

INDUSTRIAL ENERGY MANAGEMENT AND OPTIMIZATION WITH ABB

How do digital champions manage energy as they drive to achieve sustainability goals? **Part 3**



Meet ABB Process Industries's digital experts on sustainability



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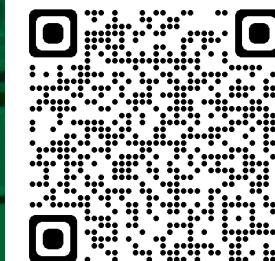
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SUSTAINABILITY
WEBINAR SERIES

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



PART 3



Cement

Mining

Metals

Pulp & Paper

Manufacturing



Have Questions for us?

Please use the link or QR code below to submit your questions via “Contact Us” form and we will get back to you

Industrial Energy Management and Optimization

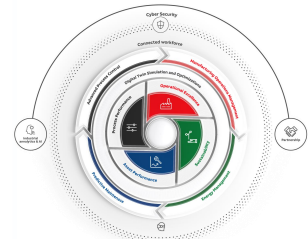
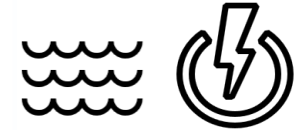
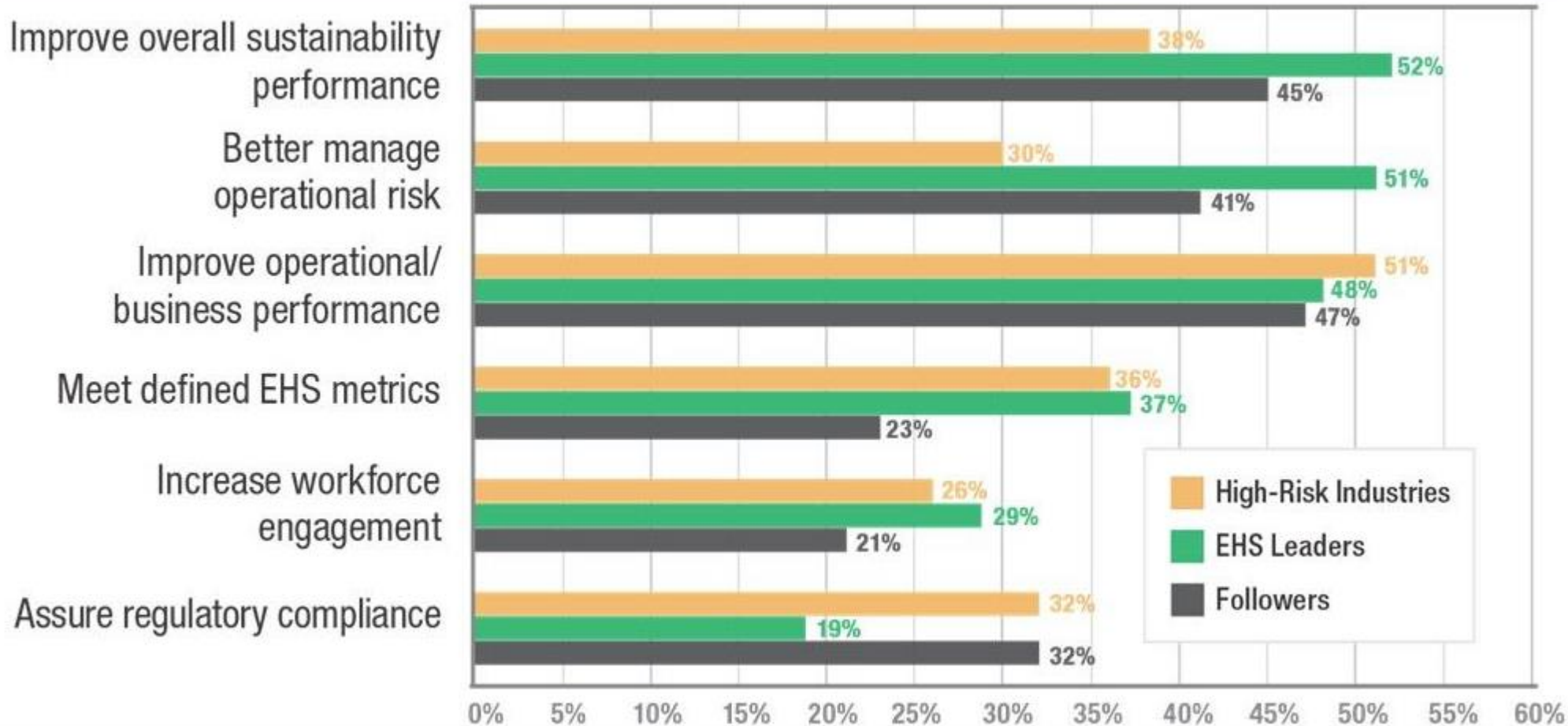


Top business objectives of the EHS managers



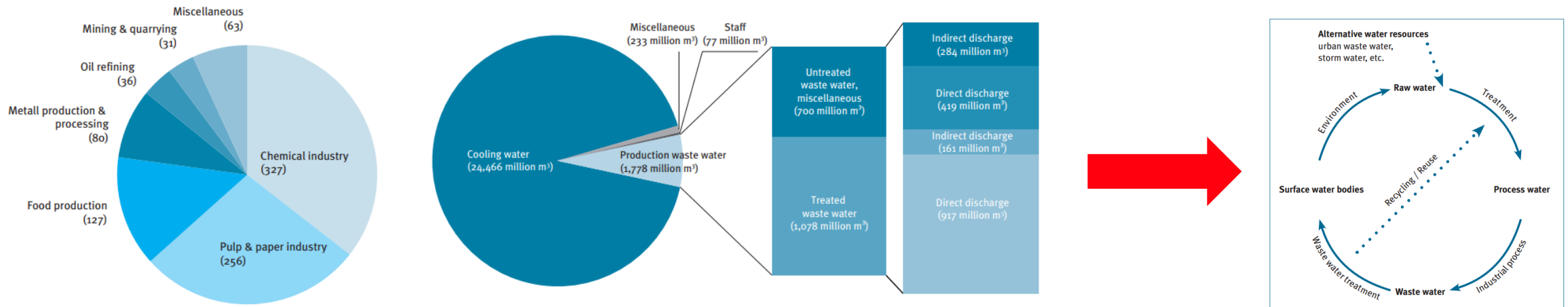
Source: [LNS Research](#)

More digital solutions to consider for EHS compliance and sustainability



The future of Water for process industries

Water is more than just a critical component of industrial operations



- Around the world, water use has been increasing at more than double the rate of population growth, according to the UN.
- Industry is responsible for **12 percent** of global water withdrawals.
- Research shows that we'll be unable to meet even ~50 percent of global water demand in next decades unless investors, companies, and governments urgently improve water stewardship.
- The Net Zero Water concept is that fresh water input to the plant is completely offset by alternative water use.

