

BROCHURE

Electrical power distribution for Wastewater plants

Building reliable and safe power distribution systems for efficient Wastewater treatment plants



**Electrical power distribution for
Wastewater plants**

Building reliable and safe power distribution systems for efficient Wastewater treatment plants

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Whether you need to reduce energy costs or ensure that operations are always up and running, ABB is your “one-stop shop” for electrical distribution solutions in Wastewater treatment plants.

ABB solutions for Wastewater treatment enable municipalities to be safer, smarter and more sustainable by streamlining process operations, optimizing plant energy usage and helping with regulatory compliance requirements.

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Introduction

Wastewater treatment involves a number of energy intensive processes. In advanced wastewater treatment systems with the most comprehensive water cleaning processes, the wastewater passes through three stages of treatment: Primary treatment to remove solids, Secondary treatment to remove dissolved organic matter and Tertiary treatment to remove nutrients like nitrogen and phosphorous as well as any remaining suspended solids.

Typically, about 50% of the energy used for wastewater treatment is consumed during the Secondary treatment. One of the most energy intensive processes in this stage is aeration during biological processing. Pumps also consume a significant amount of energy and are used for wastewater collection and other processes throughout the plant. Together, aeration and wastewater pumping can account for more than 60% of the energy consumed by a wastewater plant.

Due to its high solid content, pumping sludge uses a significant amount of energy, while processes like drying and thickening using centrifuges are the most energy intensive.

As the access to clean, safe water is a global issue, treating more wastewater is crucial to reducing human environmental impact and relieving the pressure on supplies.

On the other hand, the wastewater industry at large consumes up to 3% of the world's total energy output and contributes to over 1.5 percent of global greenhouse gas emissions.

For this reason we need to invest in innovations to reduce the risk of water shortages while optimizing water production, reducing energy consumption and minimizing the threats posed by flooding, contamination and poisoning.

The Water & Wastewater (W&WW) industry is experiencing huge growth. Rapid urbanization and a growing population, strict water treatment regulations, the increasing demand for new water resources, intensified focus on public health & water quality and the rising incidence of water-borne diseases are the factors driving the rapid development of this market.

Despite significant growth in the market, there are still many challenges that the water and wastewater treatment industry needs to address to ensure that we have access to clean water in the future.



By 2050, the demand for water is expected to increase by +30%, considering both industrial and domestic use, while forecasts estimate a water deficit of around 40% by 2030. This means that there will be a greater need for wastewater treatment plants to ensure that everyone has access to clean and safe water.

On the other hand, processing this huge amount of water and enabling it to be reused requires a lot of energy (water and wastewater treatment plants use 3% of global energy outputs), making the industry responsible for 1.5% of the world's greenhouse gas emissions.

In addition, owing to the energy crisis and the increasing cost of energy, the water and wastewater treatment industry will need to face even higher costs. So much so that energy costs often make up 25 to 30 percent of the total operation and maintenance (O&M) costs of a utility.

The highest electricity consumer in the plant is aeration of activated sludge due to the need for a continuous air supply for the biological reaction of organic matter digestion by micro-organisms.



Meet higher demands: The Water & Wastewater treatment sector must address a higher **water demand**, forecast to increase by +30% by 2050, while **scarcity of water** is expected to reach 40% by 2030.



Reduce CO₂ emissions: Water & Wastewater treatment plants use 3% of the global energy output and contribute to 1.5% of greenhouse gas emission.



Increase cost & energy savings: energy costs account for 20 to 30% of operating costs. Reduce **carbon emissions** by investing in automation & digital solutions.



Increase safety: Wastewater treatment carries risks to human health due to exposure to sewage and sludge

This is why the W&WW industry needs to invest in automation & digital solutions to increase operation cost efficiency, productivity and energy usage, thereby reducing CO₂ emissions and enhancing sustainability.

Wastewater treatment process

Wastewater treatment is the process that removes and eliminates contaminants from wastewater and converts it into an effluent that can be returned to the water cycle.

The effluent creates an acceptable impact on the environment or is reused for various purposes (known as water reclamation). The complete wastewater treatment process is illustrated below.

1 WET WELL

Collecting wastewater from domestic, commercial and industrial sources.

Applications:

- Sewage pumping stations (lift stations)
- Submersible, dry well or suspended pumps

2 GRIT REMOVAL

Process for removing sand, silt and grit from water.

Applications:

- Screw conveyor

3 DISPOSAL OF SOLIDS

At the end of the process, treated sewage sludge can be disposed of by burying it underground in a sanitary landfill or by spreading it on agricultural land. Sludge can be incinerated but in this case, air pollution control must be considered.

Applications:

- Scrubbers and filters
- Pumps

8 FINAL CLARIFIER

Flocs of biological growth are removed at this stage, making it the last chance to clean-up the effluent prior to disinfection.

Applications:

