Distribution Automation Solution
with RTU500 series

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Agenda

Distribution Automation, Trends and Challenges?
Fault Management
Voltage control
Solution together with primary equipment
Integration of Renewables into the grid
RTU500 Series - Our offering
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### Distribution Automation

**The Global Market Trends**

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<th>Applications Challenges and Solutions</th>
<th>Automation Applications</th>
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<td>• Distributed generation resulting into new integration challenges</td>
<td>Utility - Secondary substation and feeder</td>
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<td>• Need to deal with new protection and automation phenomena whilst maximizing efficiency</td>
<td>• Remote monitoring and control</td>
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<td>• Huge investment in distribution automation application</td>
<td>• Fault and outage management</td>
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<td>• Increasing power generation in some countries (e.g. China and India)</td>
<td>• MV and LV renewables integration</td>
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<td>• Middle East has been increasingly focusing on expanding its industry capabilities from raw material supplier to finished goods</td>
<td>• Battery energy storage</td>
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<td>• Huge challenges for complete ABB Grid Automation value chain, from product through to turnkey automation systems</td>
<td>• Volt/VAr optimization</td>
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<td>• Demand response/ Advanced metering infrastructure</td>
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<td>Industry and Infrastructure</td>
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<td>• Load shedding, automatic transfer switch, power quality and harmonics</td>
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<td>• Fault loop location and topography</td>
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What is important for your business?

Distribution Automation Solutions

- Reduce outage time
- Existing Automation
- Voltage Control

- Bundle with primary equipment
- Integration of Renewables
Distribution Automation market

Utilities - Applications

**Fault management**
Reduce outage time

**Volt-VAr management**
Real-time power losses optimization

- Voltage control
- Line voltage regulation
- Monitoring of voltages and currents
- Remote control
- Fault indication
- Protection
- Voltage control
- Fault indication
Portfolio and Application overview

Monitoring Control and Measurement

Functions

- Remote Monitoring and Control
- Fault detection and direction information
- Power quality
- Low voltage and medium voltage energy measurements
- Detailed power flow analysis
- Central management of security events and user accounts
- Fault Detection, Isolation and Restoration of power (FDIR)
Portfolio and Application overview
Monitoring Control and Measurement

Benefits

- Use existing infrastructure to its full potential
- Accurate awareness of the status of the distribution network
- Improved operational efficiency (SAIDI (System average Interruption Index), SAIFI (System Average Interruption Frequency Index))
- Minimizing the outage time
- Reduction of non-technical losses
Portfolio and Application overview

System protection

**Functions**

- Remote monitoring, control, measurement and protection
- Fault Detection, Isolation and Restoration of Power
- Low and medium voltage energy measurements with highest accuracy
- Advanced fault location information for system restoration and verification
System protection

Benefits

– Improved safety for the utility personnel through exact fault location
– Minimization of the amount of energy not supplied
– Reduced number of outages in the event of faults
– Outages limited to a restricted part of the distribution
Fault management

- Fault Detection, Isolation and Restoration (FDIR)
- Outage management
- Real time location of earth and overcurrent faults in distribution networks
- User-friendly central management of security events and user accounts
- Workforce management

Advanced application for distribution network with standardized devices for maximum reliability and performance
Portfolio and Application overview

Fault management

Benefits

- Improved quality of service for end user
- Operational efficiency through better tools for operators and field crew
- Safety for the utility personnel through more exact fault location
- Use existing infrastructure to its full potential
- Improved operational efficiency (SAIDI (System average Interruption Index), SAIFI (System Average Interruption Frequency Index))
- Single solution for fast restoration of the entire grid
Decentralized Fault Detection, Isolation and Restoration
Pudong Smart City

Customer challenge
High reliability and reduced recovery time needed

ABB solution
Automatic FDIR with fast fault detection
Each device participate in the Fault Analysis action, independent from SCADA system
Use IEC 61850 GOOSE to transfer the necessary information for fault isolation
Use IEC 104 to transfer the events to SCADA System

Customer benefit
Reduced fault investigation and patrol time
Reduce the recovery time to 15 seconds only
Providing solution which can be easily extended

IEC 61850 GOOSE
Portfolio and Application overview
Volt-VAr management

Functions

- Enhanced voltage control
- Network reconfiguration
- Grid storage
- Conservation voltage reduction (CVR)

Keeping the voltages within the limits for reduced power losses and increased grid efficiency
Portfolio and Application overview
Volt-VAr management

Benefits
- Improved quality of power supply through better voltage profiles
- Reduction of technical energy losses
- Increase network hosting capacity
- Significant improvement of voltage control
- Most efficient utilization of the distribution network
Smart automation harmonizes multiple energy sources

Integrating renewable energy with ease

Customer challenge

A new solar plant with 134 kW was installed
Result was violation of voltage limits in LV grid
Distribution transformer did not have regulation function

ABB solution

ABB’s remote terminal unit as control unit within LV-LVR
Monitoring and control function adjust line voltage

Customer benefit

Improved power quality
Avoided to spend high costs for a new transformer
Operational savings
Cyber-secure communication
Solution together with primary equipment change

Distribution Automation Solutions

### MV/LV Distribution
- MV/LV Distr. station
  - Packaged solution for remote monitoring of a distribution substation
    - Endpoint station
    - Ring Main Units