CASE STUDY: Mine dewatering optimization

The most efficient, cost-effective, and low-carbon system for controlling water

Mining

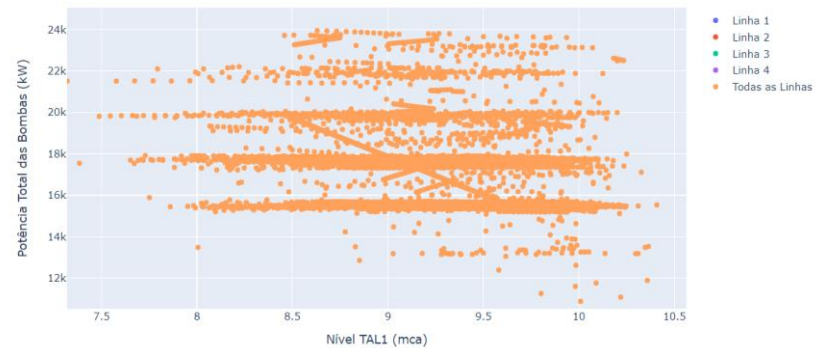


SITUATION

Underground mine dewatering system

- 4 lines of three pumps each with the direct start
- Switching pumps on and off is performed manually based on reservoir levels
- There are no pump selection criteria in this manual process, not considering the equipment health from the maintenance point of view
- Water level trends are not evaluated

Potência de Bombas x Nível TAL1



SOLUTION

Digital solution combining Machine Learning, Advanced Process Control & Condition Monitoring

Exploratory data analysis enabling

- Real-time analysis of the dewatering system behavior, monitoring OEE, Energy consumption, asset health, etc
- Soft sensors and anomaly detection capabilities
- Optimized pumping system operation model for the advanced process control set points



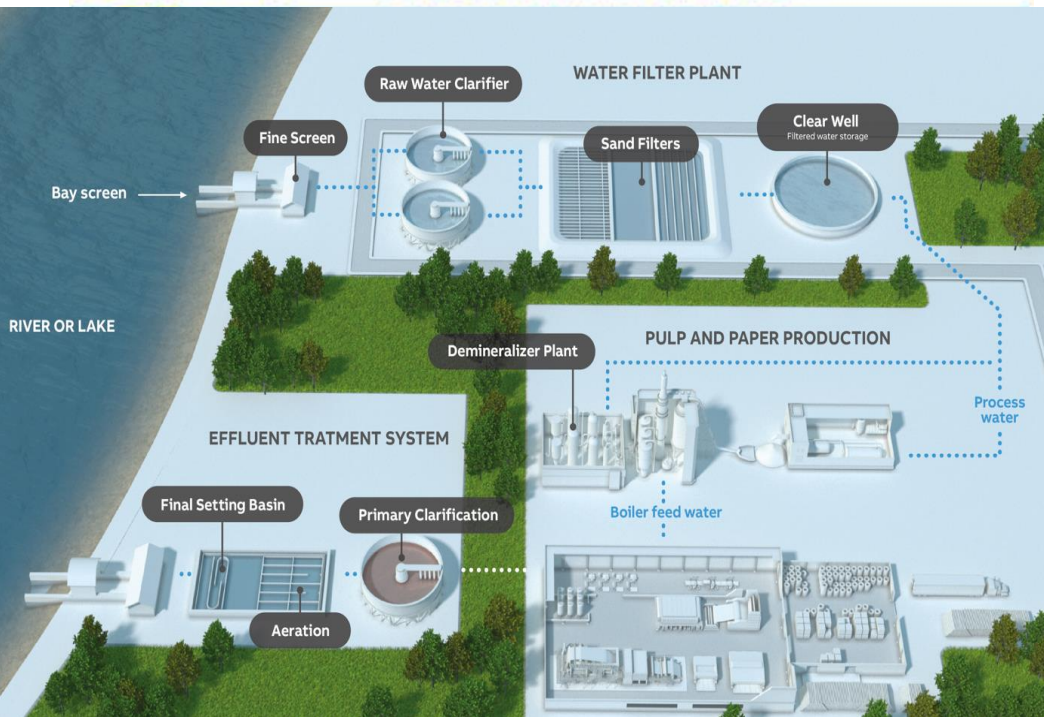
OBJECTIVES

Dewatering circuit control to improve pump selection:

- Increased energy efficiency reducing carbon footprint
- Increased productivity and lower environmental impact thanks to:
 - higher availability, better maintenance planning, longer periods between interventions
 - equipment life extension and avoiding collateral impact on mine's electrical system

Water treatment optimization in pulp & paper

What can process industries learn from the digitally advanced municipalities?



Influent management

Influent flows/composition varies with paper grade production, but also weather (e.g., heavy rains) impacting treatment process, energy cost and chemical dosing

Bioreactors' aeration and water pumping

Optimize aeration for DO/Ammonia control. Optimize blowers/pumps, chemical dosage, and bioreactors balancing

Water quality and chemical composition

Digital twin and plant simulation powered by external partner in order to meet or improve target KPIs (e.g., Nitrogen)

Key benefits



Better management of water influent disturbances



Tighter control of water quality and chemical composition



Energy efficiency: 10 – 20 % reduction in Bioreactors



Chemicals dosing: reduction of 5-10 % in expenditures

An Advance Process Control (APC) solution, with optional DHI plant digital twin

More digital solutions to consider for EHS compliance and sustainability



Why emission monitoring solutions are required

Sustainability in energy intensive industries



Stringent regulations demanding **97.5%** monitoring availability



Risk and cost of noncompliance



Complexities of finding/predicting faults



—
Continuous Emissions Monitoring System (CEMS) hardware is often used for more precise measurement & regulatory compliance, but it has **drawbacks...**



high initial
capital cost



high
operating cost



maintenance and
operator training

The software-based Predictive Emissions Monitoring System (PEMS) was developed as an alternative to overcome the above drawbacks of CEMS. A PEMS relies on using the **operating parameters of combustion facilities** through first principle, statistical or Artificial Intelligence (AI) methods to build **a model that can predict emissions**. PEMS can be used as a primary system, as a back-up to CEMS or for exploring “what-if” scenarios and better decisions.

The capital costs for PEMS are estimated to be 50% less than for CEMS, and the operations and maintenance costs are approximately 10-20% of the CEMS cost

CASE STUDY: Predictive Emission Monitoring System (PEMS) certified according to US-EPA

ABB provides maximum reliability and consistency to the compliant emission reporting infrastructure



Liquefied natural gas (LNG)



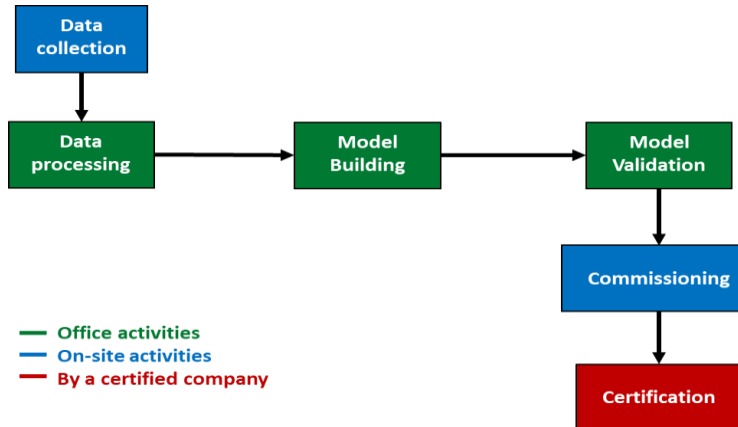
UAE



SITUATION

Oil & Gas complex

- 5 processing units (1 boiler for plant utilities, 1 Gas Turbine for power generation, 3 Gas Turbines to drive compressors) with 5 pollutants per stack (NO_x, SO₂, CO, CO₂, O₂)
- 2 flares



