




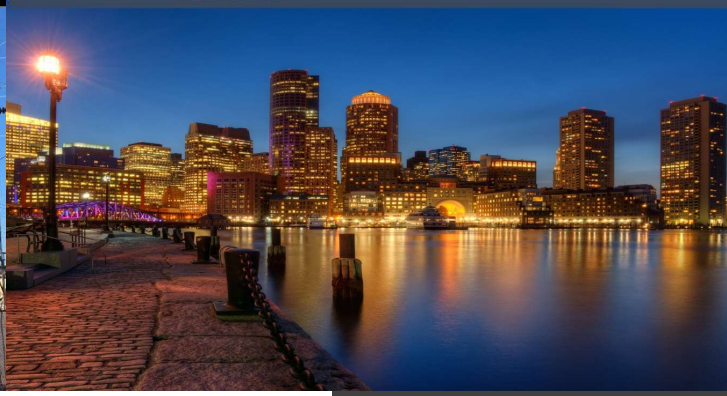

Grid Automation

Evolution of Distribution Protection & Switching

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HUBBELL®

Agenda

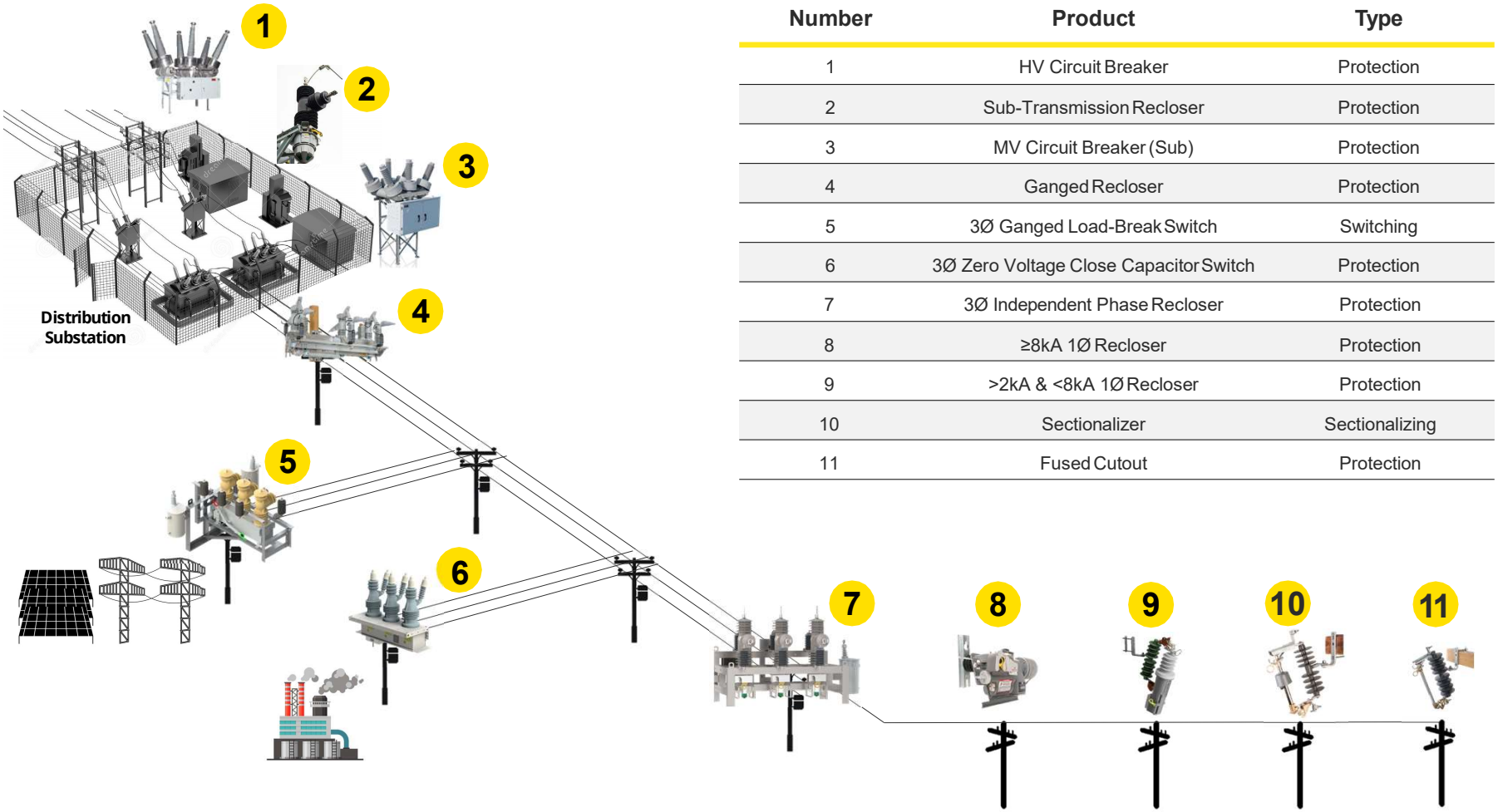
- Overview of MV distribution circuit
- Technology Evolution of MV Protection and Switching
- Applications
- Questions

