



APRIL 2020

Electrification in Food & Beverage - Service Solutions

Lee Todd

Global Product Manager

Service Solutions



ABB Service Solutions



Safety

We are committed to world-class products, systems and services with health and safety as our key priority.



Efficiency and production continuity

We enable energy efficiency and energy flow control. Pluggable power management solutions to maximize production continuity.



Asset performance and optimization

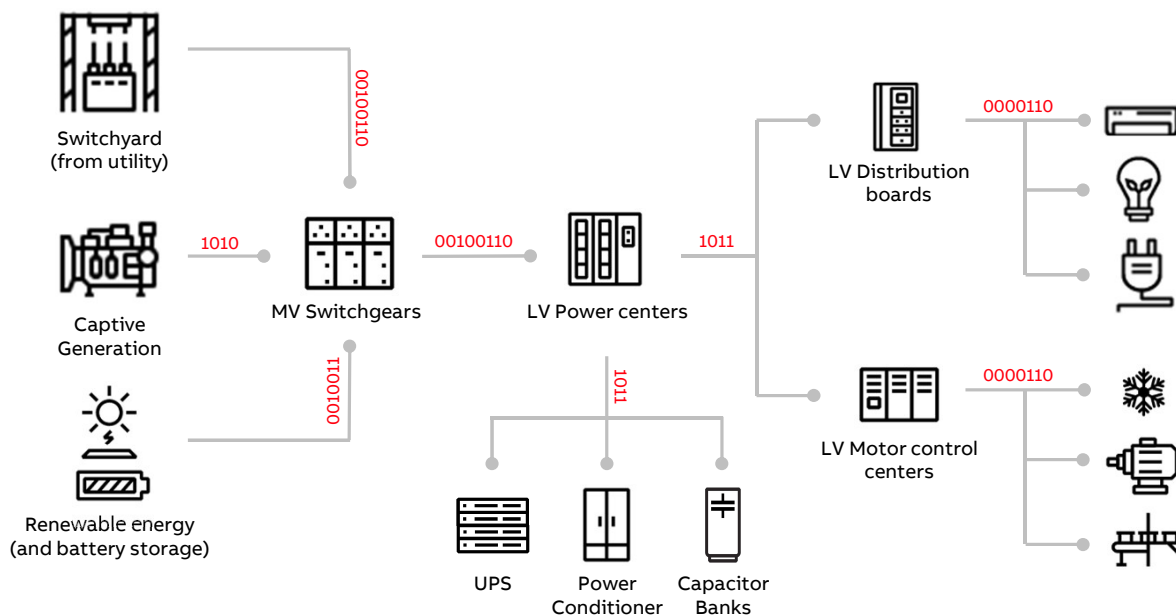
We monitor the reliability and efficiency of your assets to optimize the operation and maintenance processes.



Digitalization

We provide flexible, scalable and modular digital solutions, which allow also an efficient integration of renewables and e-mobility.

Discover how to upgrade your electrification system, reduce the costs and increase efficiency of your plant



Example of a Food & Beverage electrification system

1

Safety

- Consultative Approach
- People and Equipment Protection

2

Efficiency and production continuity

3

Asset performance and optimization

4

Digitalization



Consultative Approach and on Site Support

My Site Condition and Risk Assessment

Electrical Plant Assessment to evaluate the status of the equipment and the relative risk of failure and/or malfunctioning to prevent damage to people and production stops

Network Analysis

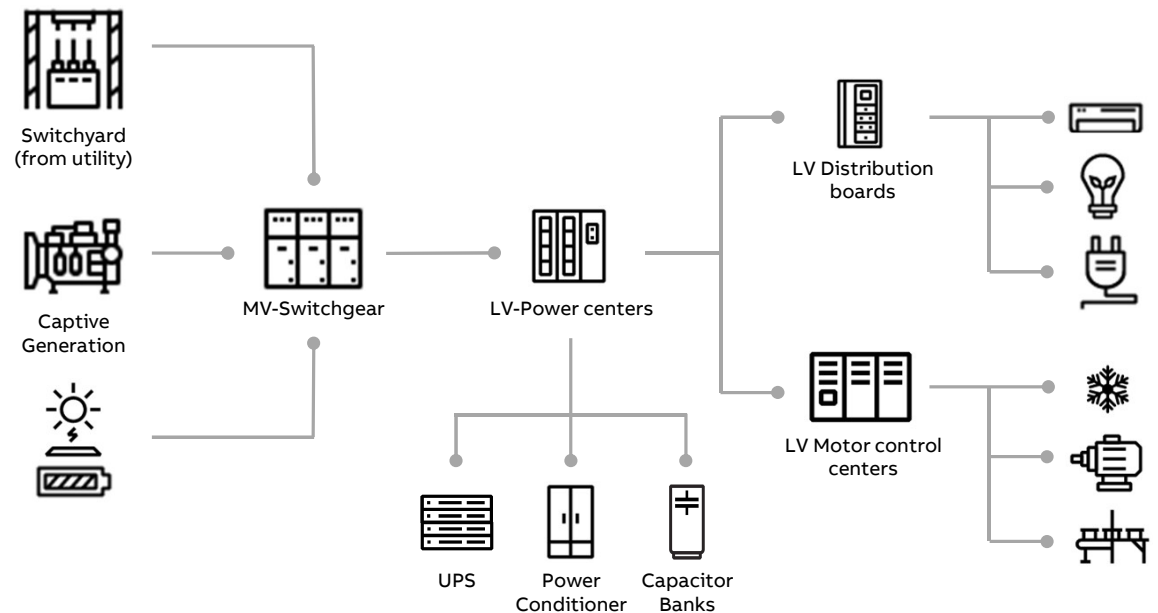
Short Circuit Calculations, Arc Flash Studies. Advise on how the network is performing and the relative optimization

Training, Procedure Developments and Engineering Studies

Complete and modularized program to assist the customer in any phase to develop his own competence as well as advising on how to maintain and optimize the plants

Installation and Commissioning

Full assistance in all phases (can be combined with trainings)



MySiteCondition

Why?

Awareness about assets reliability, lifecycle status,
Overview of safety and operation procedures and tools.

How?

ABB service offers a proven process to collect data of the installed base, advanced algorithms to estimate assets risk map, and a framework to generate a business to mitigate critical issues.
MySiteCondition App gets rid of paper work, and gives the flexibility to choose the assessment level: observation, inspection and test.



