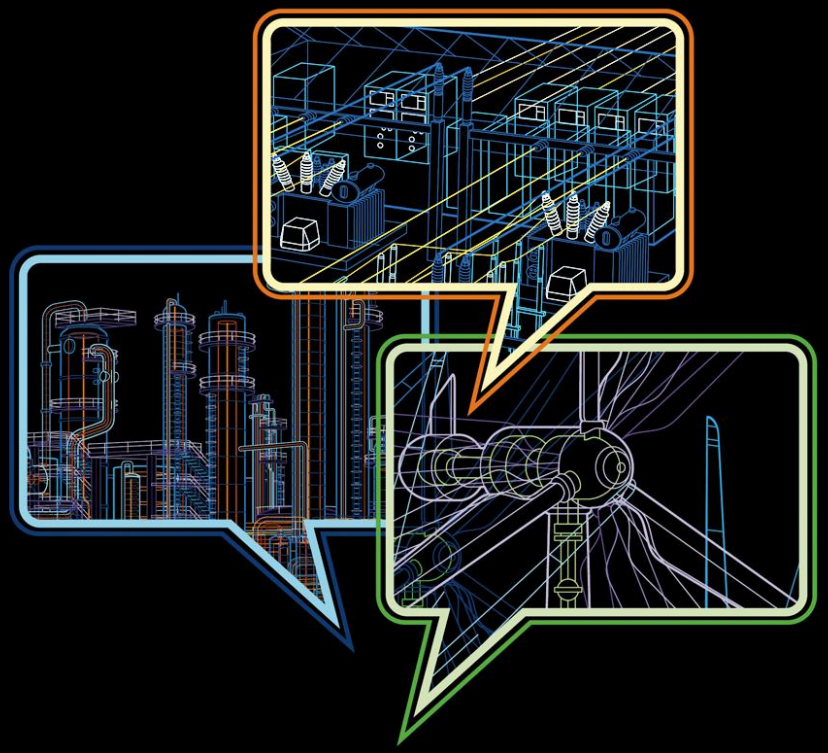


ABB Automation & Power World: April 18-21, 2011

WPO-123-1
MV outdoor products for smart grid demands

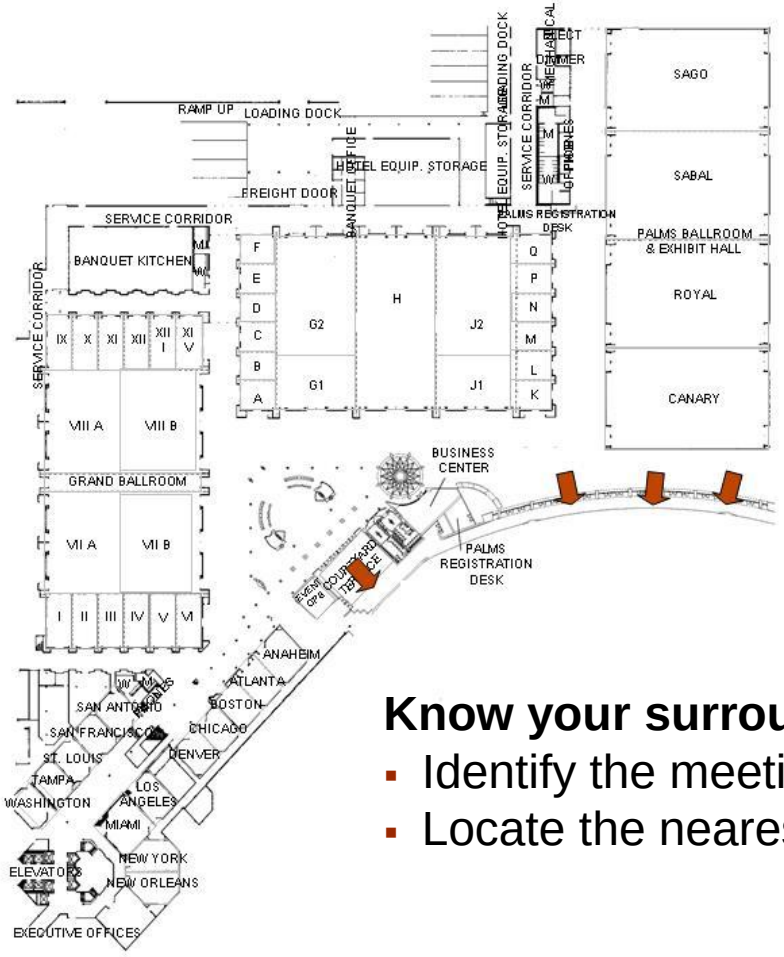
WP0-123-1
MV outdoor products for smart grid demands

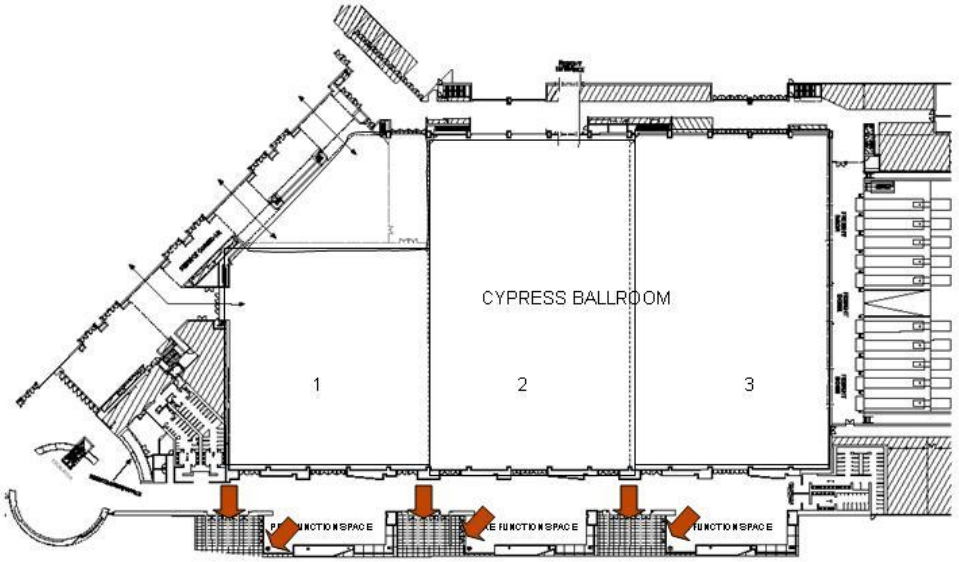
- Speaker name: Cleber Angelo
- Speaker title: Global Product Manager
- Company name: ABB
- Location: Lake Mary, FL

Your safety is important to us
Please be aware of these emergency procedures

- In the event of an emergency please dial ext. 55555 from any house phone. Do not dial 9-1-1.
- In the event of an alarm, please proceed carefully to the nearest exit. Emergency exits are clearly marked throughout the hotel and convention center.
- Use the stairwells to evacuate the building and do not attempt to use the elevators.
- Hotel associates will be located throughout the public space to assist in directing guests toward the closest exit.
- Any guest requiring assistance during an evacuation should dial “0” from any house phone and notify the operator of their location.
- Do not re-enter the building until advised by hotel personnel or an “all clear” announcement is made.

