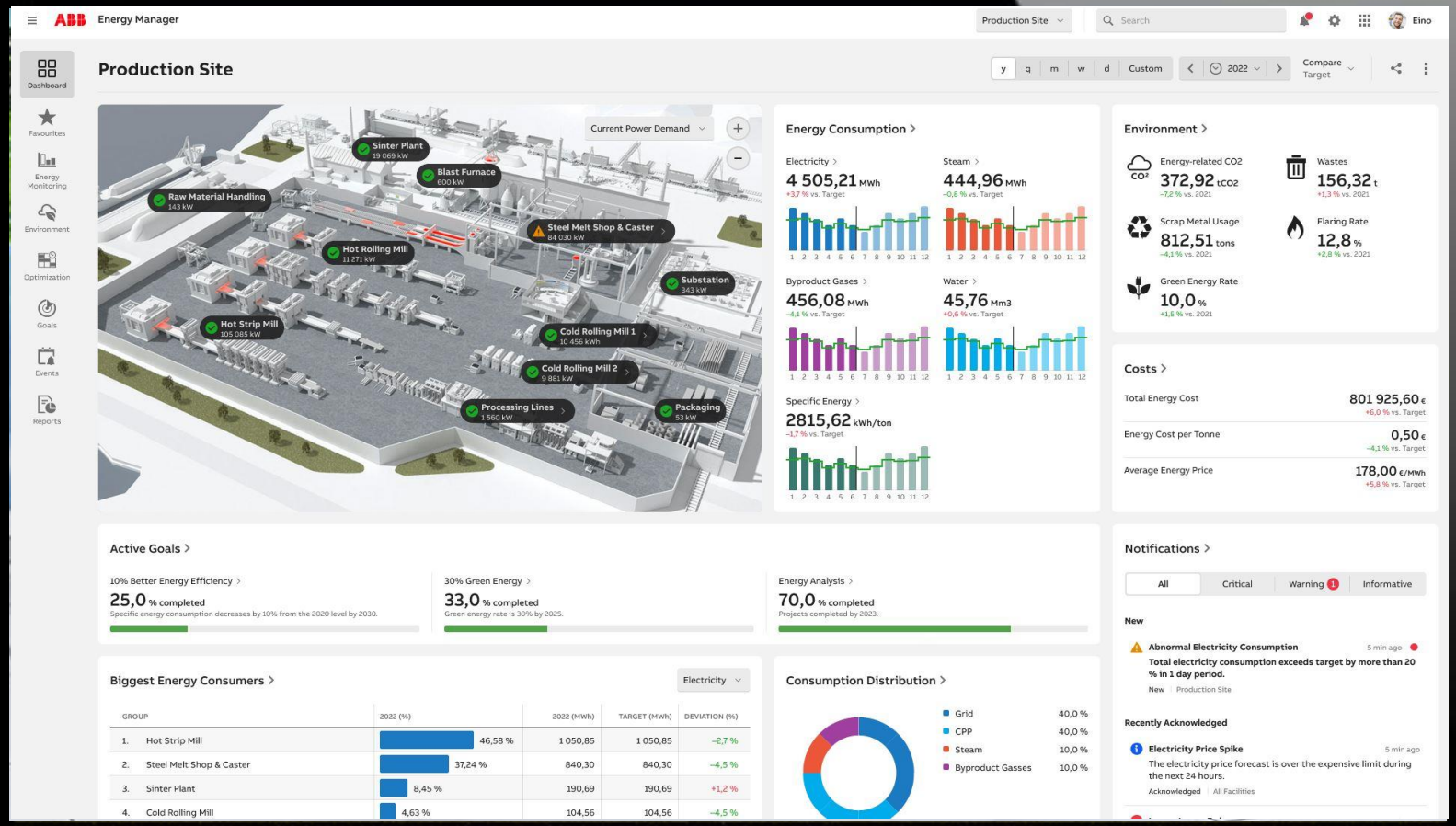
Mining Demo



[More information and downloads]

