Give an ‘advant-edge’ to your electrification operations

Scalable ECS, HMI, Data Management solutions using ABB Ability™ Electrification Monitoring and Control for distribution networks, ABB ZEE600

ABB ZEE600 seamlessly integrates ABB’s electrification products and applications to deliver the next generation on-premise digitalization solutions for state of-the-art electrification systems.

Table of contents

4	Overview
6	Value proposition
8	Architecture
12	Features
20	Applications

Overview

Unlocking digitalization and integration in electrification process

The ABB Ability™ Electrification Monitoring and Control for distribution networks, ABB ZEE600 fulfills the role of a seamless integrator of diverse devices such as ABB and 3rd party make protection relays, meters, substation equipment condition monitoring units, Programmable Logic Controllers (PLC) and Remote Terminal Units (RTUs), deployed in digital electrification solutions. In doing so, it harnesses their real-time, near-real time and diagnostics data to facilitate digitalization objectives set by the customer across diverse segment domains.

It helps realize system integration in Electrification Control System (ECS) solutions and can be deployed in a mix of brownfield and greenfield installations in primary and secondary distribution substations across utilities, industries, infrastructure and renewable segments.

The ABB ZEE600 reflects high scalability in terms of its usage or deployment. Besides being the critical component to handle and manage all electrification and substation data, the ABB ZEE600 can easily be extended as an enabler for on-premise or on-site digitalization applications for operation or predictive analytics.

The ABB ZEE600 collects electrification process status and measurement information from devices and subsubsystems in the power distribution system, ranging from multiple levels of medium voltage to low voltage substations or switchgear. While the predominant communication standards deployed are IEC 61850, IEC 60870-5 and Modbus-TCP across electrification automation systems across the world, the ABB ZEE600 not only fully supports these standards, but also substantially more standards like DNP, Profinet, Profibus and other open standards and proprietary protocols.

To summarize, the ABB ZEE600 is clearly the 'one-stopsolution', for not only as the one of the best in class substation and electrification automation offering, but also as a ready enabler for diverse on-premise applications like energy management, electrical asset diagnostics, power analytic solutions and much more.