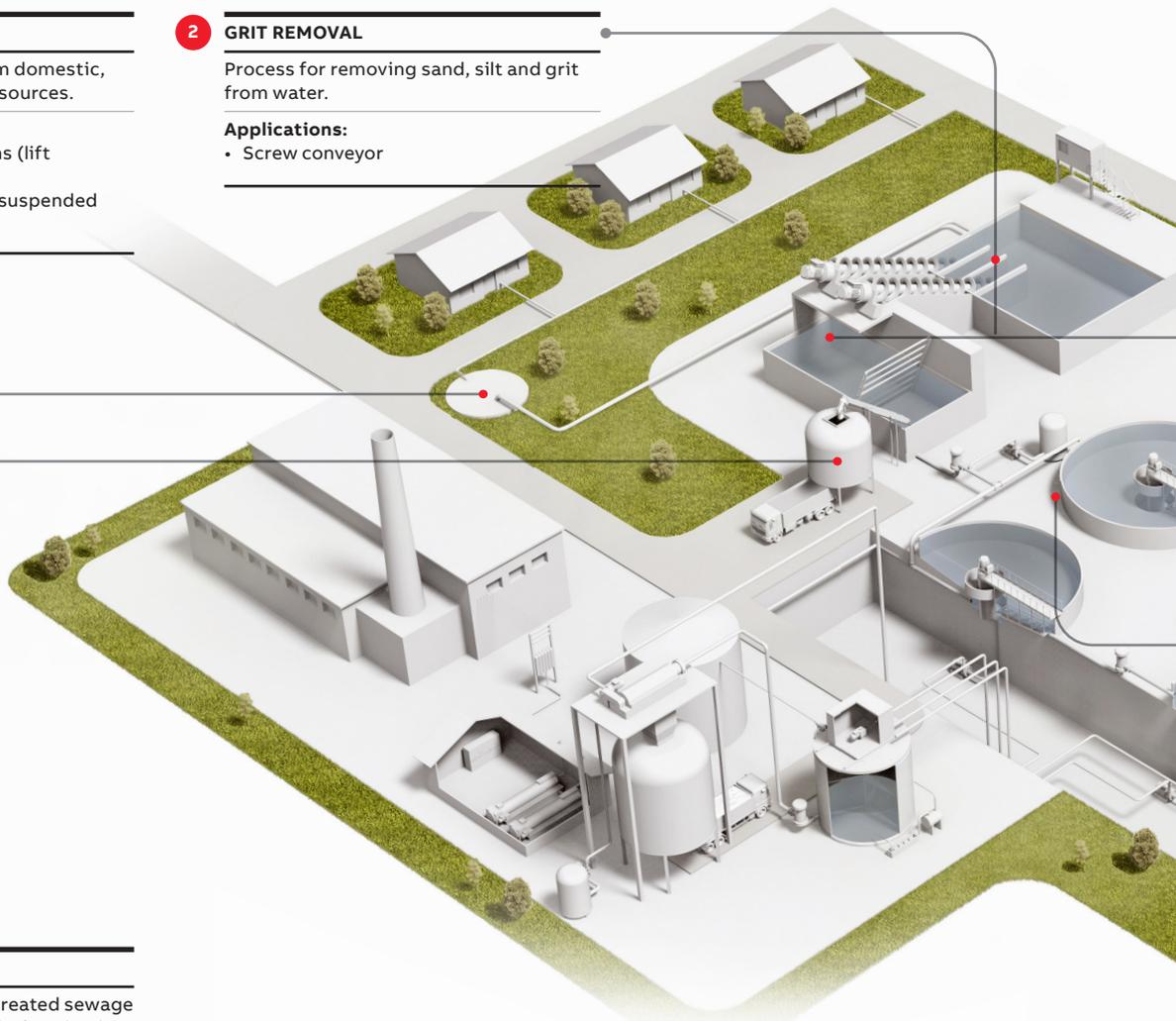
- RAS and WAS pumps
- Flocculator

9 NITRIFICATION

Aerobic biological wastewater treatment process converting ammonia to nitrate.

Applications:

- Pumps
- Blower



4 SCREENING

Removal of bulky debris from wastewater.

Applications:

- Bar screen

5 CHEMICAL DOSING

Phosphate is removed by dosing chemicals, normally iron, or occasionally aluminium, salts. The chemicals used are expensive, thus wastewater treatment plants need to exercise strict control over the dosing regime.

Applications:

- Pumps

6 SEDIMENTATION

The solids settle in the sedimentation tank while grease floats to the top.

Applications:

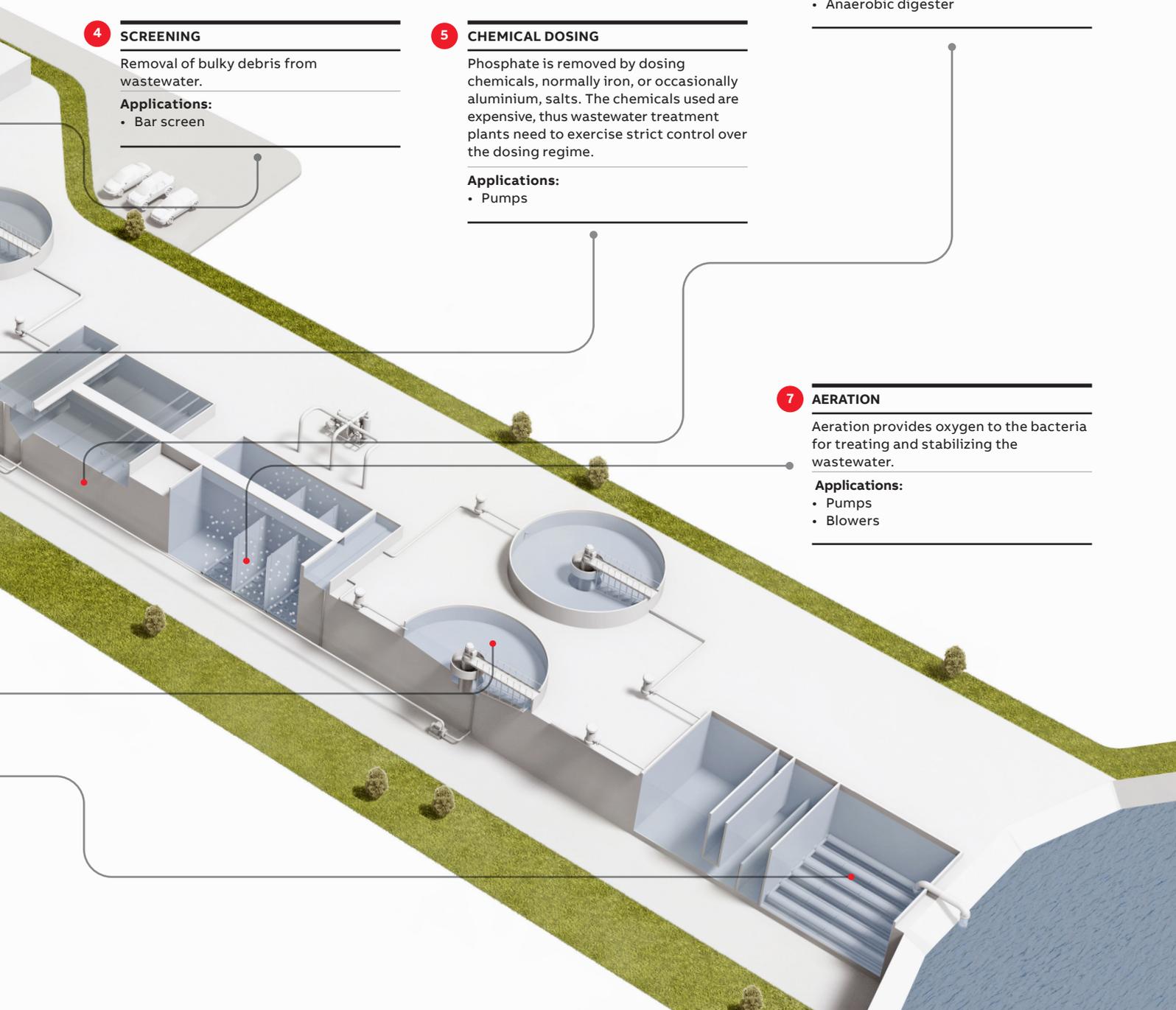
- Primary sludge pumps
- Anaerobic digester

7 AERATION

Aeration provides oxygen to the bacteria for treating and stabilizing the wastewater.

Applications:

- Pumps
- Blowers



Wastewater treatment process

Sludge Treatment Processes

1 HOLDING TANK

An aerated tank for temporary storage of digested or raw sludge prior to further treatment.

