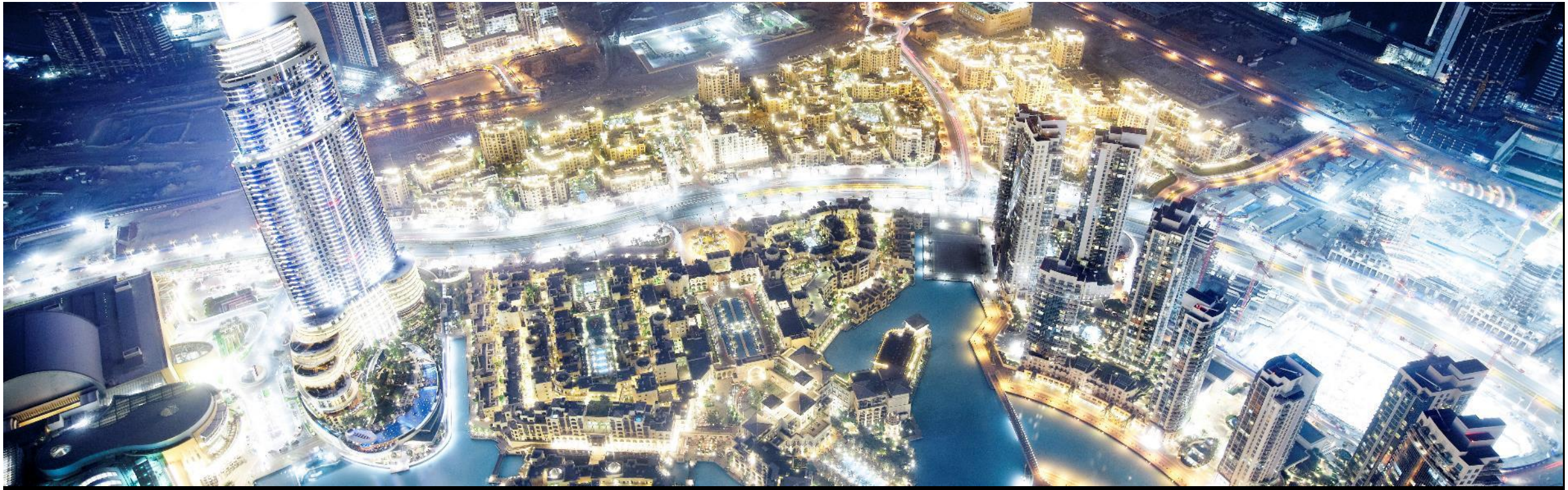


ABB Medium Voltage Days MEA 2016

# Solutions for reliable power supply through overhead distribution networks

Power and productivity for a better world™

# Technical session 10

## Solutions for reliable power supply through overhead distribution networks


- Speaker name — Roger Espert
- Speaker title — Medium Voltage Apparatus Global Marketing Manager
- Company name — ABB
- Location — Lake Mary, United States

- Co-presenter name — Dick Kronman
- Title — Medium Voltage Finland Grid Automation Manager
- Company name — ABB
- Location — Vaasa, Finland

# Key takeaways
## Solutions for reliable power supply through overhead distribution networks


Demand for outage-free power is increasing → Challenges as well

- Ensure Reliability and availability
- Reduce operational costs
- Stay ahead to integrate renewables to existing grid
- Maximize existing (sometimes aging) infrastructure performance and lifespan

- ABB is able to support all these challenges with our Feeder Automation portfolio:
  - Available now; Meeting local needs; Ready for future
  - Designed based on decades of global and local experience
  - Renew equipment or upgrade existing ones beyond traditional limits.

