APPLICATION NOTE

Intelligent Distribution for Low Voltage Main & Sub-distribution boards in Food & Beverage

Offering for Greenfield and Brownfield installations - IEC



Quality, safety, and on-time deliveries are the century's key challenges that the F&B sector is facing but working without accurate data driven solutions can lead to unexpected outcomes. Find out how our Intelligent Distribution solutions for Low Voltage (LV) "greenfield" and "brownfield" installations can help you address these challenges, saving money, time and safeguarding the environment.

What is Intelligent Distribution?
Intelligent Distribution helps you get a clear vision of consumption, general power quality and equipment status through detailed measuring of electrical parameters and power quality, 24/7 data monitoring and analyzing, maintenance optimization and minimization of CO2 emissions.

Why you need Intelligent Distribution?
The key drivers in F&B Industry are cost savings, product care and sustainability, which becomes more and more central to companies brand's strategy and reputation. And not exploiting the potential of intelligent distribution means having higher energy costs and also the risk of failures leading to unwanted downtime, additional repair costs, wasted time, product quality risk and waste of food. ABB Intelligent Distribution Application helps not only to reduce energy costs - and consequently CO2 emissions -, but also to prevent possible system failures thanks to the existence of cloud supervision systems that make it possible to collect data and monitor processes in an automated way.

Main benefits

Modular and scalable solution:
Easily extend and upgrade the capability from essential to enhanced at any time.

Energy efficiency:
Full control of power flow and reporting to maximize reduction of costs and emissions (ISO 50001 compliance).

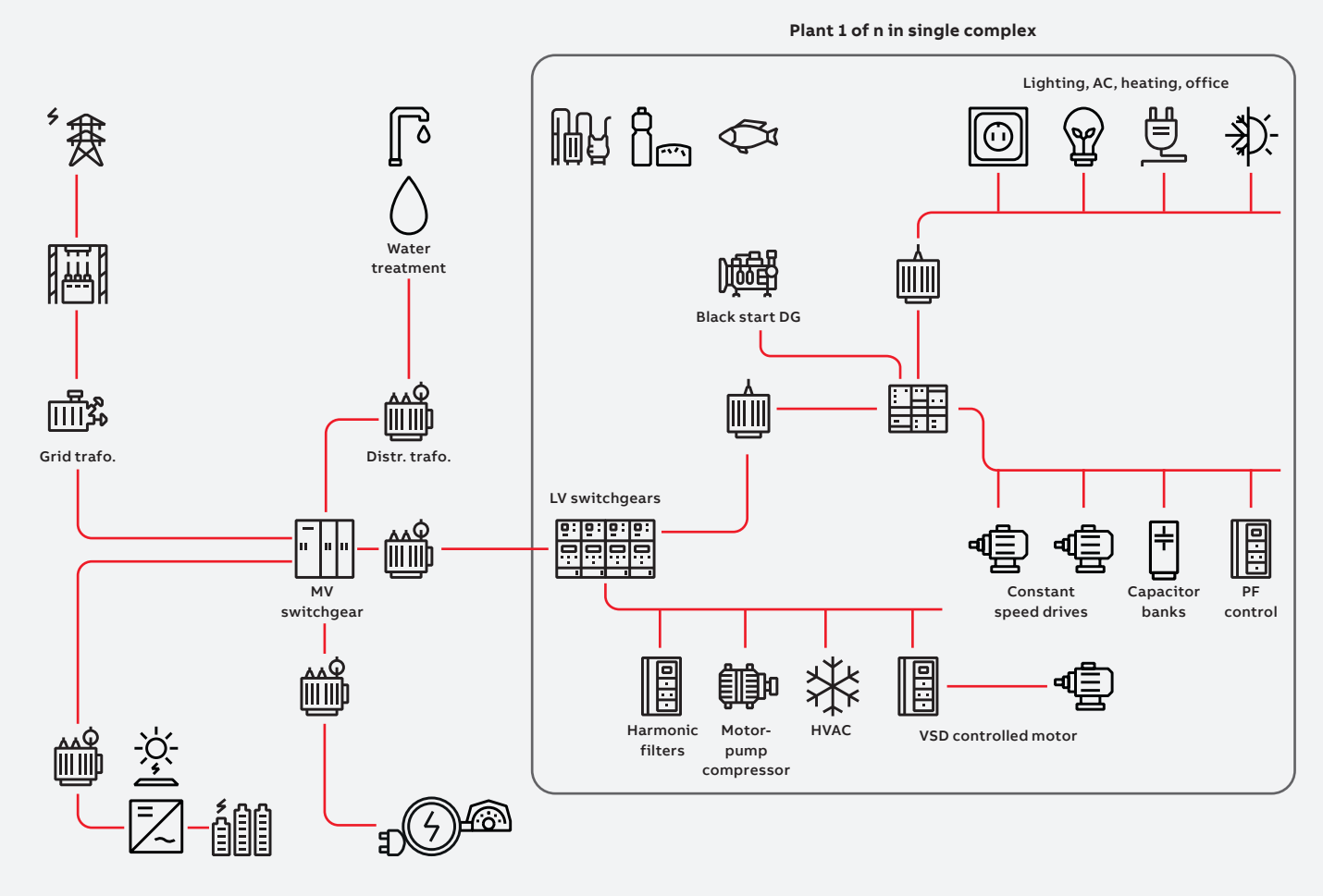
Asset performance and optimization:
Monitor the reliability and efficiency of your assets to optimize the operation and maintenance processes.

Avoid operation downtime and food recalls:
24/7 plant monitoring provides crucial information on power quality and equipment malfunction.

3rd party aggregation:
Minimize upgrade and replacement costs.

Low Voltage Electrical Distribution

The importance of digitalizing



Digitalizing the electrical distribution has never been so easy thanks to ABB digital solutions and supervision systems designed and commissioned in few easy steps. The advantages are numerous.
As first, having the possibilty to see at a glance the energy consumption of the plant can give important information to energy managers to keep under control the electricity bill as well as to understand how much electrical “disorder” the process is creating in order to know how to counterbalance.

Another opportunity of data can be when the whole fleet of industries of a company is digitalized: the comparison of the consumption can really provide an additional level of consideration (quality of machinery, success or unsuccess of a process compared to the others).

Did you know?