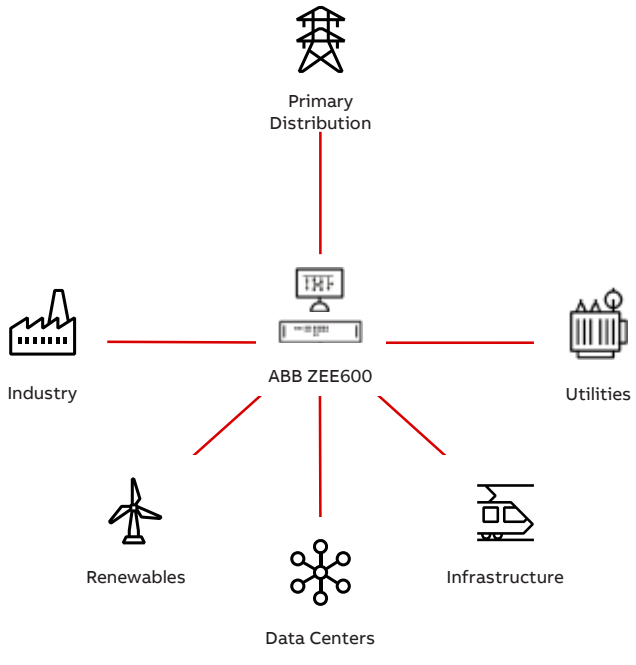


Figure 1. ABB ZEE600 in customer segments

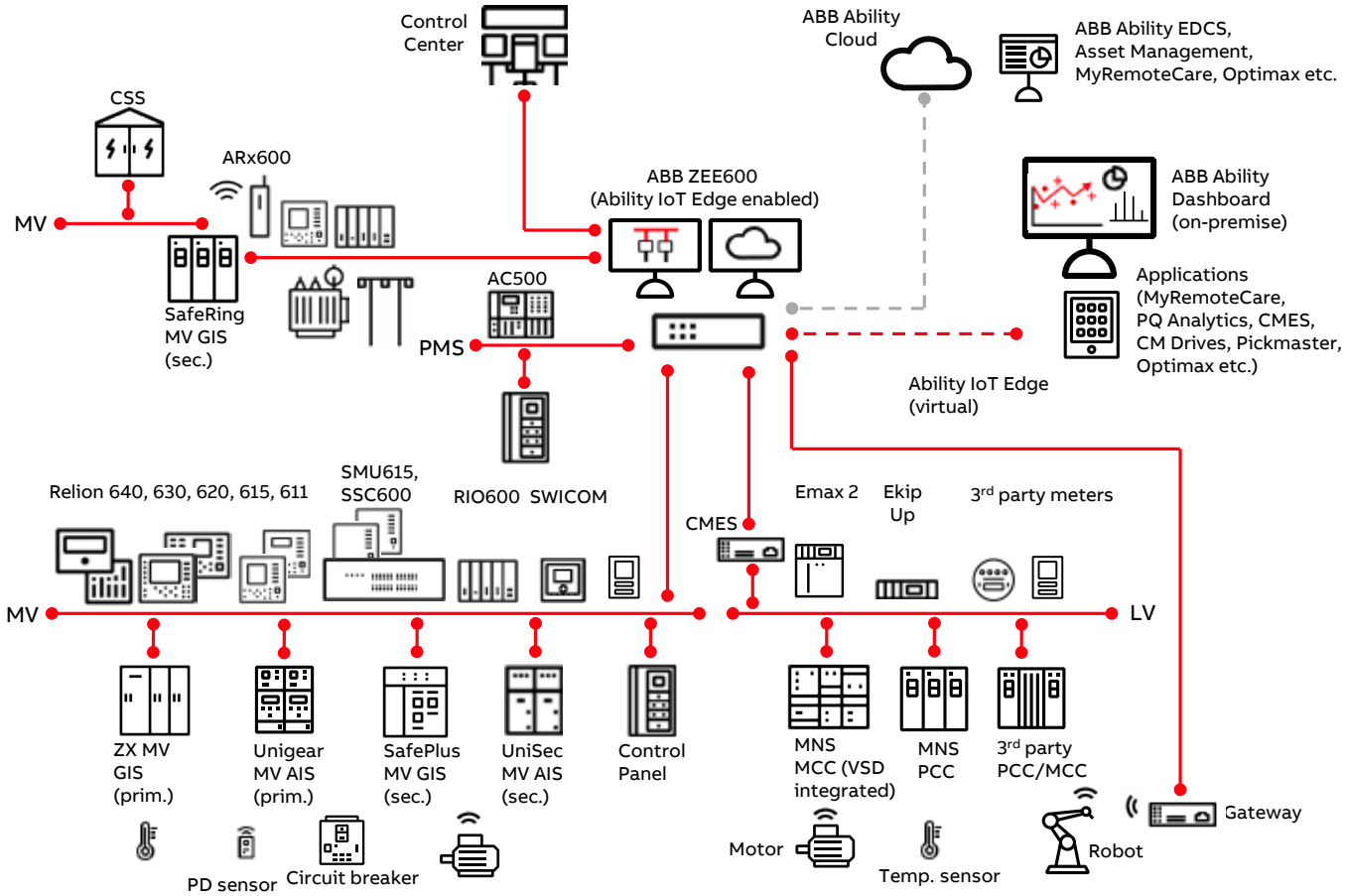


Figure 2. ABB ZEE600: A centerpiece in ABB's electrification and distribution solutions

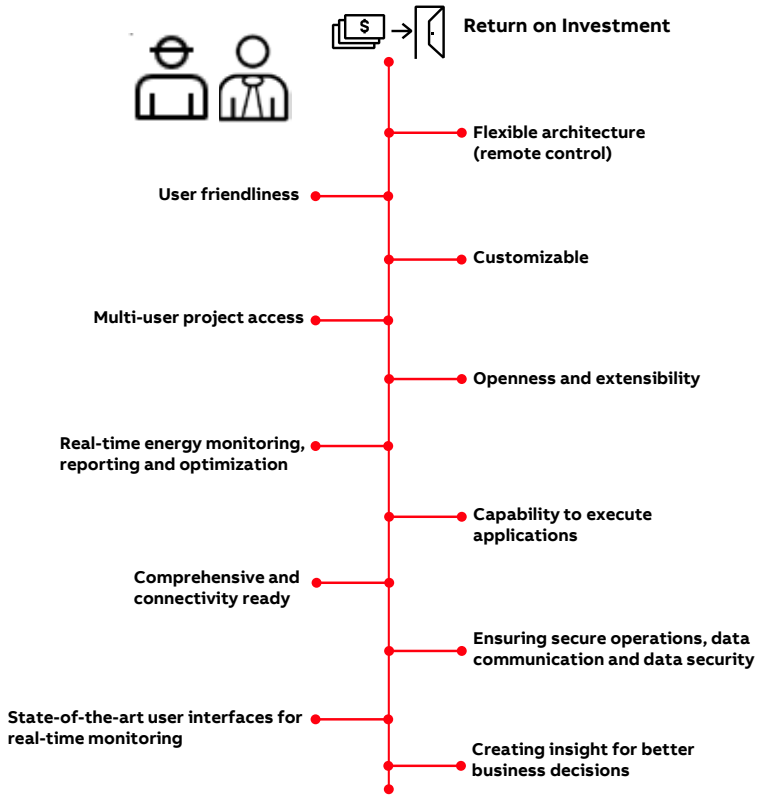
Value proposition

Making a profound impact from system design to operations

The ABB Ability™ Electrification Monitoring and Control, ABB ZEE600 contributes towards the customers' generic Key Performance Indicators (KPIs) through its rich features and functionality, by facilitating a totally integrated electrification OT system and thereby maximizing profitability.

ABB ZEE600 makes project engineering and operations fast and simple and can easily integrate with heterogeneous infrastructure, such as integration of motor and drives, e-mobility, robotized operations under the same engineering environment.

The lifespan and maintenance costs of an operating system are the crucial factors of the total cost of ownership. By automating routing tasks and eliminating errors, ABB ZEE600 saves maintenance time and improve operational efficiency.



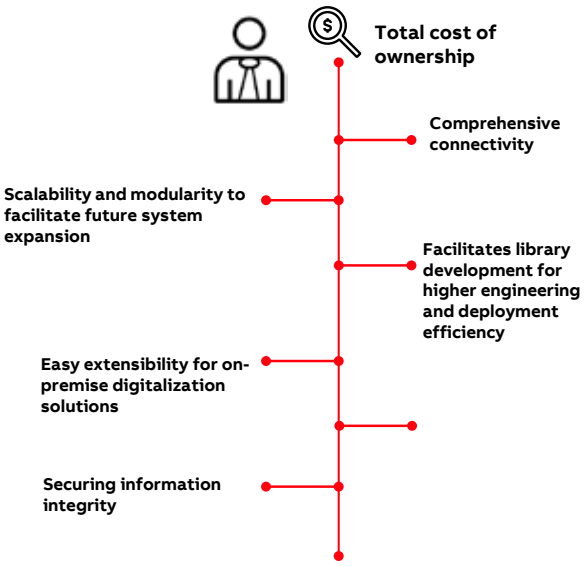


Figure 3 and 4. Value proposition with ABB ZEE600

Figure 5. Multiple operational screens with ABB ZEE600

Architecture
Enabling digital convergence

The ABB Ability™ Electrification Monitoring and Control, ABB ZEE600 is based on zenon SCADA and its Energy Edition package and therefore, fully inherits its intrinsic features. The ABB ZEE600 Electrification libraries are built over this ‘base’ layer and to adapt it closely to ABB engineering and visualization standards.

The ABB Ability™ Electrification Monitoring and Control, ABB ZEE600 has the capability to function as a combined substation HMI, communication gateway and automation controller, managing real-time, non-real time and historical data in primary and secondary substations across diverse customer segments.

The ABB ZEE600 has a significant connectivity ‘reach’ and interoperability assurance towards diverse devices, even across segment and industrial domains, thereby enabling convergence

The envisaged installations can be as follows:

- As a combination of medium and low voltage network spread across single or multiple substations (~ up to 10), with a feeder count of up to 100 feeders in a substation.
- With combined number of medium and low voltage ABB and non-ABB devices, comprising of:
  - Protection and Control relays
    - Relion series (611, 615, 620, 630 and 640)
    - Ekip Up series (Monitor, Protection and Control)
    - 3rd party
    - Legacy relays
  - PLC and IO devices
    - AC800M
    - AC500
    - RIO600
  - Intelligent circuit breakers
    - Emax 2 and Tmax XT
  - Multi-function meters
    - M2M
    - 3rd party (example, SATEC)
- Based on switchgear or panel-based installations
- Having a communication based on Ethernet or serial interfaces
- Needing connectivity to higher level systems such as Control Centers or Distributed Control Systems (DCS) based on ABB and non-ABB systems using IEC protocols like IEC 60870-5-101/104, DNP 3.0, Modbus or OPC.