SOLUTION

Complete PEMS solution for 5 processing units and simplified PEMS for 2 flares

- Smart and non-invasive digital technology with the machine learning algorithm exploiting the correlations between process variables (e.g., flow, temperature, pressure, etc.), and emissions
- Initial emission data collection, PEMS design and engineering, final commissioning and validation, customer's personnel training



↓ CapEx & OpEx



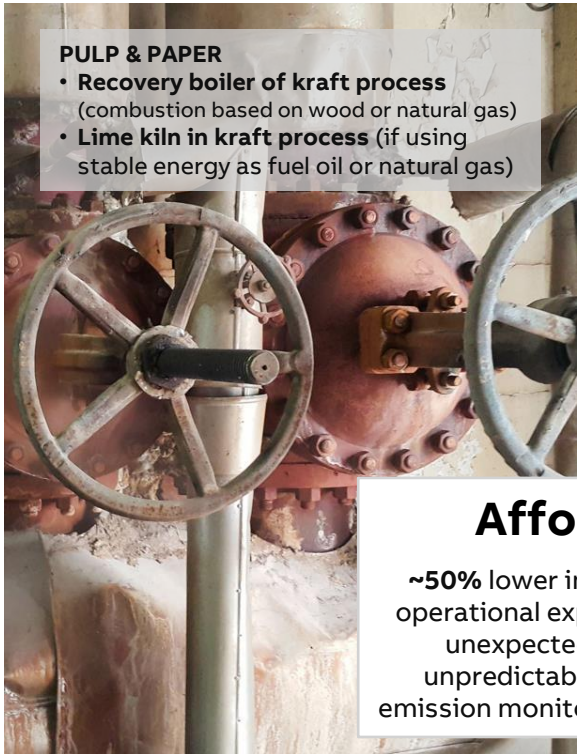
SUCCESS

High accuracy and considerable savings

- 99.5%** data availability for accurate measurement of emissions (same accuracy and reliability as continuous emission monitoring hardware)
- Significantly reduced CAPEX & OPEX for regulatory compliant tracking of emissions released into the atmosphere - under US-EPA Performance Specification 16¹

Predictive Emissions Monitoring for steel, pulp & paper, mining, cement plants

Affordable, accurate, compliant machine-learning-based solution for emission monitoring in process plants with gas turbines, boilers, furnaces, internal combustion engines and other complex process units



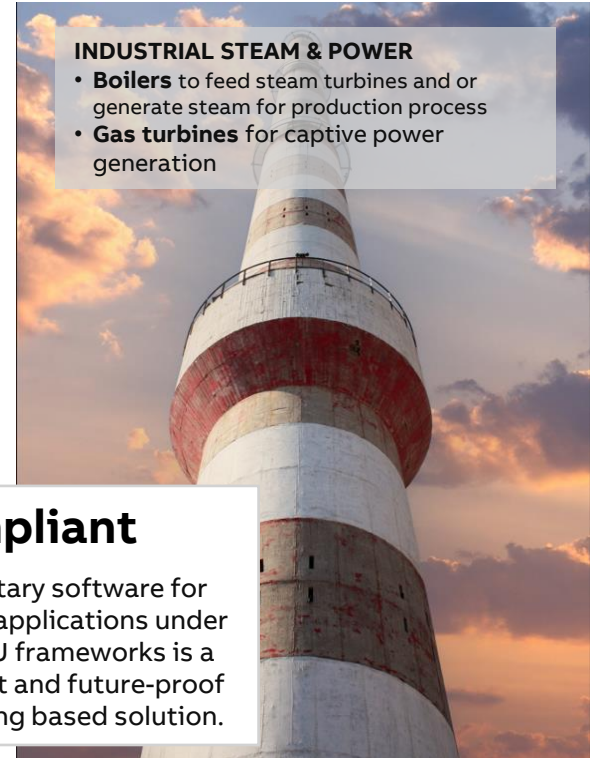
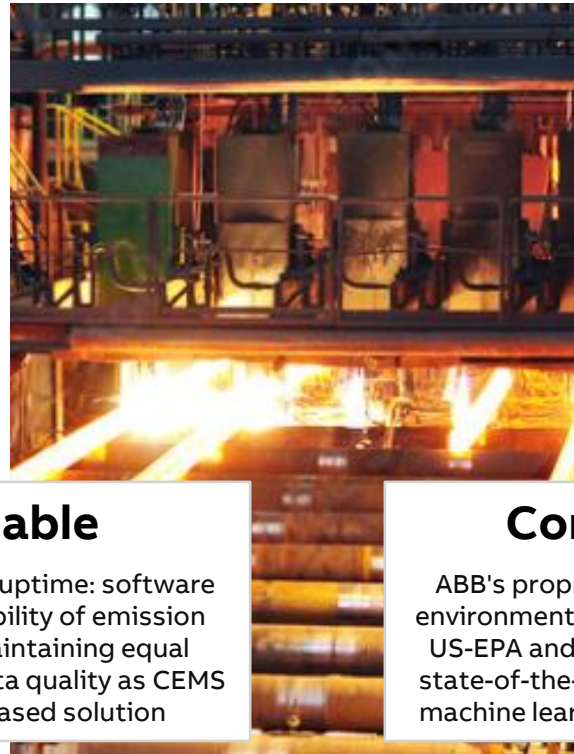
PULP & PAPER

- **Recovery boiler of kraft process**
(combustion based on wood or natural gas)
- **Lime kiln in kraft process** (if using stable energy as fuel oil or natural gas)



METALS

- **Reheat furnace**
(combustion based on pulverized coal)
- **Coke oven plant**
(combustion based on coke)



INDUSTRIAL STEAM & POWER

- **Boilers** to feed steam turbines and or generate steam for production process
- **Gas turbines** for captive power generation

Affordable

~50% lower initial investment, operational expenditures and no unexpected costs due to unpredictable failures in the emission monitoring infrastructure

Reliable

99.5%+ service uptime: software extends availability of emission data while maintaining equal accuracy and data quality as CEMS hardware-based solution

Compliant

ABB's proprietary software for environmental applications under US-EPA and EU frameworks is a state-of-the-art and future-proof machine learning based solution.

Requires the constant quality combustion fuel, as well as proper instrumentation and automation.

PEMS are compliant and accepted by international environmental regulations and standards.