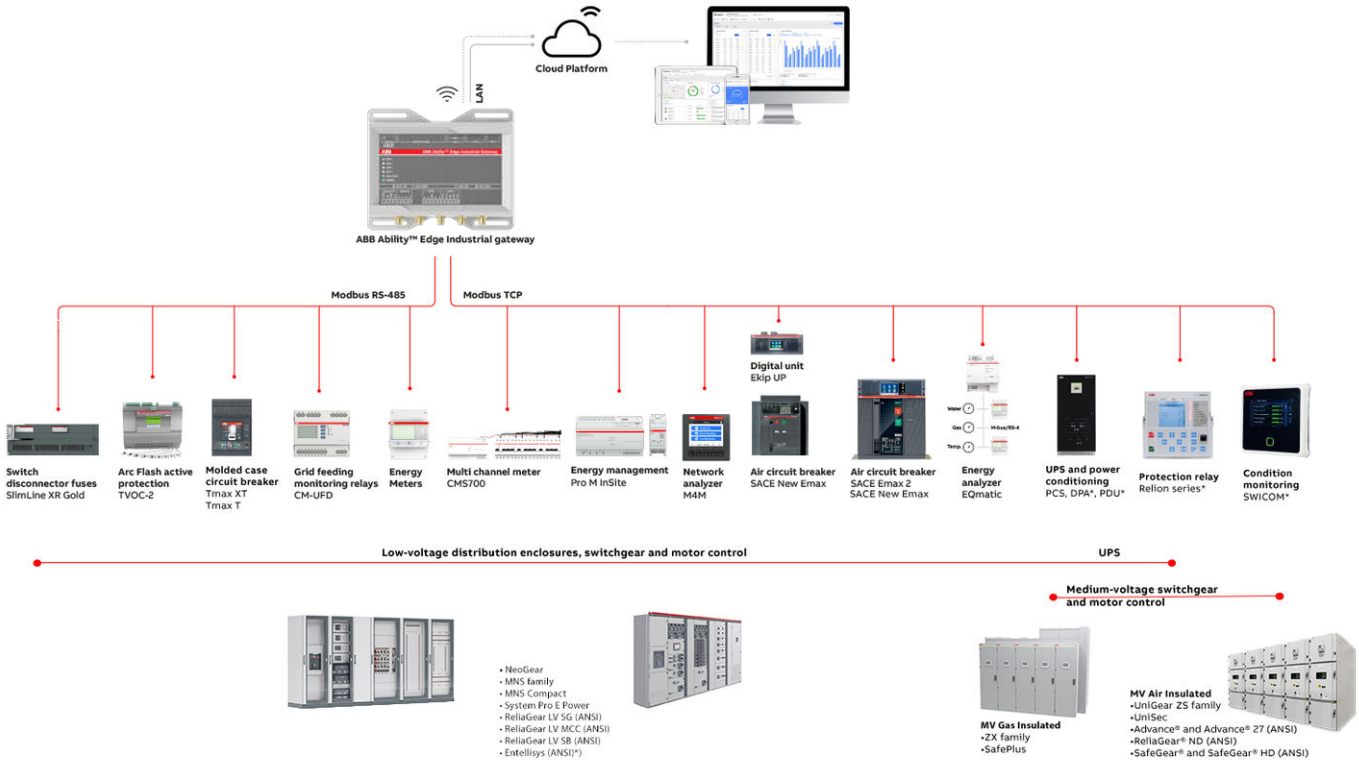
Food & Beverage industry has experienced a huge increase in demand in the past years and the global market should grow from $184.5 billion in 2020 to $274.5 billion by 2025, at a compound annual growth rate (CAGR) of 8.3% during the period forecast of 2020-2025.

The booming of this segment can be explained by the increase of the population as well as the birth of online groceries.

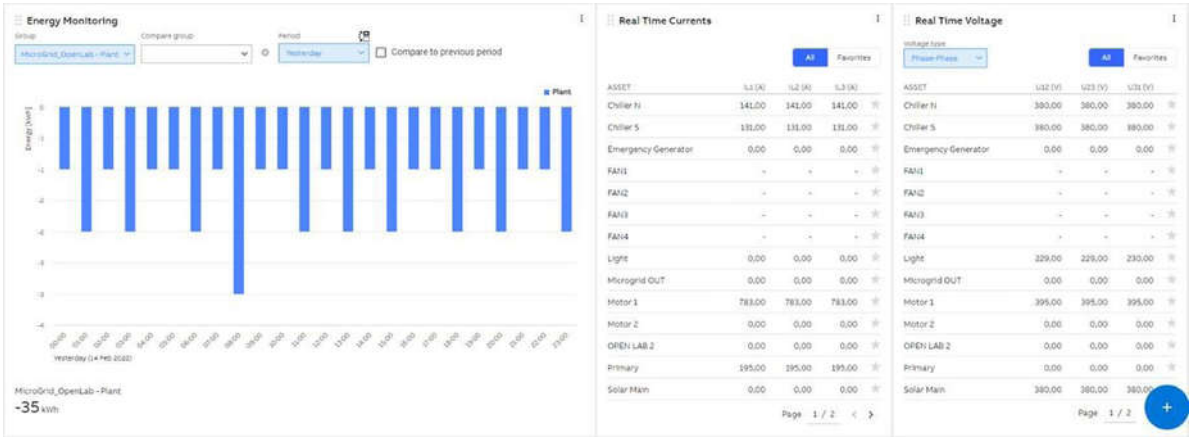
For more info **click here**

ABB Ability™ Energy and Asset Manager Cloud Supervision System

ABB Ability™ Energy and Asset Manager is the state-of-the-art on-premise and cloud solution for monitoring and analyzing site equipment. This intuitive solution has the ability to optimize every site's electrical distribution system and other utilities, resulting in improved performance, efficiency and safety.



For Food & Beverage energy managers and owners, Energy and Asset Managers provides a set of widgets and features that are essential for the continity and efficiency of the plant, let’s analyze them briefly.

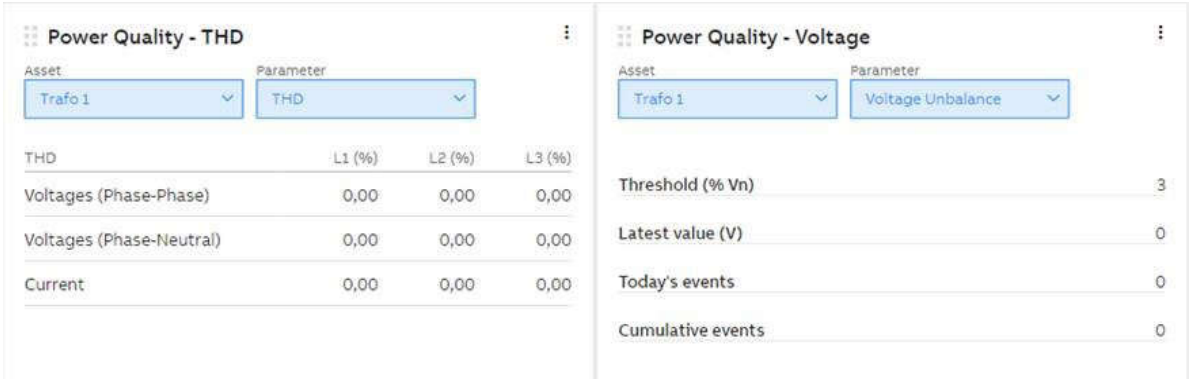


- **Energy, Currents** and **Voltages** monitoring, togheter with their phases to have first indication on the consumption and eventual load unbalances;





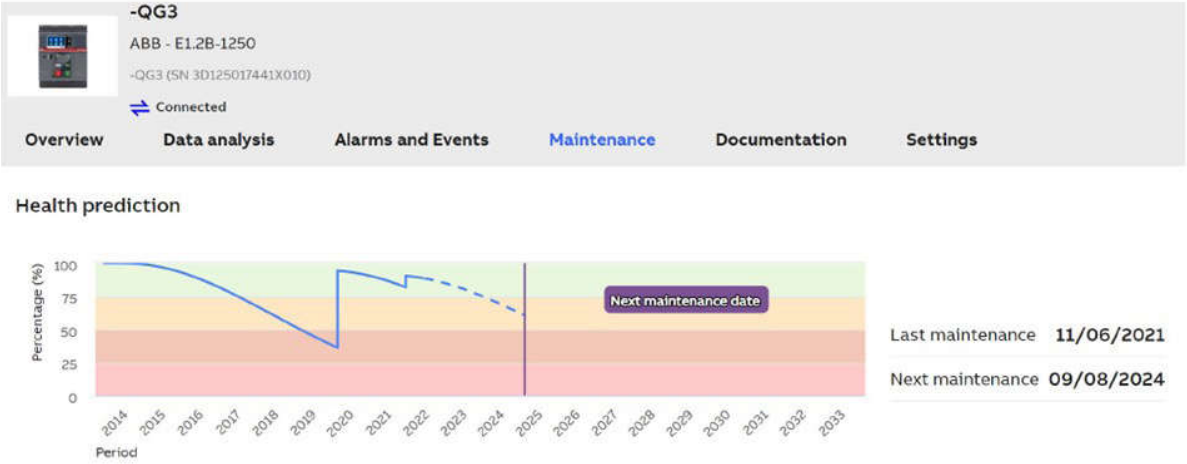
- **Power Factor** monitoring, important for energy consumption and current carry capacity.
  A PF which is not closer to 1 can accelerate aging of equipment and additional fees are applied by the utility;



- **Power Quality** widgets to monitor situation on the overall electrical distribution, but also can be used for more granular analysis taking into considera-tion a group or a single load.