Applications:

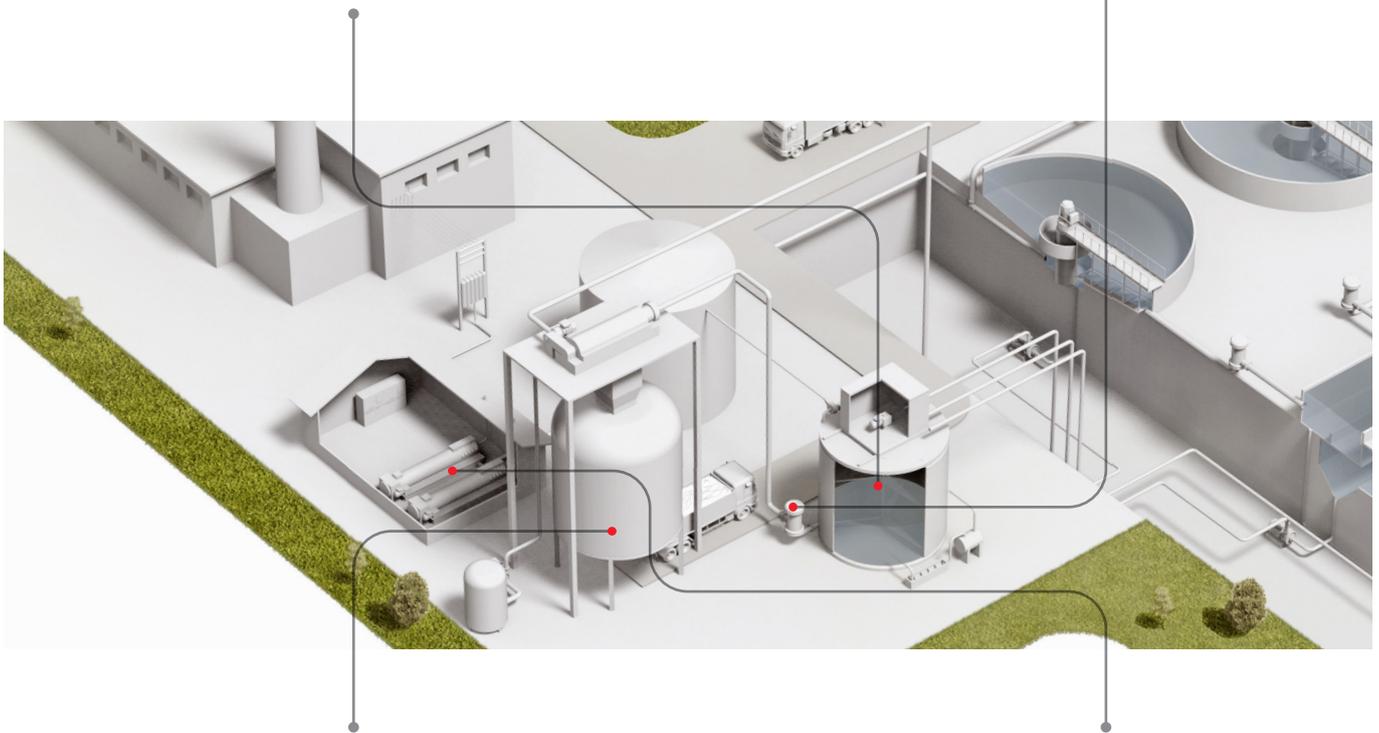
- Mixers

2 DIGESTER FEED PUMP

Optimal control of sludge pumping.

Applications:

- Pumps



3 ANAEROBIC DIGESTER

Anaerobic digestion is a collection of processes by which micro-organisms break down biodegradable material in the absence of oxygen.

Applications:

- Anaerobic digester
- Pumps

4 DEWATERING CENTRIFUGE

Centrifuge speeds are manually adjusted on the basis of visual or lab determination of the solid content of the de-watered sludge.

Applications:

- Centrifuges
- Pumps
- Conveyors
- Belt press

Make Wastewater treatment plants efficient and reliable with ABB solutions

Key challenges

The following issues must be considered whenever the electrical distribution system of a Wastewater treatment plant is designed:

Availability, operability and maintainability

Wastewater treatment plants require high process uptime. This requires a reliable power supply for each load and implementation of an appropriate maintenance policy with corrective, preventive and predictive measures.



Scalability and retrofit suitability

In new plants, it is important to ensure that equipment and systems will be properly maintained and upgraded regularly to minimize obsolescence. For plant expansions, new electrical networks must integrate seamlessly with existing equipment to minimize the effect on process uptime.



Safety of people and property

First and foremost, the electrical network of a Wastewater treatment plant must be safe: engineering studies on issues like protection, availability and coordination are a must. It is essential to request mechanical and electrical interlocking prior to the design phase and to use electrical network monitoring and control features.



Sustainability and energy efficiency

Wastewater treatment plant operators need to ensure sustainable, energy efficient processes with lower CO₂ and other pollutant emissions.



Our solution

The ABB solutions for Wastewater treatment will enable you to streamline your process operations and optimize plant energy usage while helping with regulatory compliance requirements.

Continuous operation

Avoid downtime and costly service interruptions by protecting the electrical distribution system thanks to our solutions with advanced products and specifications. Maximize reliability and reduce the likelihood of downtime by protecting your loads and processes from power outages.

Speed up your project

Ready-to-use, pre-designed solutions enable time and cost savings during the design and installation stages thanks to our preconfigured and ready to install bundle of products. In addition, you can reduce commissioning time by up to 95% using ABB software for adjusting settings and uploading configurations.

Safety and protection

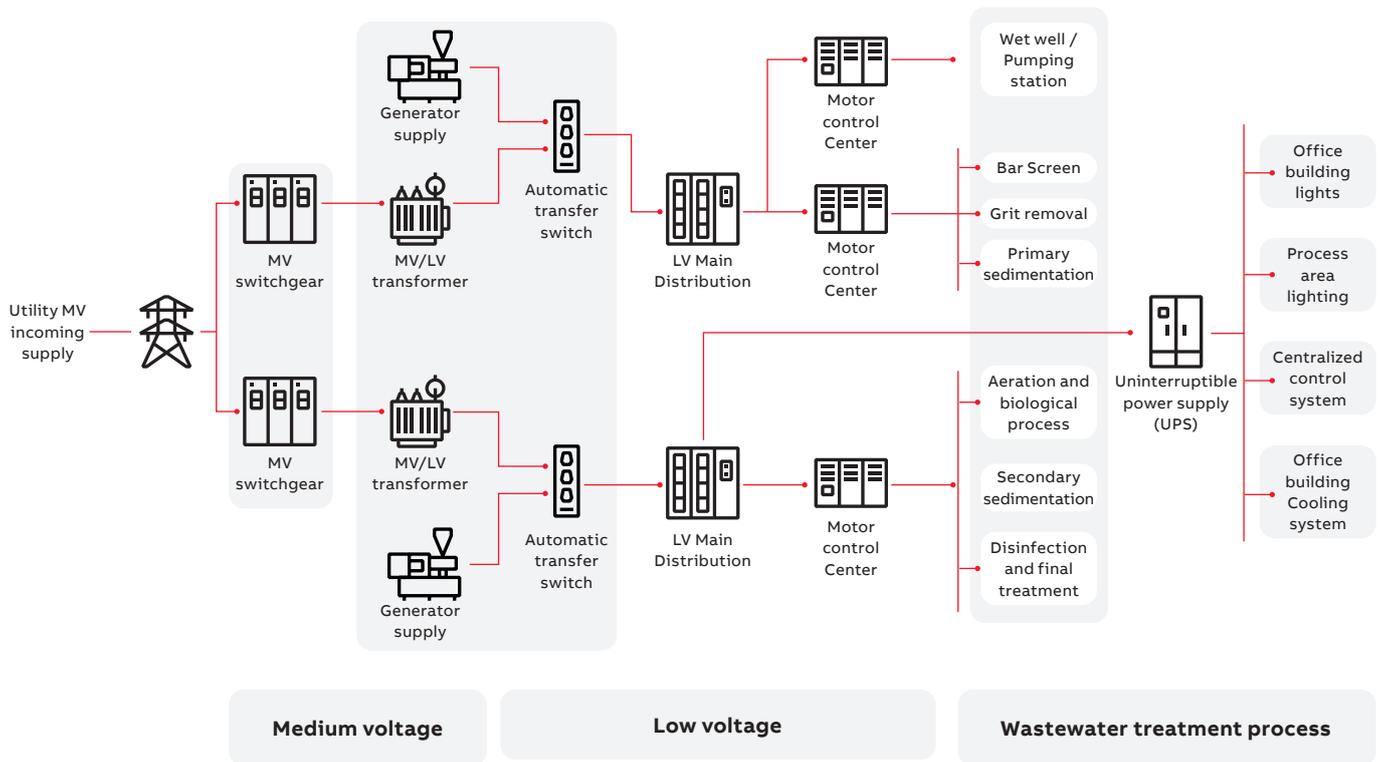
ABB product specifications often exceed standard requirements, helping you to enhance safety, reduce hazards and prevent downtime. In addition, thanks to our preconfigured bundles of coordinated products selected in accordance with installation standards and requirements, you will also enhance the reliability of the system.