Your safety is important to us
Convention Center exits in case of an emergency





Know your surroundings:

- Identify the meeting room your workshop is being held in
- Locate the nearest exit

Presentation agenda

- Introduction
- GridShield™ Recloser
- ReliaPad™ padmount circuit breaker
- AutoLink electronic sectionalizer
- Conclusion / Q&A

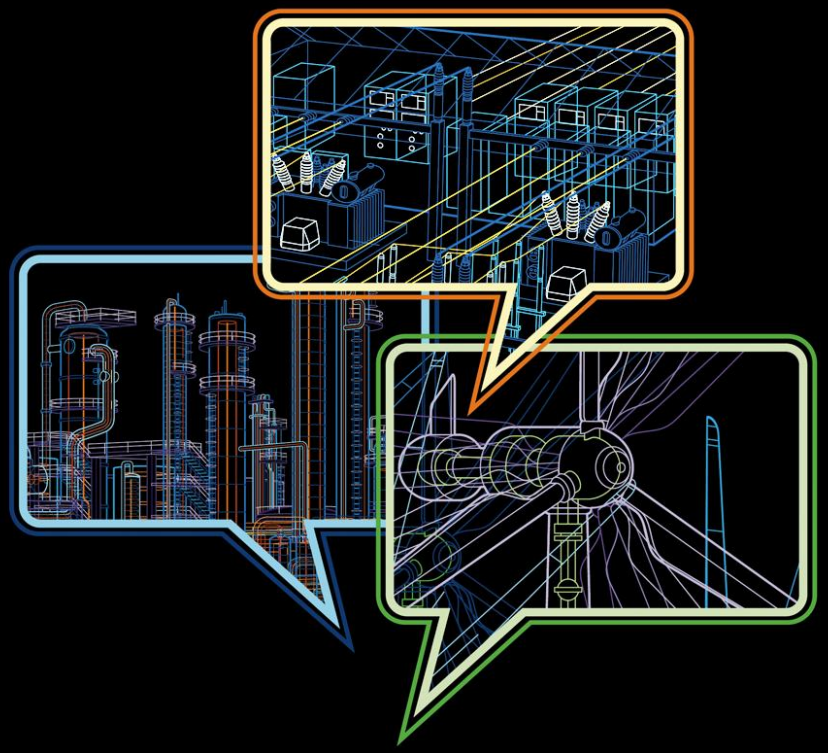


ABB Automation & Power World: April 18-21, 2011

GridShield Recloser
MV outdoor products for smart grid demands

GridShield recloser – general overview
MV outdoor products for smart grid demands

- 15/27 kV, 110-150 kV BIL, 800/1000 A Cont., 12.5 kA Interrupting
- Operate as recloser, sectionalizer, automated load break switch
- Capable of three- and single-phase operation
- High voltage cabinet
  - Modular pole design
  - Embedded voltage sensing
  - Electronic free
- Control cabinet
  - Standard and low profile sizes
  - RER620

GridShield Recloser
Construction

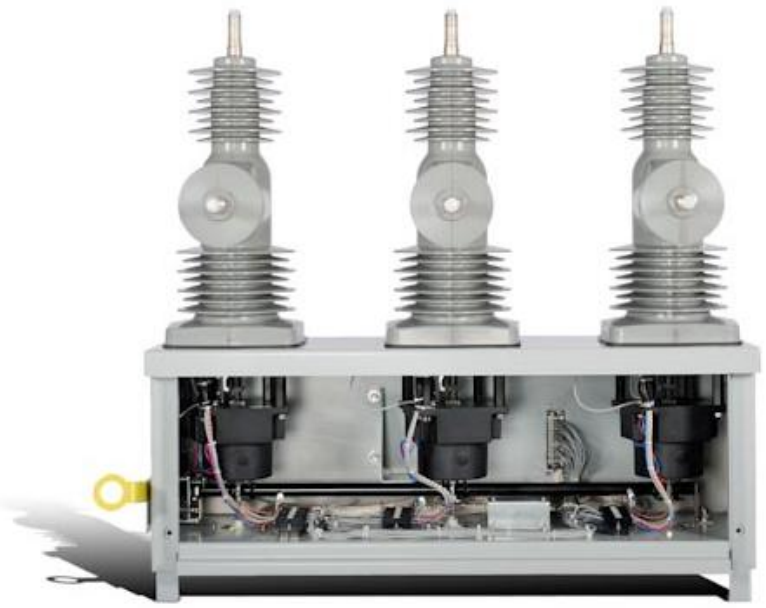
Corrosion Resistant Housings

- 304 Stainless Steel housing for HV unit
- Stainless steel housing for both Standard Control Cabinet & Low Profile Control Cabinet (LPCC)

Value

- Maintenance free housing
- No need to paint for corrosion resistance
- Increased life expectancy

GridShield Recloser
Construction



GridShield HV Unit

- No electronics in HV unit
  - Provides protection from thermal overload
  - Limits exposure to high voltage conditions that can damage electronics

Value

- Isolating electronics away from high voltage provides
  - Increased reliability & controller lifetime
  - Additional safety barrier from high voltage
- No maintenance required in HV unit
  - Electronics and batteries can be upgraded and/or replaced without a bucket truck
  - Decreased labor cost (no need to remove HV cabinet or isolate potentials to service recloser electronics)
  - Reduced Inventory Costs

GridShield Recloser
Construction

Control Cabinets

- Standard cabinet with a large mounting area for user desired equipment (such as communication equipment)
- Low profile cabinet for easy handling and installation

Value

- Flexibility in options
- Get the control cabinet that will suit needs

GridShield Recloser
The most powerful recloser control - RER 620

- Designed for over current and ground/earth fault protection
- Loop control module integrated
- Integrated IEC 61850 protocol
- High Impedance fault detection integrated

- Modulated Hardware design
- Removable case – Plug-in design
- Ideal for distributed generation
- Self Supervision
- Access controlled
- Member of ABB Relion™ relay family

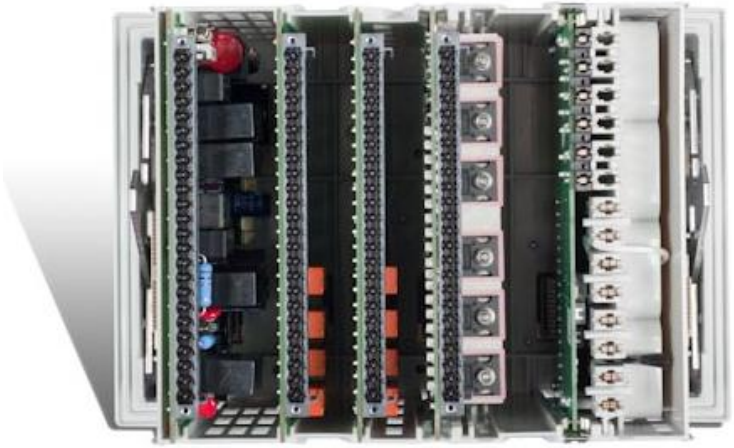
GridShield Recloser
Control

RER620 IED

- Part of Relion® family of ABB controls
- Drawout design and modular card assembly for quick and easy maintenance