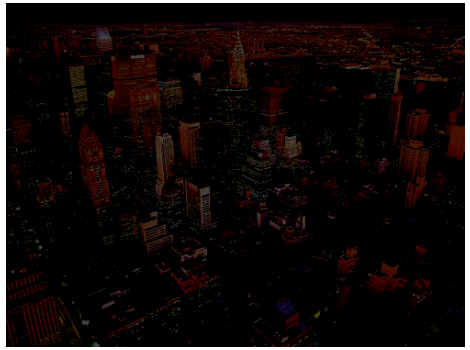
**The 4 Pillars: Positively impacting reduction of life cycle costs, moving a step closer toward smart grids**

# Electrification scenario for MV distribution networks
## Solving the safe-reliable power supply puzzle

### Challenges

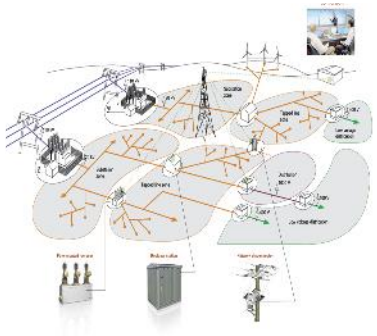
- Electrification Horizontal growth
- Deliver power in an efficient, safe and reliable way
- Reduce operational expenses

### Goals



- Improve KPI's (SAIDI, SAIFI, etc)
- Decrease restoration time and cost
- Prevent lost revenues
- Boost Utility's reputation

### Solutions



- FDIR[1]
- Substation-Based
- Main Branch or Lateral based
- Zone Concept
- Standalone solutions

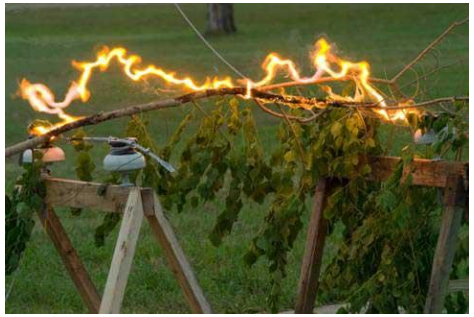

**What is the best solution to select from?**




1 FDIR: Fault Detection Isolation Restoration

# Electrification scenario for MV distribution networks

## Type of faults: Picture might be bigger than you think!



**80% to 90% of Faults in overhead networks are Temporary**

Studies show that improper selection of protection equipment by not considering type of fault can cost electric utilities more than $100,000 per year and restoration time could be reduce by 15 times [1]

And this excludes penalties for power outages and customers dissatisfaction



1) Source: EPRI (Electric Power Research Institute) & Calculations based on 20 feeders network at 5kUSD / years on savings based on rates and costs for standard utility in South America

# Electrification scenario for MV distribution networks

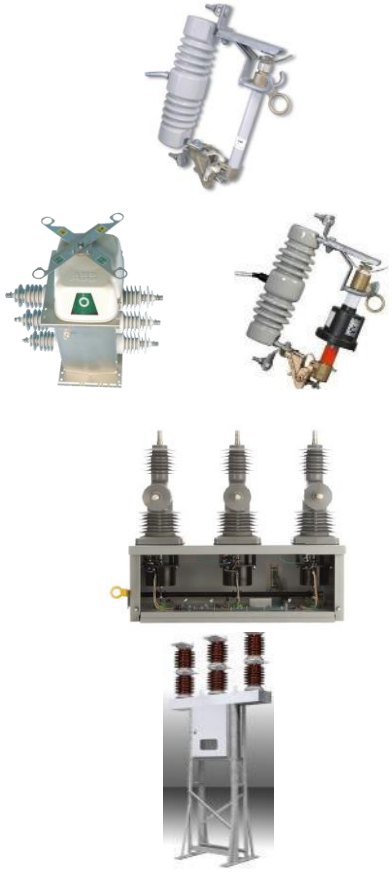
## A common situation – Outage during a critical situation

- Consumers using power supplied by Electricity Company in many ways:
  - Residential Customers / Households
  - Industries
  - Small & Medium Business
- Power Outage avoids consumers to fulfill their expectations
- Electricity Company receiving complaints to restore power immediately
- Utility restores power after several hours, finding out that the power outage was caused by a tree branch falling against a line