INTRODUCTION

Medium Voltage Distribution Products

Overview of MV Distribution Switching & Protection Products

Distribution Overview



Number	Product	Type
1	HV Circuit Breaker	Protection
2	Sub-Transmission Recloser	Protection
3	MV Circuit Breaker (Sub)	Protection
4	Ganged Recloser	Protection
5	3Ø Ganged Load-Break Switch	Switching
6	3Ø Zero Voltage Close Capacitor Switch	Protection
7	3Ø Independent Phase Recloser	Protection
8	≥8kA 1Ø Recloser	Protection
9	>2kA & <8kA 1Ø Recloser	Protection
10	Sectionalizer	Sectionalizing
11	Fused Cutout	Protection

Improved Reliability & Visibility

Technology Evolution

Advances in Distribution Protection & Switching

Protection Devices by Current Class

800A

- Three Phase Oil-Filled Hydraulic Recloser
- Substation Protection
- Primary Feeder Protection

400A – 600A

- Single Phase Oil Filled Hydraulic Recloser
- Lateral Protection

40A – 200A

- Expulsion Fusing
- Mid-End Lateral Protection

Evolution of Three Phase Reclosers (800A Class)

Oil-Filled Recloser

- Oil Interruption
- Oil Insulation
- High Maintenance & High Inventory

Electronic Ganged Recloser

- **800A, 16kA**
- Solid dielectric interruption
- Overmolded (CEP) insulation
- Low Maintenance & Low Inventory
- Paired with SEL or Beckwith Control

Electronic Triple-Single

- **800A, 16kA**
- Solid dielectric interruption
- Overmolded (CEP) insulation
- Low Maintenance & Low Inventory
- Paired with SEL or Beckwith Control

Evolution of Single Phase Reclosers (400-630A Class)

Oil-Filled Recloser

- Oil Interruption
- Oil Insulation
- High Maintenance & High Inventory

Integrated Control Vacuum Recloser

- **400A – 630A, 8kA-12.5kA**
- Solid dielectric interruption
- Overmolded (CEP) insulation
- Line-Powered
- Embedded control
- SCADA capable

Evolution of Mid-End Lateral Protection (40-200A Class)