The most commonly communication protocols expected to be used, when ABB ZEE600 Runtime is the master or client are:

- IEC 61850 MMS (Ed 1, Ed 2)
- IEC 60870-5-101, 103, 104
- Modbus TCP, RTU
- DNP3.0 TCP, serial
- OPC DA, UA

Communication with downstream devices can also be initiated from the Soft PLC engine within ABB ZEE600 using the following protocols:

- IEC 61850 MMS
- IEC 60870-5-101, 104
- Profibus
- Profinet

As a slave or server, the ABB ZEE600 Runtime can communicate with other devices or systems based on:

- OPC DA, UA
- DNP3.0 serial, TCP
- IEC 60870-5-101, 104 • Modbus serial, TCP
- SNMP

Slave or server communication can also be initiated from the Soft PLC engine:

- IEC 61850 GOOSE
- IEC 60870-5-101, 104

The ABB ZEE600 supports IEC 62349 Parallel-Redundancy Protocol (PRP) to handle and resolve identical communication messages from two separate LAN networks. However, to adapt to a High-availability Seamless Ring (HSR) network, an external 'Redundancy Box' is required.

Architecture
Enabling digital convergence

Additionally, the ABB ZEE600 supports a scalable architecture, comprising of single server and multiple clients or multiple servers with multiple clients.

By deploying an IoT Edge plug-in, it is fully possible to not only achieve intermittent or persistent Cloud connectivity (in line with the desired cyber security and customer's OT-IT policies), but also achieve a fully functional on-premise or on-site analytics system.

This integrated analytics system (IT part of ABB ZEE600) can integrate with its OT part and deliver consolidated device and system performance dashboards, aiding maintenance and operational personnel.

ABB ZEE600 represents and functions within the Control Loop, also called Operational Technology (OT) in the digitalization parlance.

An easy IoT Edge plug-in ensures that the ABB ZEE600 can also be extended to play its part in the Optimization loop, also called Information Technology (IT).

Towards this endeavor, the ABB ZEE600 can integrated to condition monitoring systems such as ABB Ability Condition Monitoring for switchgear, SWICOM (for medium voltage switchgear) and ABB Ability Condition Monitoring for Electrical Systems, CMES (for low voltage switchgear)