### Main MV station - cities
- Main MV Station
  - Cities – underground line
    - Intelligent Compact Secondary Substation

### Overhead Lines
- Overhead lines
  - Outdoor apparatus
    - Sectos
    - Recloser
    - Outdoor CB (PVB)
Solution together with primary equipment change

Distribution Automation Solutions installation with RMU example

Inside of encloser
- Safelink automation
- Outdoor enclousure

Inside of RMU
- Old aplication in IN
- RTU 511 (but principle could be reuse again)

On side of RMU
- CSS (metal or concrete)
- Position on side
RiesLing - Implementation of an intelligent grid control
Predictive Load Flow based on forecasts of DER‘s

**Customer challenge**
- New challenges caused by high share of distributed energy resources (DER)
- Voltage control and optimization
- Implementation of automation equipment in secondary substations

**ABB solution**
- Equipment for monitoring, voltage control and fault detection
- Predictive Load Flow based on forecasts of DER’s
- Topology change by remote controllable RMU via MicroSCADA Pro/ DMS600

**Customer benefit**
- Modular, scalable solutions
- Detection of bottlenecks and voltage problems in advance
Integration of Renewables into the grid

Distribution Automation Solutions

Solar Parks

- Solar plants < 30 kW
  - Reduce the feed-in power in the event of imminent system overload or
  - Limit the maximum P feed-in to 70% of the installed power

Wind Parks

- Solar plants between 30 and 100 kW
  - Reduce the infeed remotely at any time in the event of imminent system overload

Hydro power plants

- Small hydro power plants <100 kW
  - 25% of power generation from renewables by 2018
  - Growth on non-hydro renewables for 8%
Wind park – application example with RTU540
Thai solar plant
Energy from sun, delivered by ABB

Customer challenge

Amongst the largest installation using thin-film photovoltaic panels

ABB solution

- RTU (Remote Terminal Units)
- MicroSCADA Pro
- Meteorological sensors collect and combine information with the power being generated
- Live updates to the national grid

Customer benefit

- Improve the reliability of the operation and its efficiency
- Disturbances to be quickly identified
RTU500 series applications
Intelligence distributed across your power grid

RTU500 series modules

RTU500 series functions and software

RTU560 product line
RTU540 product line
RTU520 product line

Feeder automation
Secondary distribution substations
Primary distribution substations
Transmission / sub transmission
RTU500 series
Cyber security

New features

Overview and Benefits

– Secure the communication by encryption in the complete application
  • Secure IEC870-5-104
  • Support of customer certificates

– Unauthorized access to network prevented, protect the SCADA system
  • Secure authentication IEEE802.1X
  • Integrated self configurable firewall

– Maintain and Monitor by using SDM600 in the RTU560
  • Backup and recover configuration and firmware files remotely ¹)
  • Centralized cyber security logging

¹) Requires RTU500 Release 12 and SDM600 1.2
RTU500 series
Unique integrated test function

Traditional testing approach

- Complex
- Time consuming
- High operational costs

With integrated test function

- Easy & Safe testing environment
- Additional hardware no longer required
- Automatically generated Test reports
- Significant cost reduction during engineering, testing, commissioning, FAT, SAT processes
RTU500 series

New WEB server

User centric approach to improve usability for untrained users

Feature
– State of the art technology is used (HTML5 based)
– Guided workflows
– Multi language support

Benefits
– Improved usability
– Simplification of user interface
– Future open and harmonized solution
Clear split between
- engineering (pre engineered solution) and
- final configuration (change of local parameters)

Benefit
- Simple adaptation of typical solution to local conditions without special know-how
- Also possible from Remote
- Saves costs during project execution
The offering

**Products**

All the essential distribution automation elements from high voltage to low voltage exist to meet the challenges

**Engineered packages**

Primary, secondary and communication equipment packaged together and factory tested

**Trunkey Systems**

Complete and coherent solution from automation, electrical distribution to grid connection

Service team to support planning, engineering, project, commissioning and maintenance
Questions

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Flexible and ready to use solution
Seamless integration of renewables in a higher control system

Customer challenge
- Monitoring and control of renewable sources
- Secured communications

ABB solution
- Engineered packages with GPRS communication and connection to SCADA
- Better grid visibility

Customer benefit
- Cyber-secured communication
- Scalable and flexible solution

Stadtwerke Lindau, Kraftwerke Mainz – Wiesbaden, RWW and MVV, Germany
**Sundom Smart Grid - Sustainable energy solutions integration**
Enhance reliability of overhead lines with grid automation

**Customer challenge**
- Enable integration of renewable sources
- Enhance distribution reliability and efficiency
- Reduce the need for infrastructure investments

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**ABB solution**
- Automatic FDIR with fast reclosing shorten average fault duration and frequency
- Reclosers provide protection of cable networks from faults in overhead lines

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**Customer benefit**
- Less outages
- Shorter duration
- Boosted customers satisfaction
- Less penalties

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Vaasan Sähkö, Finland

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Distribution Automation Solutions with RTU50U series
Distribution Automation

Overview of automation

Utilities and renewable integration

Extend automation beyond substation zone, downstream in MV and LV grid

Ensure reliability of power energy delivery and increase efficiency utilizing integrated control and enterprise software

New automation extend automation more downstream in MV and LV grid