ABB OEM Days 2014
From components to smart solutions
Technical session
From components to smart solutions

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- Speaker title: PPMV Smart Grid Leader
- Company Name: ABB
- Location: Lake Mary, USA

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- Title: Smart Grid Program Manager
- Company Name: ABB
- Location: Dalmine, Italy
Smart grids for distribution networks
Focus is on distribution grid automation

Traditional automation areas

- Distribution control centers
  - Network management SCADA/DMS
  - Outage management
  - Workforce management
- Substation automation – HV/MV
  - Integrated protection, control and monitoring

Recent Technology and Market Changes

- Communication technology
- Distributed generation
- Government regulations
- Efficiency and performance benefits (voltage regulation)
- Secondary distribution – fault passage indication, voltage regulation
- Asset management
Smart grids for distribution networks
Customer requirements for Smart Grid

| Capacity       | Upgrade/install capacity economically
<table>
<thead>
<tr>
<th></th>
<th>Provide additional infrastructure (PHEVs, Renewables)</th>
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</thead>
</table>
| Reliability   | Stabilize the system and avoid outages
|                | Provide high quality power all the time |
| Efficiency    | Improve efficiency of power generation
|                | Reduce losses in transport and consumption |
| Sustainability| Connect renewable energy to the grid
|                | Useful life of products as technology changes |
| Safety        | Eliminate or reduce risk of harm or injury |
A smarter grid
OEM equipment for industrial and utility customers

- Reclosers, switches & disconnectors
- Transformers
- Energy storage systems
- Switchgear
- Circuit breakers
- Grid automation equipment
- Protection relays & substation controllers
- Instrument transformers, sensors, arresters
- Utility communication
- Capacitor banks
- Software Tools
A smarter grid
Medium voltage packages for industrial and utility applications

Hardware
- Apparatus & switchgear
- Sensors and Instrument transformers
- Monitoring and protection

Automation products and communication
- Connectivity & communications
- Automation & control
- Analytics and decisions

Breaker
Switchgear
Reclosers

- Current
- Voltage
- Surge arrestors
- Temperature
- Ferro-resonance damping
- Arc flash

Protection relays
I/O
RTU’s

Gateway
Data aggregator
Web server
Application software
Product manuals & operator instructions
Wireless communications

One line diagram display
Device state
Automation for self healing, voltage control/regulation

Performance monitoring
Asset health analytics
Alarming, Notifications
Building solutions for industrial & utility customers
Four functional classes for indoor and outdoor solutions

- **Protection selectivity**
  - Level 4: Line circuit breakers

- **Power flow management**
  - Level 2: MV switch operation

- **Fault isolation**
  - Level 1:
    - Monitoring: MV fault and switch indication, LV measurement

- **Situational awareness**
  - Level 3:
    - Measurement: Accurate MV measurements
  - Level 2:
    - Monitoring: MV fault and switch indication, LV measurement
  - Level 1:
    - Monitoring: MV fault and switch indication, LV measurement

- **Control**
  - Level 4:
    - Monitoring: MV fault and switch indication, LV measurement
  - Level 3:
    - Measurement: Accurate MV measurements
  - Level 2:
    - Control: MV switch operation
  - Level 1:
    - Monitoring: MV fault and switch indication, LV measurement
Building solutions for industrial & utility customers
Benefits through levels of solution offering

<table>
<thead>
<tr>
<th>Functional level</th>
<th>Customer benefits</th>
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</table>
| Level 4 Protection| ✓ Selective protection  
                          ✓ Integration of distributed generation (DG) |
| Line circuit breakers |                      |
| Level 3 Measurement| ✓ Real time power flow data  
                          ✓ Safe network reconfiguration |
| Accurate MV measurements |                      |
| Level 2 Control | ✓ Fast fault isolation and power restoration |
| MV switch operation |                      |
| Level 1 Monitoring | ✓ Faster fault localization  
                          ✓ Reliable switching status information |
| MV fault and switch indication  
                          LV measurement |                      |
Level 2 solution example
SafeRing with integrated intelligence

- Modbus
- FPI's and LV multi-meters
- I/Os
- GPRS, 3G, ... fiber, private wireless – ABB/Tropos
- Battery back-up
- IEC 104
- VPN

Level 2

- Control
  - MV switch operation
- Monitoring
  - MV fault and switch indication
  - LV measurement
Level 3 solution example
Outdoor apparatus with cabinet

- Measurement
  - Accurate MV measurements
- Control
  - MV switch operation
- Monitoring
  - MV fault and switch indication
  - LV measurement