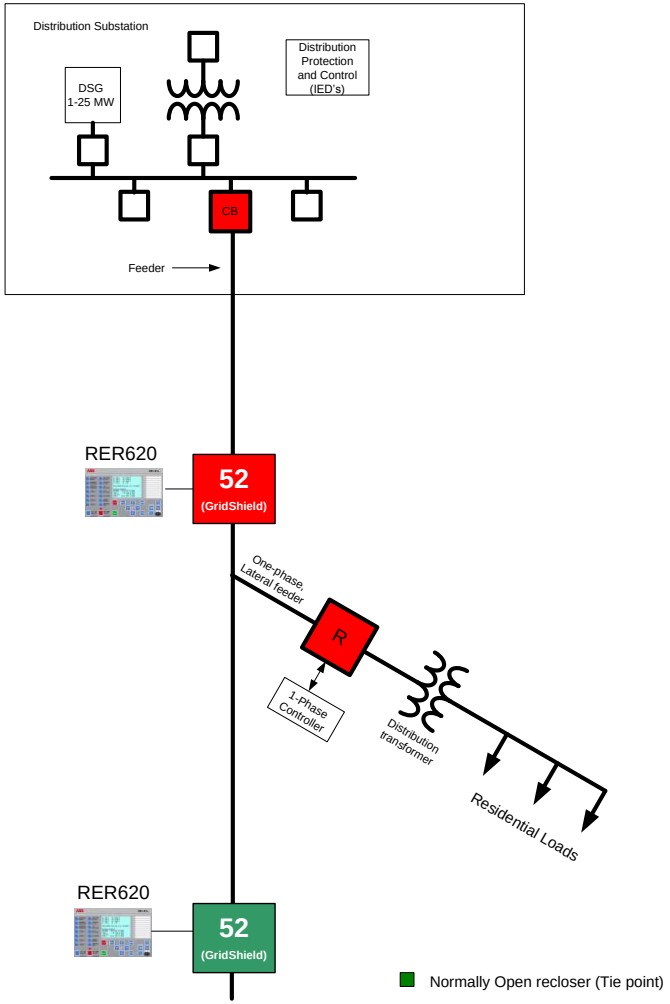
Value

- Part of an established and proven line of controls
- Withdrawable case makes reaching unit backs easier and quicker for service
- Quicker repair results in greater system reliability
- Added safety for maintenance personnel



RER620

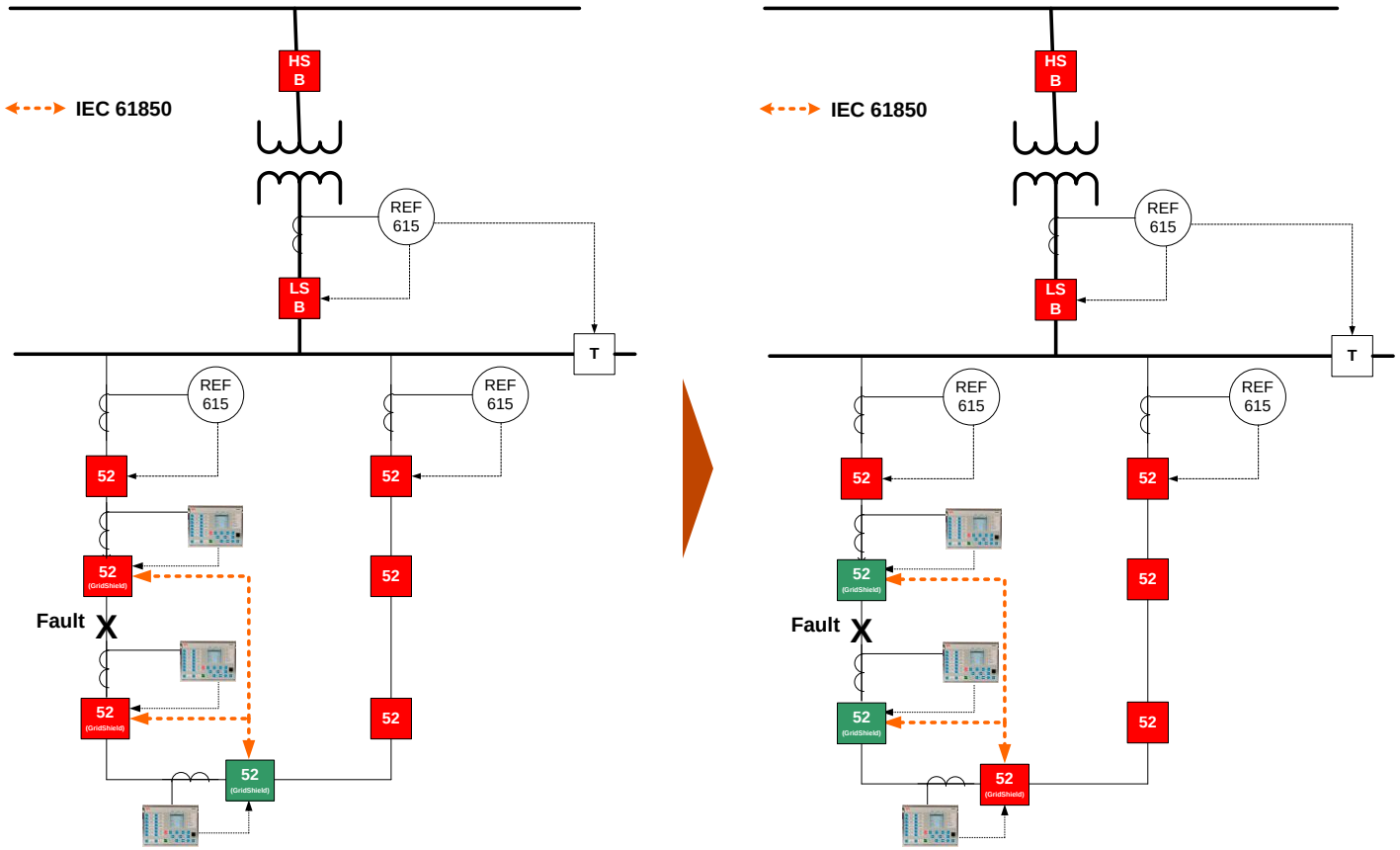
- Standard Application



- Designed for GridShield recloser applications calling for over-current, ground/earth-fault protection and automatic reclosing
- Main application areas:
  - Recloser in overhead line feeders in solidly grounded, resistance grounded, isolated or compensated networks
  - GridShield recloser as substation breaker in solidly grounded, resistance grounded, isolated or compensated networks