MySiteCondition App

It drives the collection of asset data (observations, inspections, tests).
Free of charge, for ABB service

Example: 10 panels in 2h



MySiteCondition analysis

The system is generating a report with risk map.
Analysis is based on ABB analytics for MV, LV and transformer equipment.

Generate value

It shall include budgetary or firm quotations to solve most critical issues.

Example: 4h to create a report for a small electrical system

Condition assessment



Plant

Water production, Iraq



Customer needs

Assessment of electrical system, including diesel generators, safety procedures, tools.



1100101001

Digital offering

On site assessment, MySiteCondition data collection and report.

“

Assessment was very effective, and the report highlighted clearly the criticalities and the mitigation actions.

”

- ✓ LV switchgears (40 feeders), generators, MV switchgear, transformers
- ✓ 2 field service technicians for 2 days
- ✓ Assessment report, pictures and suggested mitigation actions
- ✓ Much cheaper and effective than competitors



Consequence of an ARC fault

The severity of the consequences of failure.

It can go from “negligeable”, like a spare feeder, up to “catastrophic” which include matters such as loss of life and injury to persons.

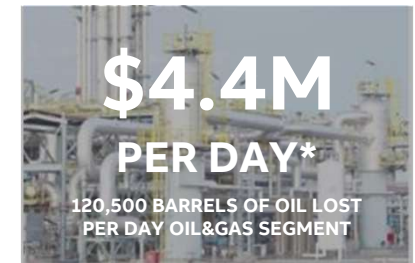
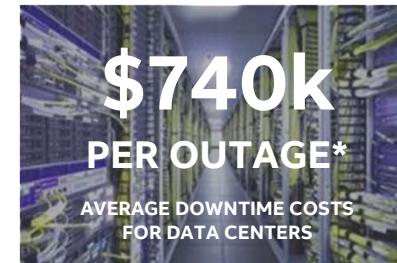
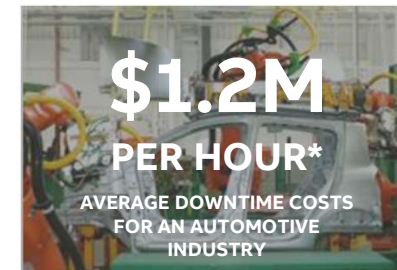
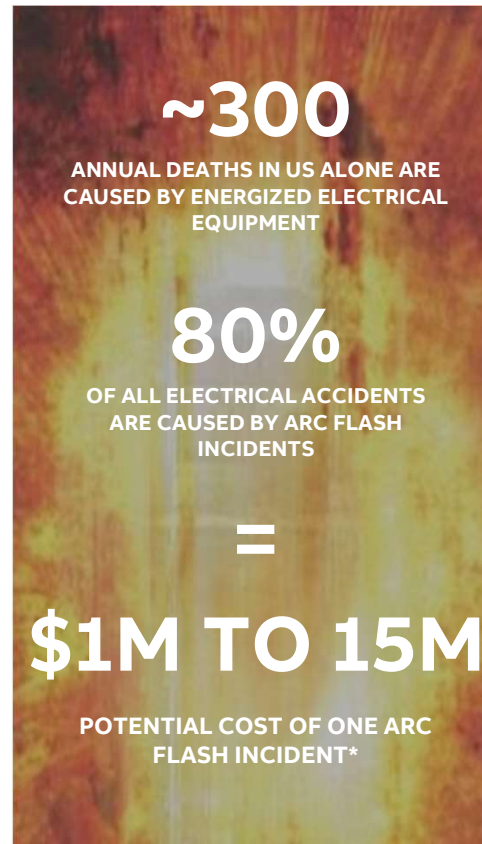
Type of Consequences:

- Physical (e.g. assets disruption)
- Financial (e.g. increased costs, loss of production)
- Legal (e.g. fines, penalties)
- Social/psychological/community

www.ecmweb.com/contractor/electrical-safety-foundation-international-unveils-how-do-you-know-workplace-safety-progr

*A 1999 Electric Power Research Institute (EPRI) study pegged total direct and indirect costs of an arc flash incident

LC©ABB



People and equipment protection



Passive people protection

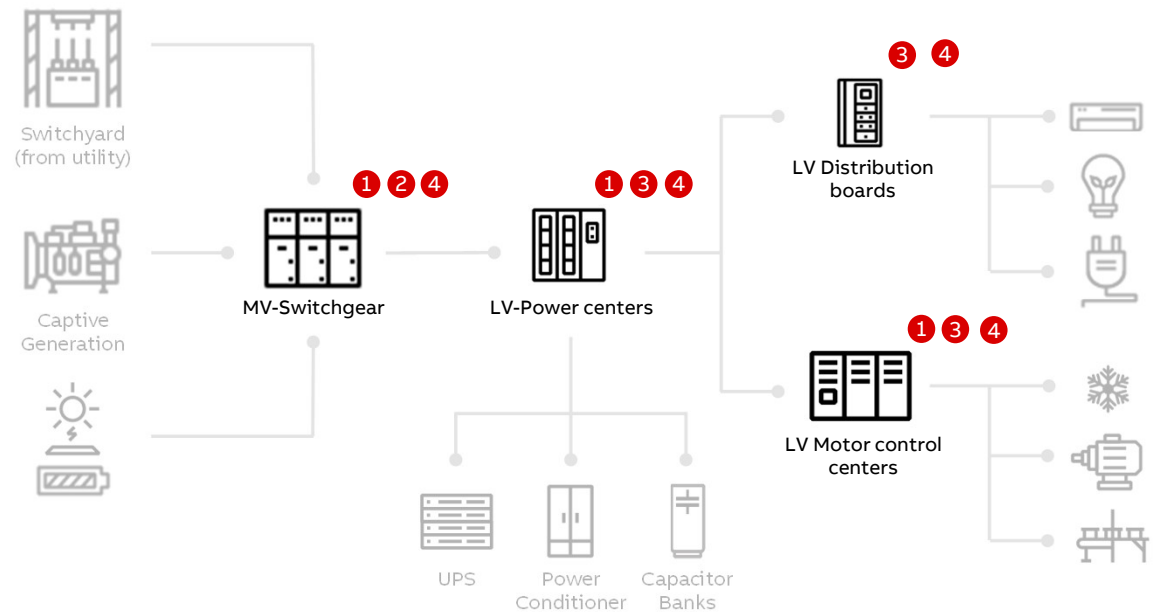
MV and LV certified switchgears against internal electrical arc fault.



