

AMEU 2012

FuseSaver

Highest availability and cost savings for your medium voltage distribution network

Challenges for rural networks

Characteristics of MV power distribution networks

1. Overhead networks

- Radial network
- Long line lengths
- Few customers
- Difficult to access

→ little revenue, but costly to own and operate!

3. Reliability challenges

- Long drive or flight time
- Long time to find faulted spur
- Patrolling line to find fault (or not)
- Limited communication
- Poor data feedback from the field
- Long outage times



2. Main fault causes

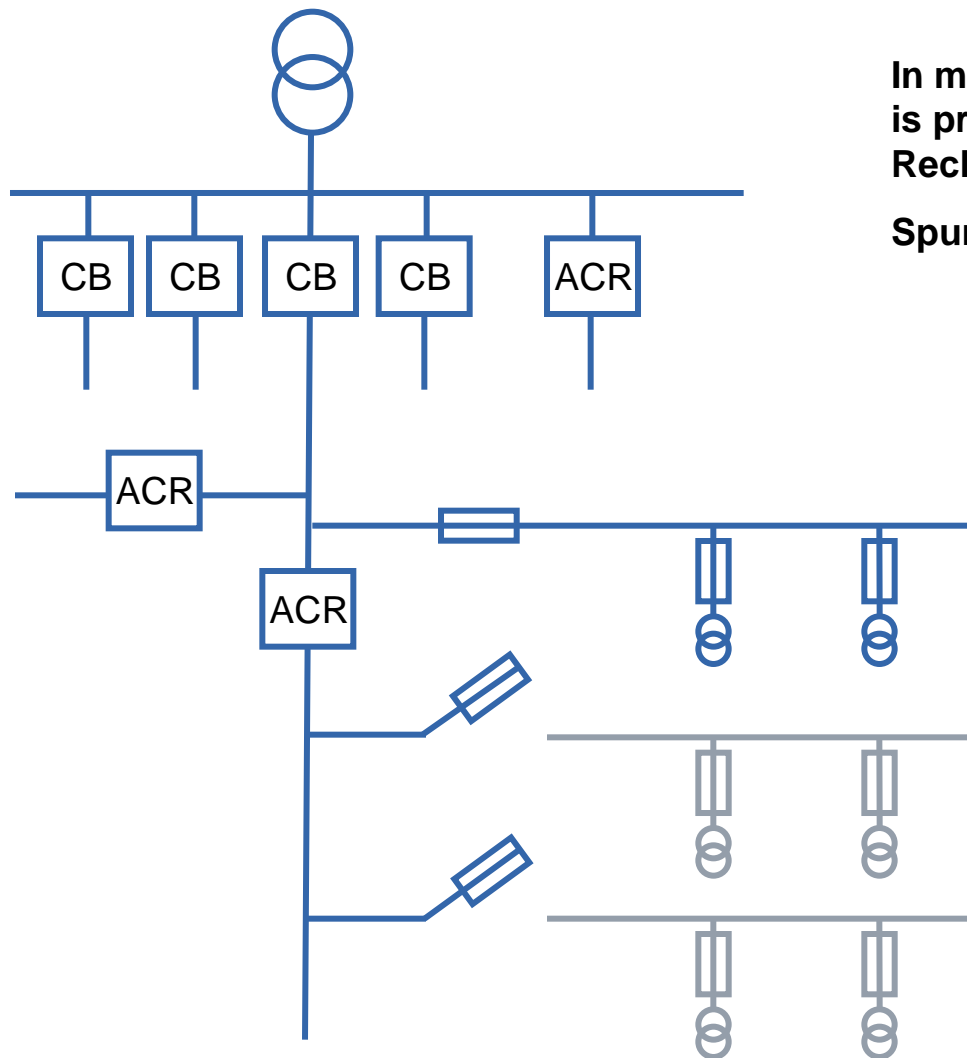
- Vegetation / Veld fires
- Wild life
- Lightning
- Wind
- Vandalism
- Fault characteristics
 - Temporary faults
 - Low fault currents

4. Consequences

- Poor reliability (SAIDI, SAIFI, MAIFI, etc.) causes financial penalties
- High operating costs
- Increasing costs to provide meaningful reliability data to the regulator

Challenges for rural networks

A typical rural network example



In most network configurations, the feeder is protected by a circuit breaker (CB) or Auto-Recloser (ACR).