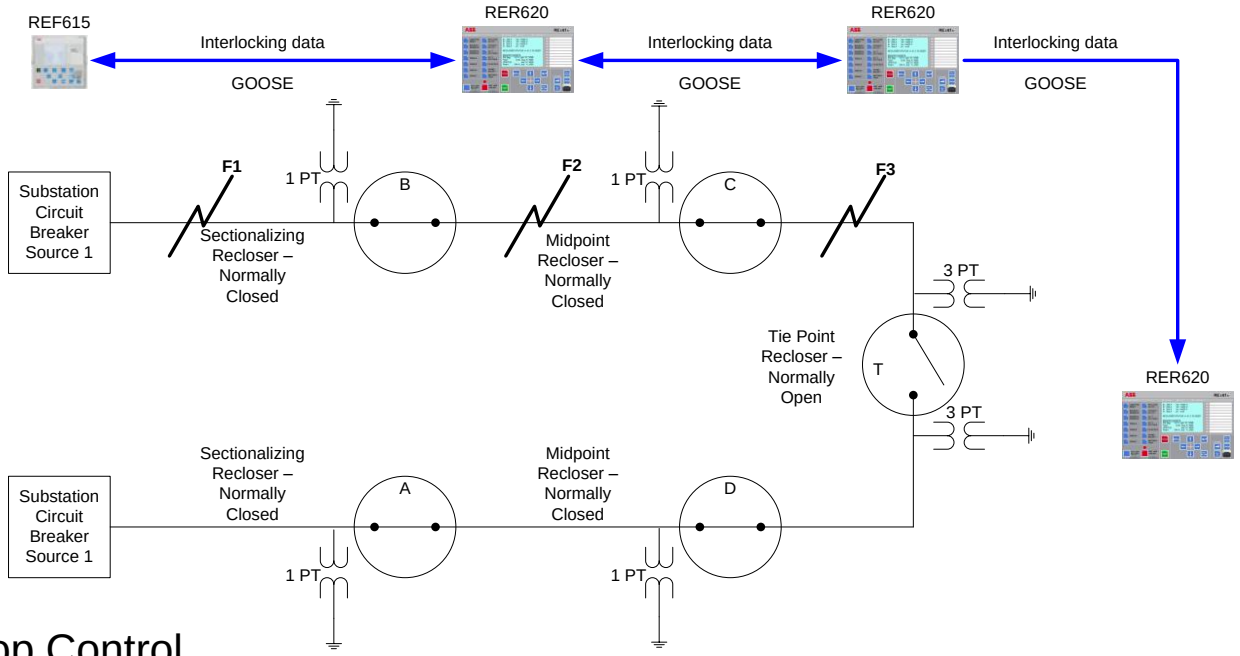
RER620

- FDIR



GridShield Recloser

Protection



Loop Control

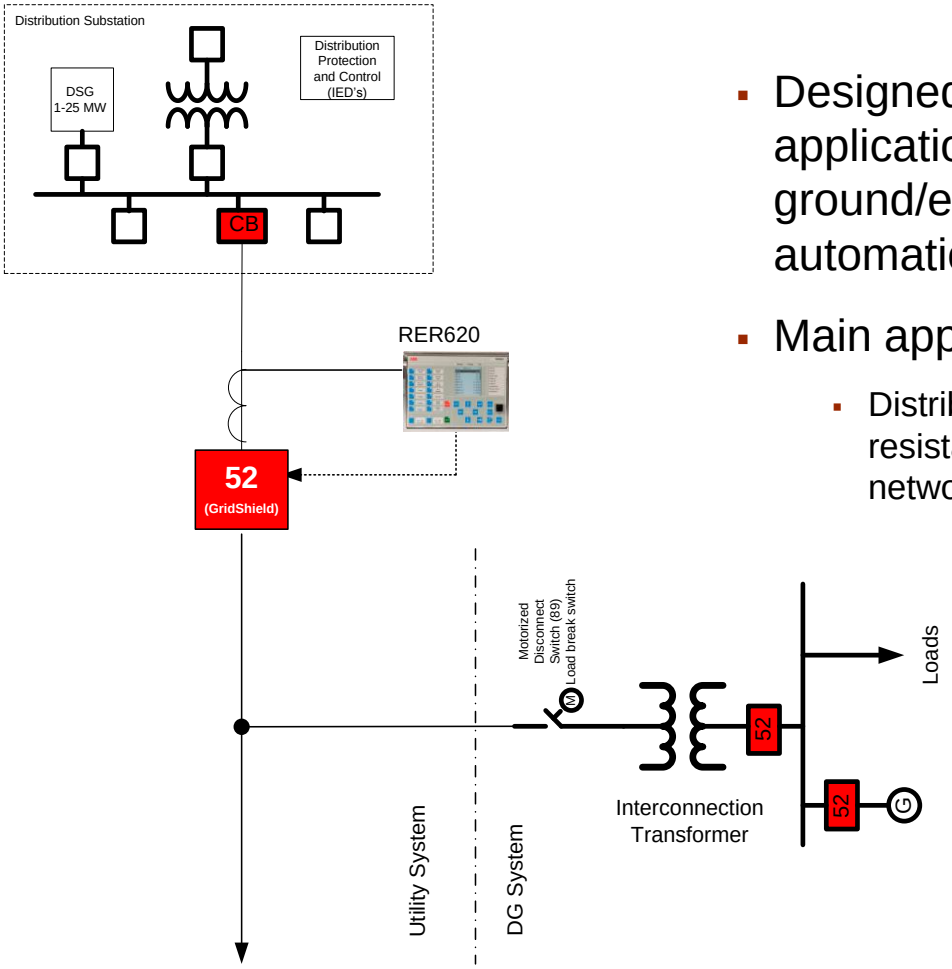
- Integrated traditional loop control based on voltage, overcurrent and reclosing sequence
- Advanced 61850 loop control scheme for fault detection, isolation and restoration (peer-to-peer)
  - Quicker than traditional loop control
  - Prevents excess reclosing

Value

- Quickly isolate faults
- Improve system reliability
- Prevent equipment from closing into a fault situation

RER620

- Distributed Generation

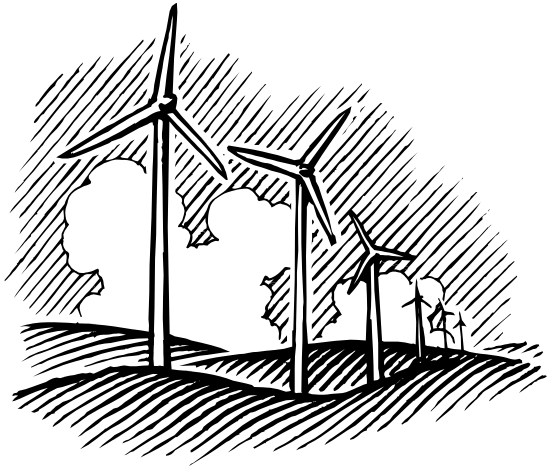


- Designed for recloser (breaker) applications calling for over-current, ground/earth-fault protection and automatic reclosing
- Main application area:
  - Distributed Generation (DG) in solidly grounded, resistance grounded, isolated or compensated networks

CB – Circuit Breaker

52 – Circuit Breaker or Recloser

GridShield Recloser
Protection



Embedded In-rush energy detection

- Eliminate unnecessary tripping from a distributed generation transformer initial current pull
- No communication equipment needed to inform relay of distributed generation connection

Value

- Increased system reliability and stability
- No additional communication equipment reduces cost

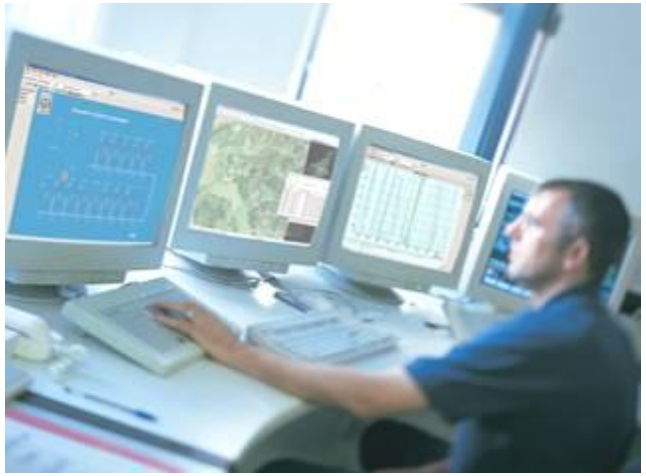
GridShield Recloser
Communication

IEC 61850

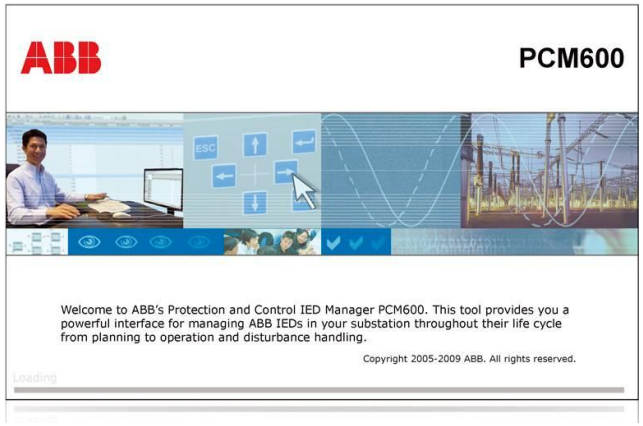
- Native support for communication between IED devices inside and outside of substations
- Enables GOOSE horizontal communication between IEDs

