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

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Based on the very well accepted zenon Energy Edition SCADA and ABB Ability™ Operations Data Management, zenon, the Ability™ Electrification Monitoring and Control for distribution networks, ABB ZEE600 advantageously inherits all their features and versatility in visualization, data communication and control.

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.

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Overview
Unlocking digitalization and integration in electrification process

The ABB Ability™ Electrification Monitoring and Control for distribution networks, ABB zenon Electrification Edition - 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.

The ABB ZEE600 is an advantageous combination of zenon Electrification Edition with ABB's latest user experience standards and a seamless integration to ABB's electrification products offering and associated applications. Needless to mention, the ABB ZEE600 emerges as a centerpiece offering in ABB's electrification and distribution solutions.

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 sub-subsystems 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-stop-solution', 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.
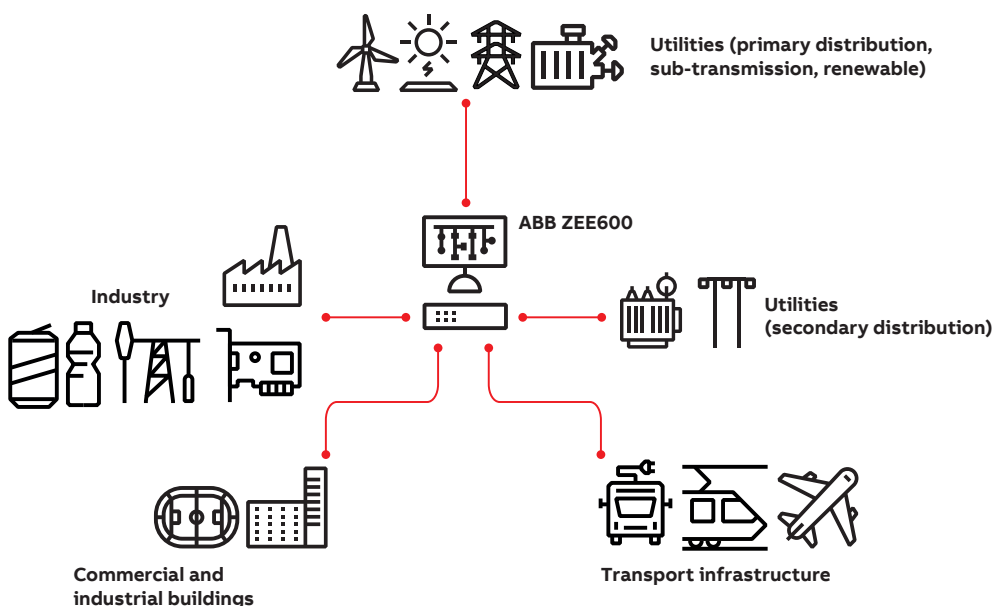

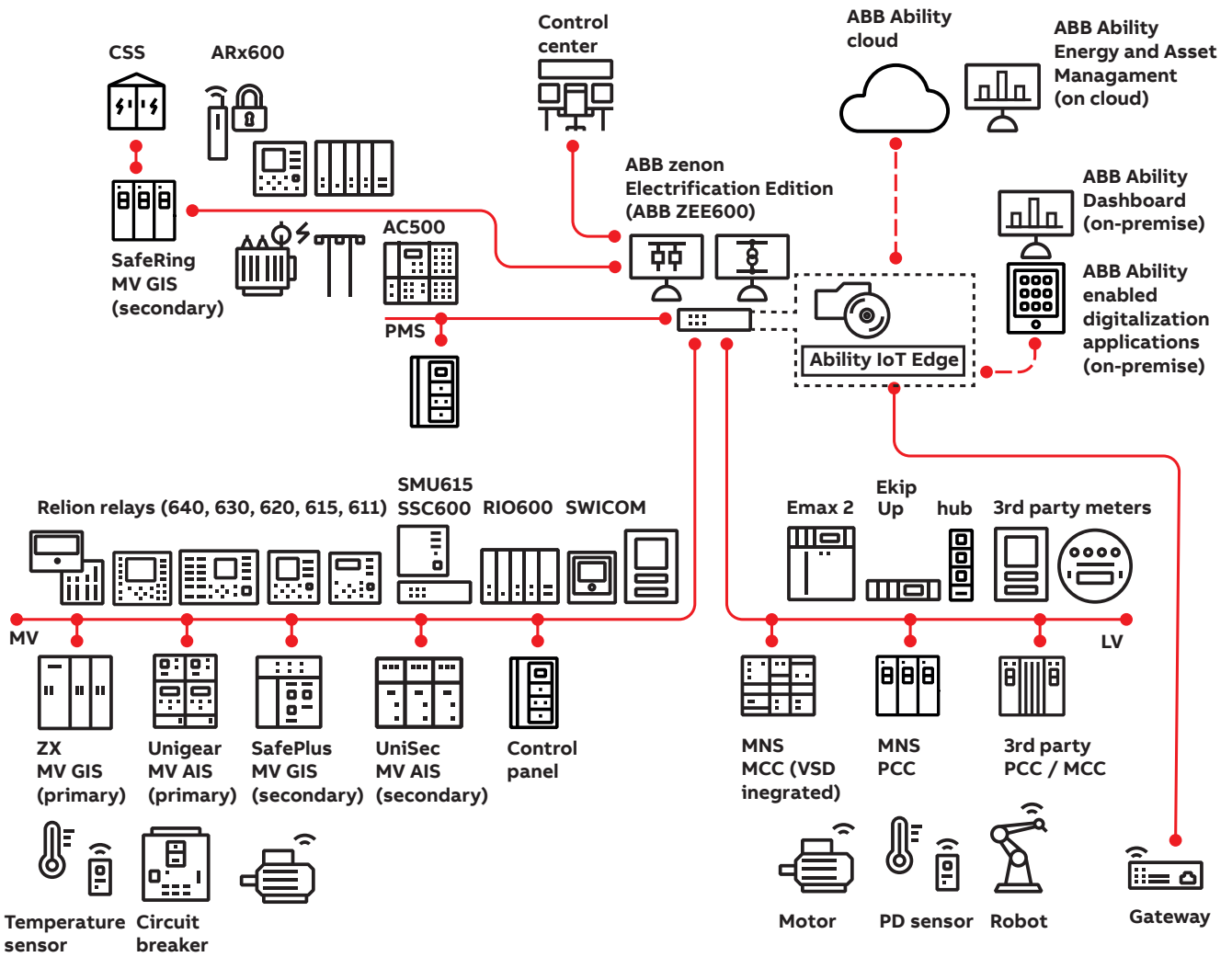Figure 1. ABB ZEE600 in customer segments