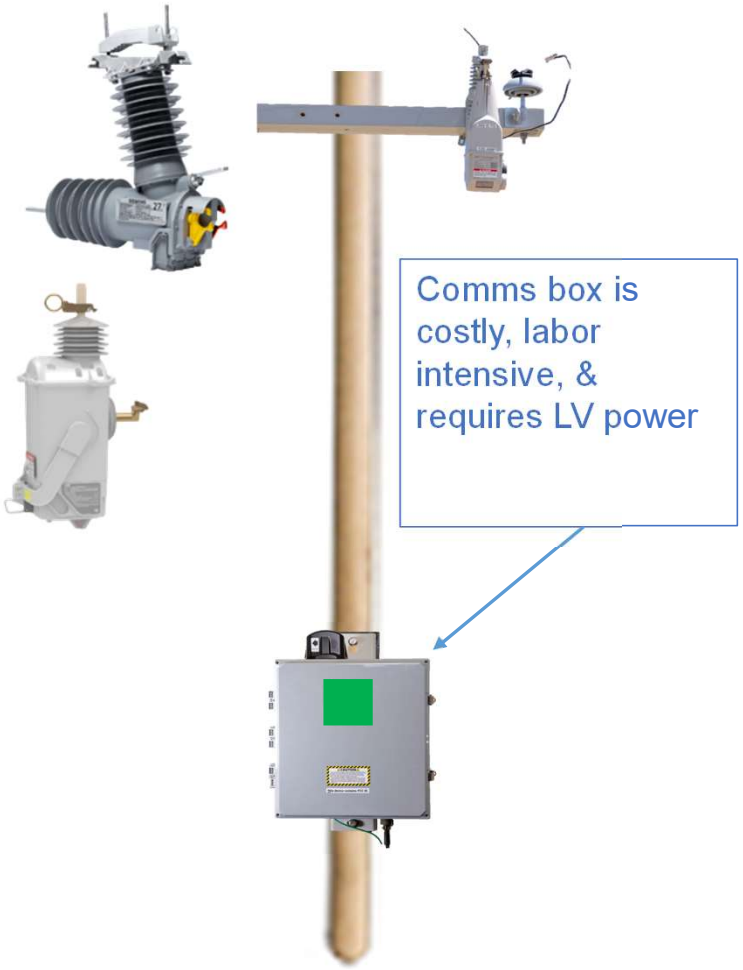
Fuses

- Expulsion Fusing
- One time use
- No data
- Always requires a truck roll

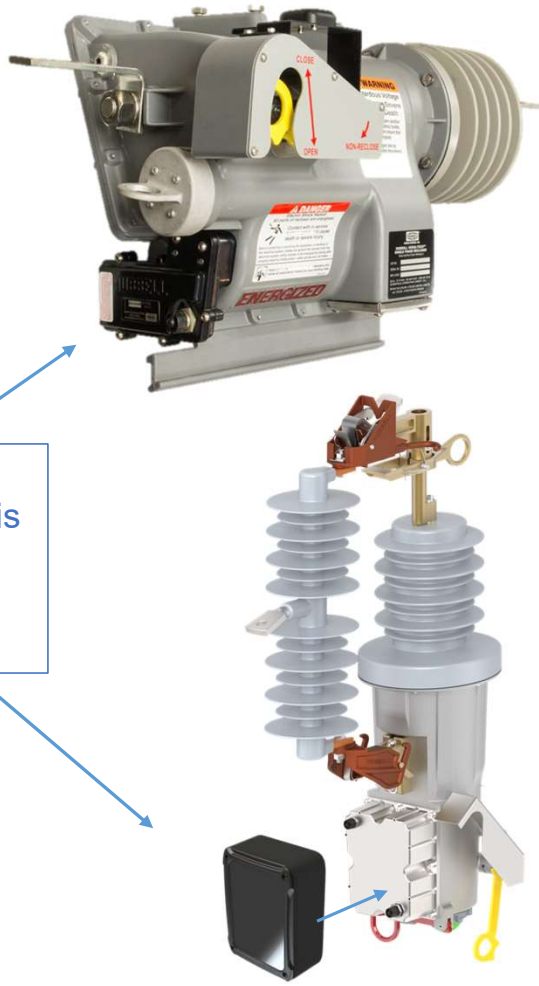
Cutout Mounted Reclosers

- **40A, 100A, 200A up to 8kA (Typically 6.3kA)**
- Solid dielectric interruption
- Line-Powered
- Embedded control
- SCADA capable

Evolution of Lateral Communications



Comms box is costly, labor intensive, & requires LV power



Modular comms that is powered by device harvester

Evolution of Load Break Switches

Air-Break Switch

- Manual operation
- No communications
- No SCADA control

Integrated Air-Break Switch Solution

- Air-Break Switch with motor operator
- Line post sensors
- SCADA capable via RTU