Active people and equipment protection

Fast acting and coordinated arc protection systems applicable on and MV and LV systems, and on new and existing switchgear, to increase safety and minimize downtime.

- 1 UFES Ultra Fast Earthing Switch
- 2 Relion® MV relays with integrated arc protection REA Arc fault protection system
- 3 TVOC Arc Guard system
- 4 CB & relay retrofitting, truck master



Active people and equipment protection

Why?

The occurrence of an arc fault is the most serious fault within a power system. The destructive impacts of an arc flash event can lead to severe injuries of the operating personnel, to costly equipment damages and long outages.

How?

ABB digital solution detects the intense light of an arc flash, with fiber optic sensors (loop or radial schema), comparing with overcurrent condition, sending a trip signal in less than 2.5ms. The arc extinction is achieved by means of innovative and dedicated switch or by circuit breakers.

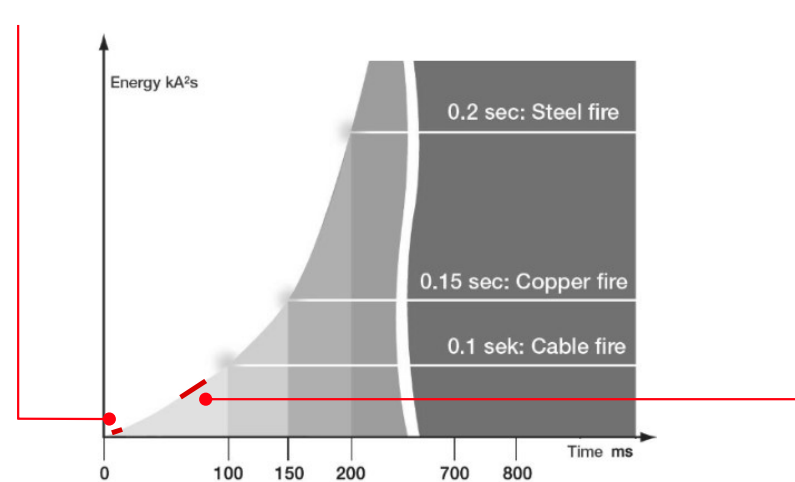


UFES Ultra-Fast Earthing Switch offers arc-fault detection and extinction in **less than 4ms**. It includes primary switching elements. It can be used **up to 40.5kV and 100kA**, and easily extended for both MV and LV with other arc detecting devices (REA, TVOC, etc).



REA solution and Relion® relays with arc protection offer fast arc-fault detection on **MV switchgear** and extinction in **60-80ms**.

TVOC 2 offer fast arc-fault detection on **LV switchgear** and extinction in **60-80ms**.



Arc protection success case



Plant

Soybean production, Brazil.



Customer needs

Improving safety of existing switchgears, minimizing downtime and meeting insurance and risk certification companies requirements.



1100101001

Service offering

REA arc-protection solution with complete installation on a not ABB LV switchgear

“

REA arc-protection solution allows detection of an arc sending trip signal within 2.5 ms.

”

- ✓ Improved protection for maintenance staff and avoid larger damage inside the panel, in case of an arc-fault, reducing downtime and restoration costs.
- ✓ Quick installation of the arc-protection system without breaker or relay retrofit.
- ✓ Modular and scalable for MV and LV.
- ✓ Regular self-supervision of the arc protection system and sensor fiber loops.



Ultra-fast earthing switch success case



Plant

Steel production, with ABB and non-ABB medium voltage switchgears.



Customer needs

After a severe failure on site, which caused a long downtime, customer asked for the highest possible protection for people and equipment for the MV network.



1100101001

Service offering

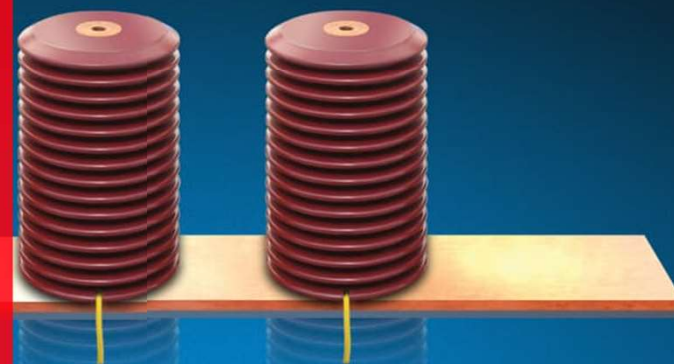
UFES ultra-fast earthing switch

“

After verifying the UFES advantages on ABB 10kV switchgear, the customer added the innovative solution also on non-ABB switchgear.

”

- ✓ Proven easy applicability on new and existing switchgears.
- ✓ Highest possible protection for operating personal on non-ABB and ABB switchgear.
- ✓ Drastic reduction of downtimes and repair costs in case of an internal arc