ABB Inferential Modeling Platform Installations



USA

- U.S. EPA defines within 40 CFR 60 and 75 the procedures to use PEMS as alternative technology to HW CEMS
- Performance Specifications 16 prescribes the specific requirements to check and certify model performances

Europe

- Europe has released a comparable set of specifications to be applied for PEMS implementation
- Technical Specification (TS 17198) defines PEMS requirements as back up and as alternative of conventional CEMS
- The new standard is largely based on the NTA 7379 available in the Netherlands since a few years

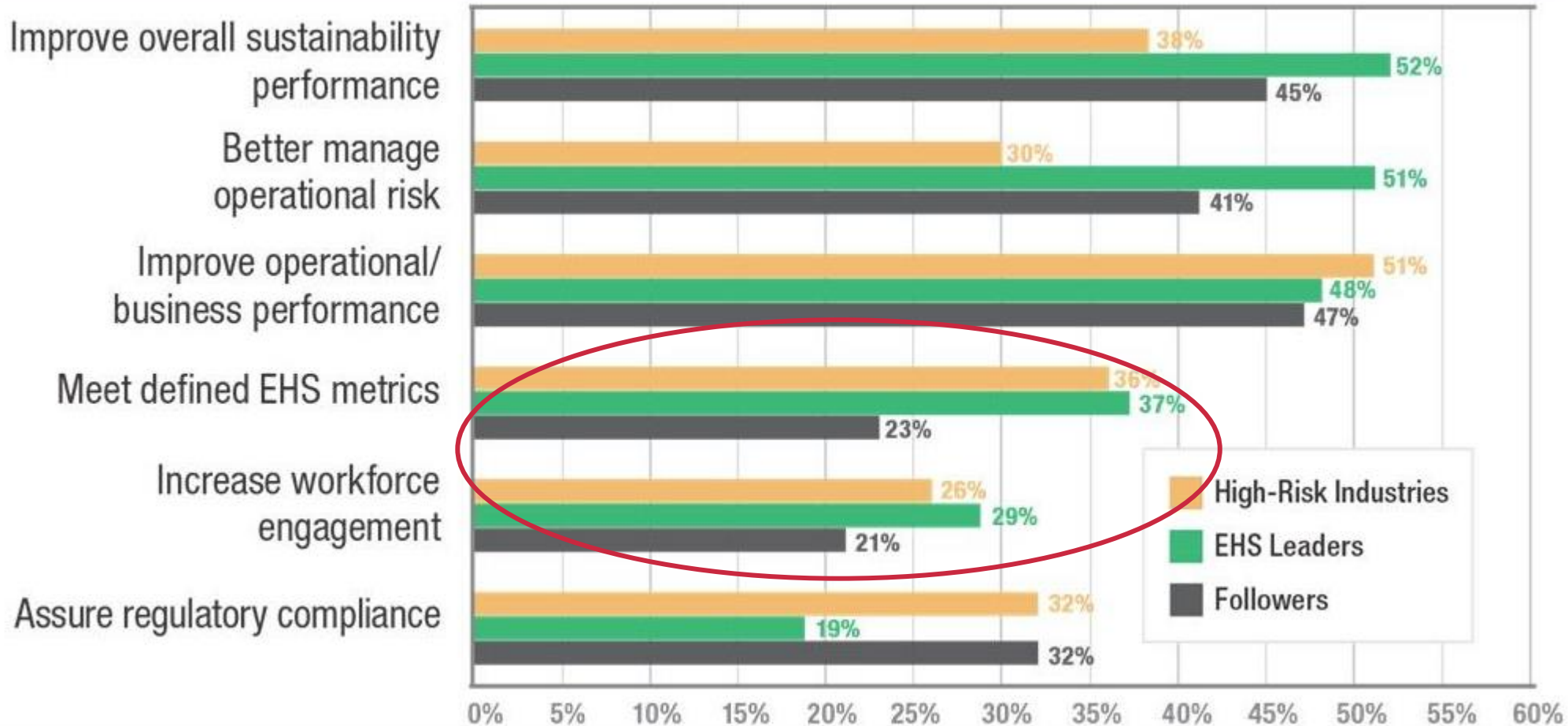
Middle East, Asia

- Several other countries are introducing PEMS within their environmental regulations: **Middle East, Malaysia, etc.**



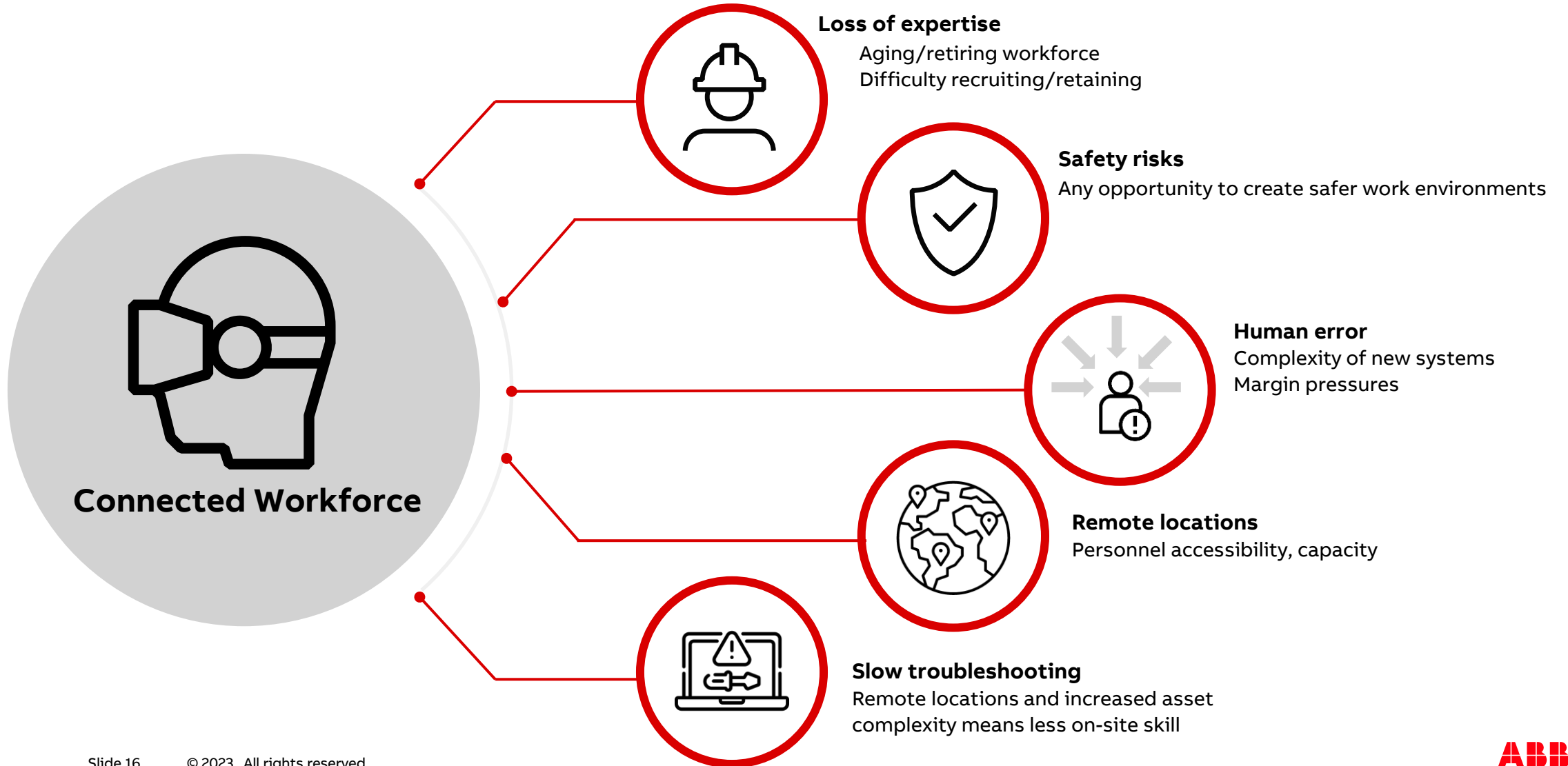
Complementary solution for environmental tracking with ABB Ability™ Energy Management System for industries