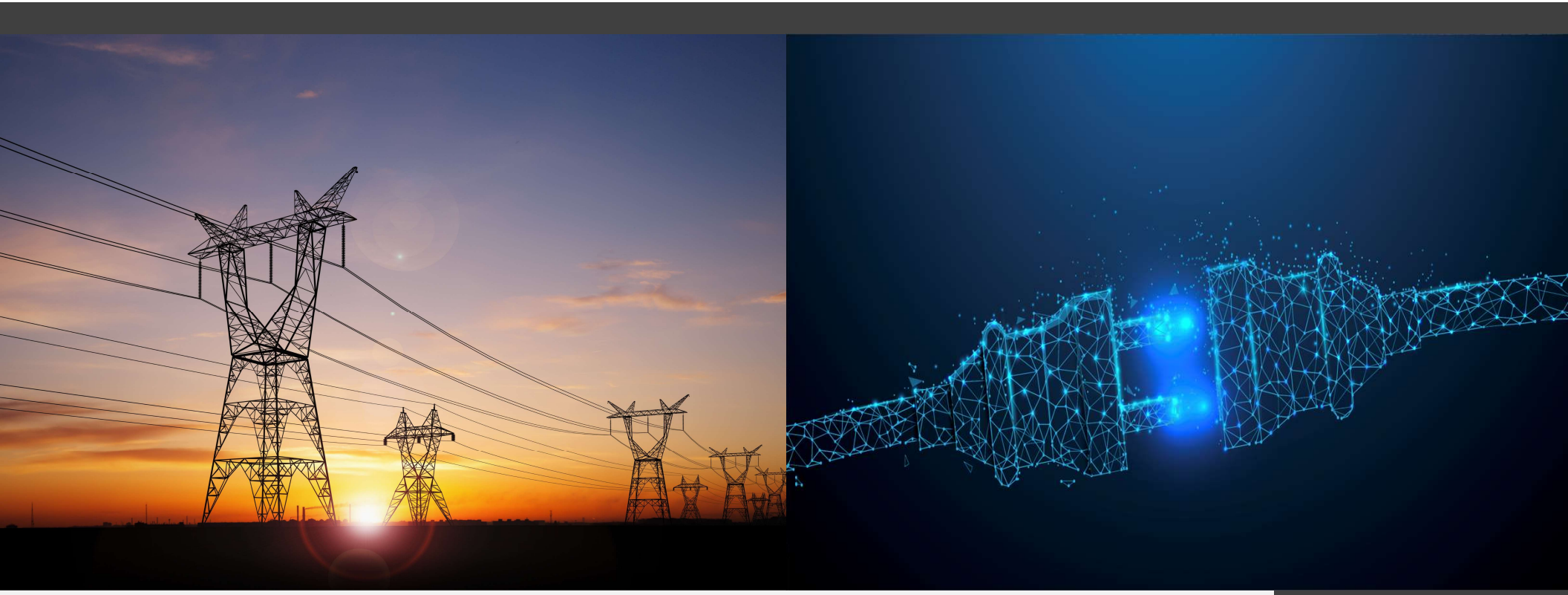
Evolution of Load Break Switches - Continued

Integrated Air-Break Switch Solution

- Air-Break Switch with motor operator
- Line post sensors
- SCADA capable via RTU

Solid Dielectric Load Break Switch

- Vacuum interrupters
- Maintenance Free
- Compact (relative to AB)
- Integrated sensing
- Controller preference (SEL, Beckwith)