**How can we reduce the probability of something like this to happen?**

# Electrification Scenario for MV Distribution Networks

## Commonly adopted solutions for overhead lines protection



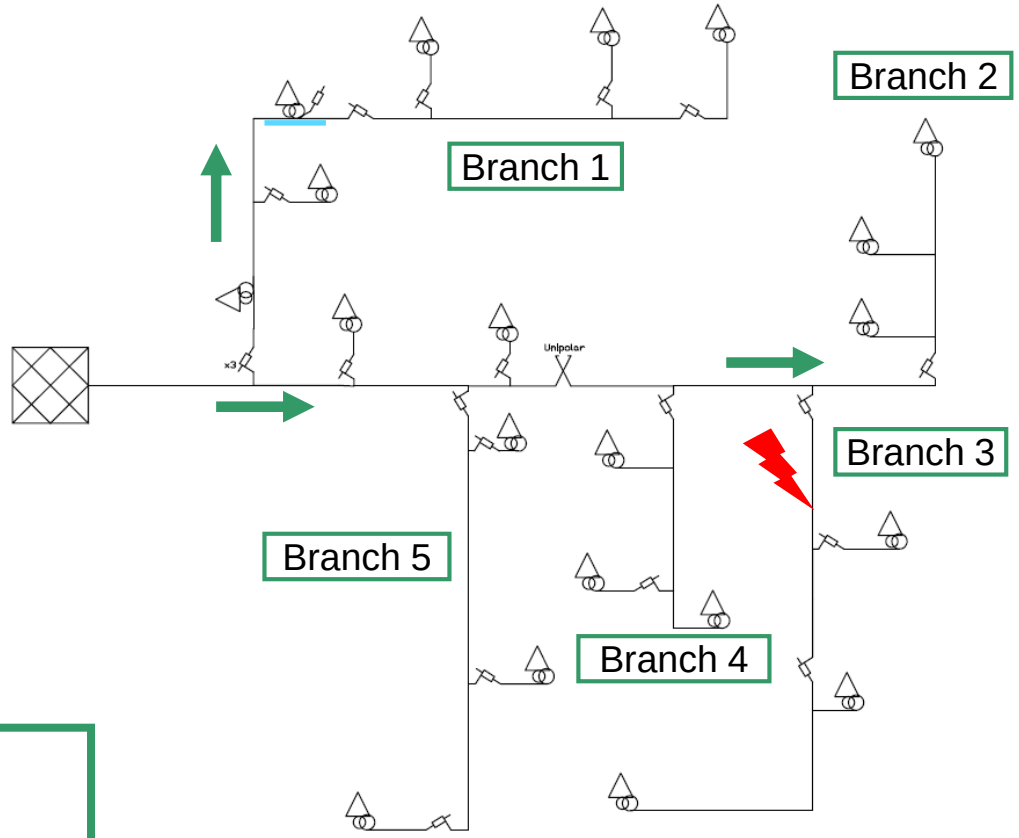
- **Fuses** are the **first stage of protection** as these protect distribution transformers at the end of the medium voltage feeder
- Then, **some fuses** are grouped and a **sectionalizer** is installed upstream. Sectionalizer has to be adjusted to coordinate the fuse (current and counts), and is **the second stage of protection**.
- As a **breaking** element, to allow the sectionalizer operation, **reclosers** are installed. Reclosers must be coordinated with the downstream sectionalizer settings, with one more reclosing attempt.
- In general, **some reclosers** (pole or substation) are coordinated with a substation **circuit breaker**.

# Electrification scenario for MV distribution networks

## Baseline scenario: Substation protection

**Scenario 1:**

- Considerations:
  - No Autorecloser available.
  - All faults (temporary and permanent) are cleared by the fuses on each branch.
  - Faults are evenly distributed through branches
- 10 faults / km.year x 5km = 50 faults / year
- 50 faults /year / 5 branches = 10 faults / branch.year
- Customers / branch average = 38 customers / branch
- Customers out of service / branch.year = 375