Sustainability and energy efficiency

Thanks to 24/7 real time monitoring, smart analytics, predictive maintenance and instantaneous alerts, ABB's digital solutions make it easy to monitor and optimize your energy consumption and CO₂ footprint. You will be able to make faster and better decisions based on data insights without advanced communication capabilities.

General electrical power distribution

Wastewater treatment plants



Municipalities need reliable, energy efficient and safe electrical power distribution systems to run their wastewater treatment processes, streamline their process operations, optimize plant energy usage and keep the processes running smoothly.

ABB offers a broad range of electrical power distribution devices to protect treatment plants from overloads, short circuits, earth or arc faults while providing digital connectivity.

The electrical power distribution system could receive power from one or more sources. Power distribution and safety systems generally include panel enclosures, bus bars, circuit breakers, fuses, relays, feeders, protection devices, safety devices, etc.

ABB Digital solutions

ABB's digitally enabled products and product connectivity enable you to set up configuration and communication architectures ready to be interfaced with ABB or 3rd party monitoring platforms or a SCADA via API, for greenfield and brownfield installations. All this in addition to ABB Ability™ Energy Manager & ABB Ability™ Asset Manager for remote

monitoring of one wastewater plant or multiple plants at the same time, thereby ensuring energy efficiency and predictive maintenance.

A digital architecture with a selection of ABB products to be used to monitor the most relevant data and signals in a Water & Wastewater treatment plant is illustrated below.

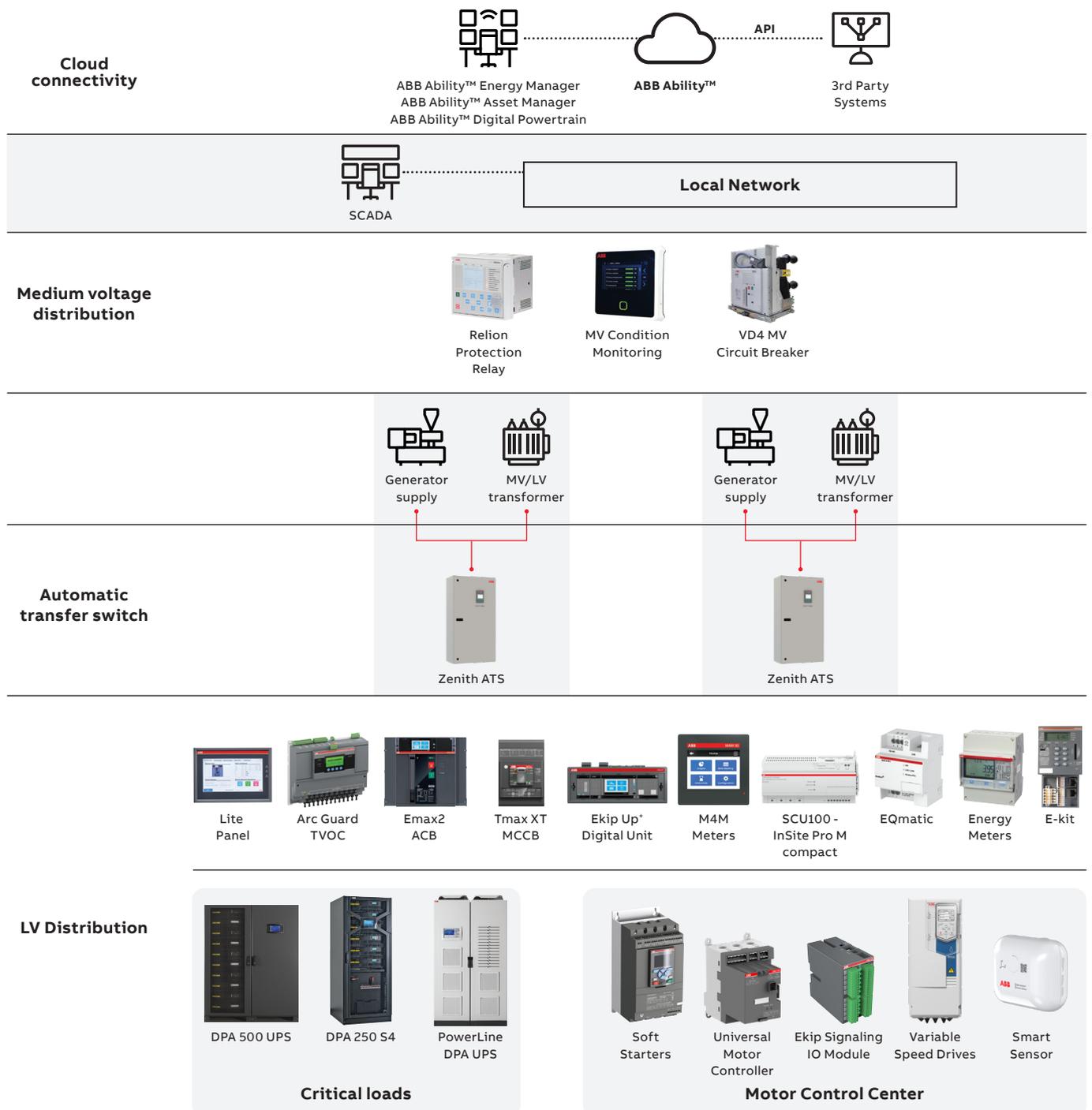
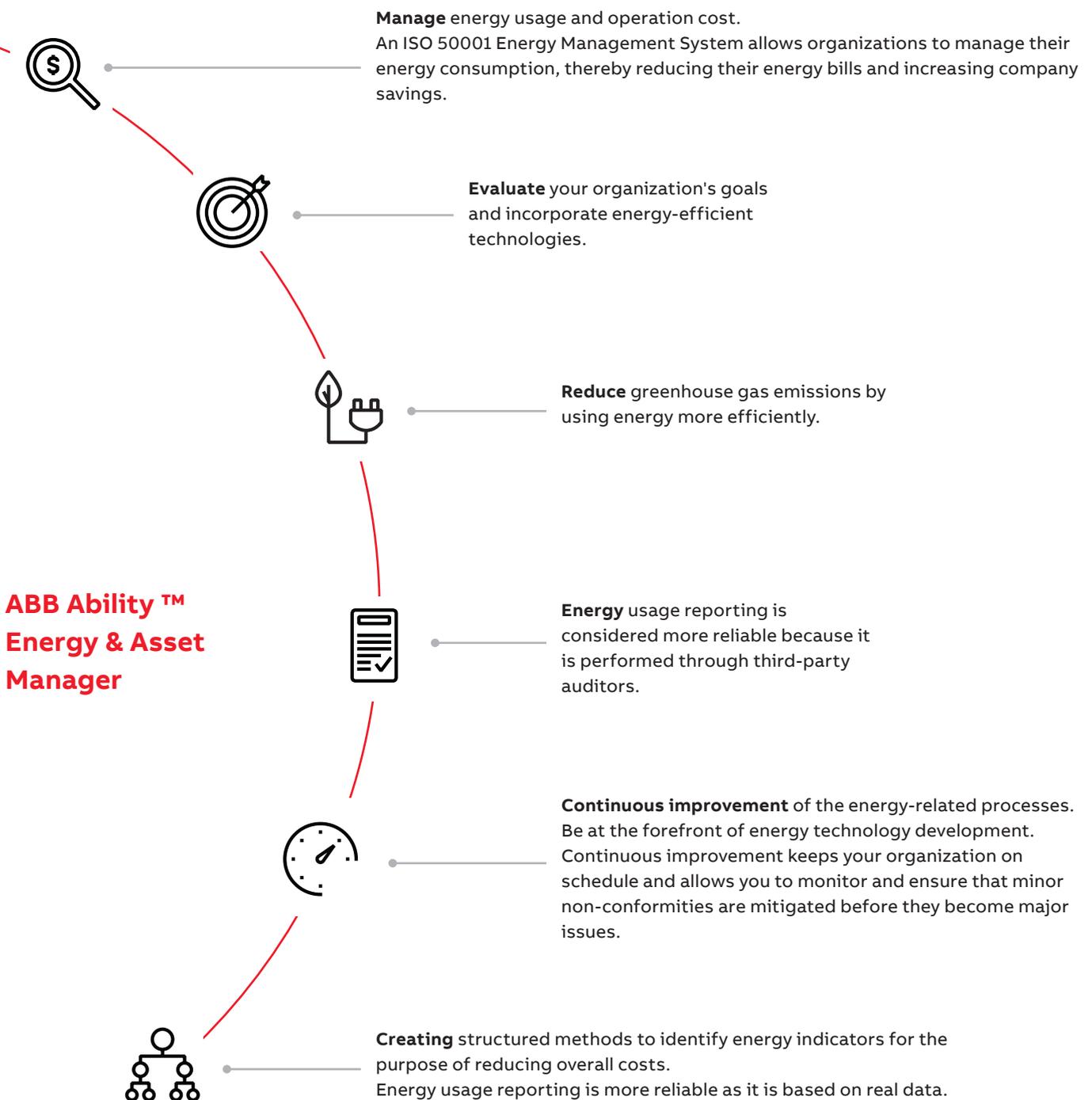