Spur lines* are usually protected by fuses.

Categorization of measured faults in MV Power Distribution Networks



~ 80 %

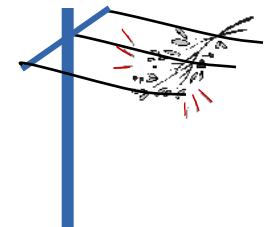
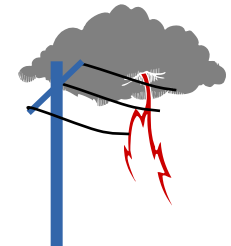
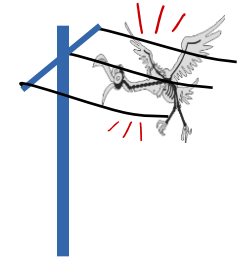
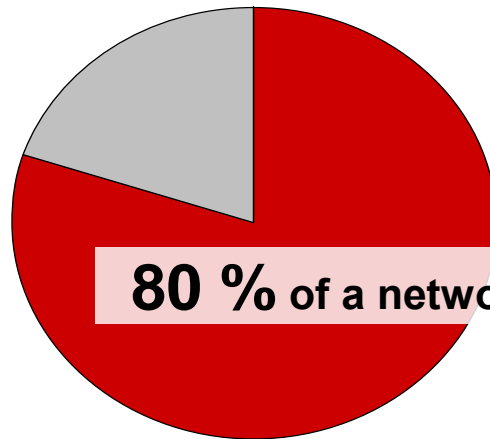
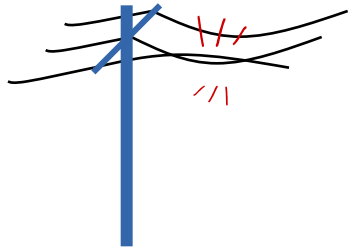
→



~ 20 %

* also referred to as T-offs or laterals

Necessity of cost saving (material, personnel, penalties)



1. Fuses are needlessly damaged !

+ material costs

2. Line crews spend time to detect the fault and replace the fuse !

+ personnel expenses

3. Downstream users are left without power . . .

+ potential penalty payments

Traditional Spur line protection

Cut-out Fuse

Benefits

- Cheap - \$100 / phase
- Relatively reliable
- Visible break
- Isolation



Limitations

- Operates on transient faults
- Can jam during operation
- No data
- No remote control