One top of this selected widgets (more are available, detailed information at this link) ABB Ability™ Energy and Asset manager offers the possibitly to an indepth Circuit Breaker predictive maintenance analysis through LV CB Health add-on.

Thus, all Emax 2 frames and XT7 frame of Tmax XT have predictive maintenance functions and users can remotely monitor the health condition of these protection devices and receive a clear picture of when the next maintenance event is needed.



Another important contribution of the supervision system is being ISO 50001 certified: like all ISO management system standards, ISO 50001 has been designed for implementation by any organization, whatever its size or activities, whether in public or private sectors, regardless of its geographical location. ISO 50001 does not fix targets for improving energy performance. This is up to the user organization, or to regulatory authorities.
ABB Ability™ Energy and Asset Manager provides all the required widget such as energy baseline or energy review to continuosly decide whether to improve efficiency, appropriately tracking the whole process.
Moreover another level of flexibility and assistance is with the possibility of setting customized widgets to track specific KPIs over time. More information are available at this link.

ABB Ability™ Edge Industrial gateway



ABB Ability™ Edge Industrial Gateway runs ABB Ability™ Energy and Asset Manager solution by connecting to the cloud, unlocking data and insights on the site's energy consumption and assets health.

Cloud View version ensures:

- Access to the data from anywhere, anytime
- Benefit from highest security standards and comprehensive services
- Flexible and scalable user and subscription management

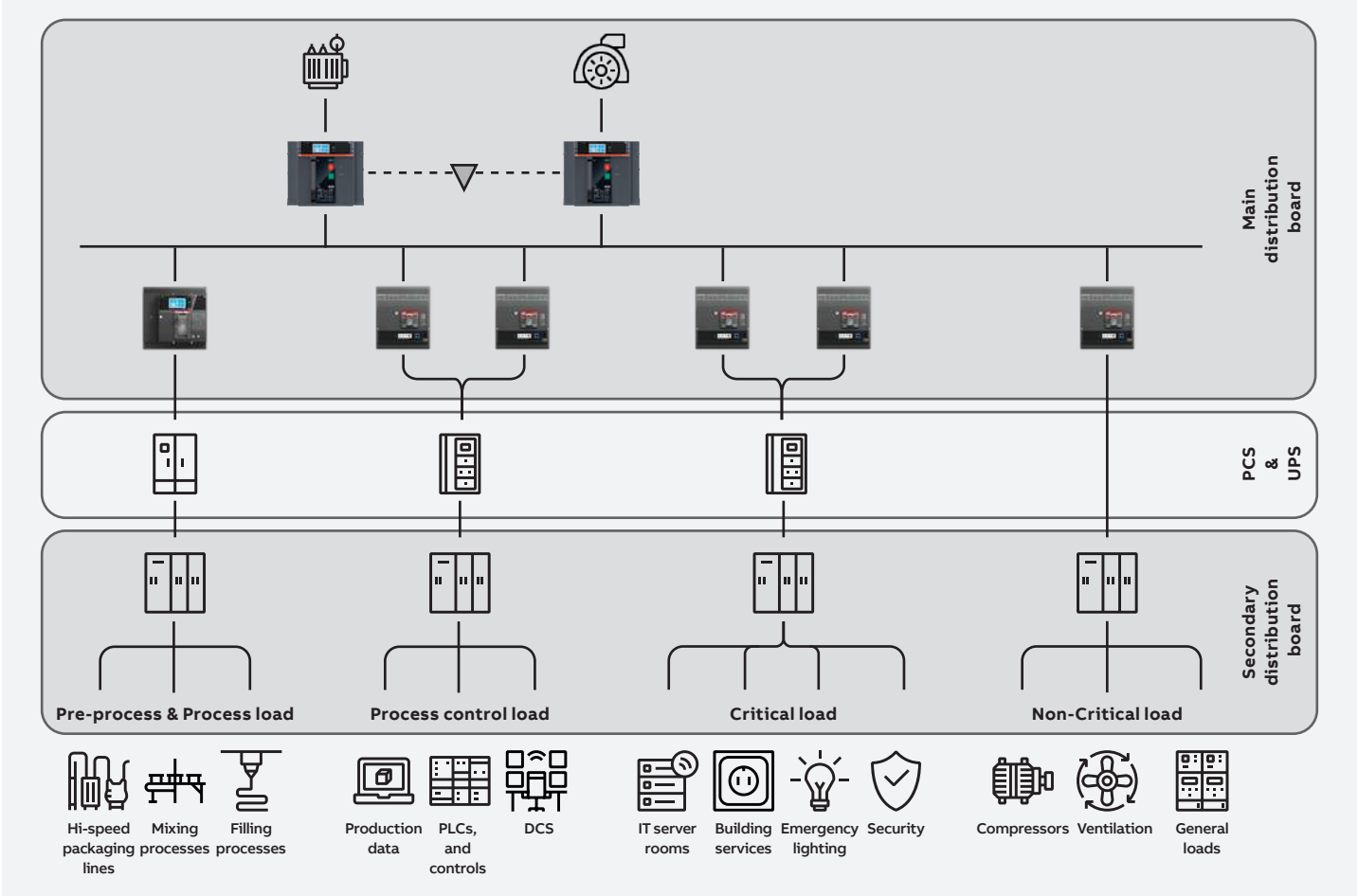
ABB Ability™ Edge Industrial gateway

Intelligent Distribution for Low Voltage Main & Sub-distribution boards in Food & Beverage

Having presented the products and solutions that will allow Food & beverage stakeholders to generate benefits based on digital adoption, this paragraph is intended to provide indications on how to approach the Intelligent Distribution from an entry level standpoint up to more advanced adoption.

Two bundles for main distribution boards will be presented, both for “greenfield” and “brownfield” installations.

For the sub-distribution there will be one proposal for each installations type, what will differ is the number of measuring points to apply.