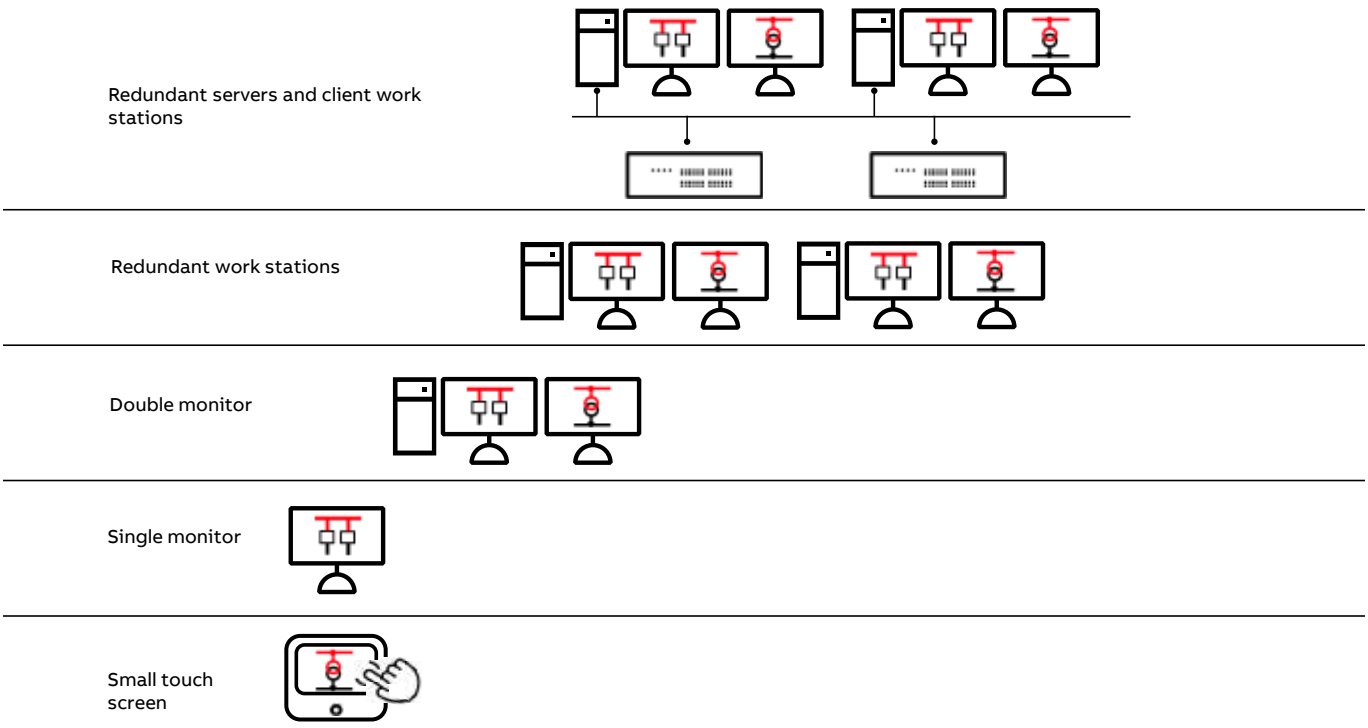


Figure 6. ABB ZEE600's deployment FLEXIBILITY

Features
A 360°degree view

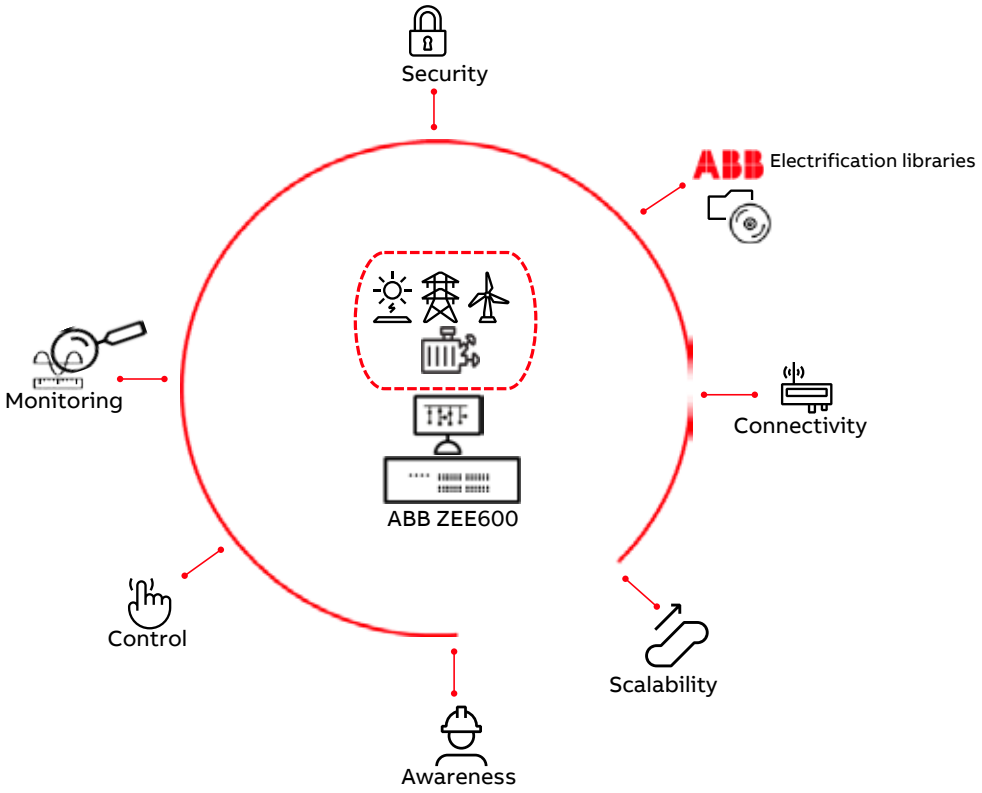
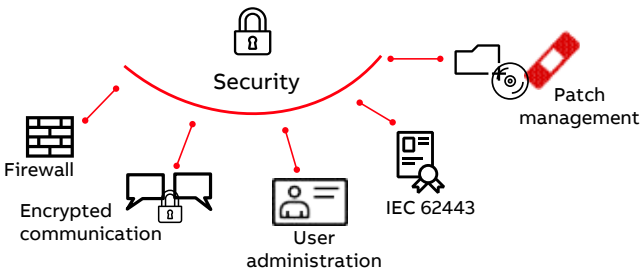
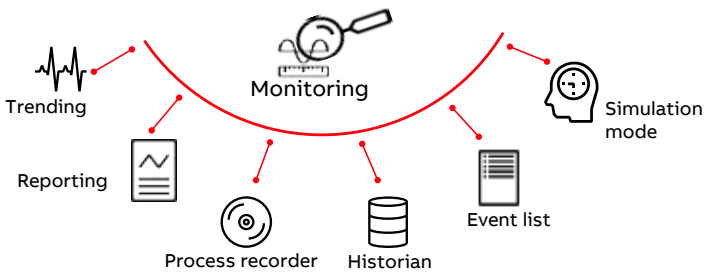
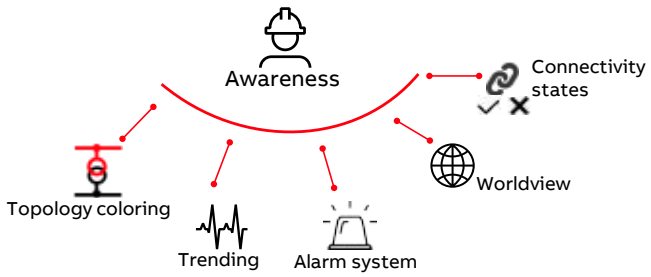
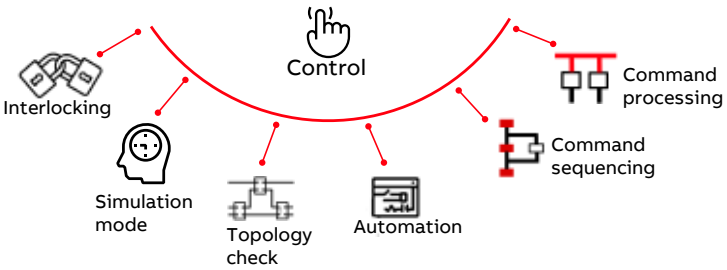


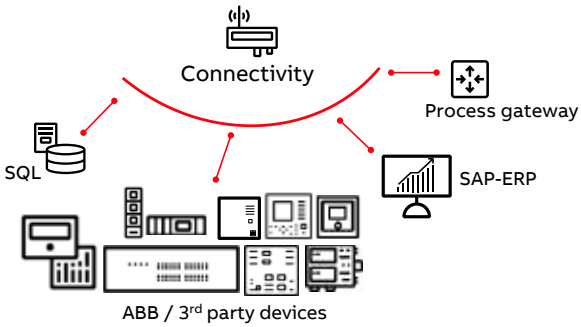
Figure 7. ABB ZEE600's versatile aspects






Awareness
Connectivity states
Worldview
Topology coloring
Trending
Alarm system


Control
Interlocking
Command processing
Command sequencing
Simulation mode
Topology check
Automation