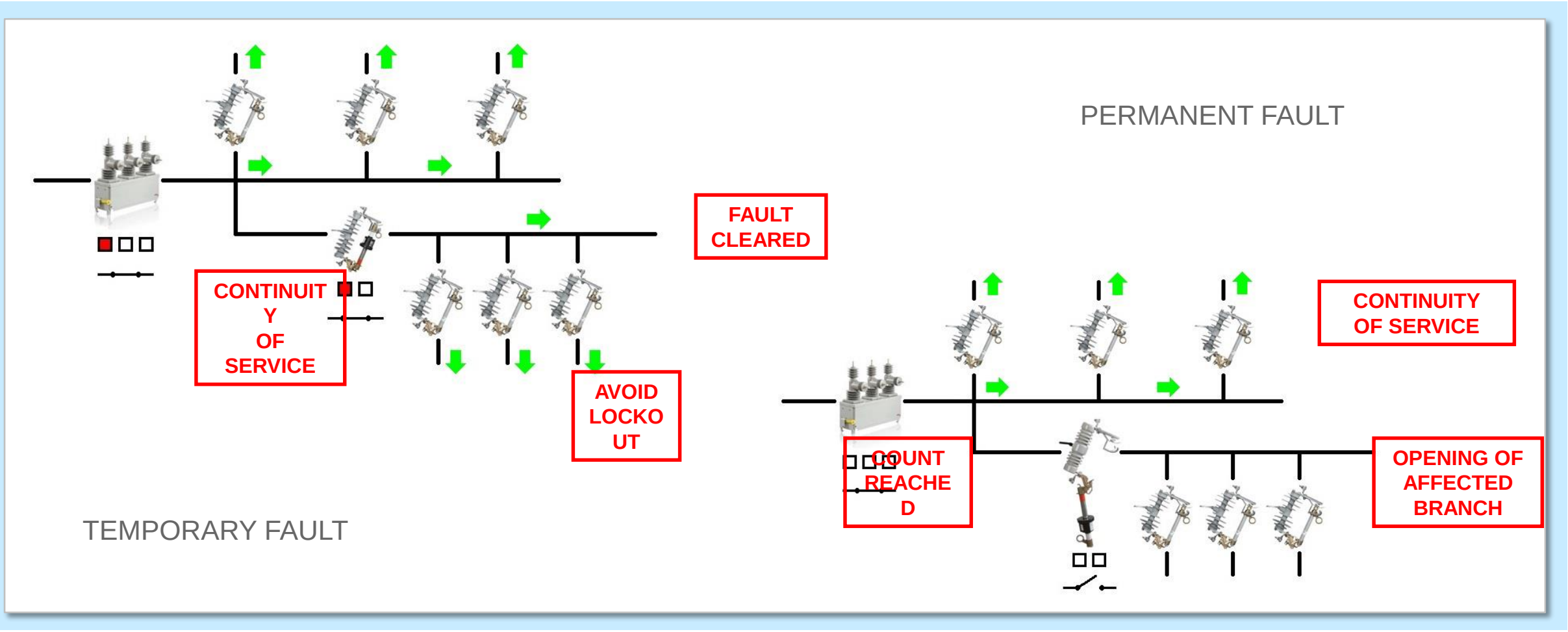



**SAIFI: 6.51 interruptions / customer.year**

**SAIDI: 19.53 hours/customers.year**

# Electrification scenario for MV distribution networks

## Commonly adopted solutions for protection – recloser + sectionalizer



# Electrification scenario for MV distribution networks

## Reliability improvement

NOTE:

Savings between Baseline Case and Scenario 3 is around 4,500 to 5,000 USD / year.

Depending on local values and costs and times associated to restoration of power.

Not considered penalties due to Service outages.

Average restoration time reduced from 4 hours to less than 1 hour

| **Scenario** | **1** | **2** | **3** |
|---|---|---|---|
| **Case** | **Baseline Case** | **Autorecloser** | **Autoreclosers + Sectionalizers** |
| Description | All faults are cleared by fuses protecting branches, leaving always one branch out of service. | 40% of temporary faults are cleared on first reclosing sequence. | 98% of temporary faults are cleared by reclosing sequences and coordination between sectionalizers and reclosers. |
| N° of Faults / year | 50 | 34 | 14 |
| **SAIFI** | **6,51** | **4,43** | **1,41** |
| **SAIDI** | **19,53** | **13,28** | **4,22** |
| **Reliability Improvement** | **Baseline Case 1:** - | **Scenario 2:** **32%** | **Scenario 3:** **78%** |

# Solutions for reliable power supply through overhead distribution networks

## Key challenges still remains with the product selection: The 4 pillars


### Reliability

- Down time halts production and reduces revenues
- Potential loss of goods due to power failure

### Safety

- Maintenance personnel are at risk
- Harm people, animals & fauna
- Property loss