Greenfields:
Main Distribution Boards

Essential

- 1% Accuracy
- Minimum Plant Monitoring
- Automatic reports and dashboards

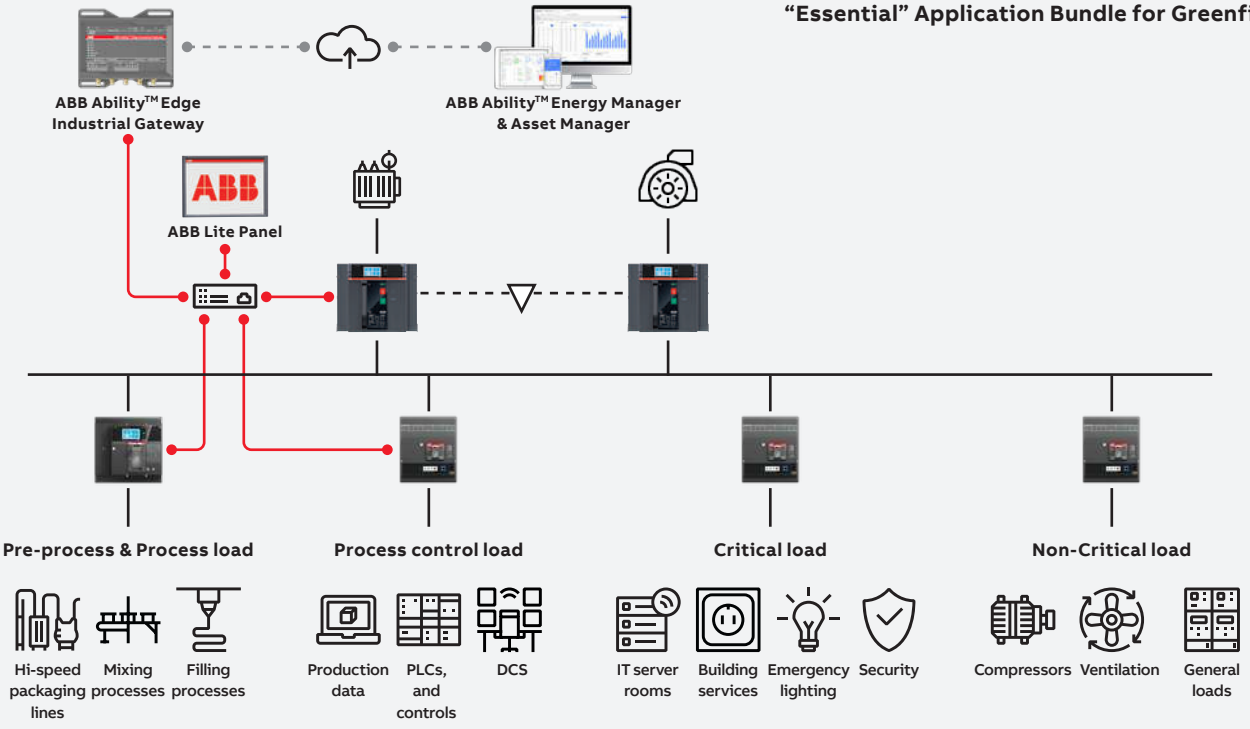
Enhanced

- In depht Power Center Analysis
- 1% Accuracy
- Automatic reports and dashboards
- Integration into 3rd party SCADA
- ISO 50001 compliance

The “Essential” application bundle has the aim of providing all the basic, but essential information for keeping under control any Food & Beverage facility.

Three measuring points in this case are suggested: one at outgoing feeder for the pre-process loads, one for process loads and one at the incomer circuit breaker of the power center.

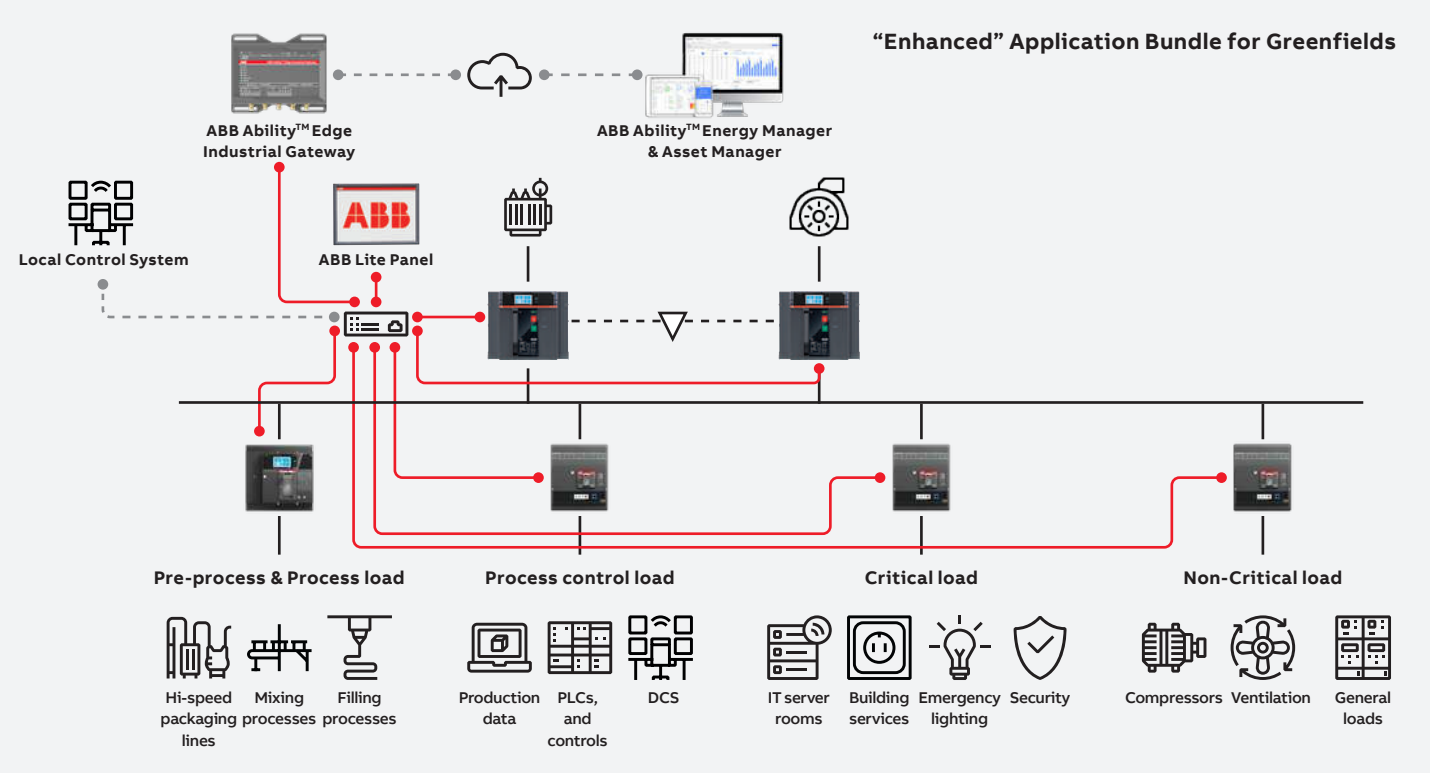
“Essential” Application Bundle for Greenfields



These measuring points provide a clear vision of Facility consumption as well as giving a perspective of what is happening to all the machinery.

It is possible to set alarms for every desired condition and being informed in every place and in every moment without being physically present in front of the switchboard.

When it comes to the “Enhanced” bundle, the scope is to include and provide full visibility of plant consumption. This bundle is strongly suggested when the subjected plant can be considered a large energy consumer and every action in terms of energy efficiency and reduction of CO2 can have a great overall impact



Product	Type	Trip Unit	Measuring	Communication Module	Accessories
Emax 2 E1.2 ... E6.2	ACB	Ekip Touch/Hi Touch	Measuring Package (already included in Ekip Hi-Touch)	Ekip Com Modbus TCP	Ekip Supply
Tmax XT XT2, XT4, XT5, XT7	MCCB	Ekip Touch/Hi Touch	Measuring Package (already included in Ekip Hi-Touch)	Ekip Com Modbus TCP	Ekip Supply

Note : For XT2, XT4, XT5 Ekip Com Modbus TCP is chosen as embedded version.

The table above shows the selected product for these application bundle and their accessories. Especially for the circuit breakers, to be connected to ABB Ability™ Energy & Asset Manager and/or other SCADA systems, Ekip Supply module for auxiliary power is required. The chosen communication protocol is Modbus TCP/IP over Modbus RTU possibility due to an easier installation and the possibility from the circuit breakers to self-control the health status of the communication modules. Modbus RTU, anyhow, is a viable option.