1

People and equipment protection

2

Efficiency and production continuity

- Power quality
- Power stability

3

Asset performance and optimization

4

Digitalization



Efficiency and production continuity

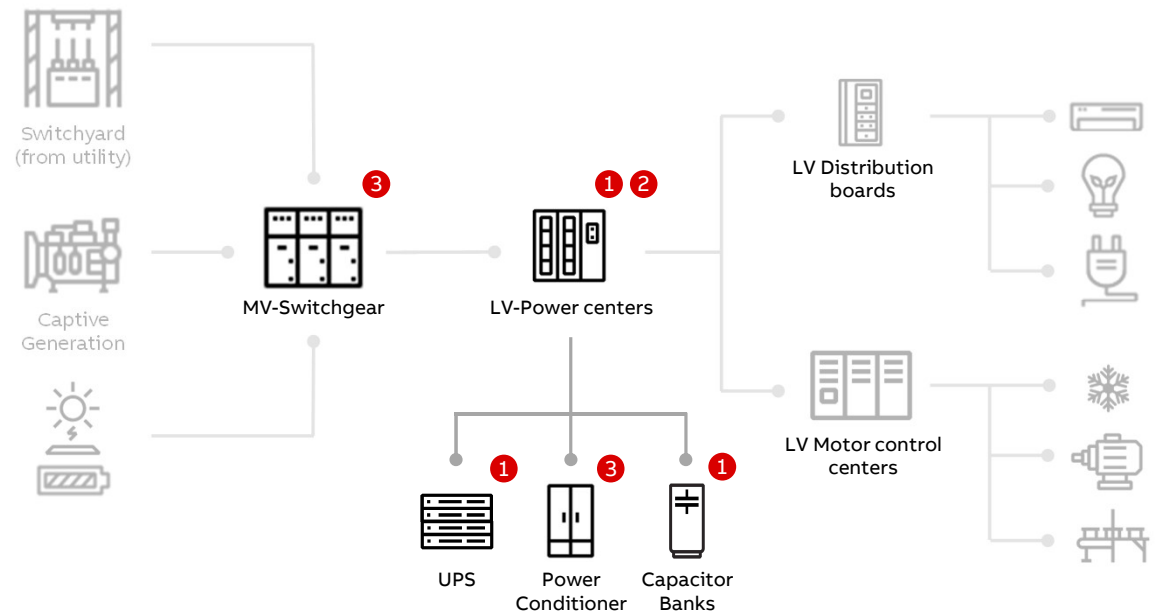


Power quality and stability

Full visibility on power quality issues, also on brown fields.

Capacitor banks, UPS and Power conditioner solution, modular and integrated in the digital LV switchgear

- ① MNS platform for integrated UPS and capacitor banks
- ② Ekip UP, M2M for power quality and metering
- ③ PCS100 portfolio for UPS and voltage conditioning



Power quality and stability

Why?

A poor power factor can increase the costs of energy and utility penalties. And electrical network disturbances, like sag and swell events, can impact the automation systems causing costly production interruptions.

How?

ABB can offer a broad portfolio of solutions to maximize the power quality and stability. In particular the reactive power and harmonics can be optimized with capacitor banks and filters. And the power stability is maximized with UPS (Uninterruptible Power Supply) as well as with AVC (Active Voltage Conditioner), which removes immediately the disturbances.

A power and voltage conditioner attempts to keep the line voltage in a given range, eliminating sag and swell, with a very high energy efficiency, small footprint and low maintenance, since it does not require batteries.



The PCS100 family provides active Voltage Conditioner for voltage regulation and sag correction in commercial and industrial applications.

An UPS provides backup electrical power for a period of time to critical equipment in the event of brownouts or total power failure. It requires a battery storage.



UPS portfolio covers applications from LV single-phase and three-phase, up to MV, and from few KVA up to 50+ MVA, with standalone installations.

Capacitor banks helps factories to reduce costs of reactive power. Typically associated to an automatic system to correct the power factory.



MNS platform offers LV solution from power distribution to motor control centers, and in the same cubicles it can embed modular plug-in UPS and capacitor banks, saving costs and footprint.

Moreover ABB offers solutions to efficiently control MV capacitor banks.

Power quality success case



Plant

Water production and bottling, USA.



Customer needs

Improve power quality with a factory greater than 92%, in order to reduce energy costs and utility penalties.



Offering

Analysis, engineering and commissioning of capacitor bank solution on MV.

“

Thanks to a reduction of reactive power we can save monthly approximately 1500 USD, with a return on investment in less than 5 years.

”

- ✓ ABB can offer online power metering and quality analysis on MV & LV
- ✓ ABB MNS low voltage switchgear can include integrated modular and withdrawable capacitors banks, as well as UPS modules



1

People and equipment protection

2

Efficiency and production continuity

3

Asset performance and optimization

- Asset Management
- Cost of ownership
- Improved safety

4

Digitalization



Asset management

Asset performance management (APM) systems act to improve the reliability and availability of physical assets while minimizing risk and operating costs.

Keep production up and running (top-line)

Installed base

Optimize maintenance costs (bottom-line)

Risk of failure (direct and indirect costs)

Asset management

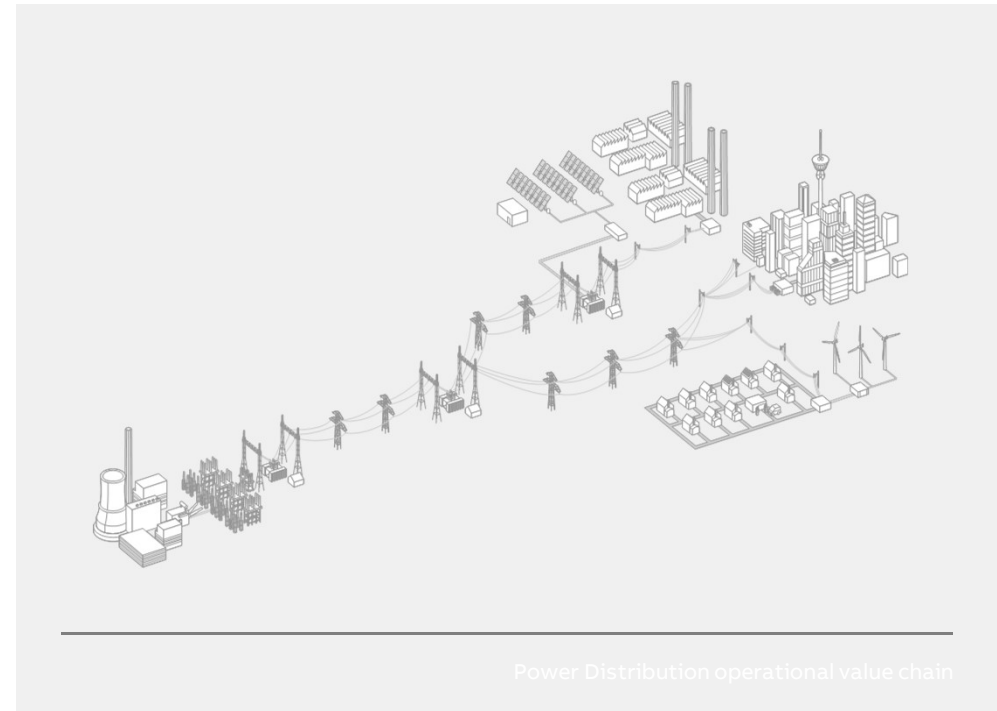
Find the optimum balance

Effective asset management

Effective asset management requires investment planning. The owners need to be aware of:

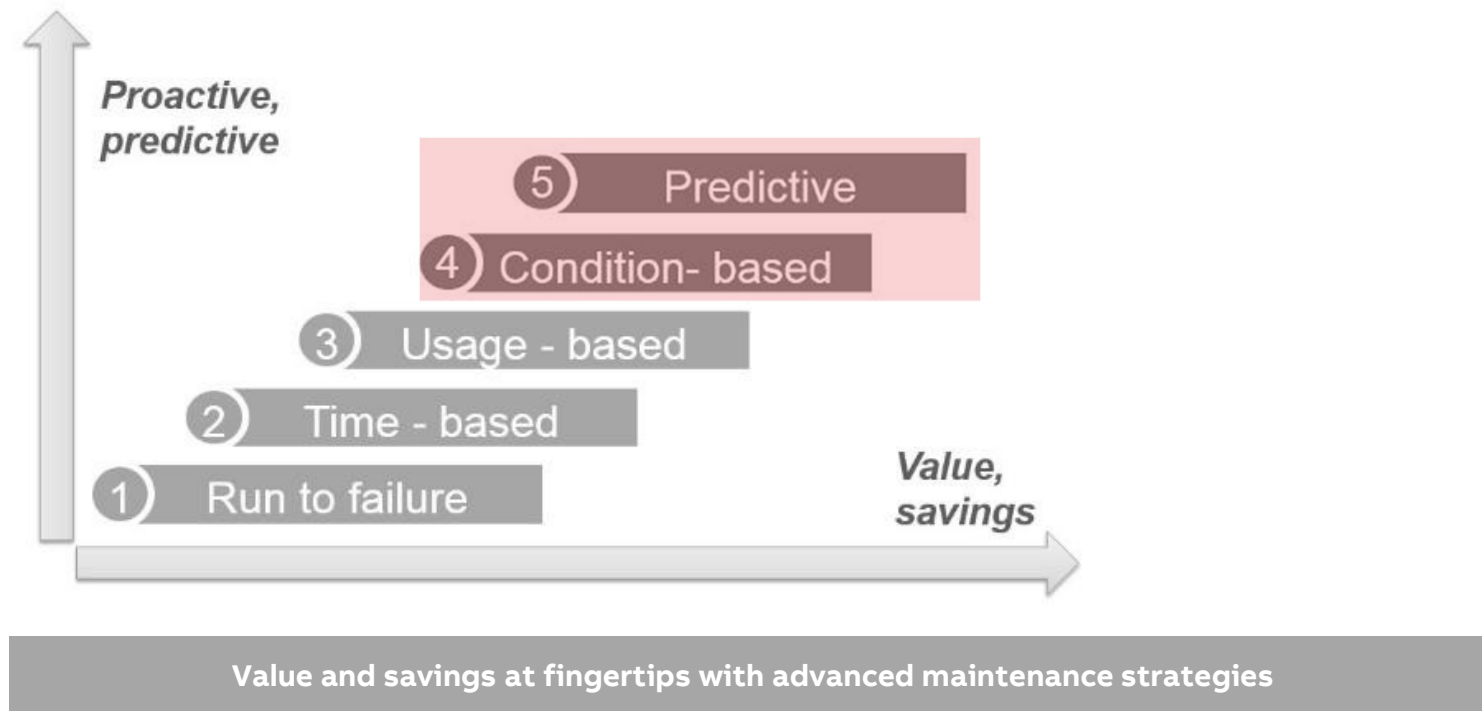
- Assets condition
- Risk level
- Failures consequences
- Life cycle status
- Retrofit investments

Optimal maintenance strategy



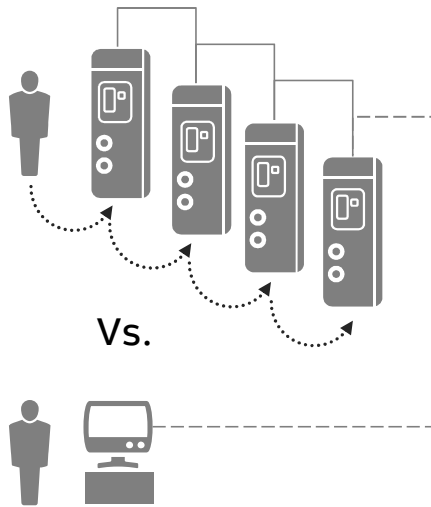
Asset health management

Maintenance strategies



Reduce total cost of ownership

Optimizing maintenance



100%

Unplanned labor cost doubles
Plan maintenance activities based on real time data diagnostic and prediction

30%

Decrease the duration of the time required for maintenance activities

Reduce labor costs by centralizing data collection and analysis

End user value

Asset type	Maintenance type	Frequency of action	Preventive / per asset	Condition / per asset
Circuit breaker	Visual/Basic	2 years	2 h	0 h
	Advance	5 years	2 h	1.4 h
Switchgear	Visual	0.5 years	0.5 h	0 h
	Basic	5 years	0.75 h	0 h
	Advance	10 years	2.5 h	1.75 h

40%

Opex cost reduction

\$336 per annum

\$168 per annum

Maximize uptime

Avoid unexpected failures

Before failure happen

- Digitalization informing before the system fails
- Know-how about the current asset
- Avoid possible failures help reduce production and asset loss