CSS

ARx600

Control center

ABB Ability cloud

ABB Ability Energy and Asset Managament (on cloud)

SafeRing MV GIS (secondary)

AC500

ABB zenon Electrification Edition (ABB ZEE600)

ABB Ability Dashboard (on-premise)

PMS

Ability IoT Edge

ABB Ability enabled digitalization applications (on-premise)

SMU615

Relion relays (640, 630, 620, 615, 611) **SSC600** **RIO600** **SWICOM**

Emax 2

Ekip Up **hub** **3rd party meters**

MV

LV

ZX MV GIS (primary)

Unigear MV AIS (primary)

SafePlus MV GIS (secondary)

UniSec MV AIS (secondary)

Control panel

MNS MCC (VSD inegrated)

MNS PCC

3rd party PCC / MCC

Temperature sensor

Circuit breaker

Motor

PD sensor

Robot

Gateway

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.
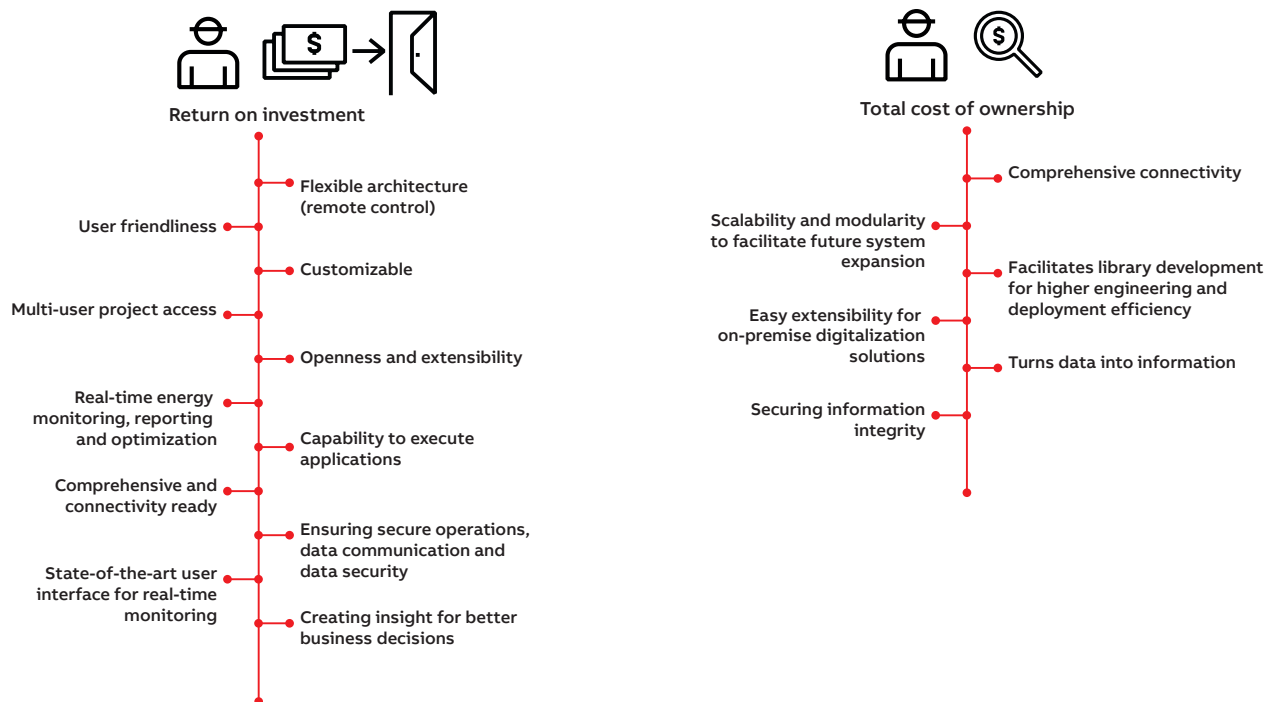