### Ease of Maintenance/ Installation

- Cost of skilled technicians to service relays in the field
- Exposure to HV equipment increases safety and financial risks

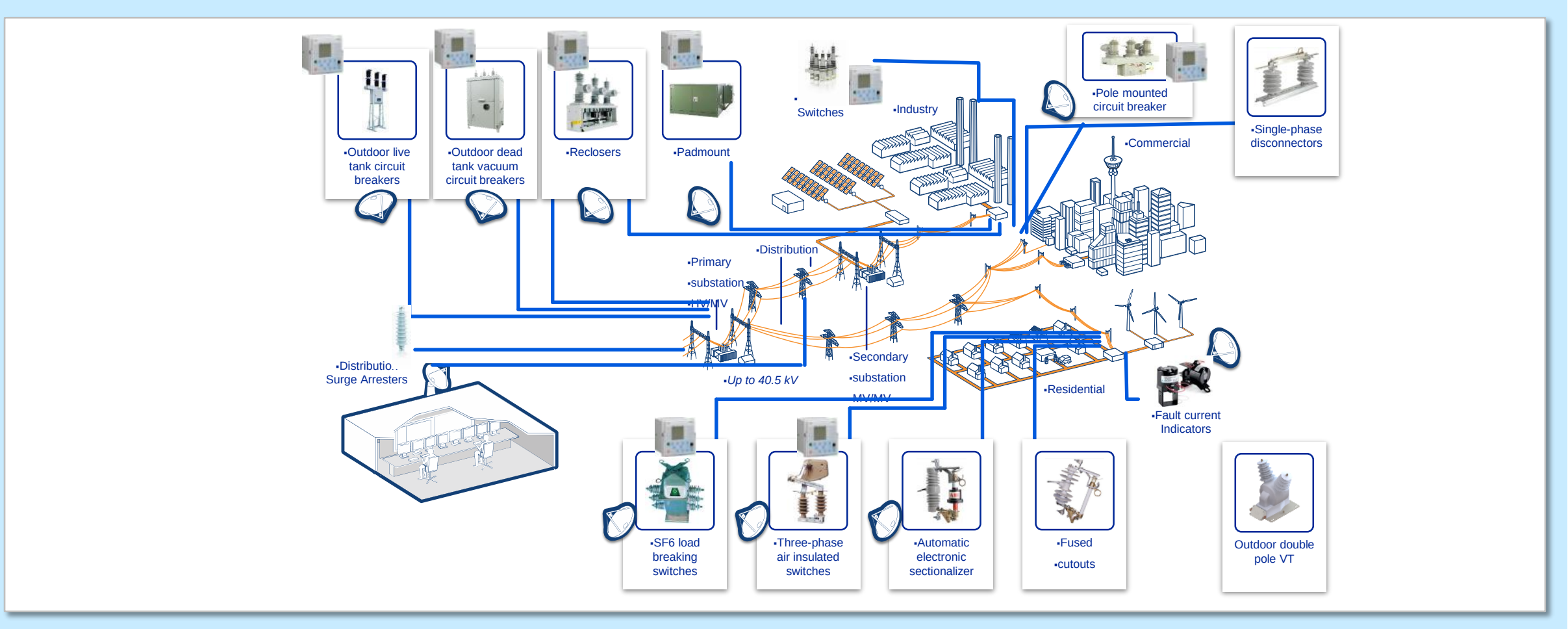
### Service/Support

- Customers need fast resolution
- Minimize revenue loss
- Reduce customers' dissatisfaction

**Fulfilling the 4 Pillars when selecting solutions provides the platform to success**

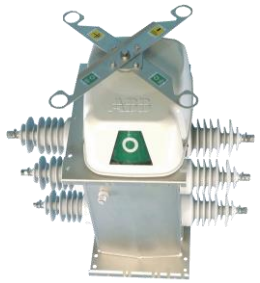
# Protection of overhead distribution networks