\$1.2M PER HOUR*
AVERAGE DOWNTIME COSTS
FOR AN AUTOMOTIVE INDUSTRY

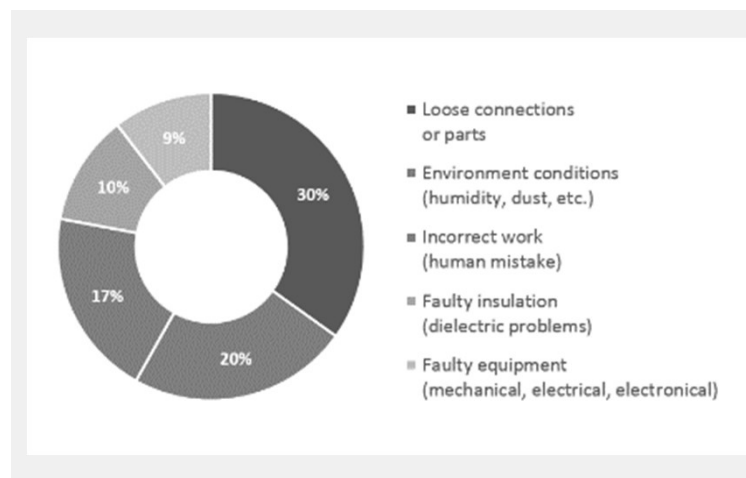
\$740k PER OUTAGE*
AVERAGE DOWNTIME
COSTS FOR DATA
CENTERS

\$4.4M PER DAY*
120,500 BARRELS OF OIL
LOST PER DAY OIL&GAS
SEGMENT

\$150M PER OUTAGE
AIRLINE LOST A SWITCHGEAR WITH
3.7% STOCK DROP IN 2 DAYS IN 2016

\$100k PER PANEL
STEEL WORKS LOSS PER YEAR PER
PANEL

\$20k PER PANEL
ANNUAL LOSS IN SEMI-CONDUCTOR
PRODUCTION



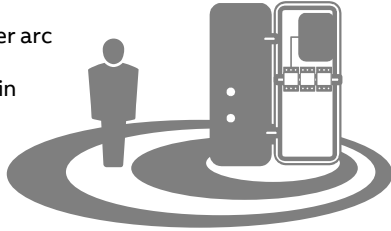
Improve safety

Avoid unexpected failures

Operate more safely

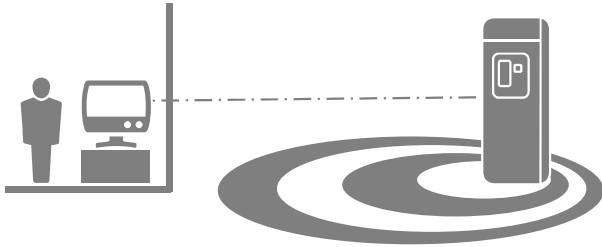
Keep your personnel out of the arc flash zone

Personnel must enter arc flash zone.
4000 injuries occur in the US each year *



Vs.

Remote communications enabled, data can be safely transmitted to a remote location



~300

ANNUAL DEATHS IN US ALONE ARE CAUSED BY ENERGIZED ELECTRICAL EQUIPMENT

80%

OF ALL ELECTRICAL ACCIDENTS ARE CAUSED BY ARC FLASH INCIDENTS

\$1M TO 15M

POTENTIAL COST OF ONE ARC FLASH INCIDENT*



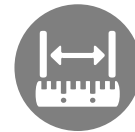
19,000° C (35,000° F) Hotter than you can imagine
Arc Flash temperatures are hotter than the sun.



1,100kmph (700 mph) Projectile-producing pressure
Arc flash can throw workers across a room. Metal and equipment become shrapnel.



+2,000 burns More than one way to burn you
Each year 2,000+ people seek treatment for serious Arc flash burns.



3 meters (10 feet) Too close for comfort
Arc flash can reach out 3 meters to take a life. Serious-injury zone is even larger.

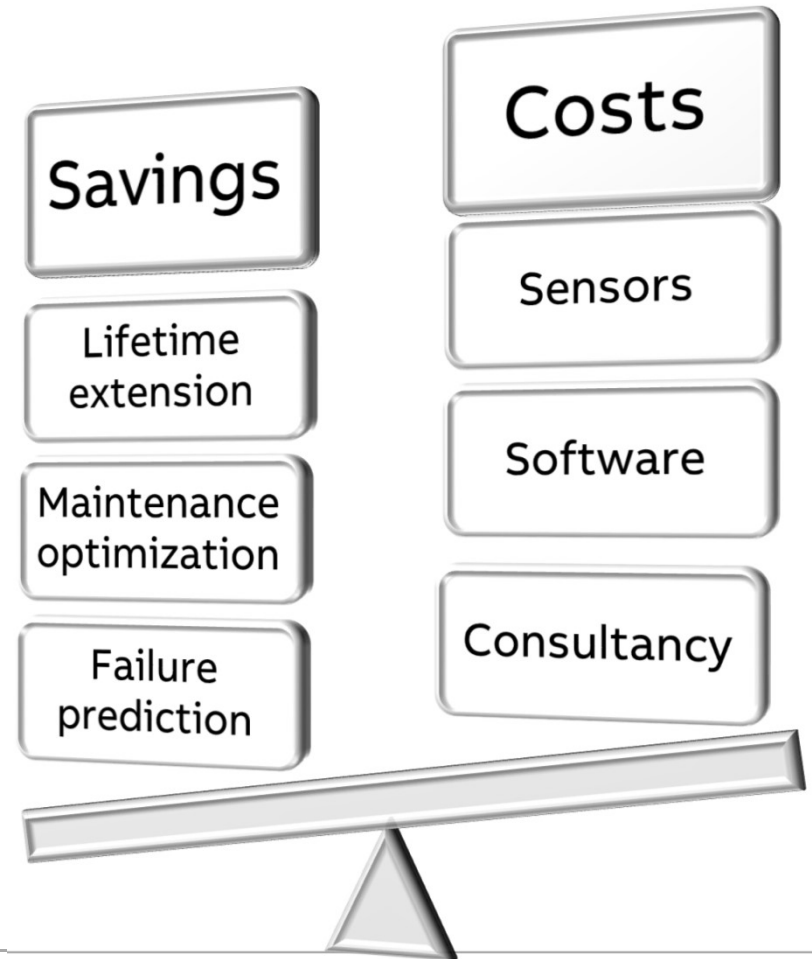


140 dB An assault on your senses
Light and sound bursts can cause vision and hearing loss.

The benefits

Costs and savings balance

Availability
Reliability
Predictability



Customers approach

*“We need **to track the health condition of our assets, and predict potential failure.** Solve a failure here can be very complex.*

[...]

*For our **budgeting and planning** it is very important to get best **estimation of remaining useful life**”*

Electrical Services Manager,

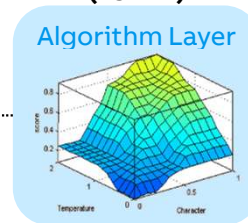
*“This is the most important attraction..... We need **highest availability and predictability** [...] Here it is not a matter of loss production [...]. ABB has to work with engineers and consultants, to ensure that **new switchgear tenders will contain diagnostic.**”*

Director of Operations

Electrification ecosystem

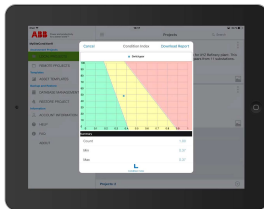
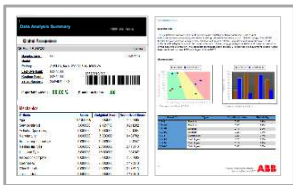
A digital world