ABB Ability™ Energy and Asset Manager web-based platform

In addition to remote monitoring and energy management, ABB can help you to enhance and demonstrate your environmental performance through a continuous improvement process compliant with ISO 50001.





—
ABB Ability™ Edge
Industrial Gateway

Optimize energy use and operating and maintenance costs at any time and from anywhere.



—
ABB Ability™ Energy
and Asset Manager

ABB Ability™ Energy and Asset Manager is an innovative solution that integrates energy and asset management into a single multi-site digital platform. ABB's new solution enables you to create the digital twin of your assets and monitor the performance of the power distribution system in a customizable and ultra-intuitive web environment.

ABB Ability™ Energy and Asset Manager provides useful information based on data and helps you to minimize costs, reduce risk and maximize the performance and safety of your operations.



—
ABB Ability™
Cyber Security

In BESS applications, the main benefit of implementing a remote monitoring platform is to guarantee simple real-time monitoring of plant conditions, anticipating faults and allowing fast reaction when they occur, thereby minimizing plant downtime.

Furthermore, ABB Ability™ Energy and Asset Manager increases your business performance by reducing up to:

100%
of unscheduled costs

40%
of maintenance costs

30%
of operating costs

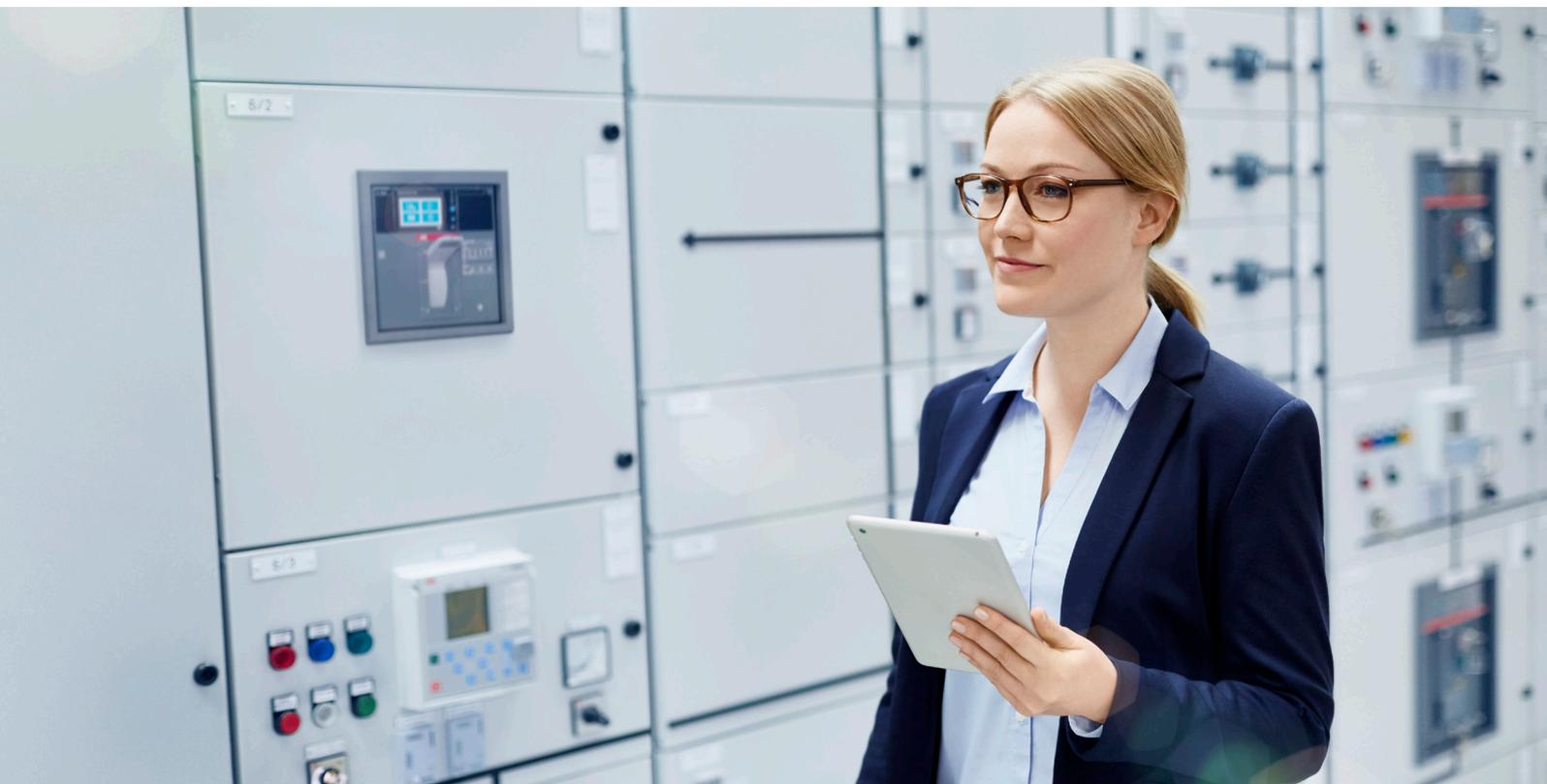
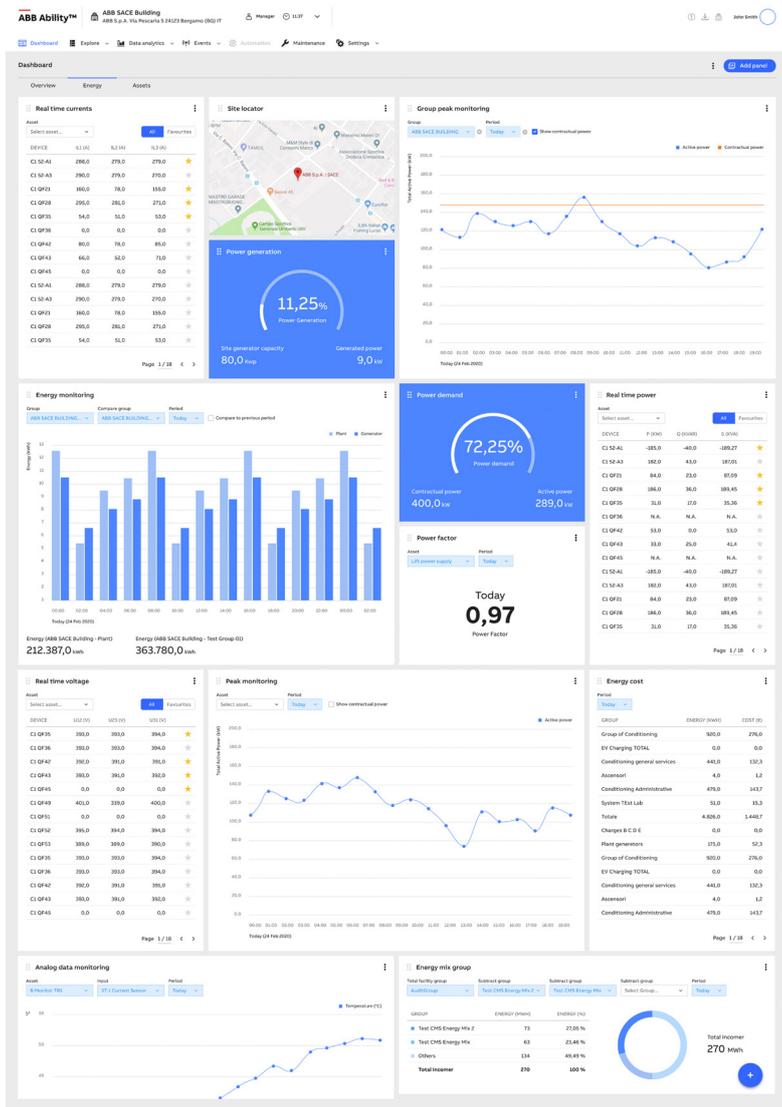


ABB Ability™ Energy Manager