Drop-out Sectionalizer

Benefits

- Sectionalizes faulted spur line*



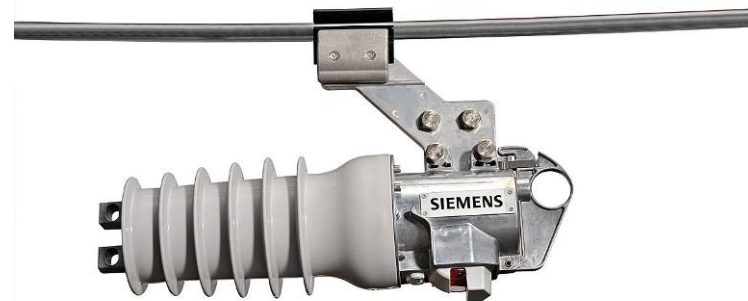
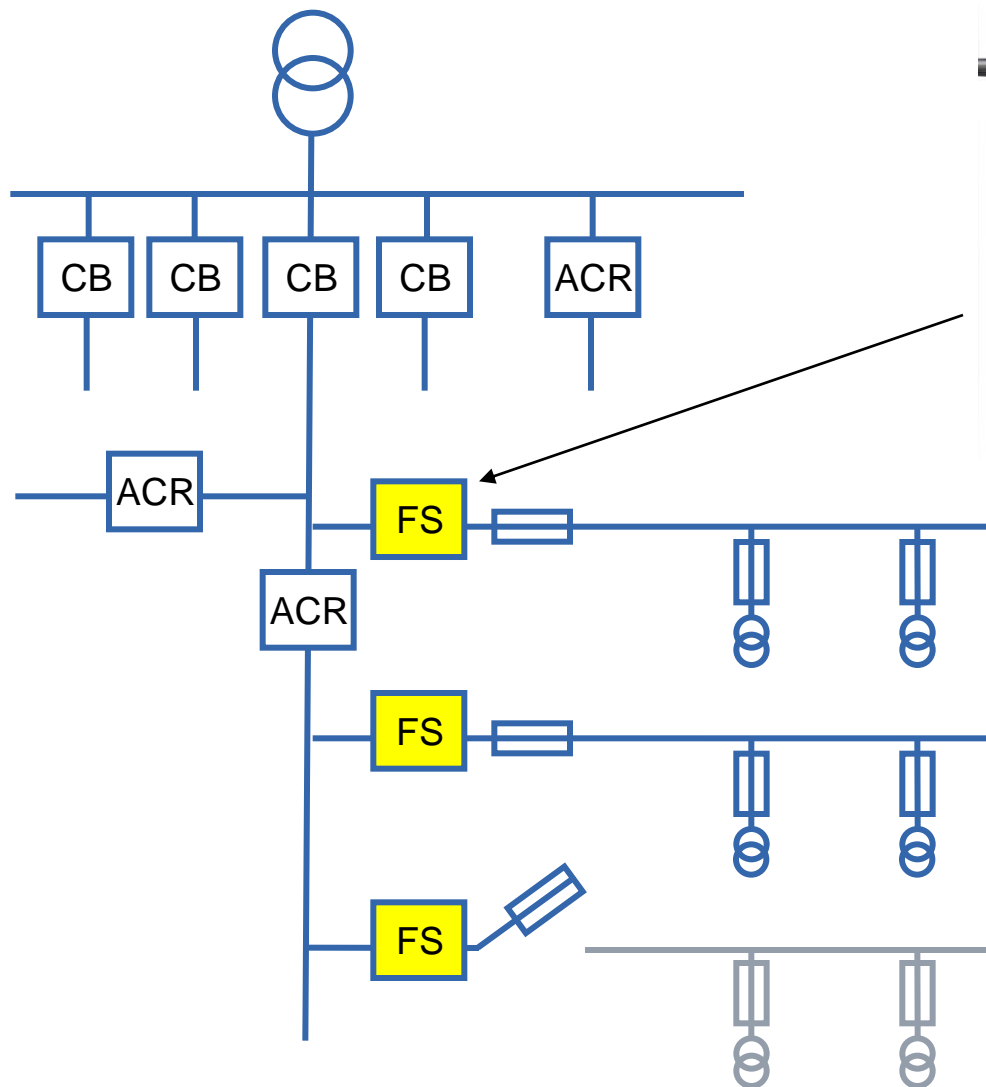
Limitations

- Requires upstream Recloser dead time to operate
- Water ingress and seizing when operating
- No data
- No SCADA

* also referred to as T-offs or laterals

Spur line protection solution Siemens FuseSaver

SIEMENS



no fault

temporary fault

~ 80 %

permanent fault

~ 20 %

The Solution – The FuseSaver

The Siemens FuseSaver...