Connectivity
Process gateway
SQL
SAP-ERP
ABB / 3rd party devices

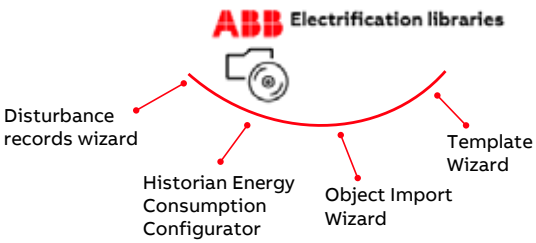
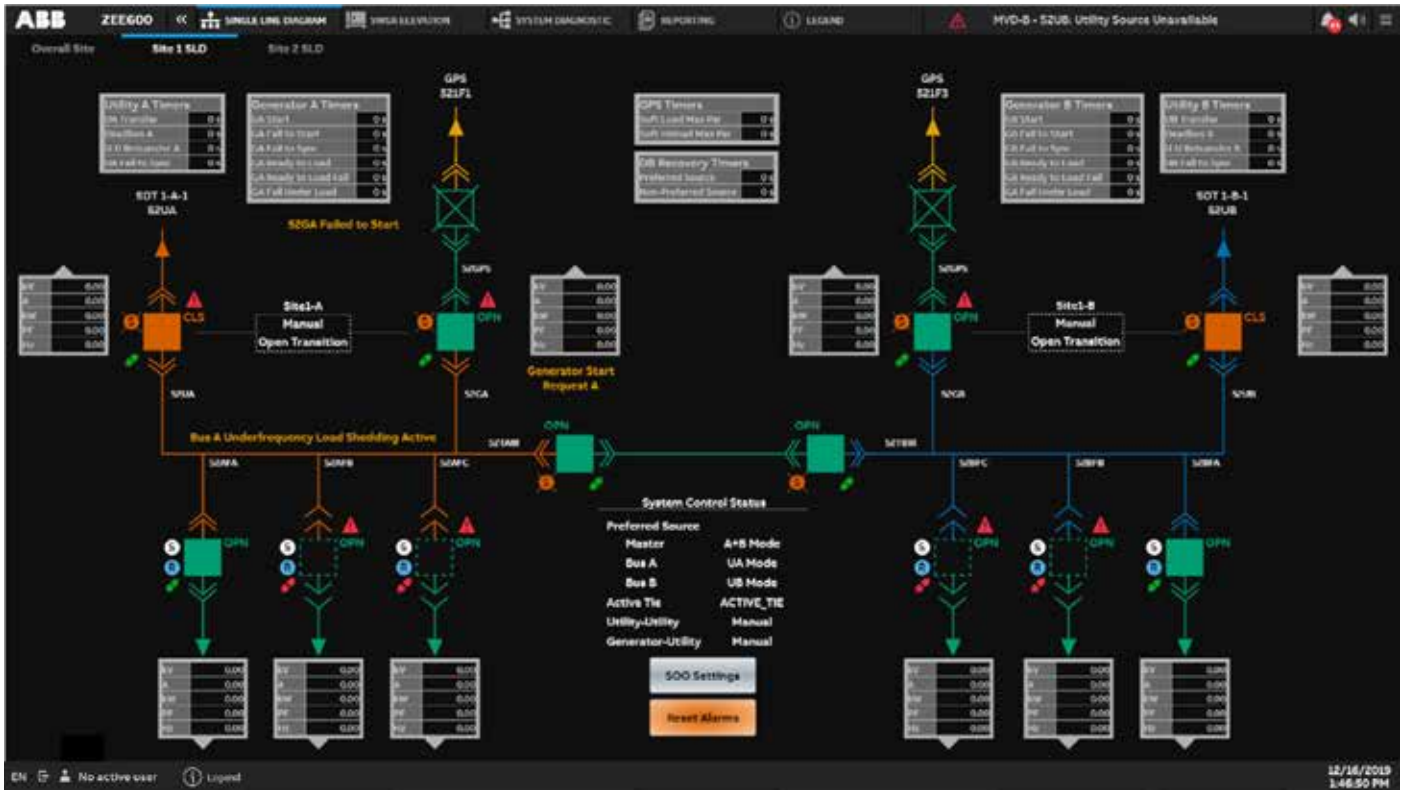


ABB Electrification libraries
Disturbance records wizard
Historian Energy Consumption Configurator
Object Import Wizard
Template Wizard

Features

A 360°degree view



F igure 8. Overall Single line diagram (ANSI)