Last observation is related to the integration on 3rd party SCADA system: this is possible either through ABB Ability™ Energy and Asset Manager thanks to API or, if ABB solution is not required, all the circuit breakers can be equipped with Profibus DP and/or IEC 61850 communication modules

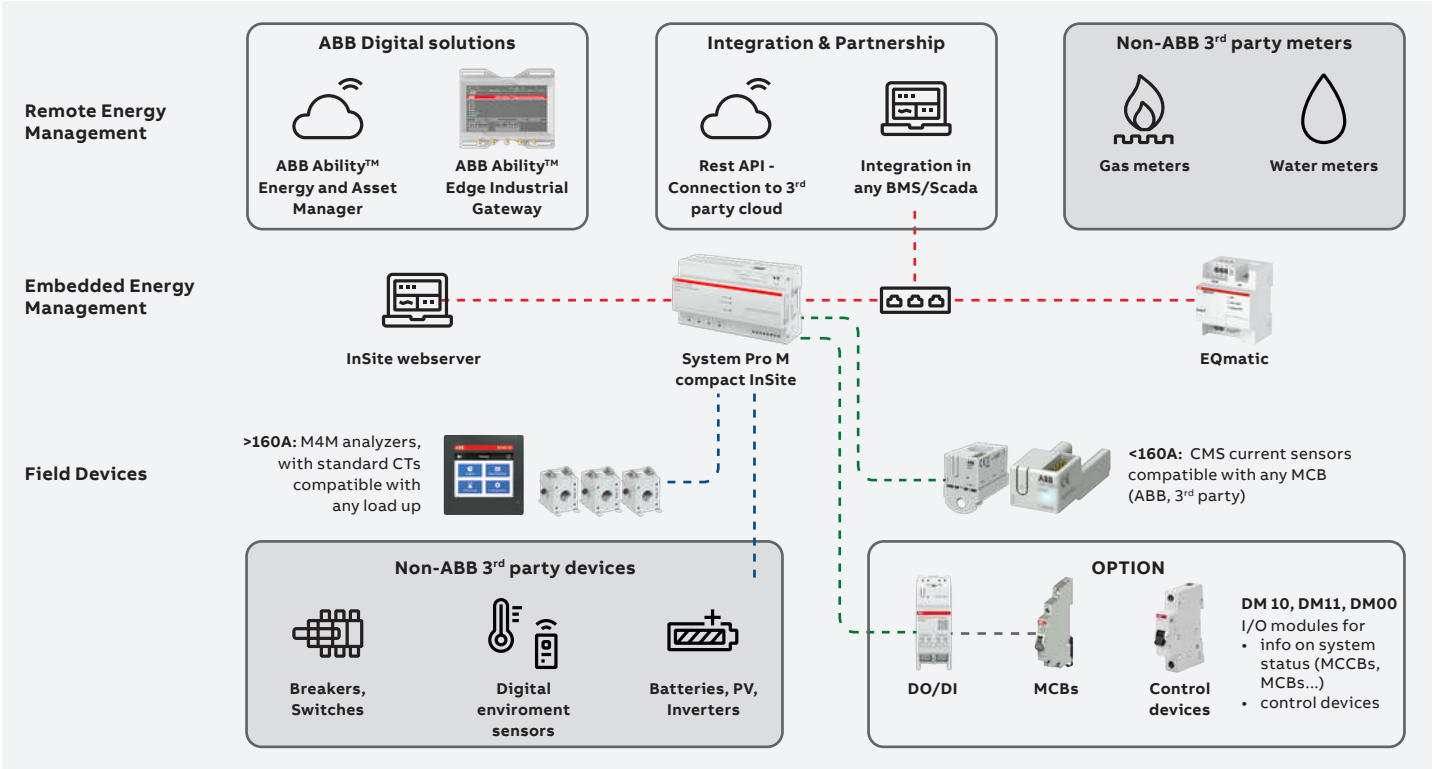
Greenfields:
Sub-distribution Boards

Having presented the application bundles for the main distribution boards, it is evident that the information acquired are important, but a little more granularities will provide crucial evidence on what is happening close to the loads and the equipment, therefore any kind of decision about improvements will lead to a higher probability of success due to more accurate data-driven decisions. That is where ABB sub-distribution bundle for “greenfield” plants comes out.

The figure below provide the completeness of what can be reached:

- M4M Analyzer to measure, aggregate and easily display at a glance the consumption of the whole branch or some loads under great interest (recommended use >160A);
- CMS current sensors (<160A usage) that, combined I/O modules will provide at the same time current and voltage measurements as well as the status of every single MCB;
- EQMatic to collect 3rd party gas and water meters to enrich measurements with other key parameters outside the electrical ones;
- System pro M compact InSite to collect all the measurements giving the possibility to display them either in webserver or in other cloud and SCADA systems (ABB or 3rd party.

In case the project is executed using an hybrid combination of electrical devices, the proposed architecture is designed to provide measurement integration to ensure still the full picture.



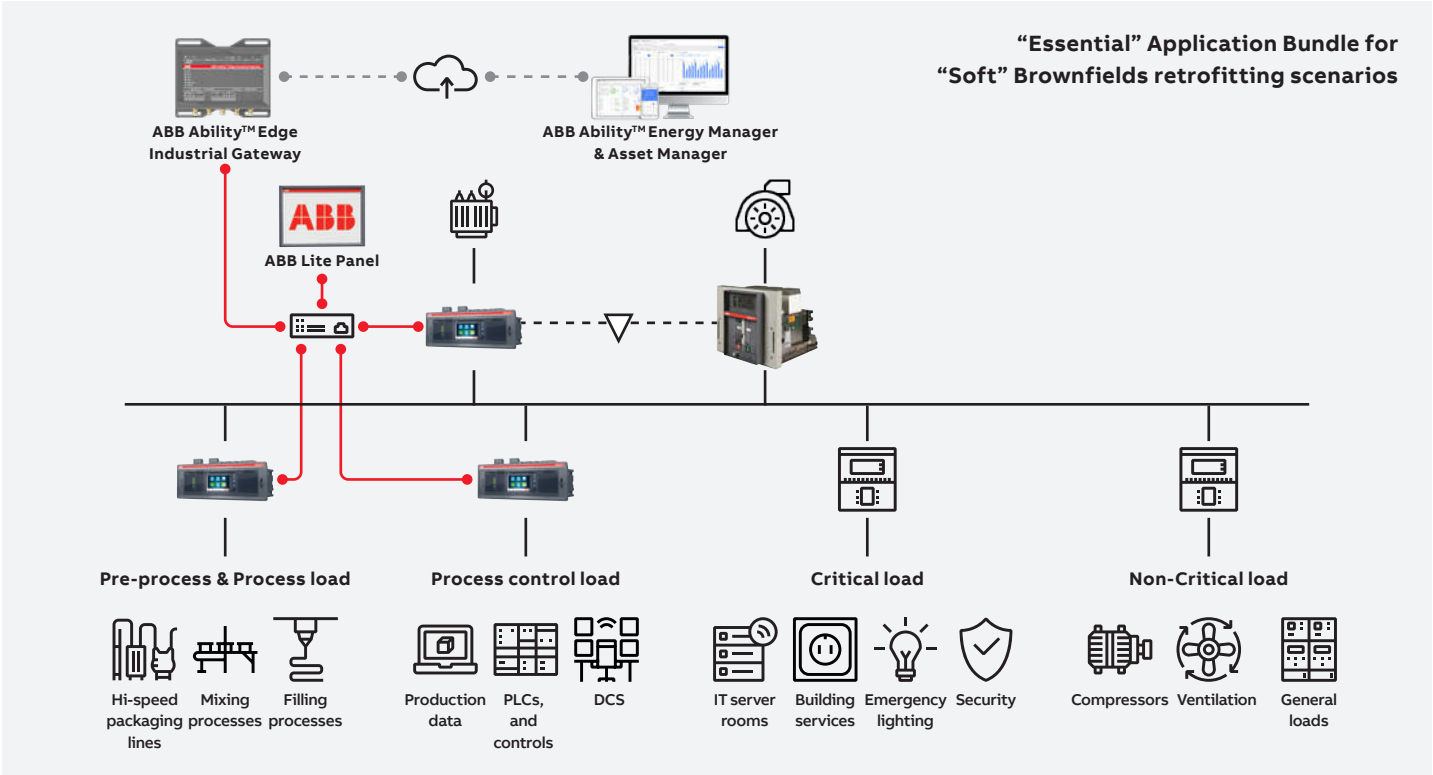
Product	Type	Load	Accessories
SCU100	Control unit	N/A	INS105 flat cable 5m + INS135 connector set
M4M	Network analyzer	>160A	CT PRO XT current transformers (3pcs each)
CMS 20x	Solid-core current sensors	80-160A	To be mounted on each single line
CMS 12x	Open-core current sensors	0-80A	To be mounted on each single line
DMxx	I/O digital modules	N/A	To be used with MCBs, MCCBs, etc
EQmatic	Energy Analyzer	N/A	To be used for non-electric measures