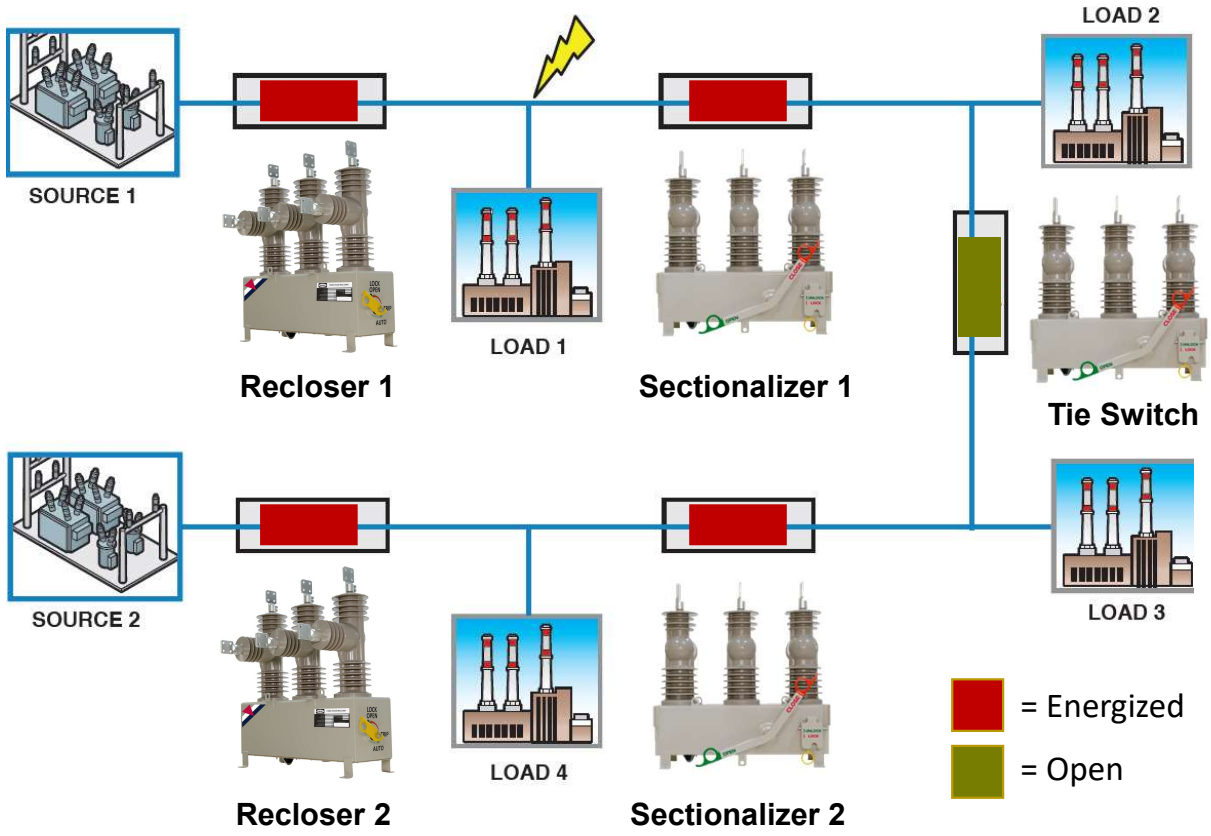
Applications

FLISR – Loop Scheme Example

Fault, Location, Isolation, Service Restoration

3GR and LBS operating as part of a loop scheme application

- Isolate permanent faults to minimize outage areas
  - In a distribution system, recloser are used in conjunction with sectionalizers to isolate faults and restore power to areas not affected by the fault



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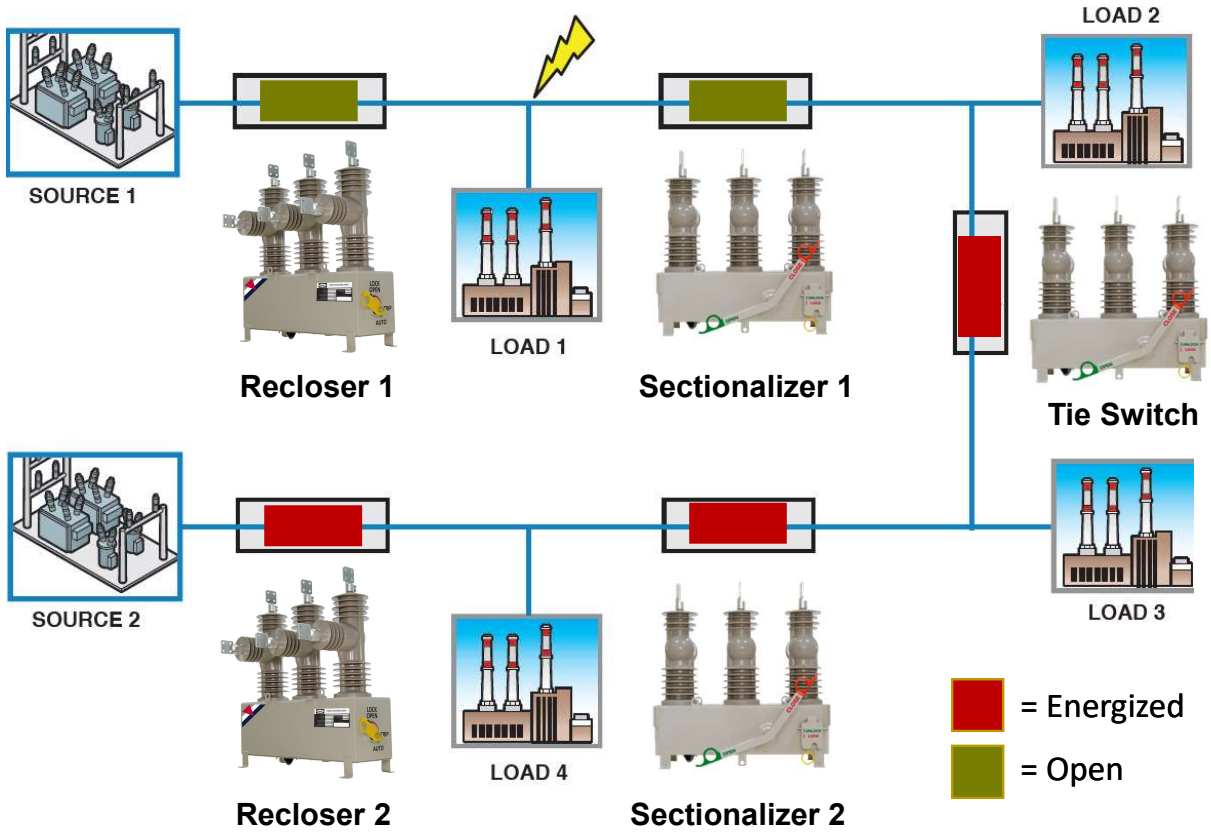

Questions