ABB Ability™ Energy Management System for industries

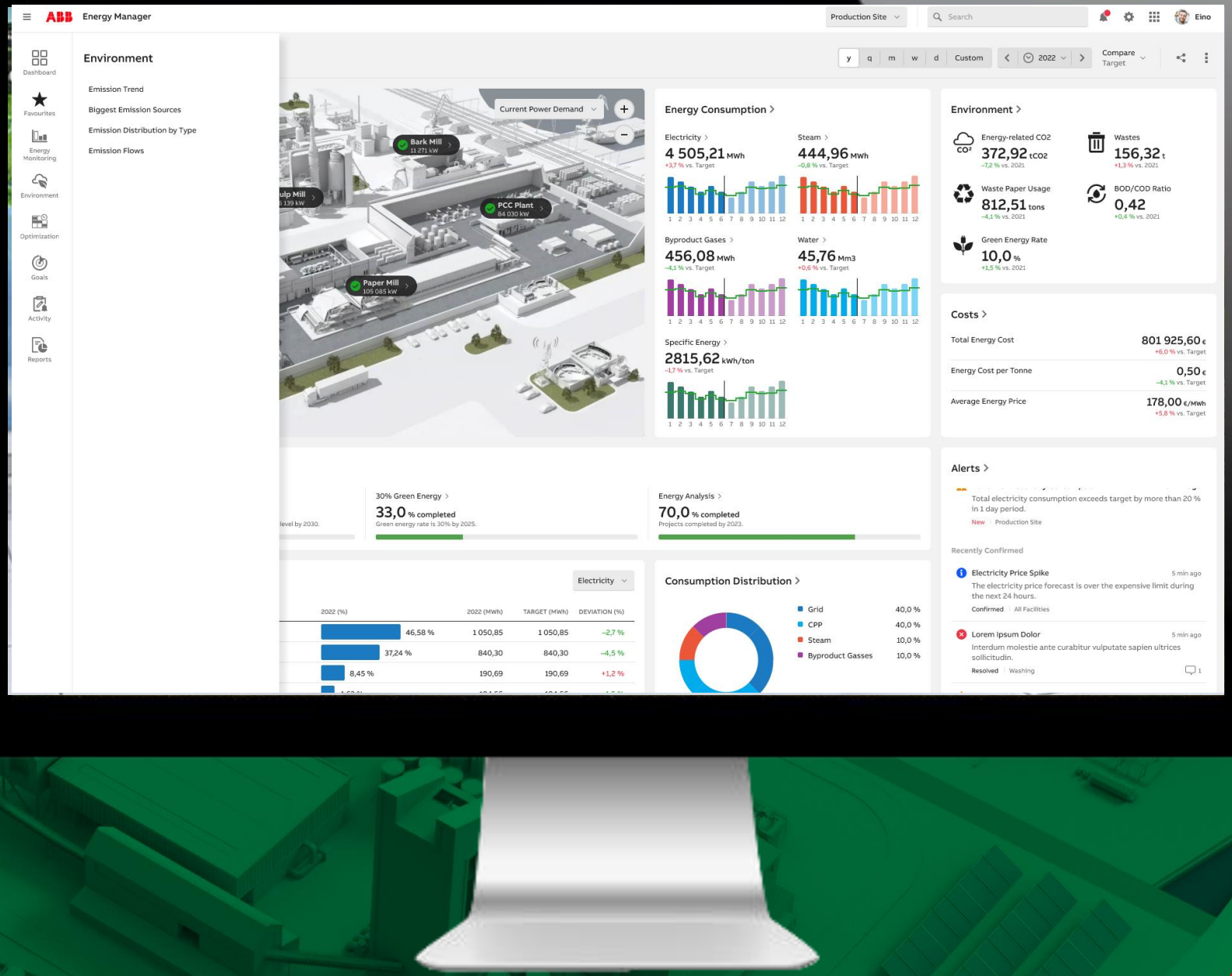
Metals Demo



[More information and downloads]

ABB Ability™ Energy Management System for industries

Pulp & Paper Demo



[More information and downloads]

Join our next webinar on May 18 to learn more

Industrial water treatment optimization
Energy efficiency, chemicals reduction, water quality and recovery in P&P and mining

Predictive emission monitoring
Lessons learnt from the oil & gas that can be applied to processes with constant quality fuel

Sustainability pathways with other digital technologies
Beyond energy management

Empowering frontline workers with modern digital tools to improve sustainability and safety
Lessons learnt from a leading utility company using Connected Worker software

Integrating sustainability into centralized mining operations
Leveraging Industrial Analytics and AI for Energy Optimization, HSE and beyond

Cement production lowers operating costs by 3-5% across multiple plants
Improving energy efficiency, availability, reliability and lifecycle of electrical & process assets while increasing yield & quality

Tissue mill digital project
Leveraging Industrial Analytics and AI

SUSTAINABILITY
WEBINAR SERIES

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

PART 3

Cement | Mining | Metals | Pulp & Paper | Manufacturing





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