Energy efficiency is essential for running your operations competitively. ABB Ability™ Energy Manager allows you to understand energy in real time and identify opportunities for continuous improvement. Since it is scalable, its benefits can be exploited to the full, from single installations through to multiple buildings with multiple users.



ABB Ability™ Energy Manager



Data acquisition

Comprehensive, real-time energy use data that allow you to quickly and agilely compare, report and identify costs.

Analyze

Analysis of relevant metrics to make better decisions and optimize the energy consumption of your facilities, reducing demand and attaining sustainability goals.

Act

Implement your effective energy management strategy and generate savings by complying with emissions requirements and standards.

Monitor

View the information you need using preconfigured and customizable dashboards and share it with your team.

Reporting

Receive automatic periodic reports in Excel or the PDF format with the most relevant information for each plant.

Audit

Discover hidden consumption and inefficiencies and control your energy KPIs.

Alerts

Automate immediate alerts on the status of your installations via email or SMS to anticipate failures.

Cost management

Check your consumption and assign rates to identify the actual costs of your operations.

Multiple energy services

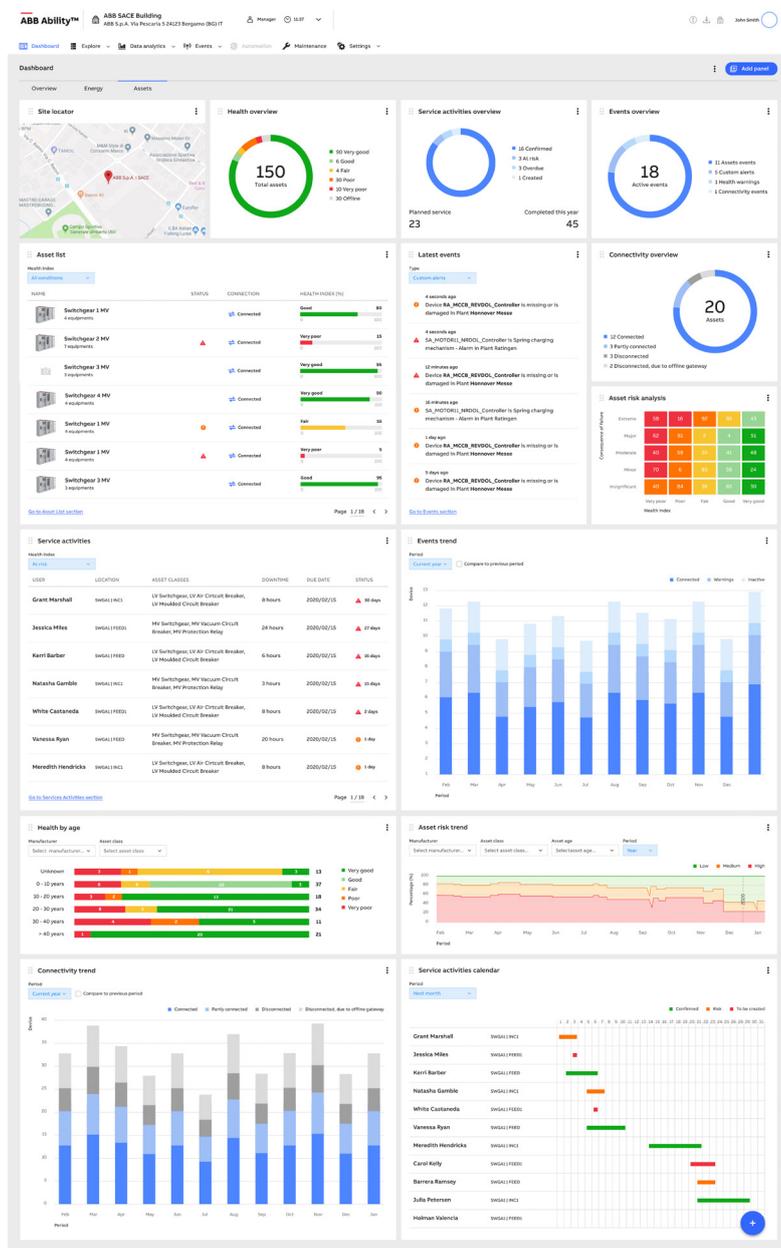
Integrate the consumption of water and the use of gas or other sources of power on the same platform in a unified way.