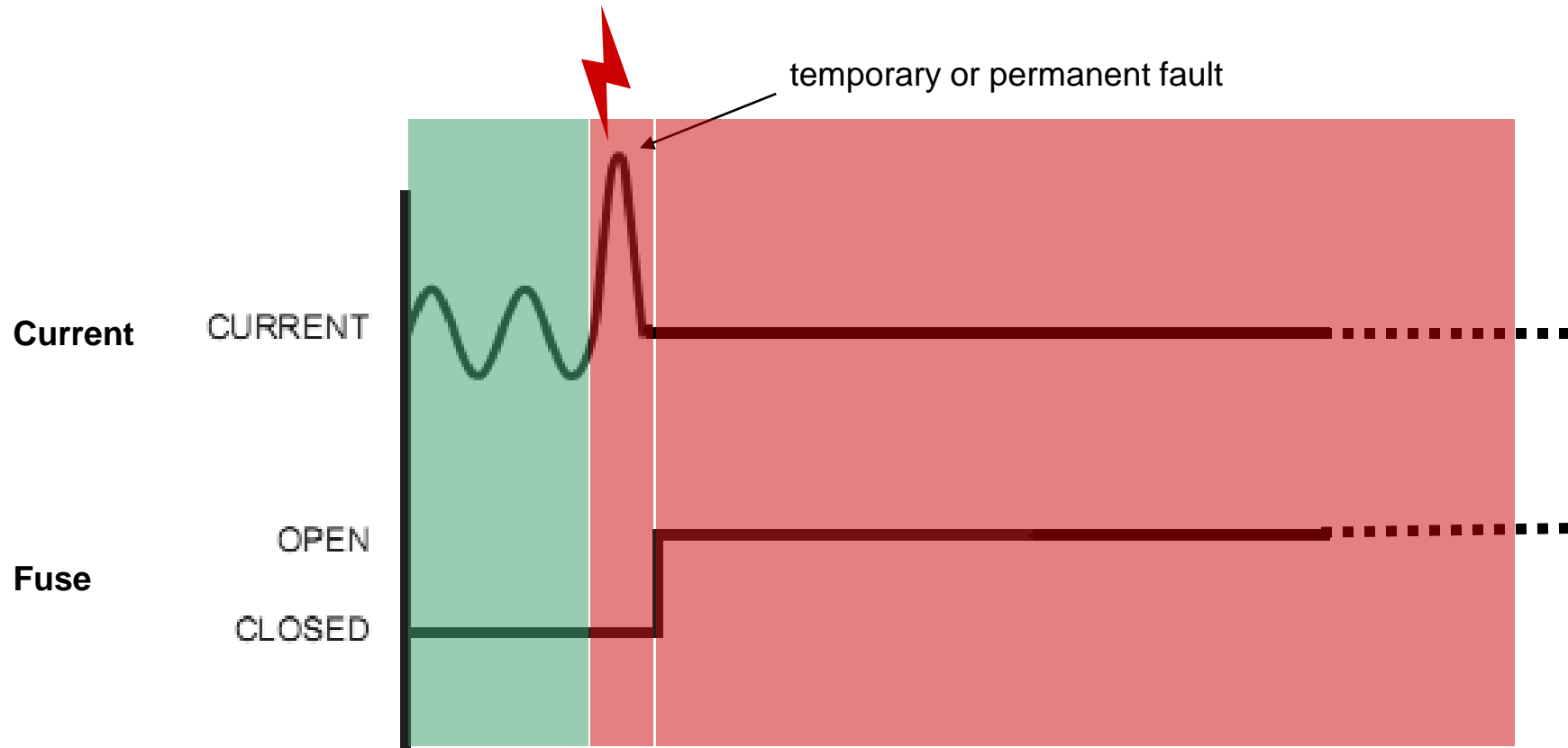
- 1** ... single-phase fault interrupting device that prevents a fuse from blowing on transient faults
- 2** ... is connected in series with a fuse, is self powered and easy to install
- 3** ... is capable of detecting, opening and clearing a fault in a half cycle
- 4** ... is primarily targeted at providing protection and automation of low fault level lines
- 5** ... creates the benefits of improved network reliability and reduced maintenance callouts
- 6** ... completely encapsulated featuring vacuum switching technology