Predictive
ABB Ability™ Data Analytics for electrical systems
(ESDAY)



Assessment without sensors

ABB Ability™ Life Cycle Assessment for electrical systems (MySiteCondition)



Condition monitoring with sensors

ABB Ability™ Condition Monitoring for breakers (MySiteCare)

ABB Ability™ Condition Monitoring for switchgear (SWICOM)



IoT 4.0 cloud solution

ABB Ability™ Asset Health for electrical systems (MyRemoteCare)



SWICOM

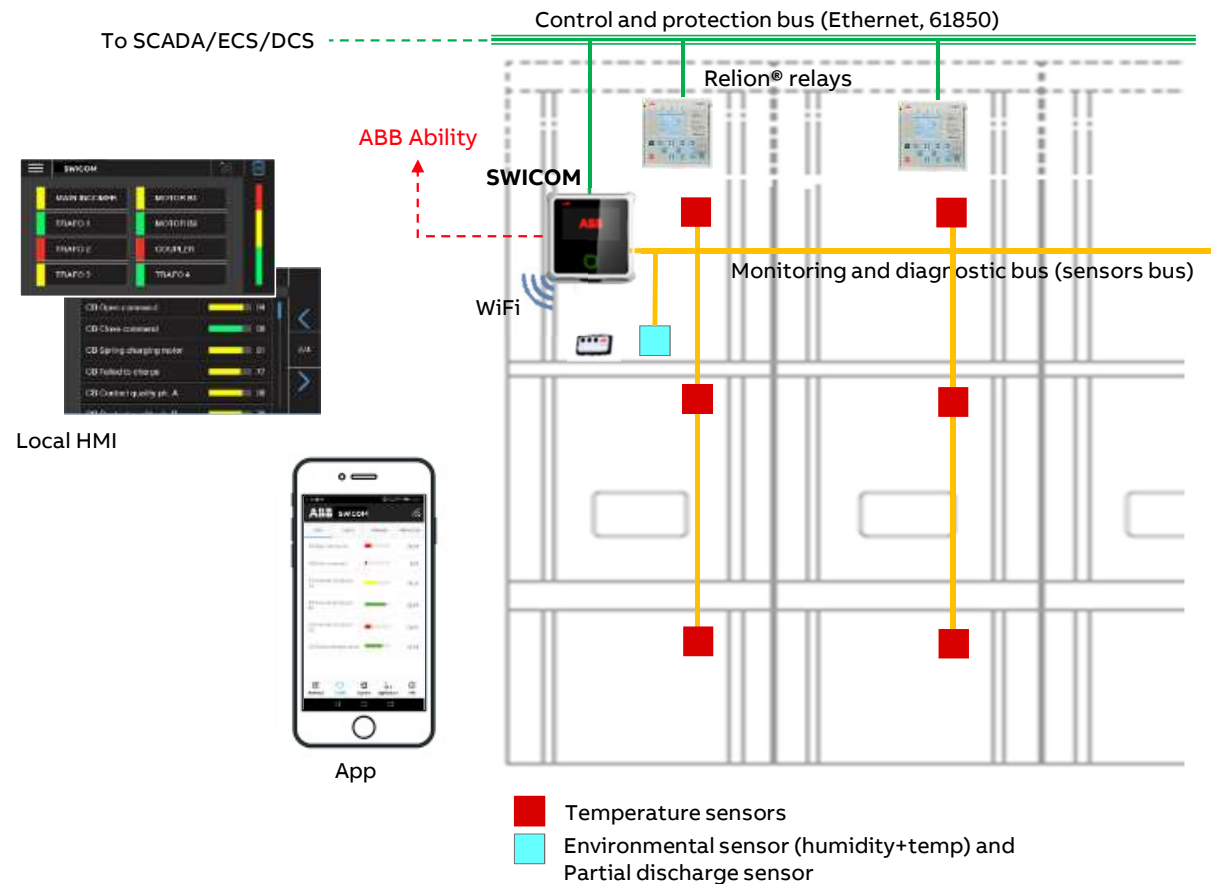
Switchgear Condition Monitoring with local color touch HMI, WiFi and smartphone App, IEC61850 system communication (e.g. to SCADA/ECS).

Up to 24 panels.

It includes an IEC61850 channel to the control and protection devices, to collect operations data.

An additional sensor bus (Modbus, CANbus) to gather dedicated sensors data.

Easy to install on new and existing switchgears (also on non-ABB equipment).



SWICOM sensors

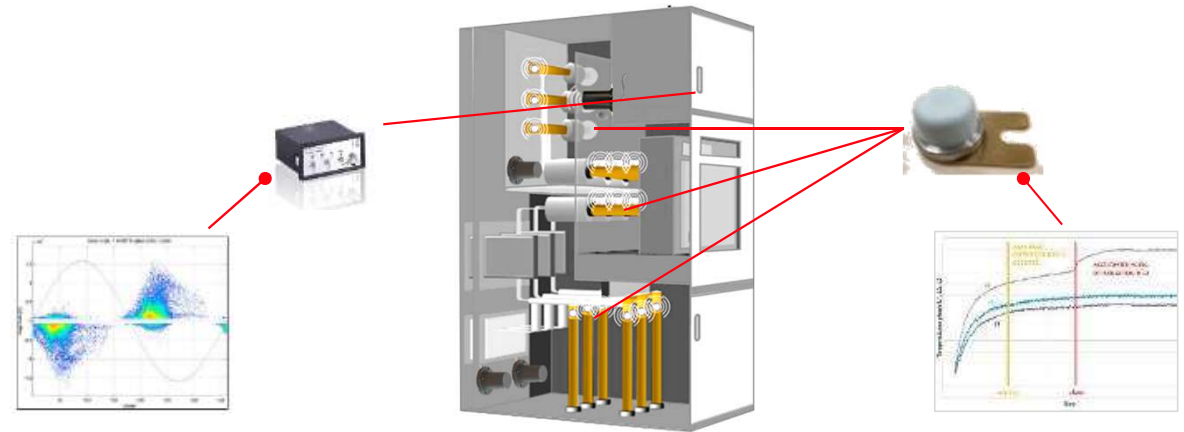
Relion® protection relays offer breaker monitoring function, such as operations timing, trips information and accumulated energy (I^2t).

Environmental sensor measures temperature and humidity of switchgear room, so important to track long term external source of failures.