ABB Ability™ Asset Manager

ABB Ability™ Asset Manager is the new benchmark for simplicity and flexibility in asset management. ABB's new solution gives you the power to view and optimize the behavior of the devices in your facility anytime, anywhere thanks to an intuitive web interface. The result is increased reliability and availability of your assets and a drastic reduction in unplanned maintenance.



ABB Ability™ Asset Manager



Condition monitoring

ABB Ability™ Asset Manager provides granular visibility into the behavior of your assets in real time for LV and MV installations.

Predictive analytics

Easily detect potential asset failures through health assessment, performance trends and proactive notifications.

Maintenance plan

Analysis of the causes of asset failure allows predictive maintenance that significantly reduces service downtime and operating costs.

Asset health

Monitor the health of your assets and view a diagnosis for each one.

Events (edit)

Notify events and alarms to help personnel to anticipate risks.

Asset management

Obtain continuous, total visibility of your installed base, your current status, your documentation and technical and historical maintenance activities.

Predictive maintenance

Optimize the cost of maintaining your assets thanks to the predictive analytics algorithms of the platform.

Maintenance activities

Schedule and track maintenance activities for each asset to increase the performance of your human team.

Reporting

Set up automatic reports to track the health and performance of your assets.

ABB Ability™ Digital Powertrain

The ABB Ability™ Digital Powertrain is a suite of digital solutions that enables you to remotely monitor the health and performance of powertrains, including drives, motors and applications such as pumps. It combines connectivity and data analytics with our expertise to make your operations efficient, predictable and safe.

- Integrated visualization of powertrain performance via a monitoring portal.
- Enables you to take actions leading to less down time, extended equipment lifetime, lower costs, safer operations and increased profitability.
- Offers full transparency of the key operational parameters of individual assets as one unified system.
- Data about components is transmitted via the cloud from the ABB Ability™ Smart Sensors / NETA-21 to the monitoring portal.



ABB Ability™ Digital Powertrain

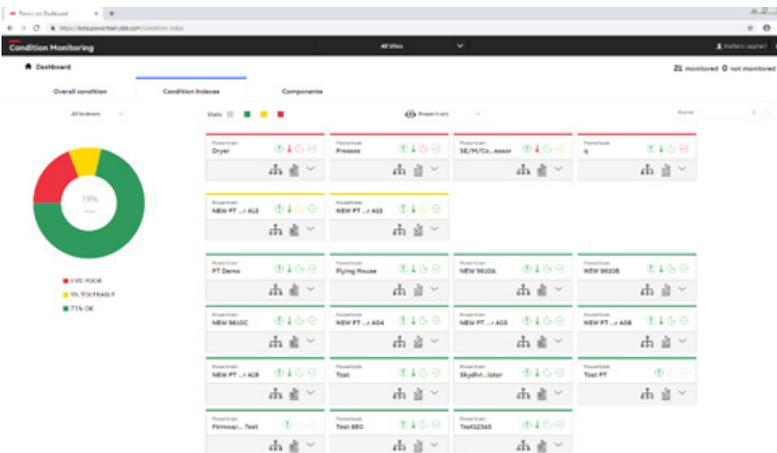


ABB Product portfolio

Low voltage products

Air circuit breaker - SACE Emax 2:



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Molded case Circuit breaker - SACE Tmax XT:



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Ekip Up*:



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Manually operated switch-disconnectors:



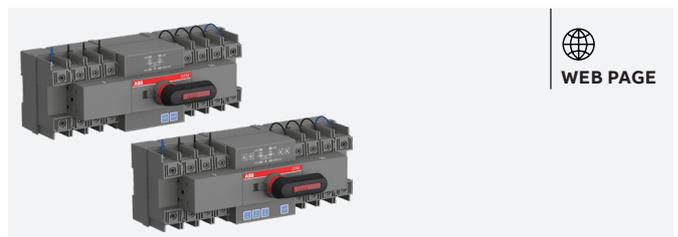
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TruONE™ ATS:



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Compact ATS:



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Manually operated change-over switches:



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Arc Guard System™ TVOC-2:



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Contactors and Contactor relays:



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Push-in-Spring motor starting solution:



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Manual Motor Starters:



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Intelligent Motor controller - UMC100.3:



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Softstarters:



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Electronic Compact Starters:



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Measuring and monitoring relays:



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Interface relays and optocouplers:



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Power Supplies:



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Electronic timers:



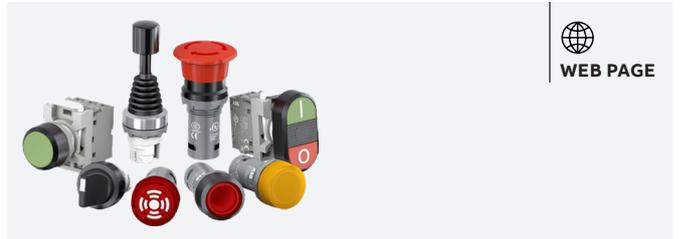
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Temperature Monitoring Relays:



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Pilot devices:



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Safety relays:



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System Pro M:



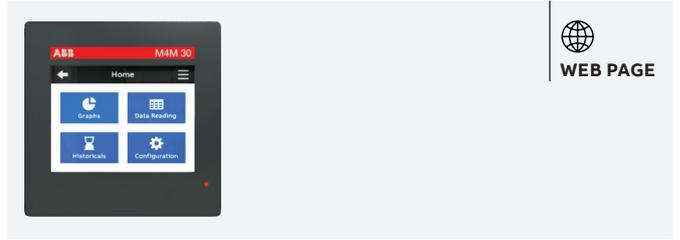
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Surge Protective devices:



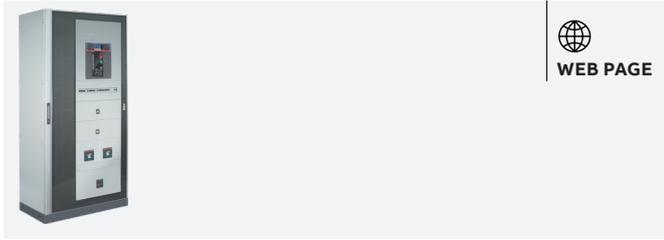

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M4M network analyzer:



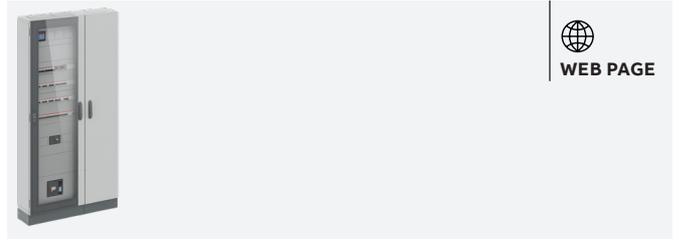

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System pro E power:




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System pro E® energy:




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MNS® Low Voltage Switchgear:




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ABB NeoGear™:




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Drives:



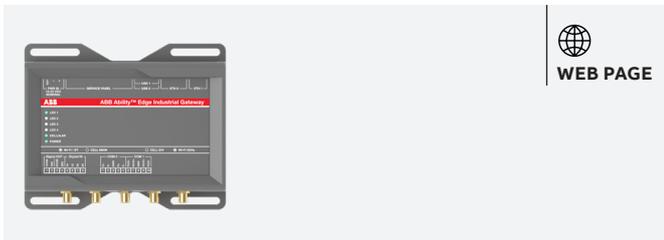

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Motors and generators:



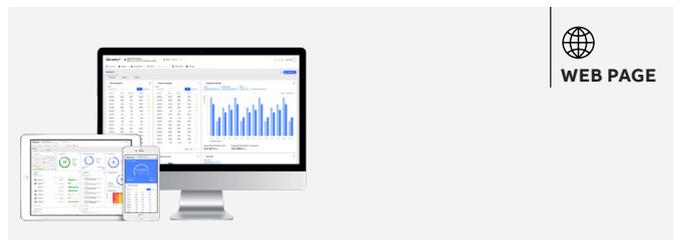

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ABB Ability™ Edge Industrial Gateway:




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ABB Ability™ Energy Manager:




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ABB Ability™ Asset Manager:




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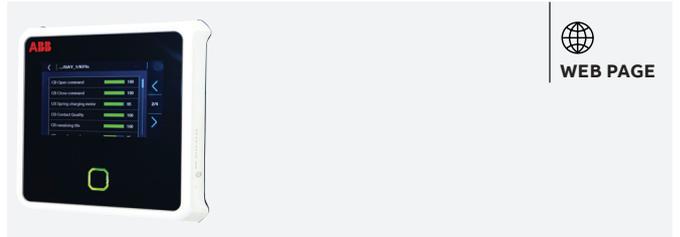
ABB Product portfolio

Medium voltage products

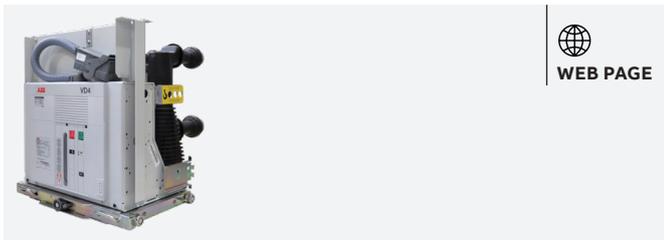
Relion protection and control:



ABB Ability™ Condition Monitoring for switchgear – SWICOM:



Medium Voltage - Circuit breakers:



Medium Voltage – Protection relays:



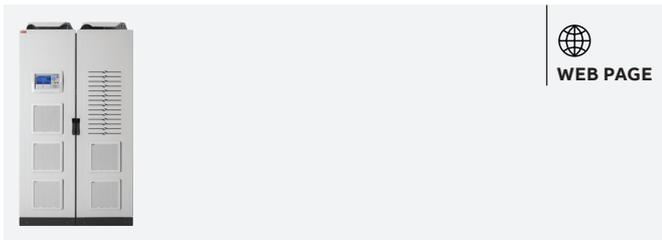
Air insulated switchgear:



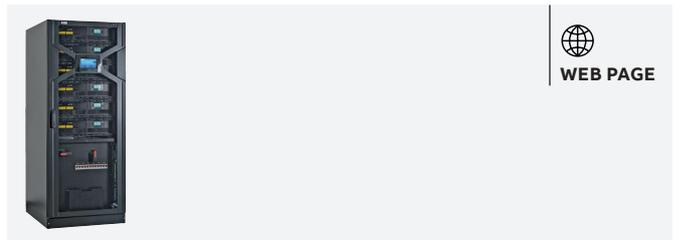
ABB Product portfolio

Power protection (Uninterruptible power supply)

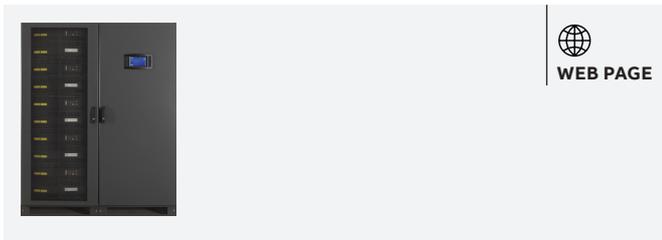
PowerLine DPA:



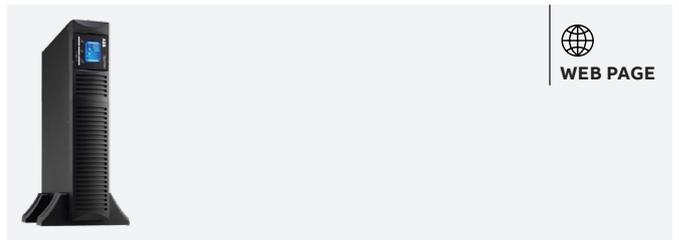
DPA UPScale ST S2:



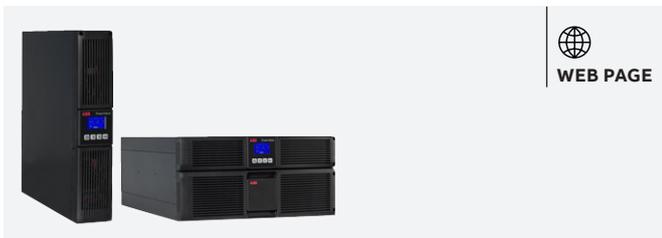
DPA 500:



PowerValue 11 RT G2 IEC:



PowerValue 11/31 T:



Conclusion

This brochure aims to provide insights on the wastewater treatment process and its general electrical power distribution system, as well as a general overview of suitable ABB solutions for wastewater treatment plants.

To provide you with more details about Intelligent Distribution and Motor Starting & Protection functionalities, we have assembled the following reference architectures and accompanying application bundles to get you started on your next design.

The bundles include concrete examples, inclusive of schematic, product suggestions and Bill of Materials (BOMs) to provide a framework for designing the electrical distribution system of a Water & Wastewater plant using ABB solutions and other wastewater treatment-related products.

Click on the reference architecture most suited to your needs and create the configuration of your next project!

 DOCUMENT


Intelligent Distribution for the Main Distribution board in Wastewater plants - Offering for Brownfield and Greenfield installations (IEC)

 DOCUMENT


Motor Starting & Protection for optimized wet wells in Wastewater plants (IEC)

At ABB, we strive to provide our customers with the tools and resources they need to be as effective and successful as possible. That is why we have developed an Application Finder to help you speed up your projects by easily locating the full list of Applications, Single Line diagrams and related Bill of Materials.

Check the Application Finder now to find other useful Data Center reference architectures or to customize the ones available in other configuration tools.

APPLICATION FINDER


We've made it simpler for you to set up your project!
Click here to find the reference architecture that best fits your needs and download the Bill of Materials.



—
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—
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more**

—
APPLICATION FINDER



Find the reference architecture tailored to your needs and speed up your project thanks to our new Application Finder Tool!



—
CONTACT US



Do you have a similar project and are you searching for the right Application configuration? Contact us and talk to our experts!



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