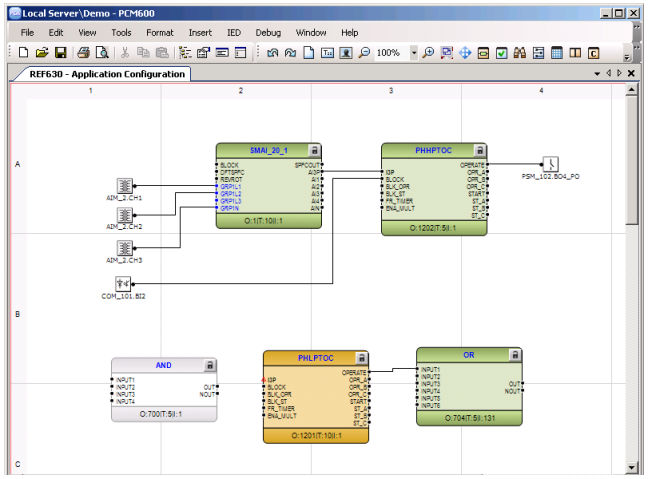
Value

- Non-proprietary protocol allowing communication between various devices
- Quick communication between devices, making peer-to-peer networking easy to implement.



GridShield Recloser
Control





PCM600 Tool Suite

- Powerful tool suite useable with or without being connected to the RER620
  - Application Configuration Tool
  - Graphical Display Editor
  - Disturbance Handling and more
- Create settings ahead of time and load onto IED via RJ-45 connection
- Develop recloser, sectionalizer and automated load break switch modes with Application Configuration Tool
- Import and export GOOSE messages

Value

- Make and implement changes at your leisure
- User has the ability to customize settings as much as desired

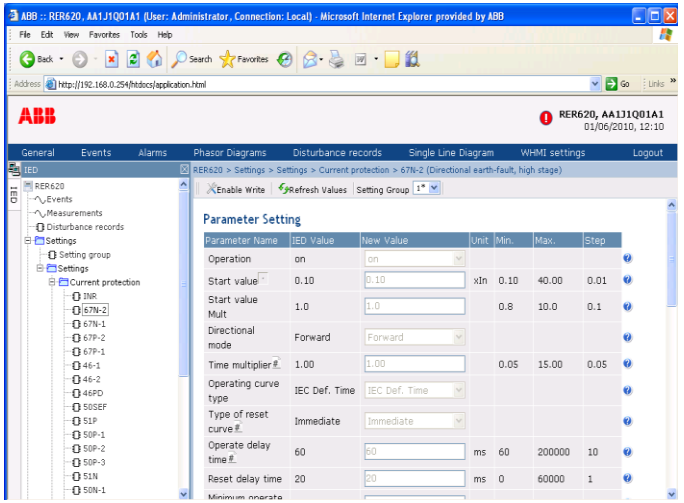
GridShield Recloser
Control

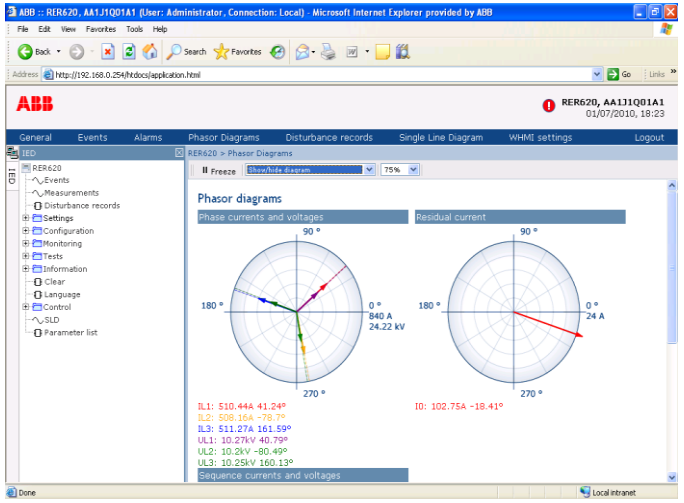
Web HMI

- Access RER620 via a web browser, locally or remotely
- No additional software needed
- View alarm LEDs, event lists, and measurements
- Read disturbance records
- Review phasor/tabular diagrams with various representations
- Freeze current and voltage measurements for a “snap shot” view during testing
- Set parameters and print settings

Value

- No need to be at location when using remote connection
- Quickly make settings changes





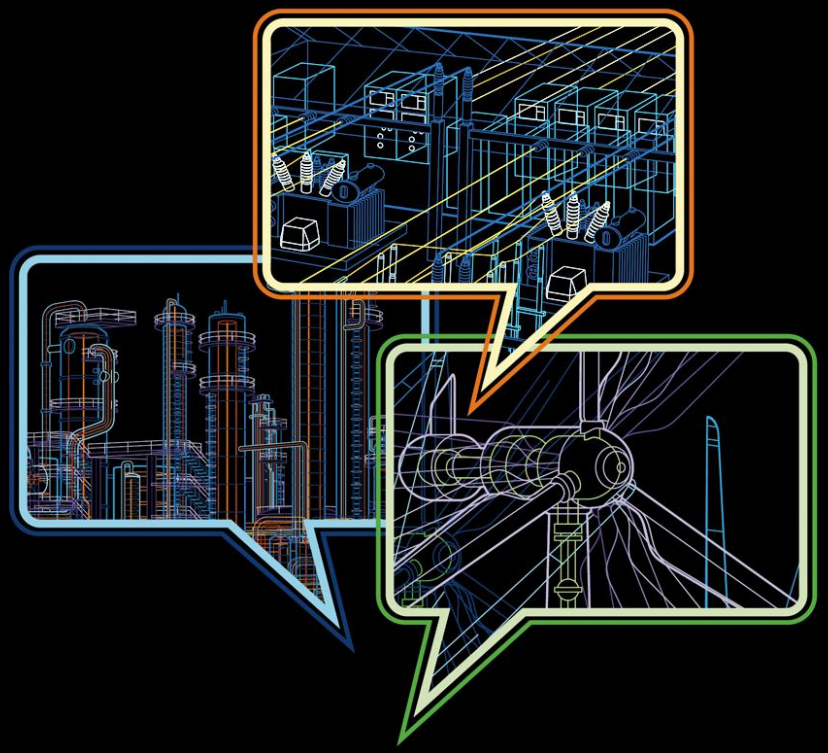
GridShield Recloser
Protection

HIZ fault detection

- High impedance faults are manifested with small current magnitudes that are difficult to be detected by standard protection
- Ground/earth fault current signature used in HIZ algorithm
- Created HIZ (PHIZ1) function in protection schemes
- Result of 7 years of dedicated research and extensive field testings