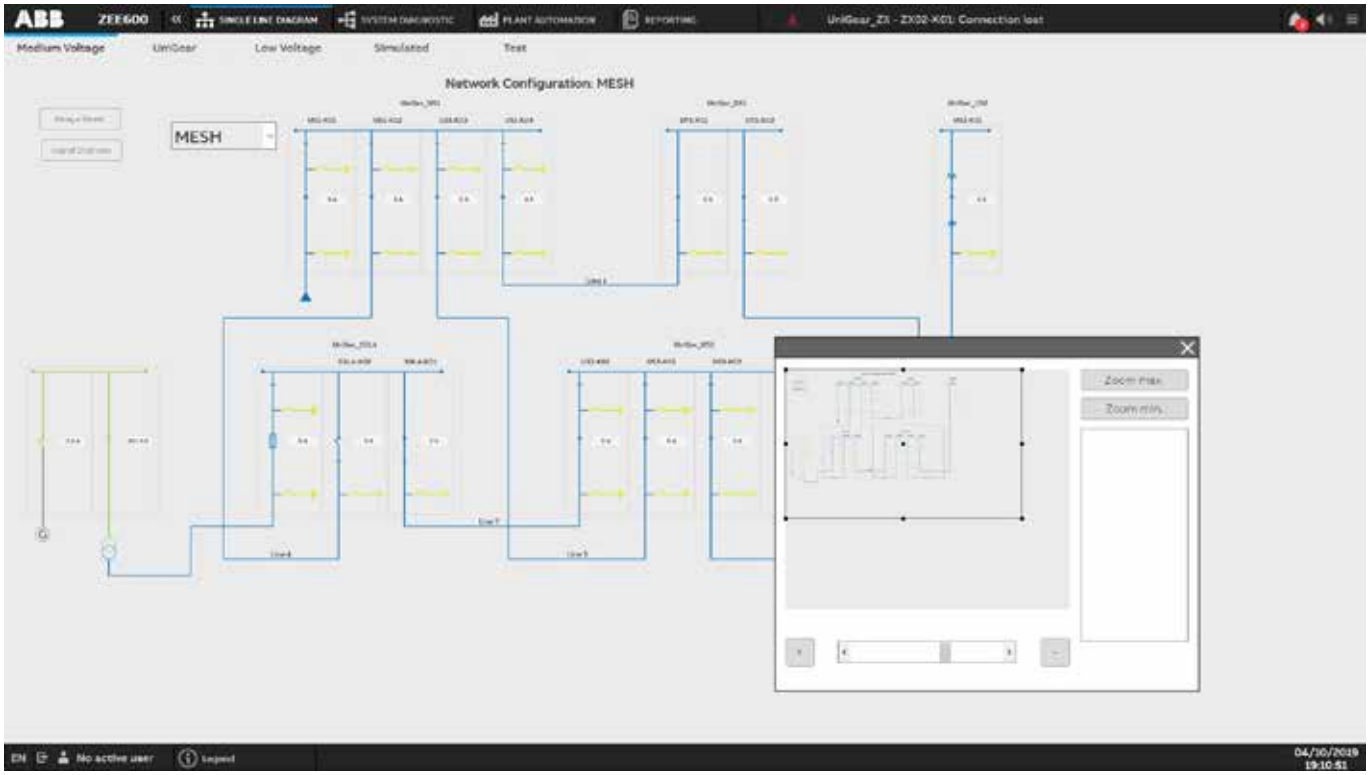


Figure 9. Overall SLD (IEC) with worldview

Features

A 360°degree view

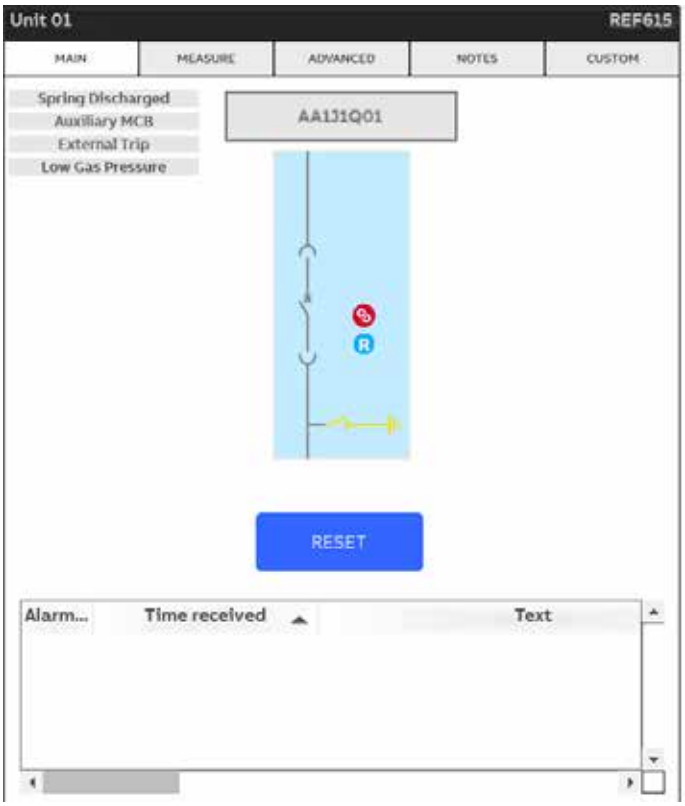


Figure 10. Bay measurements display

Figure 11. Circuit breaker condition monitoring data from SWICOM

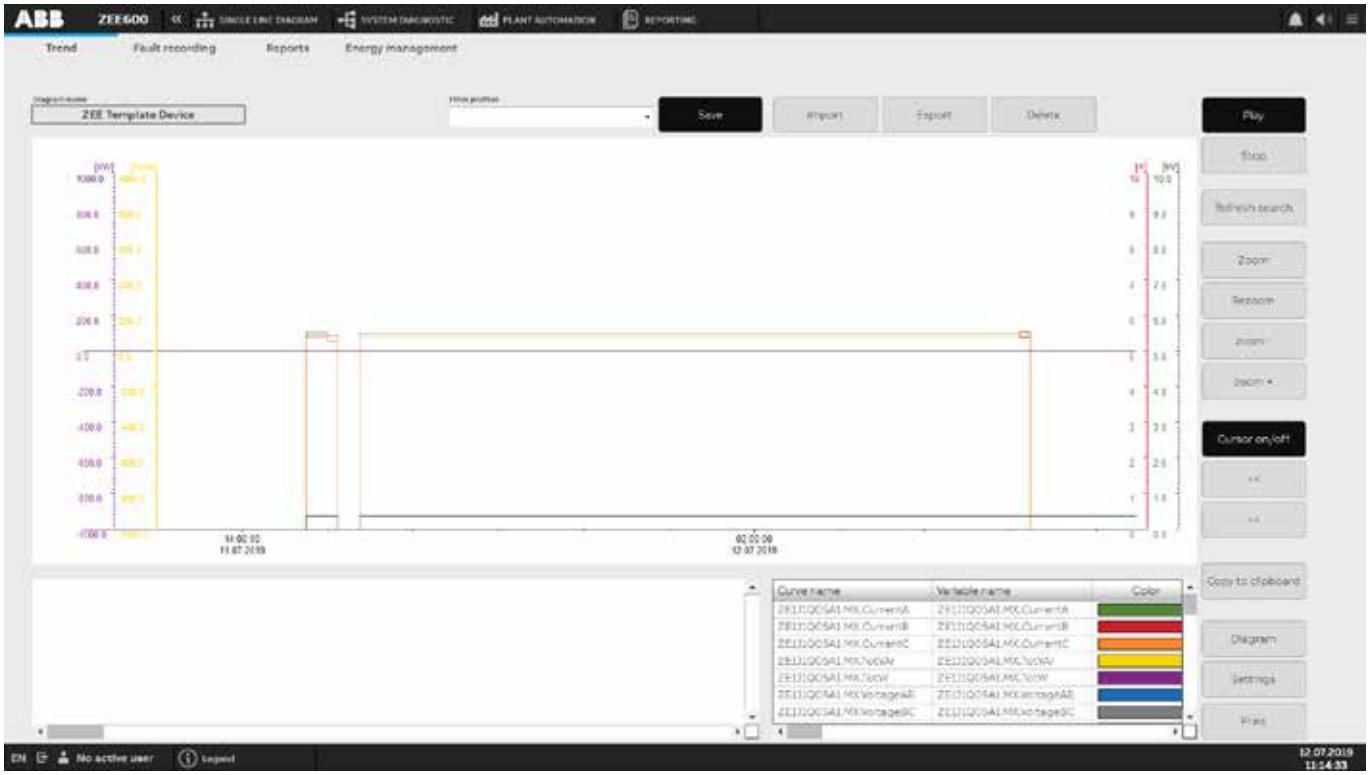


Figure 12. Trends page

Features

A 360°degree view

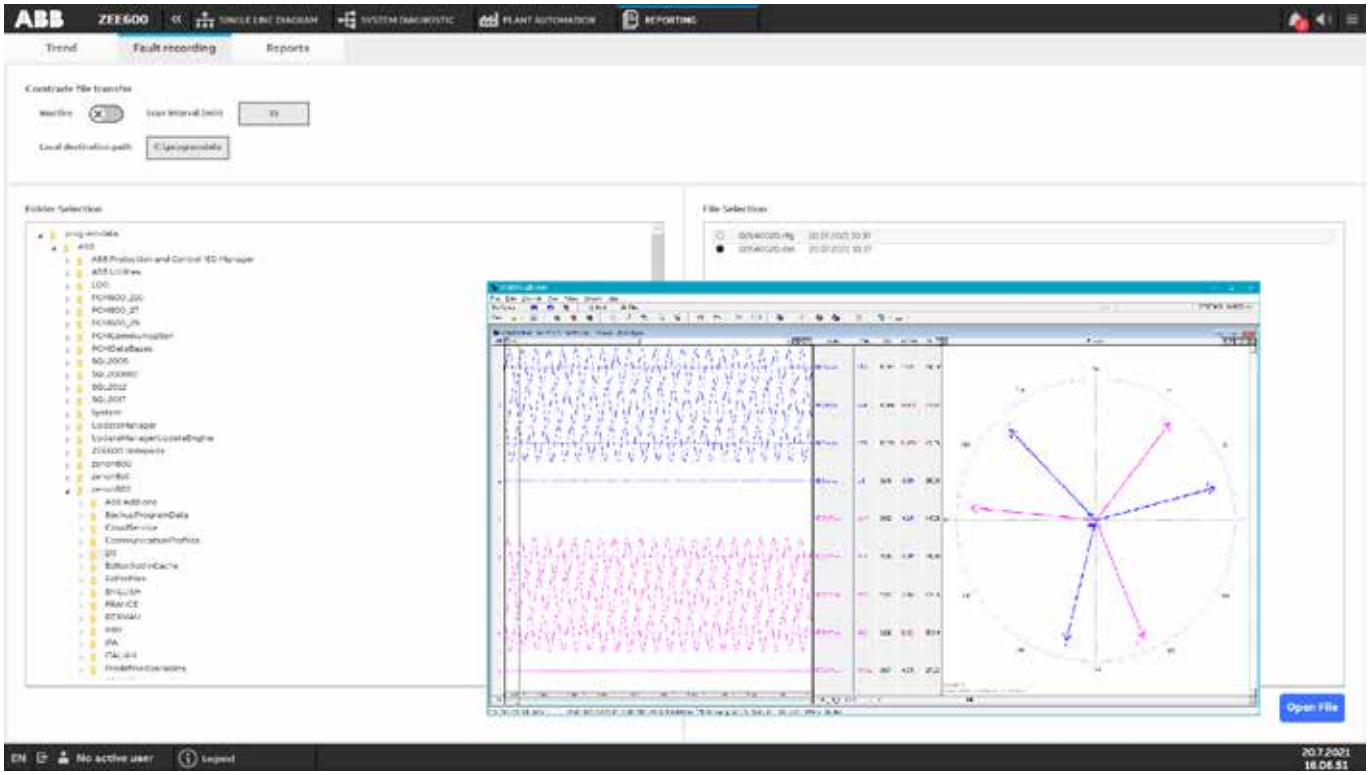


Figure 13. Disturbance record page

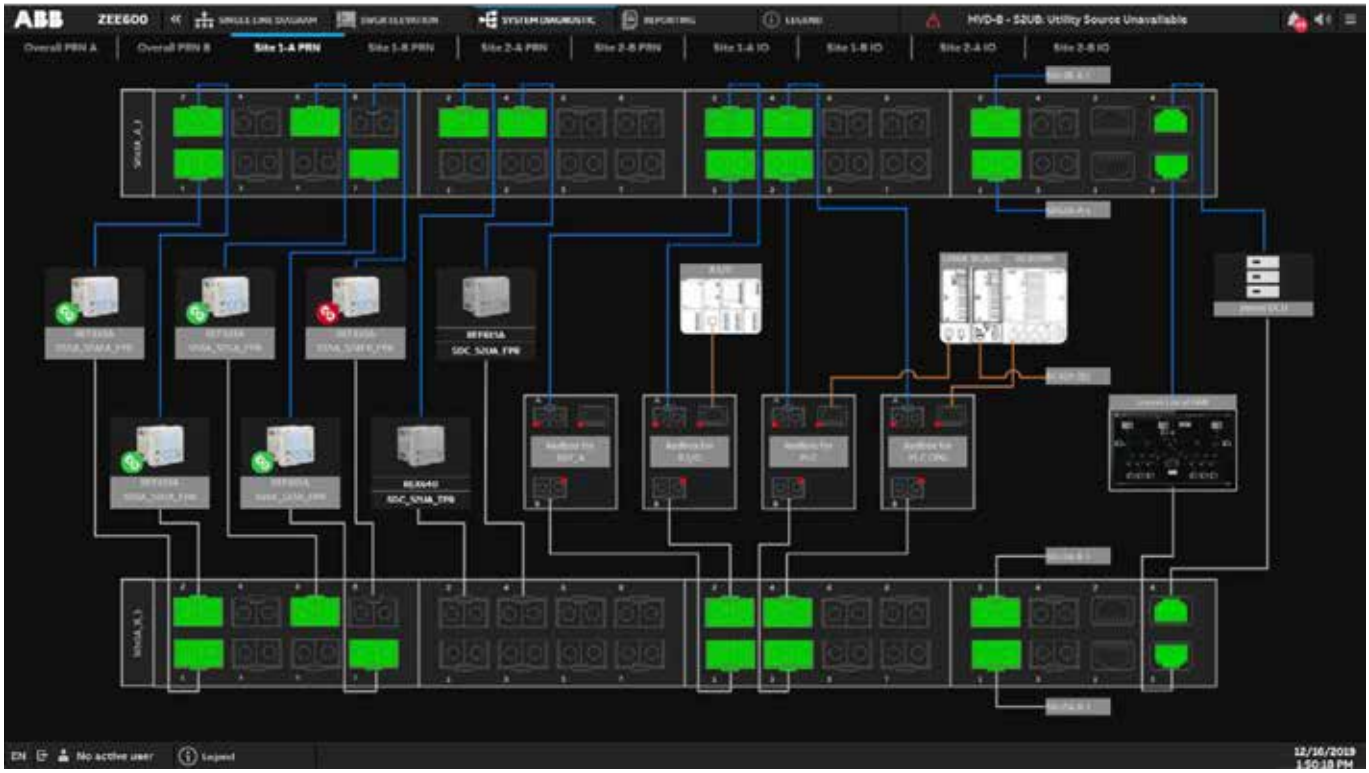


Figure 14. Communication overview display page

Applications
True versatility at work

The features, functionality, device and application libraries offered by ABB Ability™ Electrification Monitoring and Control, ABB ZEE600 can be advantageously deployed across diverse segments, such as Utilities, Industries, Infrastructure and Renewables, and help customers in achieving their operational and strategic KPIs.
Some of the common, broad KPI categories include Safety, Cost of Ownership, Efficiency and Productivity.
State owned and private **Power Utilities** as well as **Industries**, which have their substation operations in power distribution, renewables' based power generation, energy storage, can greatly benefit from ABB's electrification solutions and especially, when the ABB ZEE600 is deployed in the various possible roles.