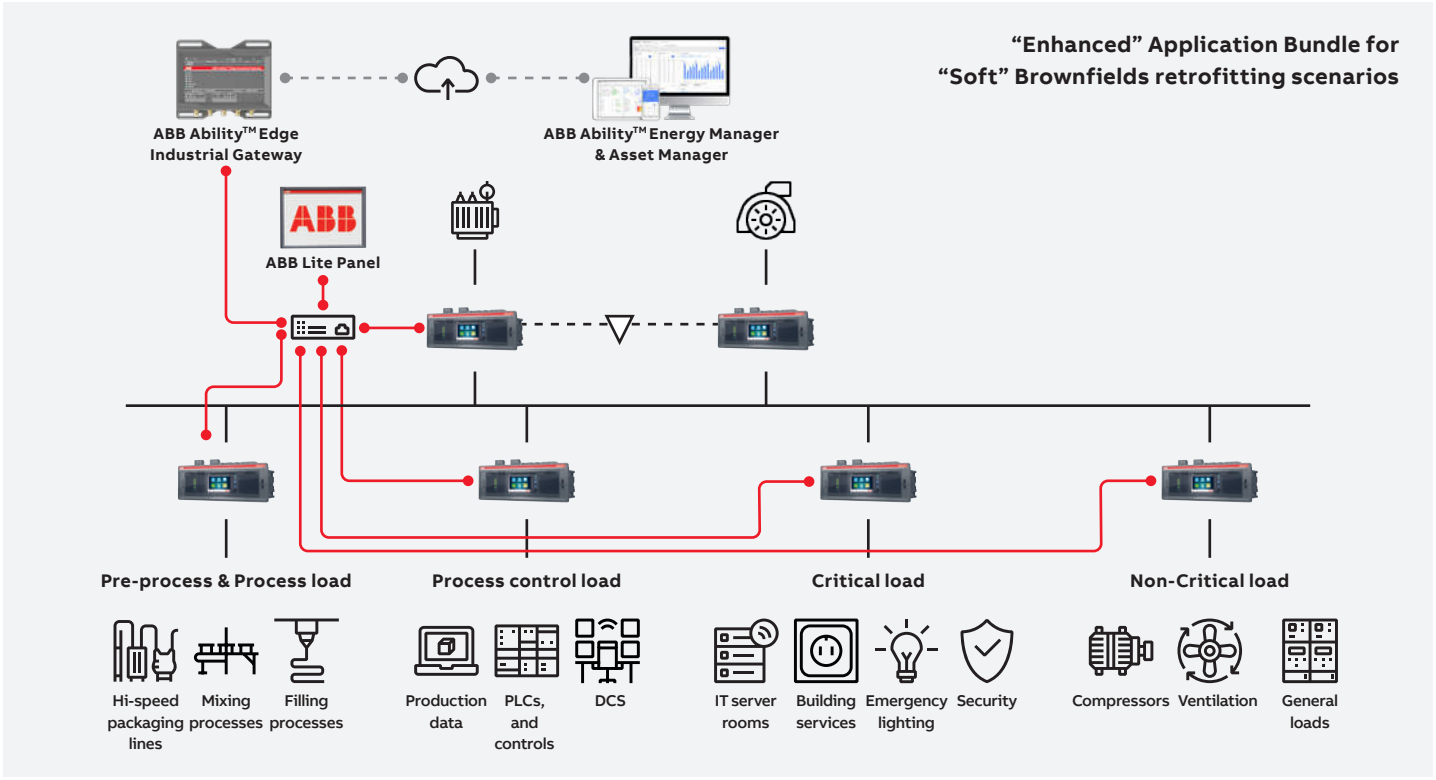
Brownfields:
Main Distribution Boards

Revamping of existing installation can usually happen identifying two main drivers:

- Needs change over the years following progress, energy efficiency and sustainability trends. This means in practice that the installed base of electrical devices can be considered in a good health condition, but without any communication or digital capabilities.
- A consistent retrofit of the Installation is required. The equipment may be too old and not guaranteeing acceptable intervention times, thus safety of people and plant. The digitalization of the switchgears is a good occasion to catch in order to dramatically improve the efficiency of the plant.

These two drivers require different types of products/solutions.
The below proposed application bundles are exactly following the features obtained by the “Essential” and “Enhanced” bundles for Greenfield projects, but they can be obtained by means of a “soft” retrofitting or by an “hard” one