More digital solutions to consider for EHS compliance and sustainability



Connected workforce

The needs for higher workforce engagement in EHS initiatives



CASE STUDY: Empowering frontline workers with modern digital tools

How connected workforce solutions help improve safety, regulatory compliance and sustainability

 **Electric utility**

 **Japan**



“ We are very pleased to confirm that this project can contribute to significant improvements in quality and safety ”

Company CEO

SITUATION

Power station

- Participation in Sustainable Open Innovation Initiative (SII), a subsidiary of the Ministry of Economy, Trade and Industry (METI)
- Aiming to save labor in power plant maintenance work, improve overall plant performance, safety and sustainability

SOLUTION

Remote Assistance and Digital Workflow apps

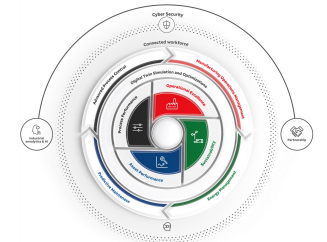
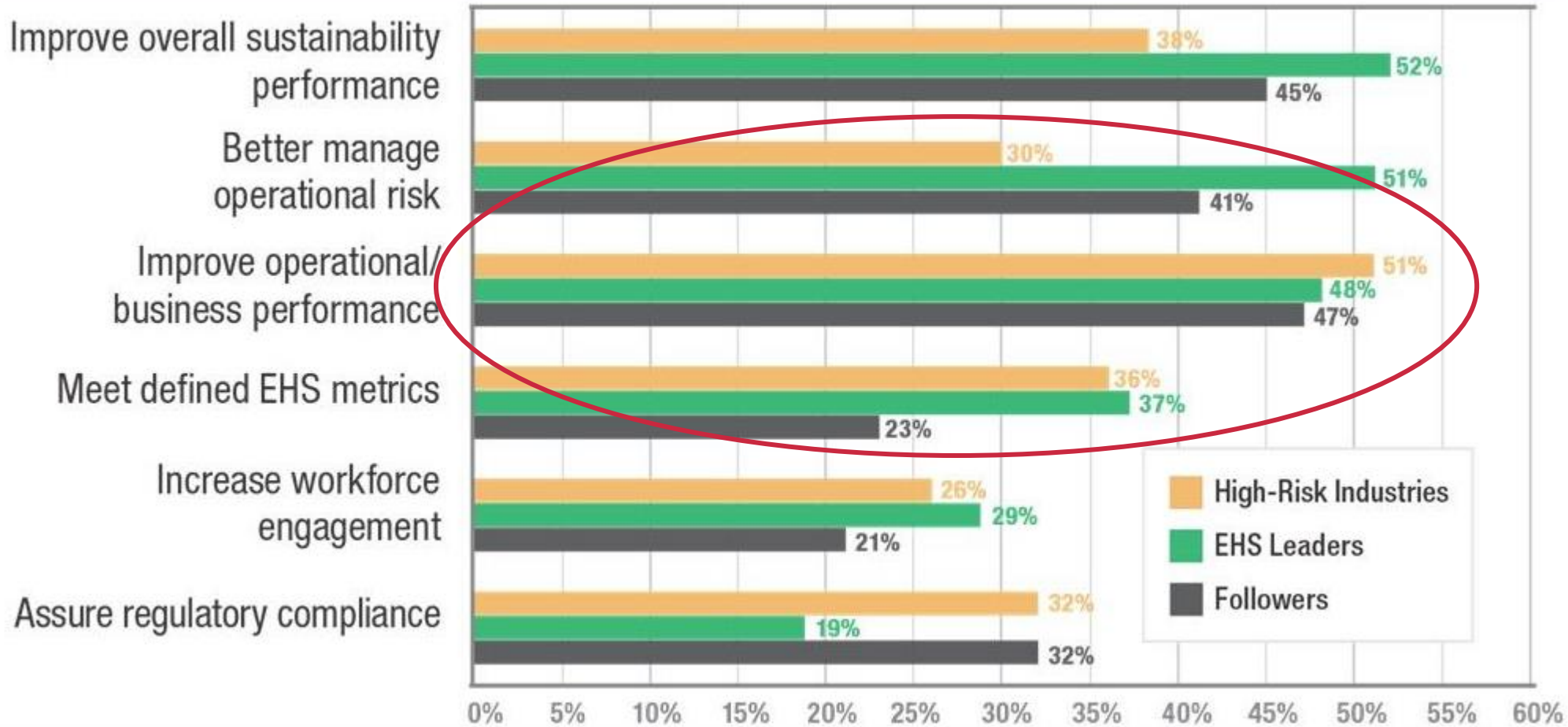
- Enabling remote assistance and troubleshooting over audio, video and augmented reality annotations to fully leverage the expertise within and outside of the organization
- Digitized paper runbooks so site engineers can interactively execute work procedures directly from their tablets
- Site engineers manage work progress in the application in real time while attaching images and video of a procedure for further reference.
- Teams are empowered to digitize and continuously improve any procedures – safety, environmental compliance, audits, etc

SUCCESS

Leveraging connected workforce in company-wide digital transformation program

- Reduced travel costs and resolution speed, preventing losses
- No waiting for experts to arrive onsite
- Safer, smarter operations that maximize resource efficiency and contribute to a low-carbon future, streamline and save labor onsite
- Digital workflow automatically acquire process values to determine whether a procedure has been performed as planned.