Value

- Added safety for humans and animals around power lines



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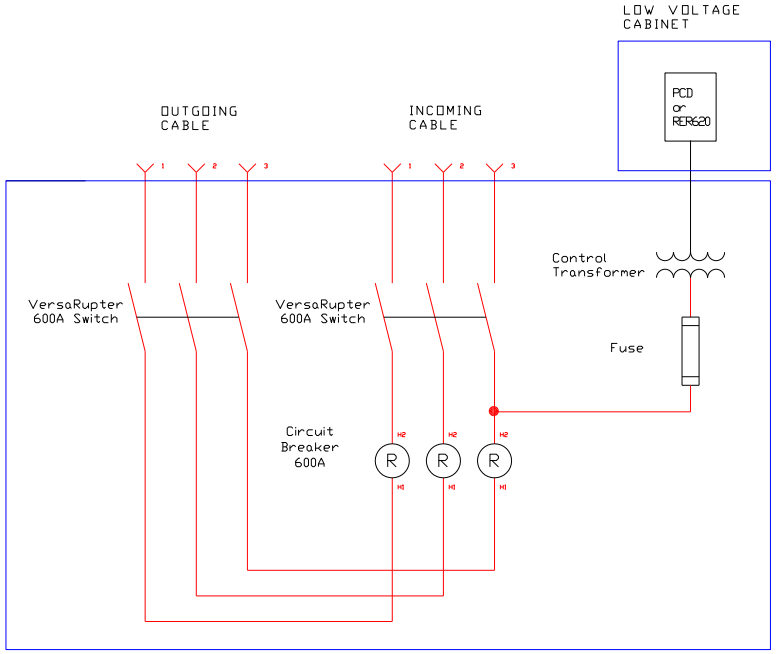
ReliaPad padmount circuit breaker MV outdoor products for smart grid demands

ReliaPad – general overview
MV outdoor products for smart grid demands

- 15/27 kV, 95/125 kV BIL, 600 A Cont., 12.5 kA Interrupting
- Dead-front design
- Visible break
- Capable of single-phase tripping
- No external control power required
- Two control options
  - PCD 2000
  - RER620

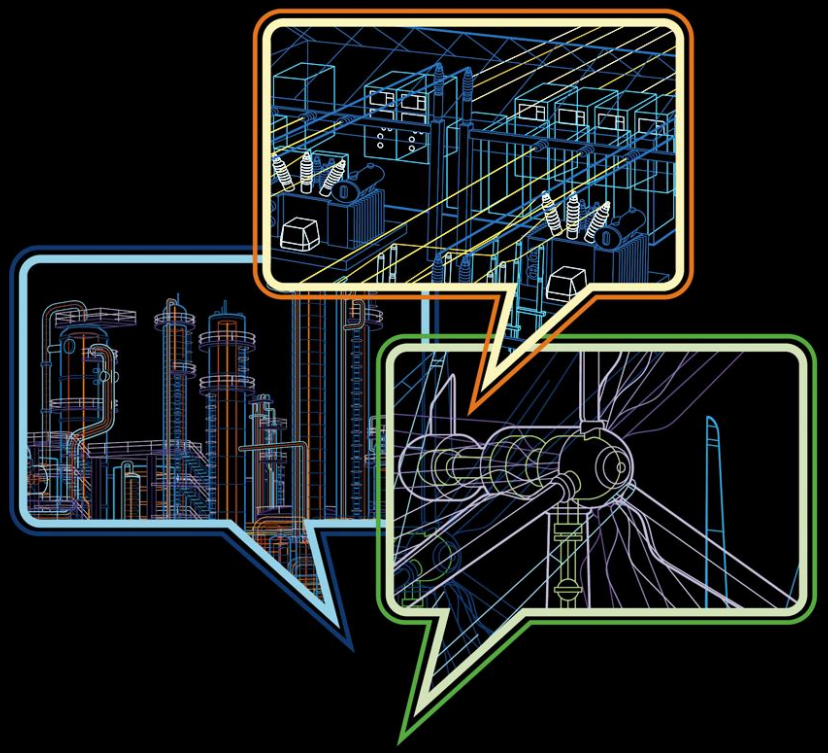
ReliaPad – typical configuration
MV outdoor products for smart grid demands

- Standard Enclosure
- Three-phase circuit breaker, MV switches, control cabinet, potential transformer, and fuse for potential transformer control power
- A radial circuit, shown below, providing incoming & outgoing load-break switches delivering visual disconnect points for servicing the underground system.



ReliaPad – intelligent design
MV outdoor products for smart grid demands

- Single-phase tripping so only affected areas are acted upon
- Disturbance recording
  - Record faults for analysis
  - Identify issue before going into field
- Remote control
  - Control from office
  - No need to go into field for reset



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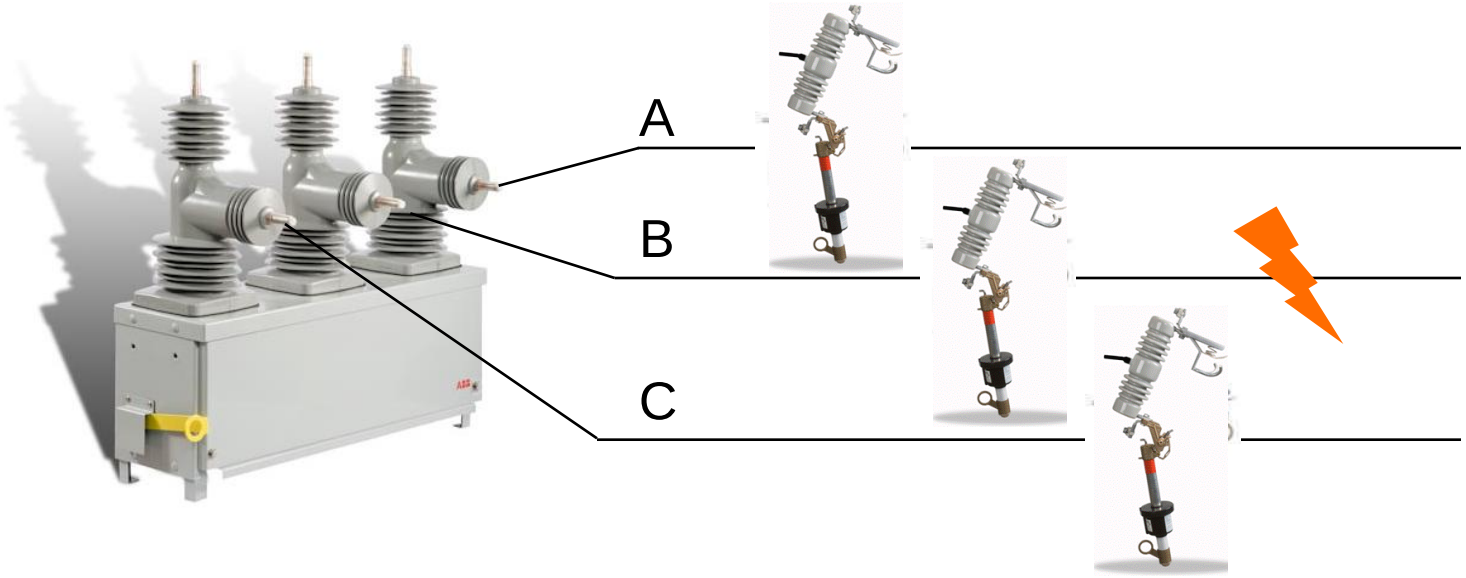
AutoLink automatic sectionalizer MV outdoor products for smart grid demands

Autolink – general overview
MV outdoor products for smart grid demands

- 15/27/33 kV, 6-215 A settable acutating current,
- Electronic Sectionalizer
  - Three-phase tripping
  - Single-phase tripping
- Replaces fuses, increases coordination
- Detects symmetric and asymmetric inrush currents