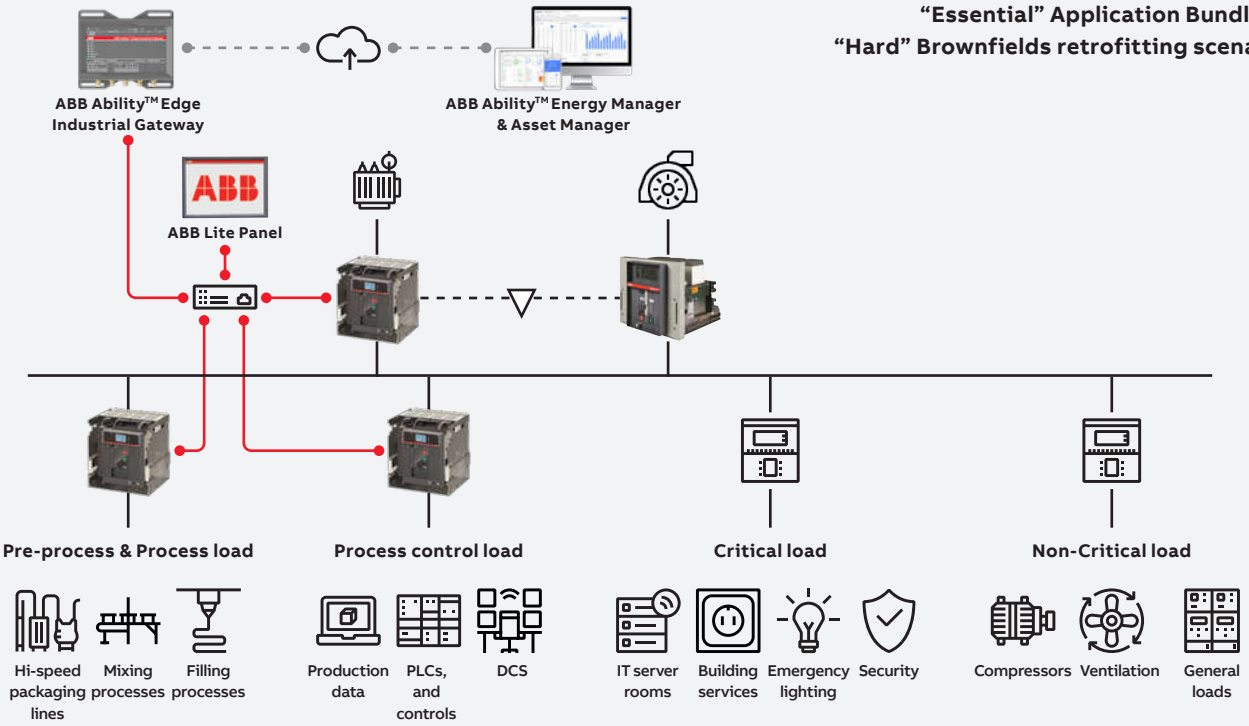



"Enhanced" Application Bundle for
"Soft" Brownfields retrofitting scenarios
ABB Ability™ Edge
Industrial Gateway
ABB Ability™ Energy Manager
& Asset Manager
ABB Lite Panel
Pre-process & Process load
Process control load
Critical load
Non-Critical load
Hi-speed packaging lines
Mixing processes
Filling processes
Production data
PLCs, and controls
DCS
IT server rooms
Building services
Emergency lighting
Security
Compressors
Ventilation
General loads

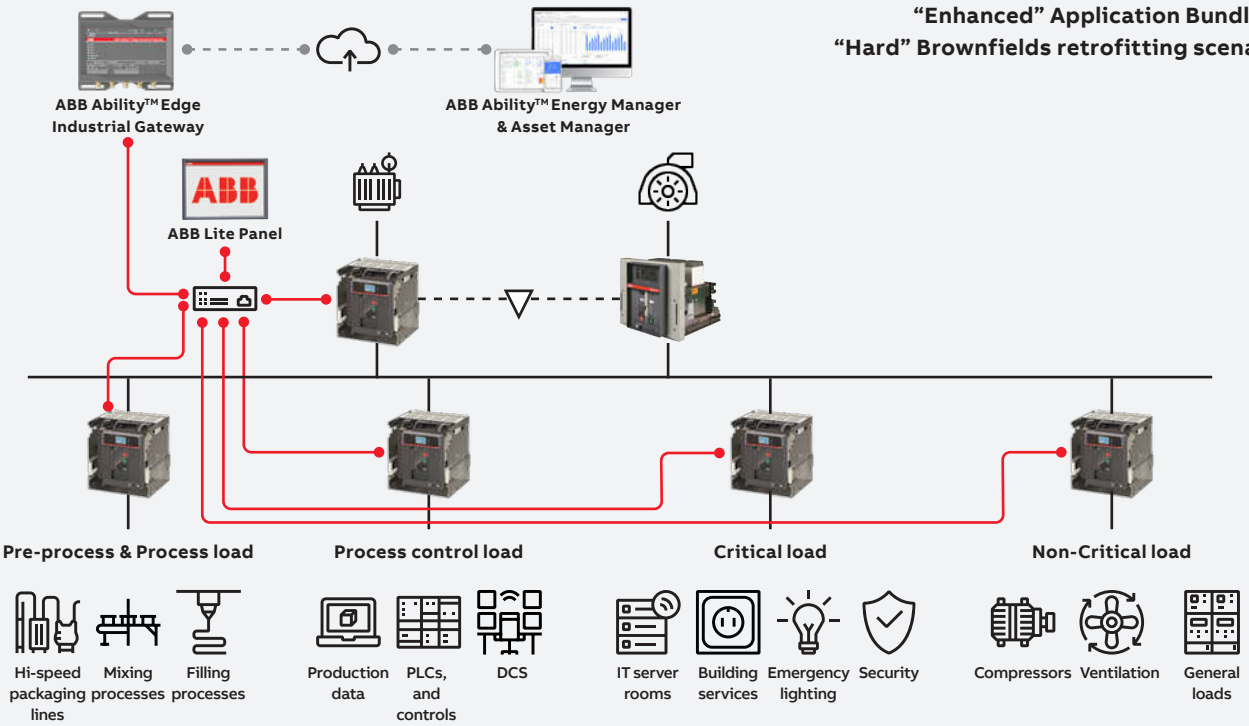
"Soft" Retrofit of main distribution boards requires the adoption of Ekip Up devices at least to guarantee that the measuring points and measurements are sent to supervision systems. ABB Ability™ Energy and Asset Manager LV CB Health add-on is available on Ekip Up Protect and Control series, even with 3rd party devices, giving clear indication about the overall health of the power center.

Additional information are available at this link.
"Hard" retrofit can be, instead, managed in many different ways, addressing the specific customer need with the best fitting proposal.
Useful information can be retrieved at this link or either contacting ABB service experts for ad hoc customization.

"Essential" Application Bundle for "Hard" Brownfields retrofitting scenarios

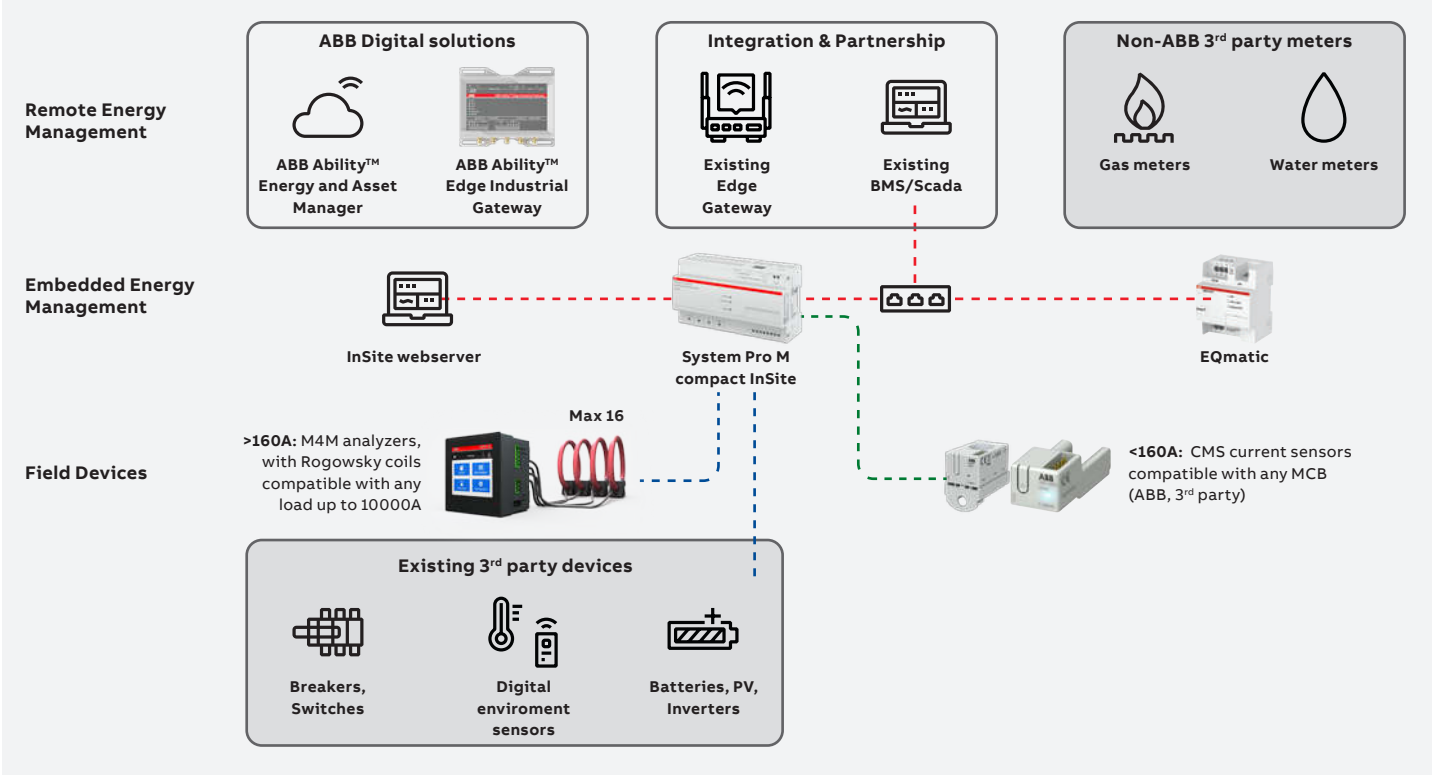


"Enhanced" Application Bundle for "Hard" Brownfields retrofitting scenarios



Brownfields:
Sub-distribution Boards

The bundle proposed for “Brownfields” installation slightly differs from the previously presented. M4M analyzers are now equipped with Rogowsky coils for a fast plug and play commissioning and the role of System Pro M Compact Insite with CMS current sensors has a predominant usage for the 3rd party installed fleet. Gas and Water meters are still manageable by EQMatic devices.