Partial Discharge sensor⁽¹⁾ offers a non-invasive detection of a potential insulation problem in the switchgear, which can lead to catastrophic failures.

Primary parts **temperature sensors** helps in finding potential problems early in advance, especially about loose joints.

(1) Globally available end of 2019.



Partial discharge (PD) is a localized dielectric breakdown (which does not completely bridge the space between the two conductors) of a small portion of an electrical insulation system under high voltage stress.

The sensor, is easily installed and can detect any PD (not just the surface, but also internal ones)

Output, to drive maintenance on condition

Yellow: PD is very likely to be present

Red : PD is present and it is potentially leading to a dangerous situation

Statistically is primarily important to monitor cable connections and then also CB connections and busbar joints, to detect temperature differences among phases.

The sensors are very easy to position, without electronics nor batteries on hot primary parts, meaning high reliability and long life (like switchgear life). Based on SAW Surface Acoustic Wave technology (based on resonating quartz technology, no electronic on hot and primary part)

Output, to drive maintenance on condition

Yellow: unbalanced hot-spot temperature among phases, plan inspection

Red : high unbalanced hot-spot temperatures meaning loose joints leading to a dangerous situation, plan urgently maintenance

Predictive maintenance

Why?

Predictive maintenance provides benefits that improve the bottom line, with a focus on maintenance and retrofit cost optimization. It is not just cost effective maintenance with maintenance based on best predicted scenario, but also full visibility on assets risk analysis, used to prioritize remedial actions. Accurate prediction saves from costly breakdowns.

How?

Predictive maintenance is based on predictive analytics, which exploits collected data with offline assessment and/or online condition monitoring.

Typical calculated outputs are probability of failure within a year, remaining useful life, service prescriptions, and risk map analysis.

Asset condition data collection

Relevant electrification assets in the plant can be monitored to track condition. Raw and calculated data can be predictive analytics.

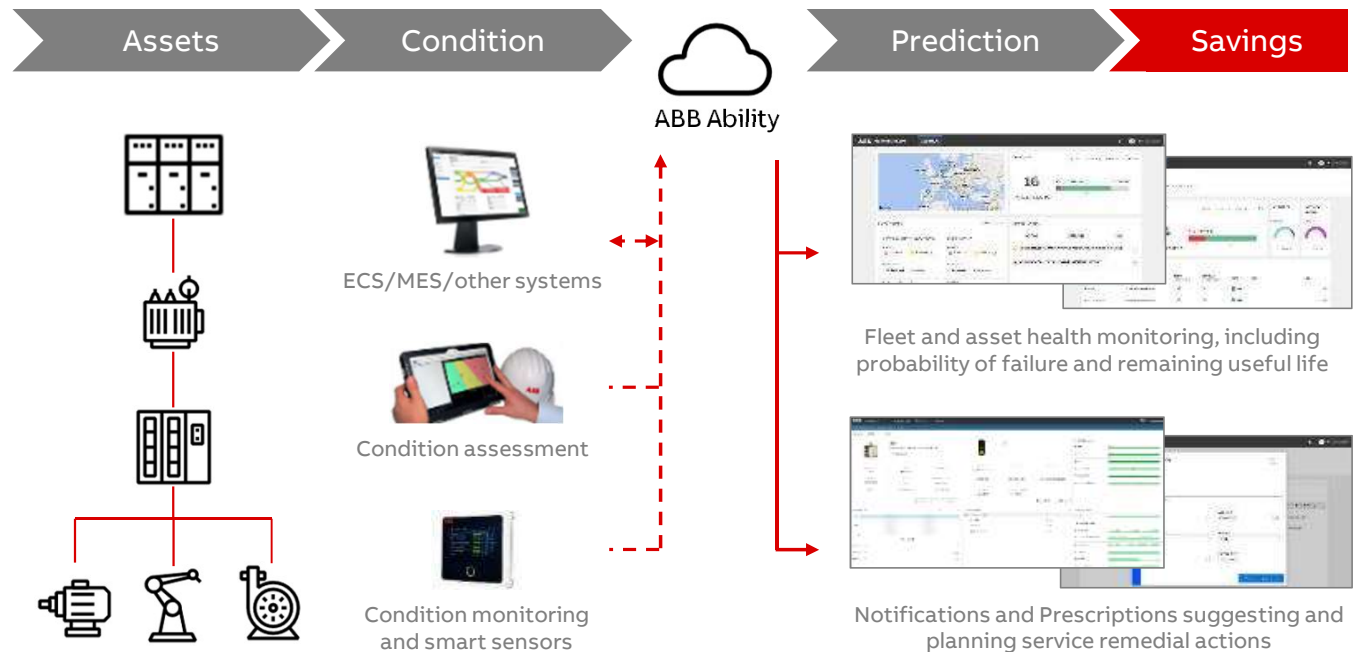


ABB Ability™: gain insights on assets

ABB Ability solutions offers asset health dashboard, and predictive analysis to optimize maintenance and improve availability, reliability.

LV MCC condition monitoring



Plant

Batisoke Cimento, Cement producer, Turkey



Customer needs

Optimize operations at their cement manufacturing, safeguard process uptime.

Ensure a modern solution: highly flexible and configurable



1100101001

Digital offering

CMES on MNS Digital (motor control center)

“

ABB Ability™ CMES offers a seamless integration with local systems and helps the operation and manufacturing team to reduce opex (up to 30%).

”

- ✓ CMES can be integrated with temperature sensors
- ✓ CMES knowledge base offer problem/cause/remediation information to field service, for quick troubleshooting



1

Safety

2

Efficiency and production
continuity

3

Asset performance and
optimization

4

Digitalization



Digitalization & service support for tailored solutions and field services



10 Digital solution centers

Engineering teams able to consult, design and implement tailored solutions for energy and power management, electrification digitalization and asset management.



40+ service centers

Supporting the customer in adoptive predictive maintenance, offering Power Care service agreements with remote support and extended warranty.



Digital services transformation

ABB Ability™.

Safety

Being committed to world-class products, systems and services with health and safety as our key priority.

Efficiency and production continuity

Enable energy efficiency and energy flow control. Pluggable power management solutions to maximize production continuity.

Asset performance and optimization

Monitor the reliability and efficiency of your assets to optimize the operation and maintenance processes.

Flexibility and sustainability

Enjoy flexible, scalable and modular digital solutions, which allow also an efficient integration of renewables and e-mobility.



ABB