- Senses
  - CT/VT
- Modbus
- IEC 104
- GPRS, 3G, …
  - fiber, private
  - wireless
  - ABB/Tropos
- VPN
Level 4 solution example
UniSec with integrated intelligence

Level 4

Protection
- Line circuit breakers

Measurement
- Accurate MV measurements

Control
- MV switch operation

Monitoring
- MV fault and switch indication
- LV measurement

GPRS, 3G, … fiber, private wireless – ABB/Tropos

VPN

IEC 104

IEC 61850

Battery back-up

Extended I/O’s
Sensor modules
I/O’s
Sensors

Accurate MV measurements
MV switch operation
MV fault and switch indication
LV measurement
Smart Lab
Configuration

- Equipped with all the basic equipment found in distribution networks:
  - wireless network communication, SCADA, MV transformer with tap changer, inverter, solar panels and LV circuit breaker with IEC 61850 communication

- The simulation model enables multiple scenarios and observes the behavior of protection and automation equipment when faults occur in different sections of the network
ABB’s grid automation products and solutions
Optimal solution for entire value chain

- Relay products
- IED solutions
- Integrated switchgear
- Integrated RMU
- Smart CSS
- System integrator
- OEM
- Industrial/utility customer
Using the Center of Excellence and Smart Grid Lab

New market positioning

<table>
<thead>
<tr>
<th>OEM needs</th>
<th>ABB solutions</th>
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<tbody>
<tr>
<td>Multiple protocols and migration to a single</td>
<td>System with multiple protocols converted to</td>
</tr>
<tr>
<td>communication standard (IEC 61850)</td>
<td>IEC 61850 platform</td>
</tr>
<tr>
<td>Support OEM manufacturers growth</td>
<td>Integration lab connects different components and validates operation as one</td>
</tr>
<tr>
<td>Lack of automation expertise</td>
<td>platform</td>
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<tr>
<td>Resource constraints</td>
<td>Expertise in distribution automation available</td>
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<tr>
<td>Selling bundled solutions</td>
<td>Engineering support for configuration</td>
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<td>Support to develop standard solutions</td>
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<td>Sales training and marketing collateral available as well as support when</td>
</tr>
<tr>
<td></td>
<td>using ABB components</td>
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- Reliability
- Distributed generation
- Better customer service
# Relion® product family
Best fit for every need

## Series Highlights

<table>
<thead>
<tr>
<th>Series</th>
<th>Highlights</th>
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<tr>
<td>670/650</td>
<td>Flexibility, performance and ease of use from ready-to-use solutions for generation, transmission and sub-transmission applications</td>
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<tr>
<td>630</td>
<td>Flexibility and performance for demanding applications</td>
</tr>
<tr>
<td>620</td>
<td>Expandability and performance</td>
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<tr>
<td>615</td>
<td>Compact with powerful standard configurations</td>
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<tr>
<td>611</td>
<td>Preconfigured solutions and Web HMI</td>
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<tr>
<td>610</td>
<td>Protection for dedicated applications</td>
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<tr>
<td>605</td>
<td>Simplicity for protection</td>
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Grid automation
RER601/603 - overview

- For collection of monitoring information from secondary substation, both from hardwired (RER603) or serial communication (RER601/603)
- Offers a seamless upgrade
- Able to communicate with control center using wireless public network GPRS
- RER 603 one switching device to control open and close
Grid automation
REC601/603 - overview

- For monitoring and control switching in secondary substation, both from hardwired and serial communication
- Able to communicate with control center using wireless public network GPRS
- It can control from 1 (REC601) up to 3 (REC603) bays of secondary switchgear with switch disconnector
- Advanced battery charger always included
Grid automation
RER615/REC615 - overview

- Able to control one CB bay and up to 3 switch disconnector bays (only with REC 615)
- Advanced smart grids functionalities like load shedding and power quality
- Supports IEC 61850, IEC 60870-5-101, IEC 60870-5-104
- Available for connection with traditional CTs, VTs and innovative combined current and voltage sensors
Remote I/O unit RIO600
Overview of features

- IEC 61850 G.O.O.S.E. remote I/O, digital and analog signals
- Provides I/O extension flexibility to Relion® protection relays ensuring improved functionality and performance
- A modular design
Device level

Loop automation (Loop Control - no communications)
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Device level
Loop automation (Loop Control - no communications)
Device level
Peer-to-Peer (61850 GOOSE, Communication)
Device level
Peer-to-Peer (61850 GOOSE, Communication)
Take away from this session
Products and resources to support OEM manufacturers

- OEM’s and system integrators can select ABB products and assemble elements into a “smart” solution.
- Resources available to support application design, component selection, assembly considerations
- Software tools and documentation available
- Smart Lab available to support your needs
Power and productivity for a better world™