Product	Type	Load	Accessories
SCU100	Control unit	N/A	INS105 flat cable 5m + INS135 connector set
M4M Rogowski	Network analyzer	>160A	R4M Rogowski coils (3pcs each)
CMS 20x	Solid-core current sensors	80-160A	To be mounted on each single line
CMS 12x	Open-core current sensors	0-80A	To be mounted on each single line
EQmatic	Energy Analyzer	N/A	To be used for non-electric measures

Bill of materials

Intelligent Distribution For Main Distribution Boards in Food & Beverage - Greenfield installations (Enhanced offering)

Considered Parameters	
Power Supply Configuration	Main Main configuration
System Voltage	415 V AC, 50 Hz
Monitoring System	ABB Ability™ Energy Manager and ABB Ability™ Asset Manager (Cloud Monitoring Solution)
Communication Protocol	Modbus TCP
Measuring Points	5 Connected Devices
Network switch	Ethernet 8 Ports Switch requires 110 - 240V AC power supply
IoT Gateway	ABB Ability™ Edge industrial gateway requires power supply with nominal input 12 or 24 V DC and maximum current 2 A (15 W maximum consumption)

Device	Part number	Total quantity
EMAX2 ACB E2.2C 2500 Ekip Touch LSIG	1SDA085307R1	2
Ekip Supply Power Supply Module 110-240V AC-DC	1SDA074172R1	2
Modbus TCP Com Module	1SDA074151R1	2
Measuring Package for Emax 2	1SDA107525R1	2
Network Analyzer for Emax 2	1SDA105234R1	2
Shunt Opening Release 220-240V AC-DC	1SDA073674R1	2
Shunt Closing Release 240-250V AC-DC	1SDA073688R1	2
Geared Motor DEevice 220-250V AC-DC	1SDA073725R1	2
Trip Indication 24V DC	1SDA073779R1	2
Mechanical Interlock HZ -TYPE A	1SDA073881R1	1
KIT Lever Mechanical Interlock Type A-B-C-D	1SDA073889R1	2
Support Mehchanical Interlock TYPE A-B-D	1SDA073895R1	2
EMAX2 ACB E1.2B 1250 Ekip Touch LSIG	1SDA071456R1	1
Ekip Supply Power Supply Module 110-240V AC-DC	1SDA074172R1	1
Modbus TCP Com Module	1SDA074151R1	1
Tmax XT4N 250 MCCB	1SDA068178R1	1
Modbus TCP Com Module	1SDA105177R1	1
Ekip Touch Measuring LSIG	1SDA100329R1	1
Tmax XT5N 400 MCCB	1SDA100552R1	1
Ekip Touch Measuring LSIG	1SDA100685R1	1
Modbus TCP Com Module	1SDA105189R1	1
Tmax XT5N 630 MCCB	1SDA100553R1	1
Ekip Touch Measuring LSIG	1SDA100686R1	1
Modbus TCP Com Module	1SDA105189R1	1
Lite Panel Switchboard HMI	1SDA114809R1	1
ABB Ability Edge Industrial gateway	1SDA116751R1	1
Fast Ethernet Switch 8 Ports	2CDG120082R0011	2
ABB Ability Energy Manager 1 year subscription	1SDA116735R1	1
1 extra device for ABB Ability	1SDA116046R1	2
Load Power Forecasting		1
Standard subscription of ABB Ability Multisite Energy Manager 1 Y	1SDA118332R1	1
Asset Manager Subscription (1 Year)	1VCF681602R0001	1
LV CB Health Analysis (Up to 25 LV Circuit Breakers)	1VCF681602R0005	1
VFI UPS PowerValue 11 RT 1000VA/900W;230V;50/60Hz;4 min	4NWP100100R0001	1

Intelligent Distribution for Sub-Distribution Boards in Food & Beverage - Brownfield installations

Considered Parameters (List of parameters that were taken into consideration for the development of the bill of materials)	
Standard	IEC
Monitoring System	ABB Ability™ Energy Manager
Communication Protocol	Modbus TCP-Modbus RTU
Subscribed Device No	7 pcs
Power supply need for monitoring system	Gateway requires 12 or 24 VDC power supply (15 W maximum consumption) Ethernet switch requires 110 - 240 VAC power supply (1.4W maximum consumption)

Device	Part number	Total quantity
System pro M compact S200P miniature circuit breaker	2CDS283001R0974	13
SCU100 - InSite pro M compact	2CCG000242R0001	1
Connector set (35pcs) - InSite pro M compact	2CCG000244R0001	2
Flat cable 5m - InSite pro M compact	2CCG000243R0001	1
CMS-122PS 18mm Open-Core Sensor 20A	2CCA880212R0001	39
Eqmatic Energy Analyzer up to 16 meters	2CDG110228R0011	1
-	3rd party device	1
-	3rd party device	1
-	3rd party device	1
M4M Network Analayzer	2CSG202461R4051	1
Rogowski Coil (80mm diameter, 3m length)	2CSG202160R1101	3
ABB Ability Edge Industrial gateway	1SDA116751R1	1
Fast Ethernet Switch, 8 Ports	2CDG120082R0011	1
CP-D 24/2.5 Power Supply Output 24 V 2.5 A	1SVR427044R0200	1
ABB Ability™ Energy Manager Watching (5 Devices - 1 Year)	ABB Ability Marketplace™ (2)	1
1 extra device for ABB Ability™ (1 Year)		2
Multi-utility Metering (1 Year)		1

(1) 3rd party Gas/Heat/Water meters should have Modcus RTU communication to connect Eqmatic.
(2) These subscription codes can be purchased through ABB Ability Marketplace™.

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.

Product offering

Emax 2:



WEB PAGE

CATALOG

Tmax XT:



WEB PAGE

CATALOG

Ekip Up:



WEB PAGE

CATALOG

Lite Panel:



WEB PAGE

LEAFLET

M4M network analyzers:



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CATALOG

System pro M compact® InSite:



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CATALOG

CMS branch monitoring:



WEB PAGE

EQmatic:



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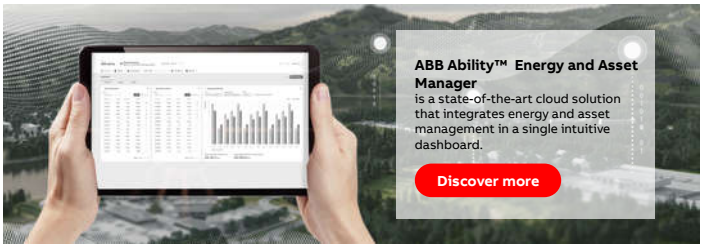

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APPLICATION FINDER

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