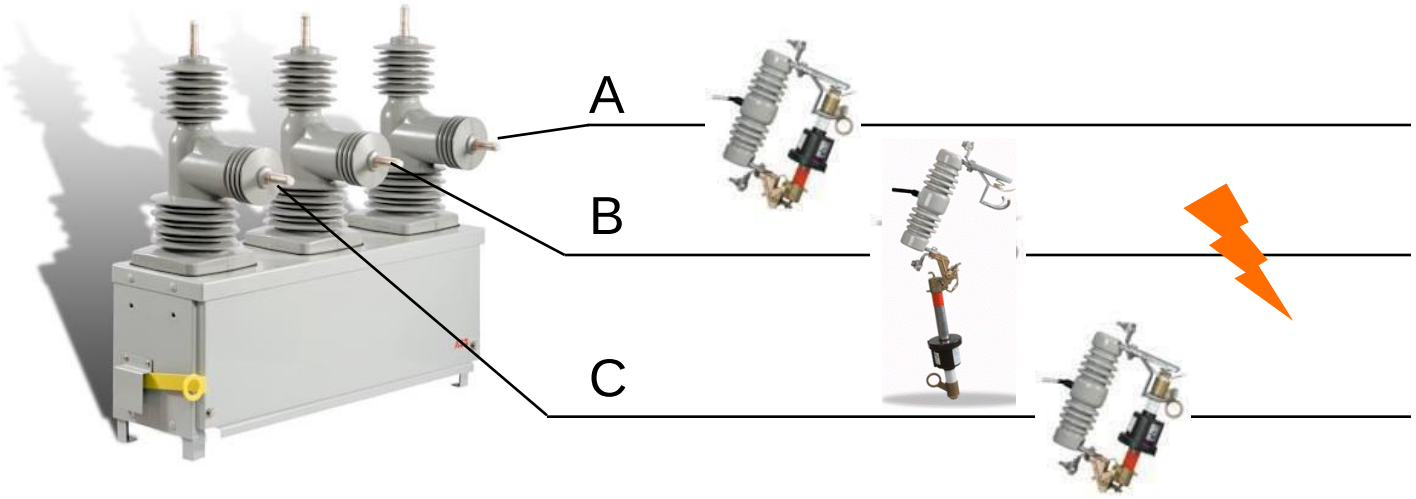
AutoLink – three-phase application
MV outdoor products for smart grid demands



Assume a single permanent line to ground fault occurs on Phase B - (recloser is set to 3 trips to lockout and ABB AutoLink is set at 2 counts)

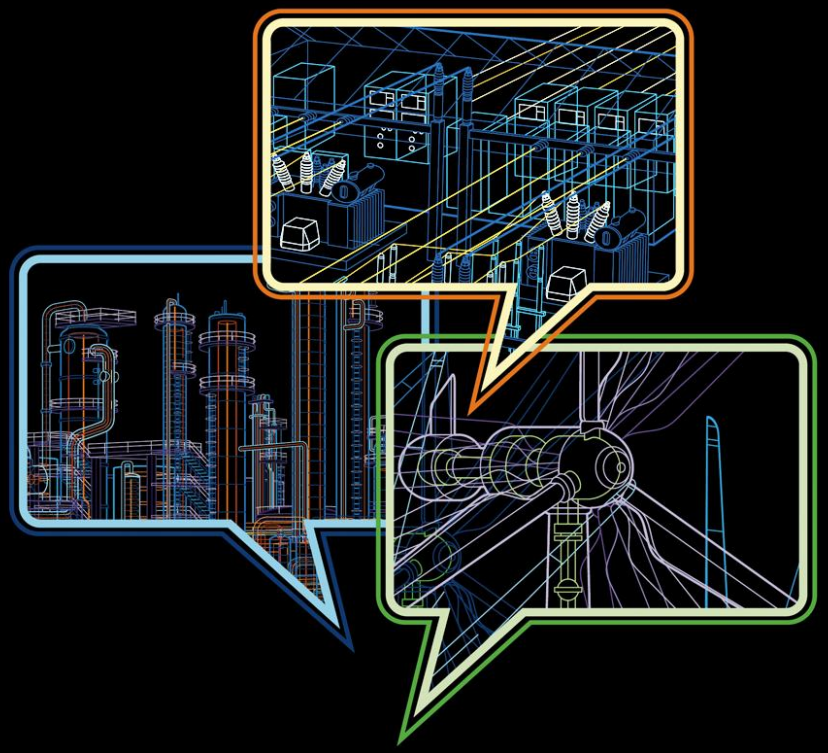
- Recloser performs its first open operation
- Sectionalizer will “count” 1, then recloser will close
- Recloser performs its second open operation
- Sectionalizer will “count” 2, then physically the three sectionalizers open before the recloser closes for the second time
- The three phases are isolated

AutoLink – single-phase application
MV outdoor products for smart grid demands



Assume a single permanent line to ground fault occurs on Phase B - (recloser is set at 3 trips to lockout and ABB AutoLink is set at 2 counts)

- Recloser performs its first open operation
- Sectionalizer will “count” 1, then recloser will close
- Recloser performs its second open operation
- Sectionalizer will “count” 2, then physically open before the recloser closes for the second time
- Phase B is isolated while Phases A and C remain energized



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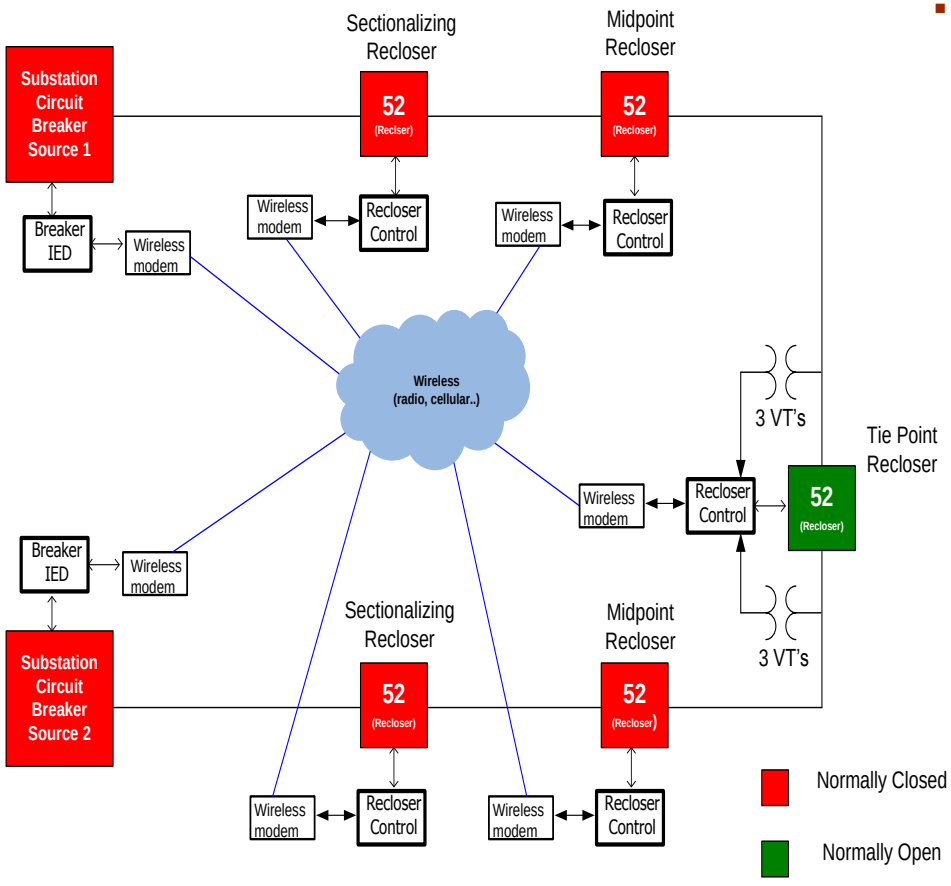
Conclusion / Q&A
MV outdoor products for smart grid demands

Decentralized Controller – COM600

- Deliver feeder automation active logic
- Graph theory-based search mechanism
- Logic Processor (SoftPLC)
- Dynamically update system configuration and load profile
- Provide generic logic for FDIR and power restoration
- Substation Gateway
- Support multiple protocols

FDIR
Using GOOSE messaging



- Fault is Detected automatically by the upstream protection device – breaker or recloser.
  - After the upstream device goes to lock out, it broadcasts a GOOSE message.
  - A sequence of broadcasting messages occurs among the devices and the Isolation and Restoration happen extremely fast.
  - Using the GOOSE messaging the devices can keep the coordination of the entire system.
    - ABB GridShield recloser is full compliant with IEC61850 and capable of broadcasting and receiving GOOSE messages.