## ABB portfolio offering – Shaping a resilient and brighter outdoor



# Solutions for reliable power supply through overhead distribution networks

## OVR Recloser, Sectos Load Break Switch & AutoLink Sectionalizer



- Paired and fully type tested with ABB's Relion® family relays.
- Total cost of ownership at their best with highest quality ABB design & manufactured main components
- Ready for Smart Grid implementation by offering communication with Control Centre on IEC 61850 / IEC 60870-5-101 & 104 protocol
- From most advanced to simplest: variety of options enable customer to select the best fit based on technical demands without restrictions

# ABB Offering – OVR Reclosers

## Meeting expectations to overcome challenges

### Reliability

- ABB is the world's largest VI manufacturer – Near 5,000,000 interrupters manufactured
- Highest vacuum level in the market
- Highest life expectancy (30 years)

### Safety

- HCEP - traditional CEP material with hydrophobic additives that migrate to the surface
- Reduced flash-over probability in heavily polluted areas: Less wetting of surface material
- Reduced erosion and aging: Improved life expectancy

### Ease of Maintenance/ Installation

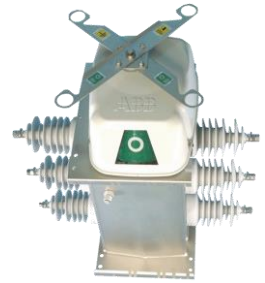
- Access RER615/620 via a web browser, locally or remotely - No additional software needed
- The 615 series IEDs are characterized by their compactness and withdrawable-unit design
- Rapid set-up and commissioning – standard configurations

### Service/Support

- 24/7 service support and hotline available from any location throughout the region
- Troubleshooting ability for quick evaluation and restoration

# ABB Offering – Sectos Load Break Sectionalizers

## Meeting expectations to overcome challenges



### Reliability

- Reliable spiral spring operation mechanism with light reflecting and clear position indicator
- Completely sealed stainless steel tank

### Safety

Completely sealed stainless steel tank (Leakage<0.15% per year)

In-built Earth Switch

Gas-low locking device or manual locking device as options

### Ease of Maintenance/ Installation

Easily upgrading from manual to motor operation

Powerful relay REC615 with strongly logic function

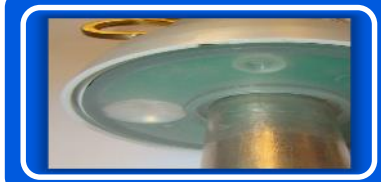
Full options for Sectionalizer: Current-count and Voltage-time

### Service/Support

- 24/7 service support and hotline available from any location throughout the region
- Access to WebHMI for event log & Upgradeability

# ABB Offering – AutoLink Electronic Sectionalizers

## Meeting expectations to overcome challenges



### Reliability

- **Detects inrush** to avoid incorrect count
- **Status** LED.
- FCC, IC and ETSI **robust communication** feature in unlicensed Wifi band**.**

### Safety

Programmable through **micro USB Port.**

AutoLink can distinguish between transient and permanent faults

### Ease of Maintenance/ Installation

It is **independent** of the **time-current curve**

**No need to replace the trip device** after its operation.

### Service/Support

- **Event** Log
- **Firmware** upgrade capability.
- 24/7 service support and hotline available from any location throughout the region



Link to video

# Solutions for reliable power supply through overhead distribution networks

## Application examples – references

# Key takeaways
## Solutions for reliable power supply through overhead distribution networks


Demand for outage-free power is increasing → Challenges as well

- Ensure Reliability and availability
- Reduce operational costs
- Stay ahead to integrate renewables to existing grid
- Maximize existing (sometimes aging) infrastructure performance and lifespan

ABB is able to support all these challenges with our Feeder Automation portfolio:

- Available now; Meeting local needs; Ready for future
- Designed based on decades of global and local experience
- Renew equipment or upgrade existing ones beyond traditional limits.

**The 4 Pillars: Positively impacting reduction of life cycle costs, moving a step closer toward smart grids**

# Q & A

## Solutions for reliable power supply through overhead distribution networks

Contact Information

If you have further questions, please contact us at:


Presenter : Roger Espert
Company : ABB
Contact phone : +1 (407) 314-1965
Contact e-mail : roger.g.espert@us.abb.com

Presenter : Dick Kronman
Company : ABB
Contact phone : +358 50 334-2887
Contact e-mail : dick.kronman@fi.abb.com

Power and productivity
for a better world™