Return on investment

- Flexible architecture (remote control)
- User friendliness
- Customizable
- Multi-user project access
- Openness and extensibility
- Real-time energy monitoring, reporting and optimization
- Capability to execute applications
- Comprehensive and connectivity ready
- Ensuring secure operations, data communication and data security
- State-of-the-art user interface for real-time monitoring
- Creating insight for better business decisions

Total cost of ownership

- Comprehensive connectivity
- Scalability and modularity to facilitate future system expansion
- Facilitates library development for higher engineering and deployment efficiency
- Easy extensibility for on-premise digitalization solutions
- Turns data into information
- Securing information integrity

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.

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)
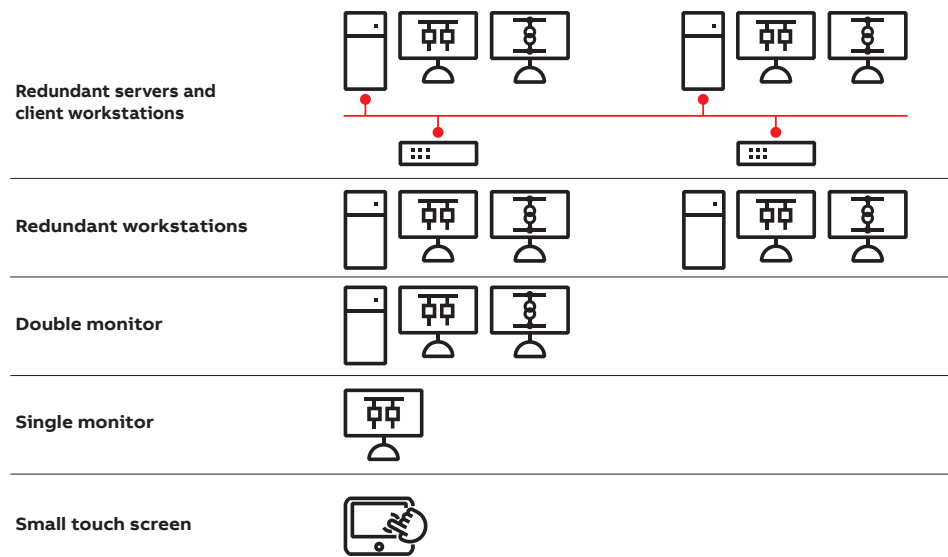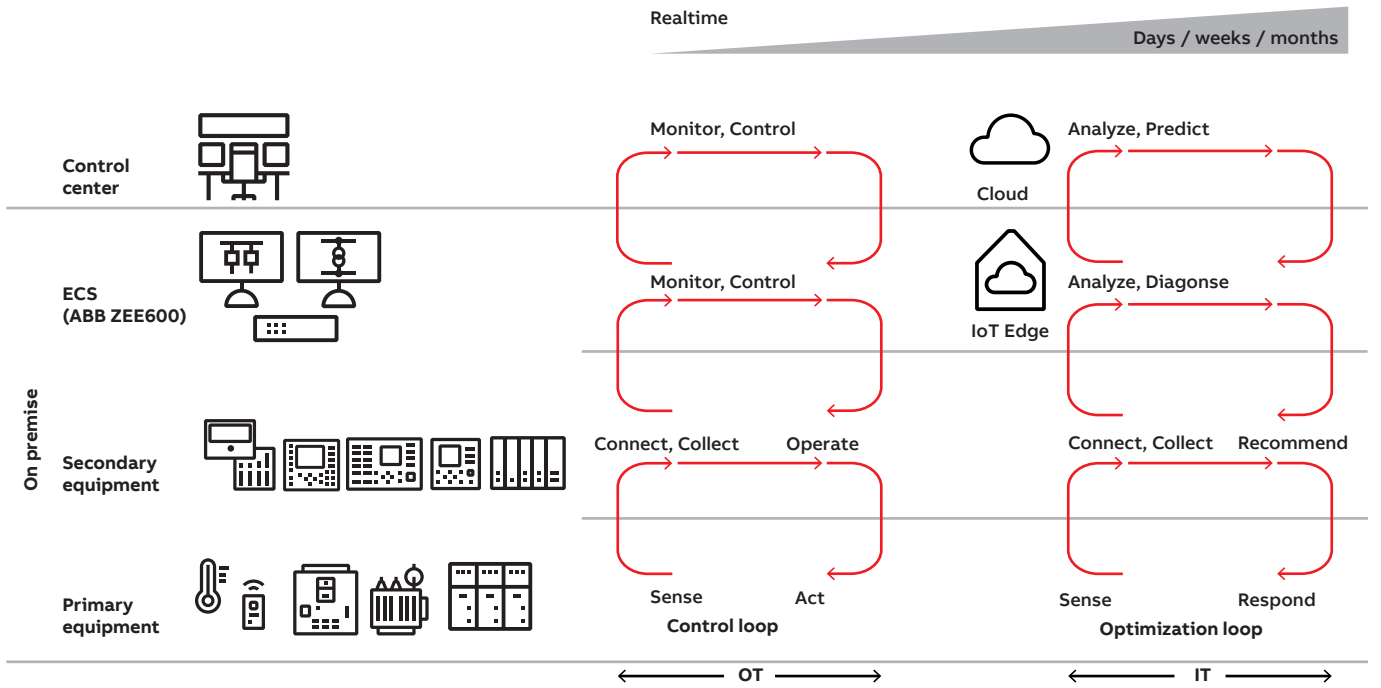