FDIR
Decentralized Scheme

- After the upstream device goes to lock out, it will broadcast a GOOSE message.
- The Decentralized substation controller decides which transformer has the additional capability to assume the load based on the logic of FDIR scheme.
- After considering the load, the Decentralized controller initiates the switching to Isolate the fault and Restore the healthy portion of the system.
- The protection coordination of the system is maintained.
  - Decentralized controllers, such as the Com600, are capable of performing complex FDIR logics.

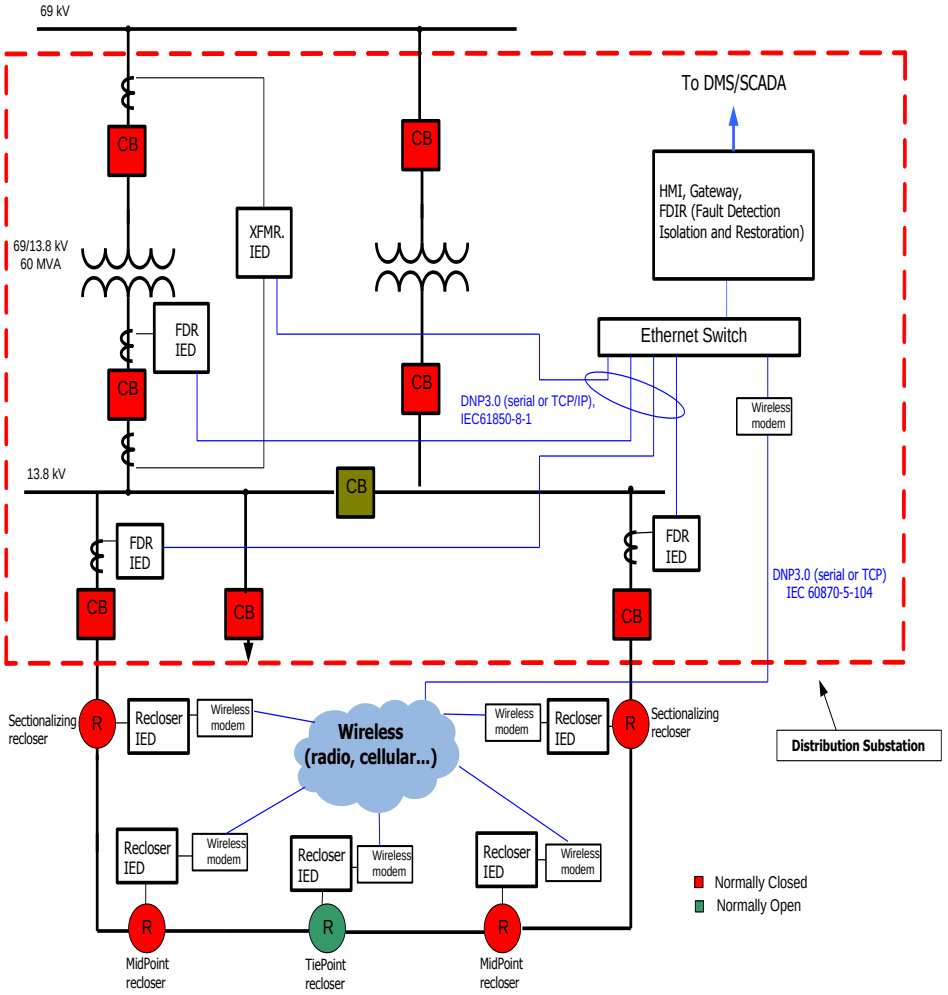
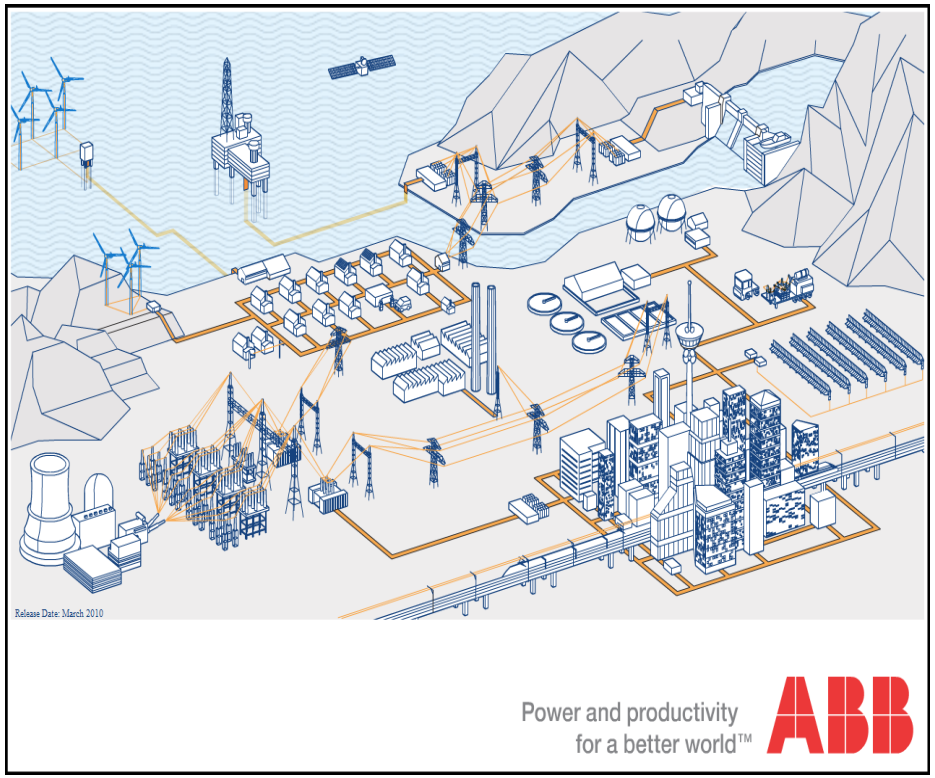


ABB – Complete Solution Provider

- ABB offers full feeder automation solution comprising of:
  - Primary equipment for distribution systems
    - Reclosers, 3 phase load break switches, single phase electronic recloser, single phase sectionalizers, cut outs, switches, instrument transformers, sensors
  - Field devices (IEDs)
    - Complete family of relays for transmision and distribution usage.
  - Communication enabling devices (radio, satellite, fiber..)
  - Substation gateway/HMI with automatic fault isolation and restoration



Conclusion / Q&A
MV outdoor products for smart grid demands lusion

- ABB’s GridShield recloser, ReliaPad padmont circuit breaker and AutoLink sectionalizer are leading the way to meet smart grid demands

Q&A

Reminders
Automation & Power World 2011

- Please be sure to complete the workshop evaluation
- Professional Development Hours (PDHs) and Continuing Education Credits (CEUs):
  - You will receive a link via e-mail to print certificates for all the workshops you have attended during Automation & Power World 2011.
  - BE SURE YOU HAVE YOUR BADGE SCANNED for each workshop you attend. If you do not have your badge scanned you will not be able to obtain PDHs or CEUs.

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