- Rich **communication capability** like IEC 61850, IEC 60870-5, DNP3, Modbus greatly facilitates device and external system communications (Control Centers), without the need of additional protocol conversion hardware etc. – **Efficiency, Cost of ownership**
- An **HMI 'speaking' IEC 61850 GOOSE** with peer devices greatly facilitates creation of system interlocking applications, instead of engineering intensive efforts in the protection relays. In addition, the supervision helps to ensure fail-safe actions. – **Safety**
- **Command sequencer** ensures complex and error free switching processes, by first as test simulation and thereafter in automatic live operations. This will prevent incorrect switching and unintended switching actions, thereby saving time and costs, improves operational efficiency.
- **Perfect situational awareness:** Using the ABB ZEE600's Worldview functionality, the entire power network including power sources, switching equipment and cable/line feeders etc. can be displayed. From there one can zoom, pan, scroll and declutter on the power network components at any level of details, enabling system views and insights for the operator to make an informed decision. – **Efficiency**
- Using the **process recorder**, one can reconstruct prior network and process states, especially after a fault or abnormal condition. This feature displays the past situation in the network view and enables chronological navigation using the time scroll bar. Thus, the user can analyze faults, deduce their occurrences and effects more easily. – **Efficiency and Productivity**
- The **Automatic line coloring**, enables the operator to have an immediate overview of powered, unpowered, grounded or faulty parts of the electrical network, depending on power status of the lines. – Productivity
- Through **secure switching** operations, ABB ZEE600 ensures error-proof command processing, circuit breaker tripping detection, interlocking, switch locking (lockout-tagout). – **Safety**

Figure 15. Utility customer segments

- By supporting seamless redundancy using **Parallel Redundancy Protocol (PRP)**, ABB ZEE600 ensures a robust communication solution, when in combination with other substation devices on the IEC 61850 network. – **Efficiency**
- The **reporting feature** enables precise and reliable logging and archiving of process data. One can generate reports, lists, trends for analyses to get invaluable insight to the electrification process. - **Productivity**
- Comprehensive **alarm management** such as alarm areas allow quick reactions to problems and faults. - **Efficiency**
- The **Message Control** feature triggers SMS, email or text-tospeech in the event of alarms and ensures a rapid reaction or corrective actions in the event of problems. – Safeguarding **cost of ownership**
- Comprehensive user administration, industrial and network security mechanisms, patch management etc. ensure **system security** and consequent safeguarding **cost of ownership.**

Most of the other segments such as Infrastructure (Data Centers, Airports, Commercial buildings, hospitals etc.), Process Industries (Food and Beverage) may also tend to use many of same features as mentioned for Utilities and Industries, as well as other specific features/functionality.

- Industrial **communication** protocol **capabilities** such as OPC (DA, UA), Profinet, Profibus, KNX and BACnet further add to the possibilities of increased integration of electrification automation systems and process automation systems (DCS), building automation systems, fire alarm systems etc. This aspect greatly enhances convergence of diverse process data and provides the user with a comprehensive assessment of the monitored process and operations. – **Cost of ownership, Productivity and Efficiency**
- **Server redundancy** and flexible **client-server** network technology enable the user to improve network reliability and have constant access to projects without interruptions, downtime, or data loss. – **Cost of ownership, Productivity and Efficiency**
- Advanced functionality **zenon Load Management** uses sophisticated energy trend calculations to optimize energy consumption and can be combined with load-shedding applications running in downstream devices to take automated (or even manual) actions. This enables the user to avoid load peaks effectively and results in operational cost reduction. – **Cost of ownership, Productivity and Efficiency**
- Advanced functionality **zenon Energy Data Management** ensures automated collection of energy data, enabling data evaluation and consequent decision making on energy management. This contributes towards optimizing equipment and reduction of energy costs. – **Cost of ownership and Efficiency**

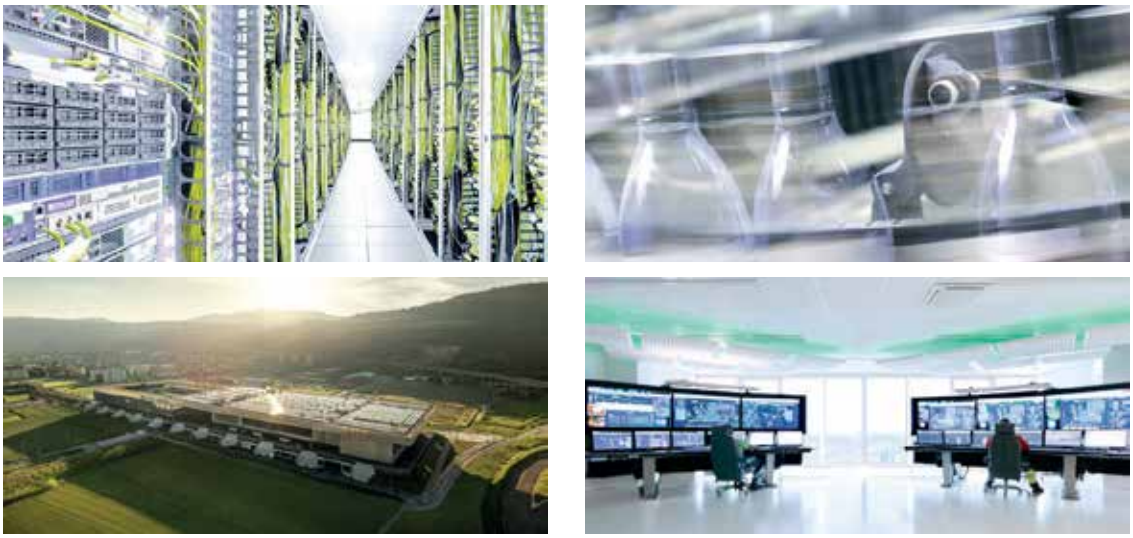


Figure 16. Industrial and Infrastructure customer segments

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