Figure 6. ABB ZEE600's deployment FLEXIBILITY

Figure 7. An integrated OT-IT approach with ABB ZEE600
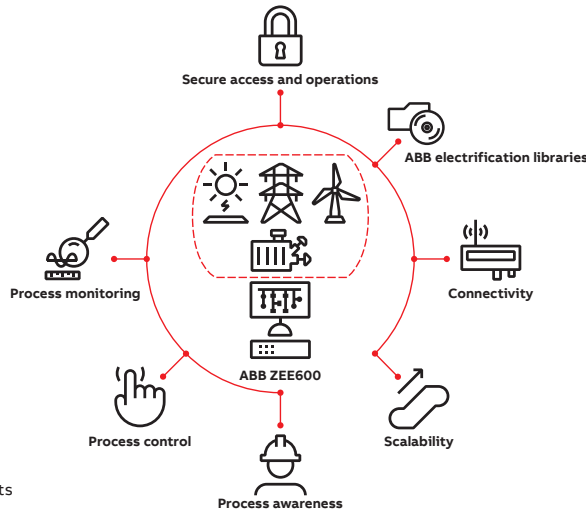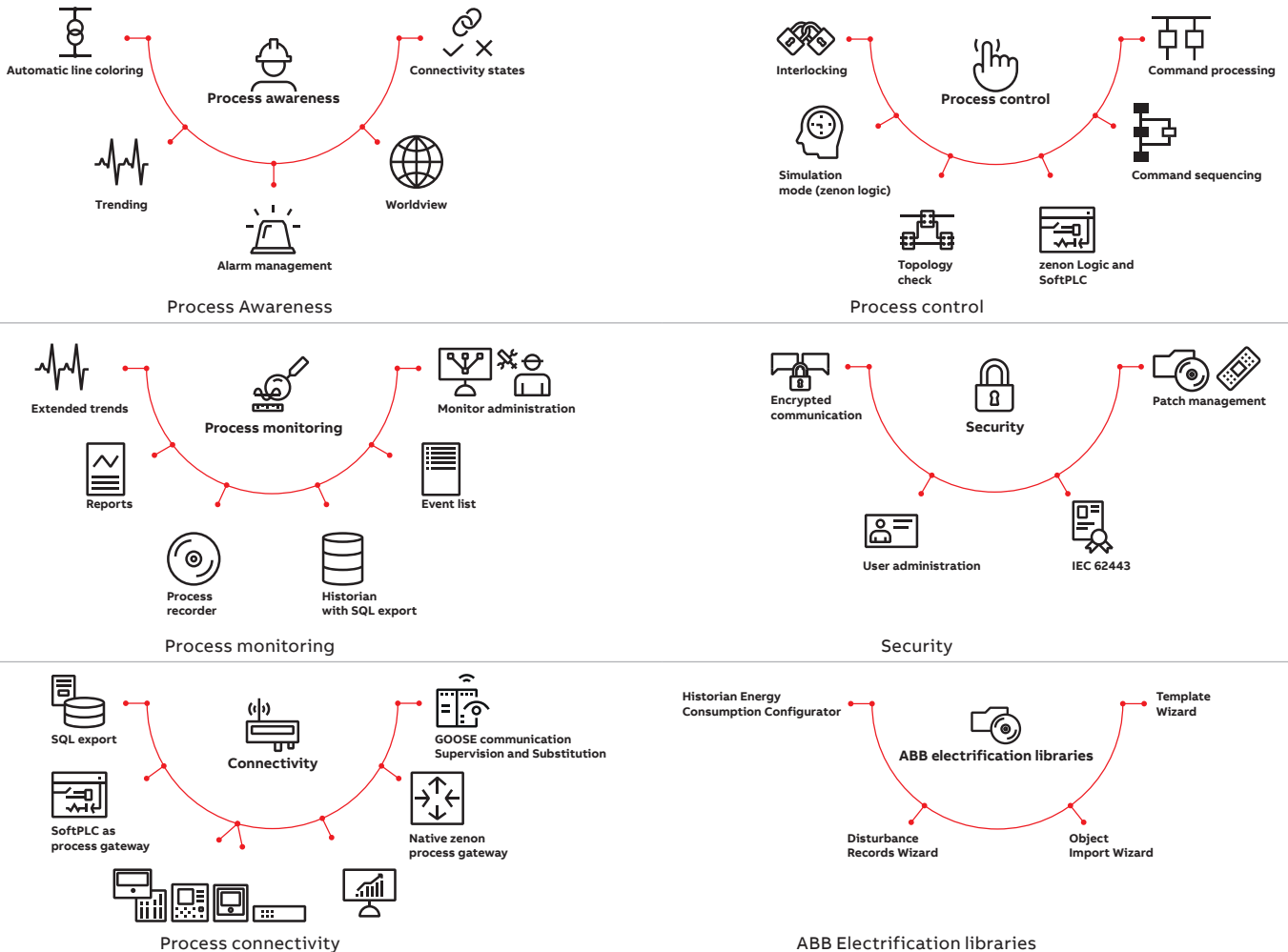
Features
A 360°degree view