More digital solutions to consider for EHS compliance and sustainability



Integrated digital operations

Integrated Digital Operations

Creating value in the industry



Operational Excellence

Deliver **flexible** execution of industry-specific value chain



Sustainability

Optimize energy consumption, reduce emission footprint, preserve resources, and automate ESG reporting



Assets Performance

Maximize **uptime**, peak performance and reduce maintenance costs



Process Performance

Improve **quality**, throughput and process **profitability**

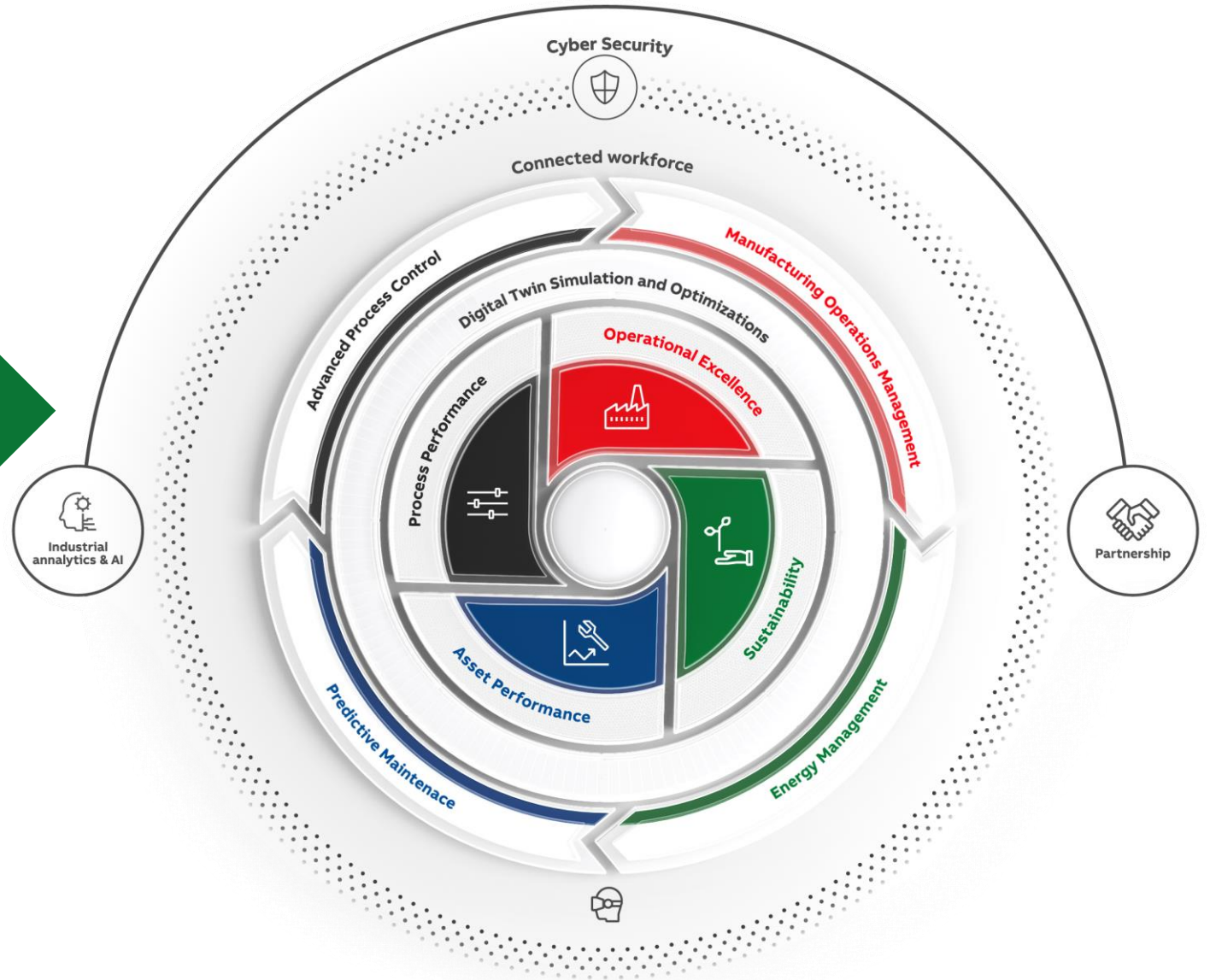


Connected Workforce

Retain operational **knowledge**, drive workforce competency and **safety**



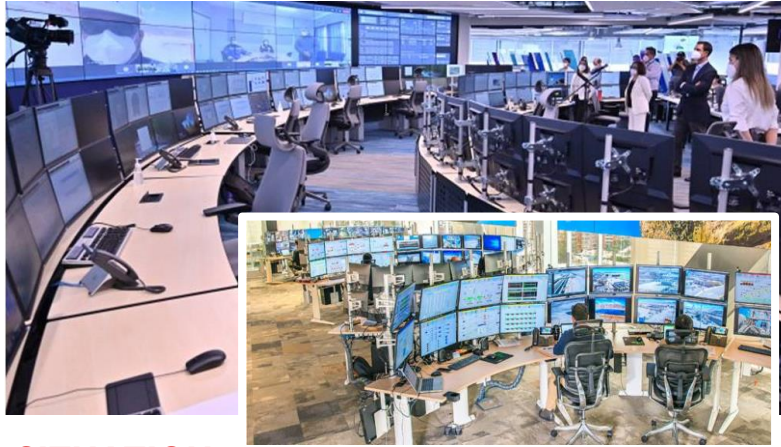
All with Embedded Cyber Security Best Practices



CASE STUDY: Integrating sustainability into centralized operations in mining

Remote Central intelligence and operations room promoting collaboration and full value chain visibility

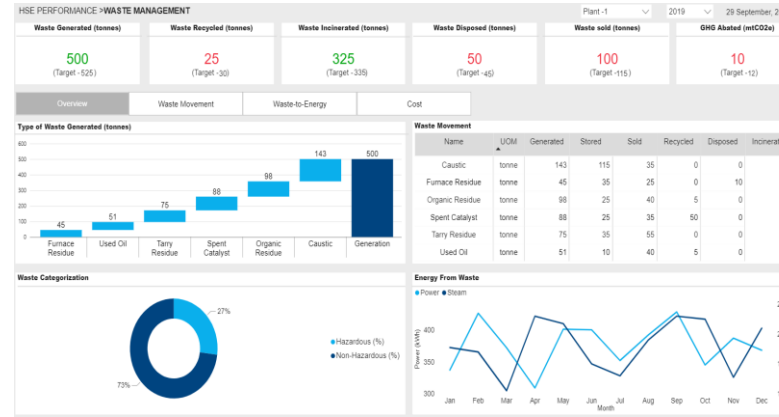
Mining



SITUATION

Pushing intelligence towards large centers

- Optimize operations headcount
- Take people out of risk areas
- Leverage from pool of specialists to assist multiple operations



SOLUTION

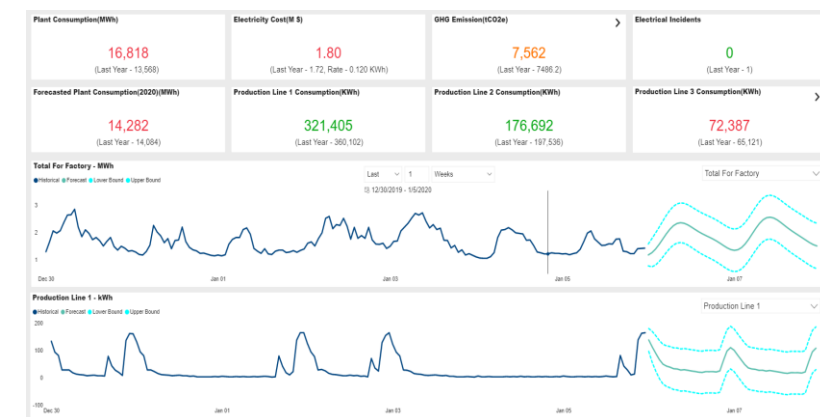
Integrated Remote Operations Centers

A single source of truth from multiple sites, e.g. for HSE Report:

- Process Air Emissions;
- Ambient Air Emissions;
- CO2 Report;
- Waste Management;

AI/ML analytics for better decision making, e.g.:

- Real time Energy Consumption forecast
- Breakdown per process area and major process equipment
- Benchmark the energy consumption of your assets
- Improve energy contracts accuracy



OBJECTIVES

- Increased collaboration and productivity
 - Better reaction to tactical production issues and emergency situations, more efficient and reliable operations, better production throughput
- Increased visibility over full value chain
- Improved ESG performance

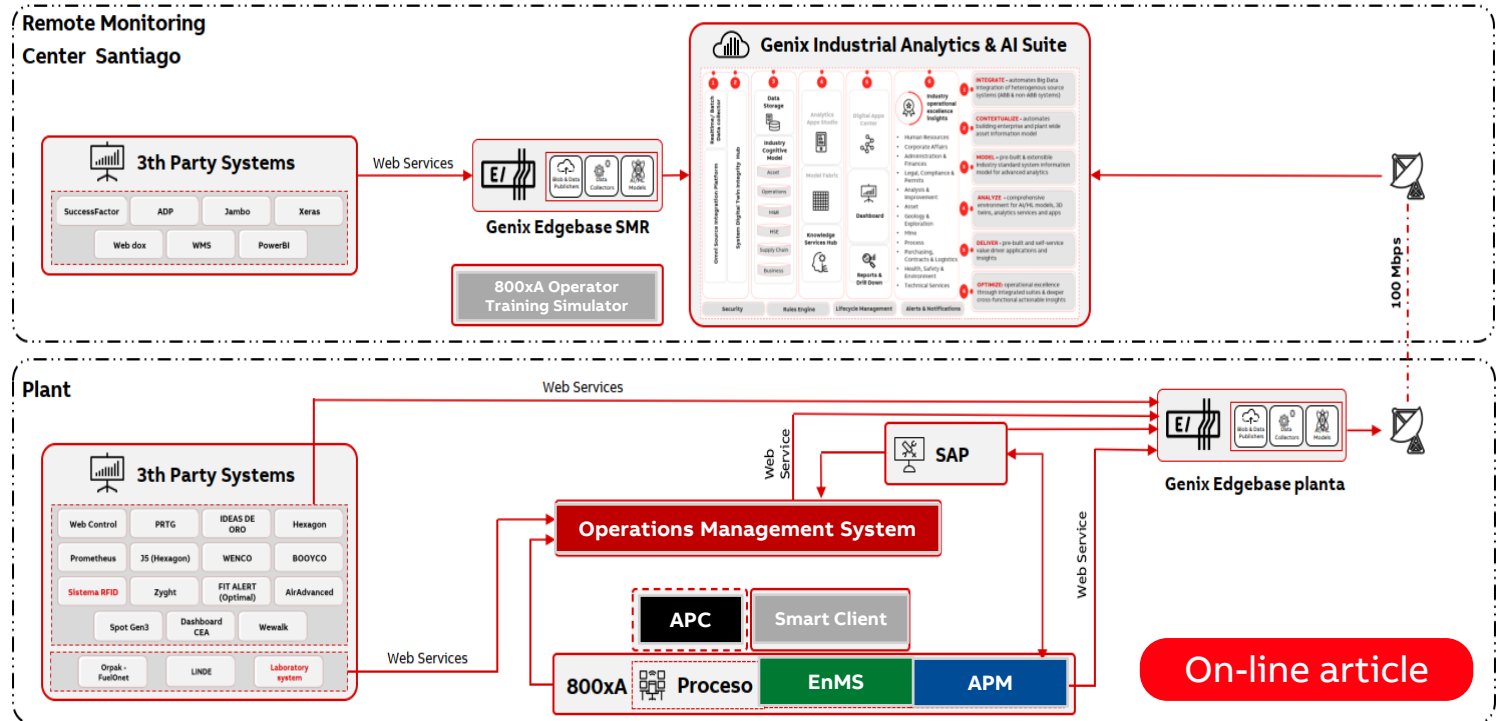
Unifying data from multiple systems and sites for strategic decision support

IROC – Integrated Remote Operation Center – mining example

Mining project

ABB Ability™ Genix Industrial Analytics & AI Suite considering:

- Real-time operational data will be monitored and analyzed to help the mine and processing facility improve efficiency.
- Integration of 25 third party systems (OT & IT), including different areas (mine, processes, geology and exploration, asset, HSE, finance, legal, human resources, others).
- Additionally, the integration of 5 SAP modules (PM, MM, FI, CO, PS).

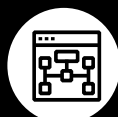


On-line article

Asset Performance



Process Performance



Operational Excellence



Sustainability




Connected Workforce





CASE STUDY: Group-wide visibility and integration in cement production


Improving energy efficiency and reliability while increasing yield & quality

 Cement  Multiple sites

 Integrated digital solutions

 ↑ Quality
15%

 ↓ OpEx
3-5%

 ↑ Productivity
1-5%



“19 integrated plants, one clinkerization plant, 25 grinding units, seven bulk terminals and overall operations spread across different countries”

SITUATION

Fragmented visibility of plant performances

- As an asset intensive business, maximizing both return and lifetime of these investments is crucial
- Evolved a diverse and disintegrated system landscape - high cost of ownership, low visibility
- Limited insights across the efficiency, quality and performance of processes, equipment and fleets

SOLUTION

Integrated IT-OT

- Group-wide information management solution
- Integrated plant wide approach covering the critical process and electrical assets
- Leveraging vast experience on the cement domain and advanced process control know-how
- IT-OT convergence with horizontal and vertical integration, predictive maintenance strategy
- Seamless integration with Quality (LIMS) and Business (ERP) system interface