Secure access and operations

ABB electrification libraries

Process monitoring

Connectivity

ABB ZEE600

Process control

Scalability

Process awareness

Figure 8. ABB ZEE600's versatile aspects

Constituent functionality

Process Awareness

Automatic line coloring

Connectivity states

Process awareness

Trending

Worldview

Alarm management

Process control

Interlocking

Command processing

Process control

Simulation mode (zenon logic)

Command sequencing

Topology check

zenon Logic and SoftPLC

Process monitoring

Extended trends

Monitor administration

Process monitoring

Reports

Event list

Process recorder

Historian with SQL export

Security

Encrypted communication

Patch management

Security

User administration

IEC 62443

Process connectivity

SQL export

GOOSE communication Supervision and Substitution

Connectivity

SoftPLC as process gateway

Native zenon process gateway

ABB Electrification libraries

Historian Energy Consumption Configurator

Template Wizard

ABB electrification libraries

Disturbance Records Wizard

Object Import Wizard

Figure 9. Overall Single line diagram (ANSI)
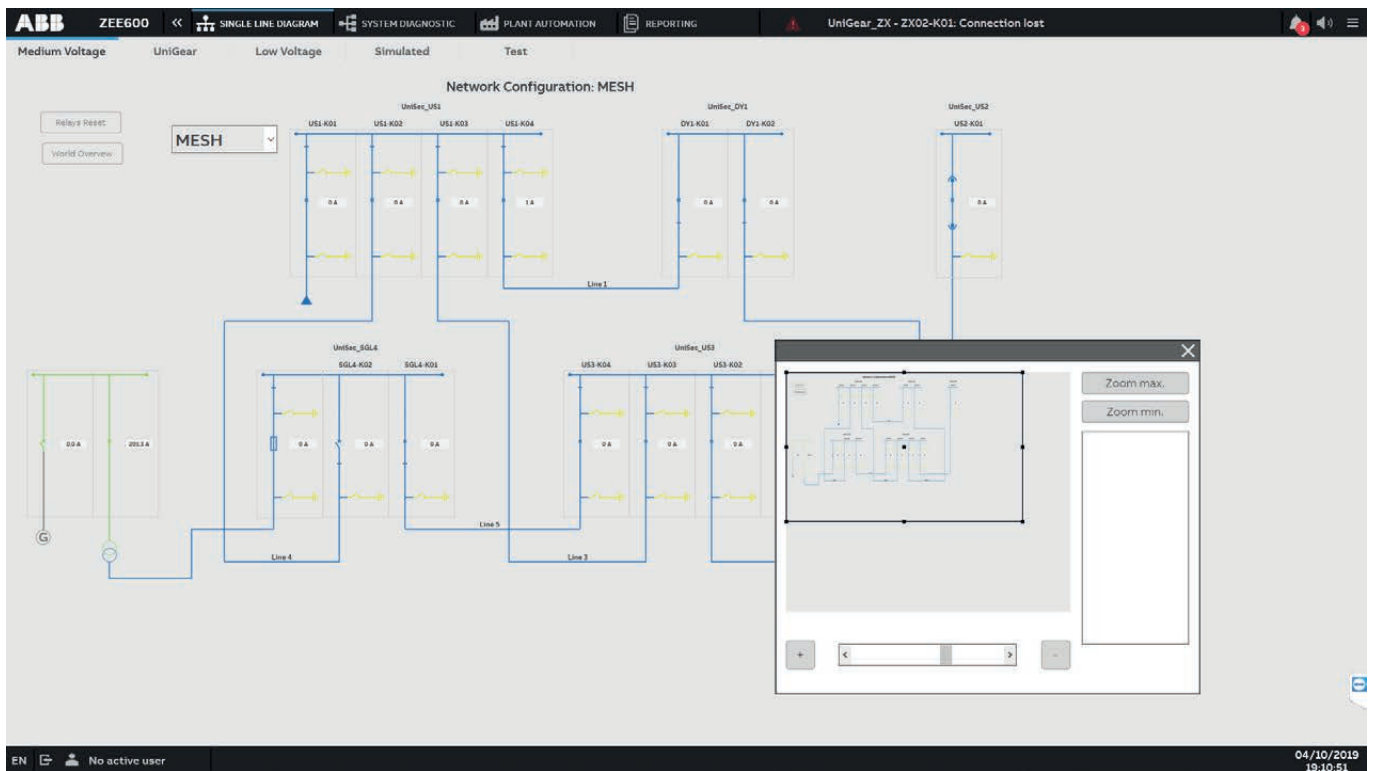
Figure 10. Overall SLD (IEC) with worldview
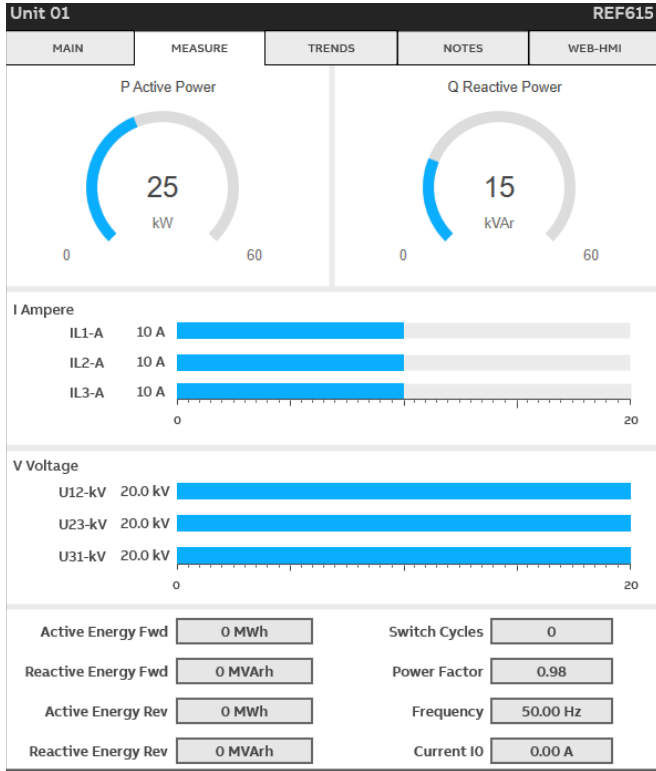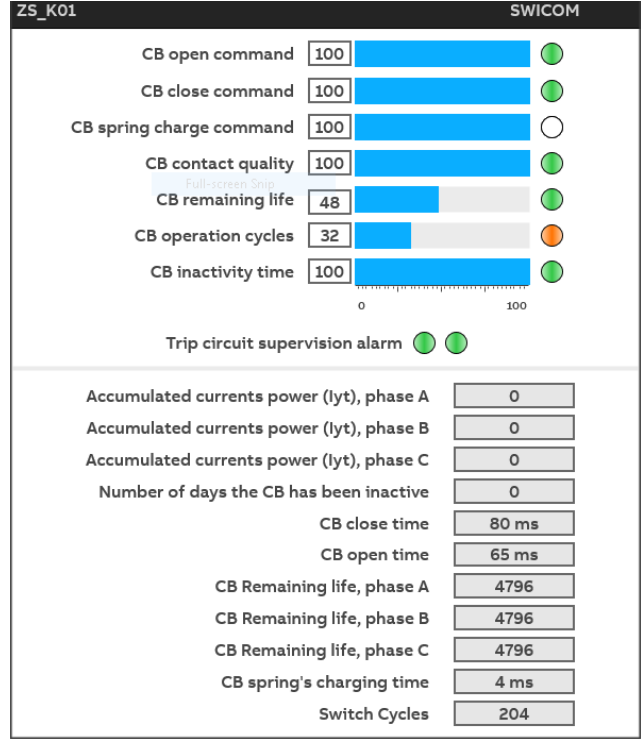
Figure 11. Bay measurements display

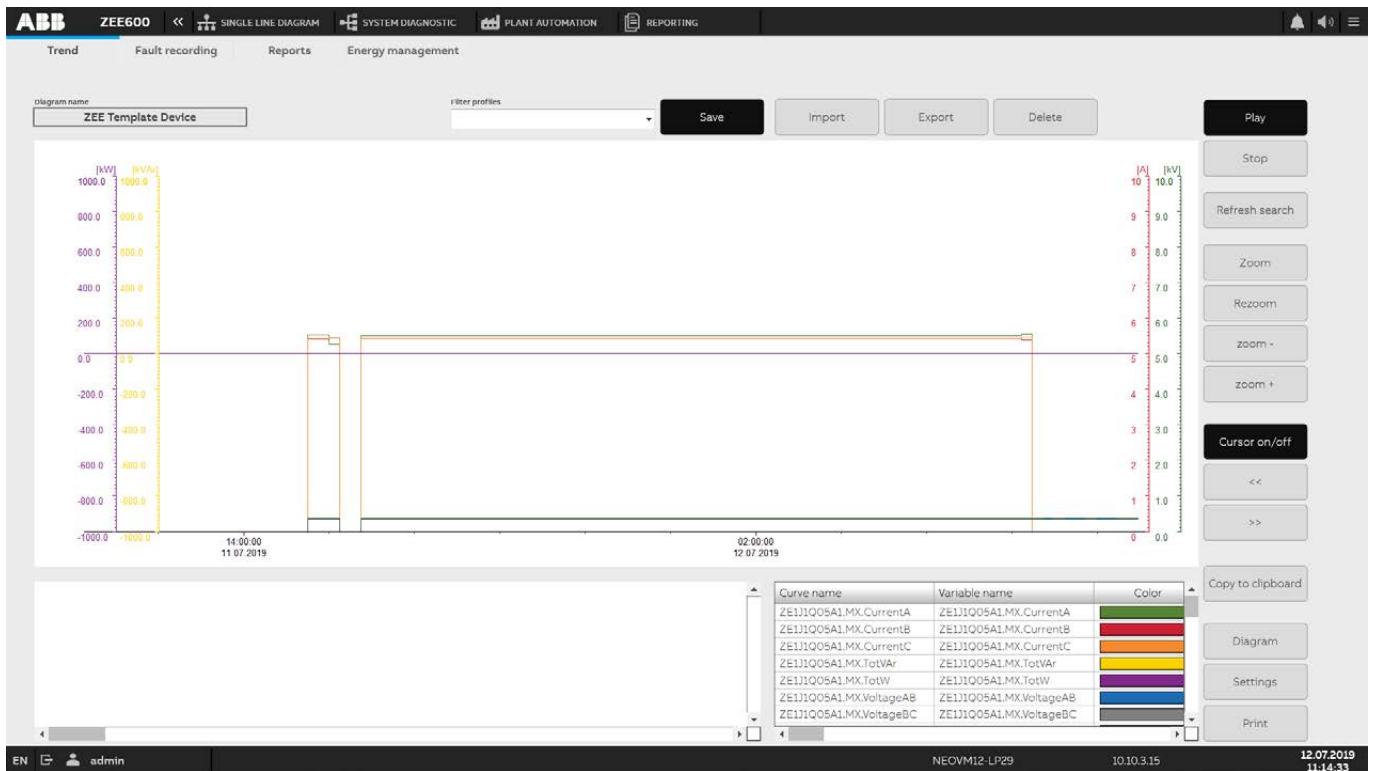Figure 12. Circuit breaker condition monitoring data from SWICOM