SUCCESS

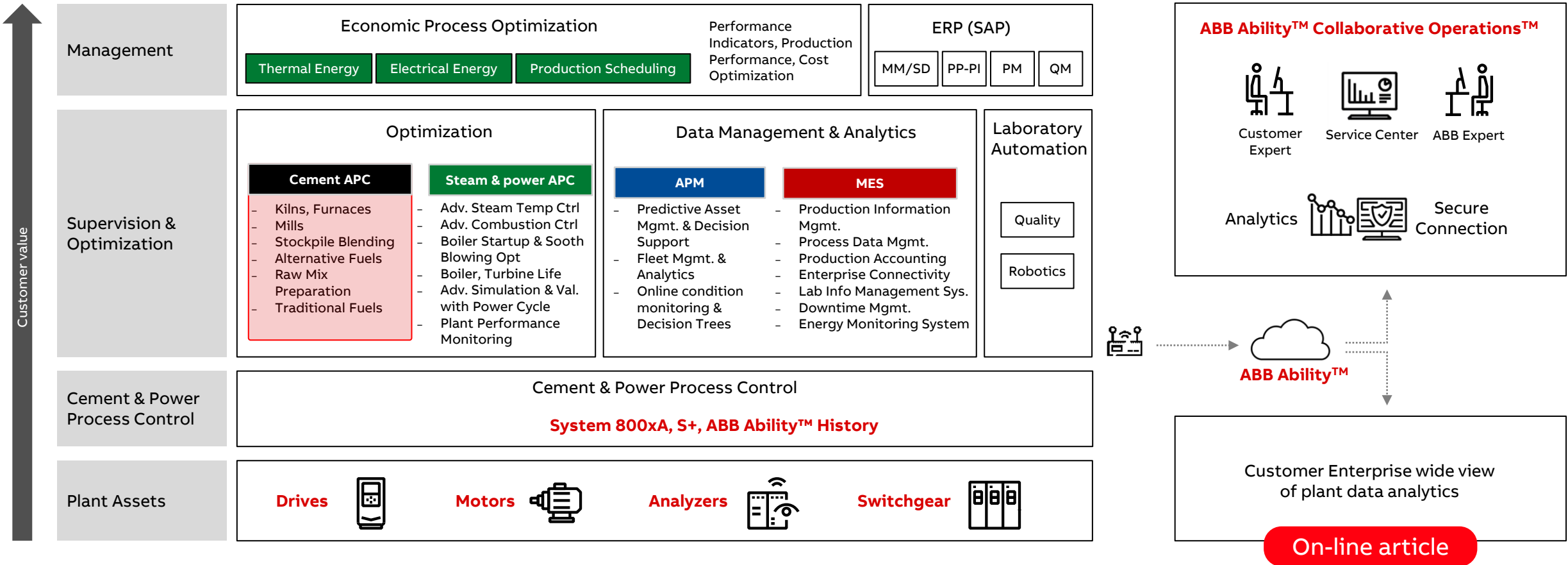
Payback within 1st year

Improved yield, quality, production costs and energy efficiency with a positive impact on sustainability performance:

- 1-5% of energy (thermal & electrical) efficiency
- 1-2% of heat rate improvement
- **2-5% productivity increase**
- Up to 15% quality and consistency improvement
- **Improved reliability of plants assets**
- **Payback: 5-12 Months**

Cement producer lowers operating costs by 3-5% across multiple plants

ABB delivers first of its kind integrated IT-OT solution for the cement industry supporting strategic goals



Asset Performance



Process Performance



Operational Excellence



Sustainability



Connected Workforce



Digital project example in the pulp & paper industry

Sustainability reporting and energy management – part of a phased approach including process optimization, manufacturing execution, asset performance management, analytics and more

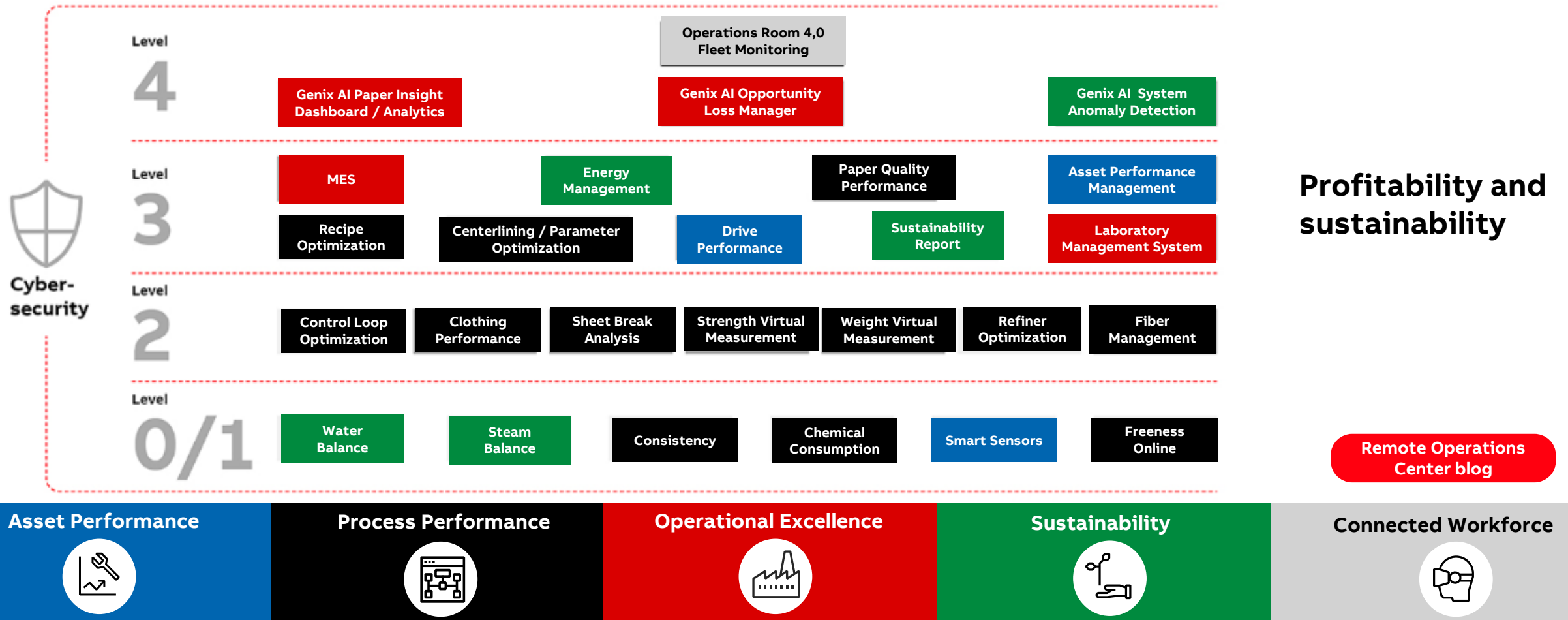


ABB helps move towards your sustainability targets through multiple pathways

Connectivity / data integration ecosystem: DCS, PLM, MES/MOM, AGVs, Smart Sensors, IoT, Cameras, LIMS, ERP, CMMS, CRM ...



Suppliers & partners



Customers

Sustainability pathways and use cases with digital technologies



Spot 'bad actors' for energy reduction potential, prolong asset life, reduce waste with **APM**

Operate closer to constraint limits at economic optimum, less energy & fuels with **APC**

Automatically shift production schedule to times when energy is cheaper, trace CO2 with **MES**

Deliver on ESG commitments, maximize energy cost savings with purpose-built **EnMS**

Drive workforce competency in energy efficiency & safety with **mobile & remote** solutions

Asset Performance



Process Performance



Operational Excellence



Sustainability



Connected Workforce



Reliability & maintenance



Operations



Energy manager

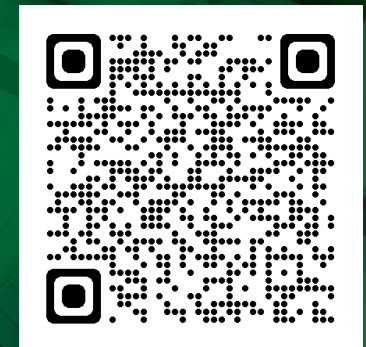


Corporate Sustainability Manager

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

Do you have questions?

Please use the “Contact Us” form on our website
[Industrial Energy Management and Optimization](#)



AABB