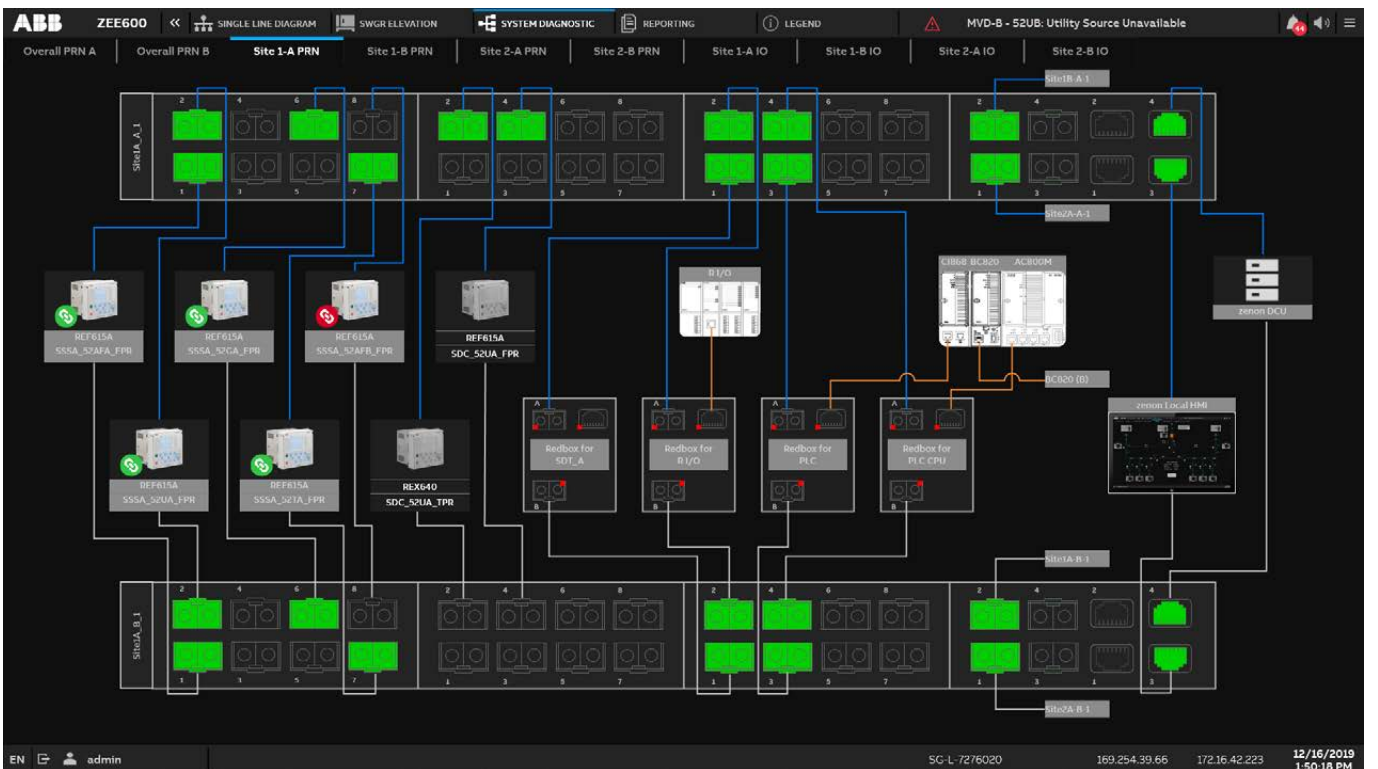Figure 13. Trends page

Figure 14. Disturbance record page

Figure 15. 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**

Figure 16. Utility customer segments

- **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**
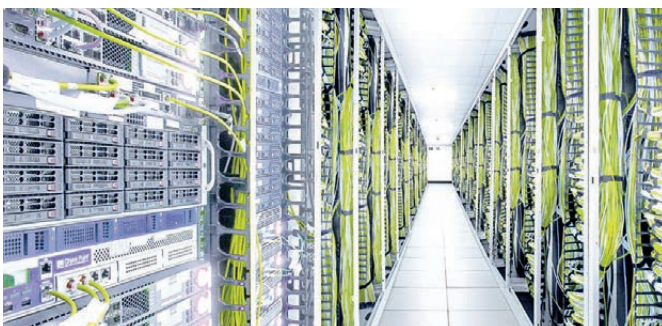
- By supporting seamless redundancy using **Parallel Redundancy Protocol (PRP)**, ABB ZEE600 ensures a robust communication solution, when in combination with other substation devices on the IEC 61850 network. – **Efficiency**
- The **reporting feature** enables precise and reliable logging and archiving 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-to-speech 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.
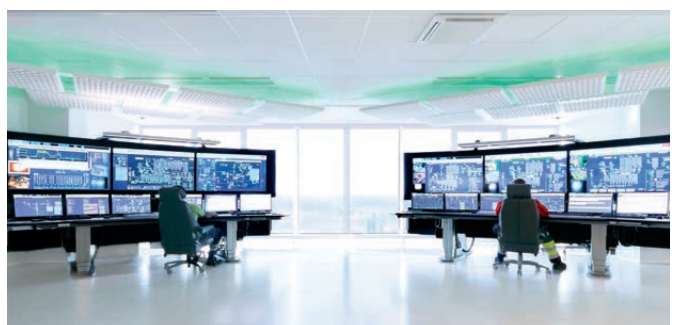
- Industrial **communication** protocol **capabilities** such as OPC (DA, UA), Profinet, Profibus, KNX and BACnet further add to the possibilities of increased integration of electrification automation systems and process automation systems (DCS), building automation systems, fire alarm systems etc. 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 17. Industrial and Infrastructure customer segments

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2NGA000200 A 12.2019