Siemens FuseSaver: Introduction

Performance - today

SIEMENS

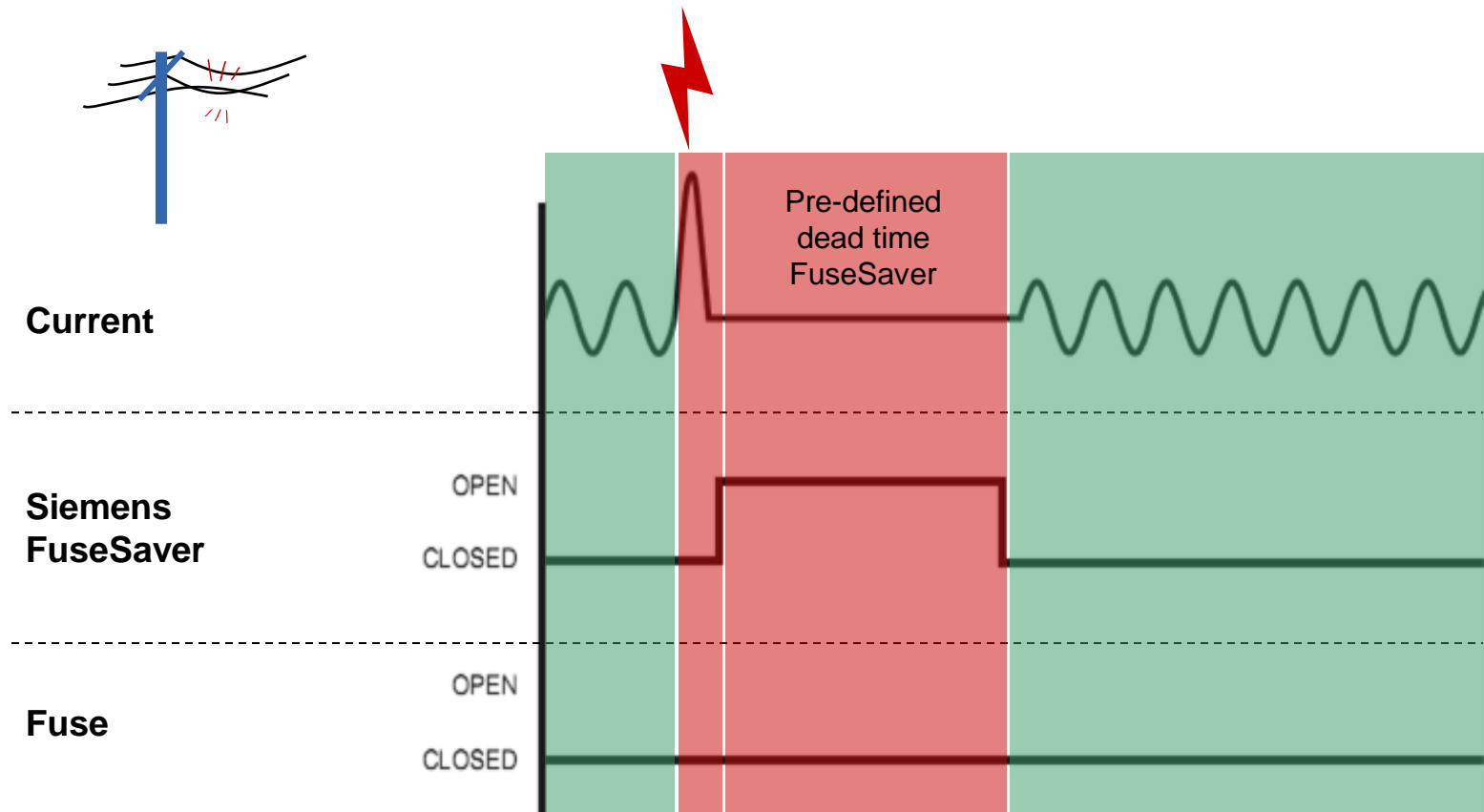
The fuse protects the spur line from temporary and permanent faults
... but it needs to be replaced !



Siemens FuseSaver: Introduction

Performance with FuseSaver - temporary faults

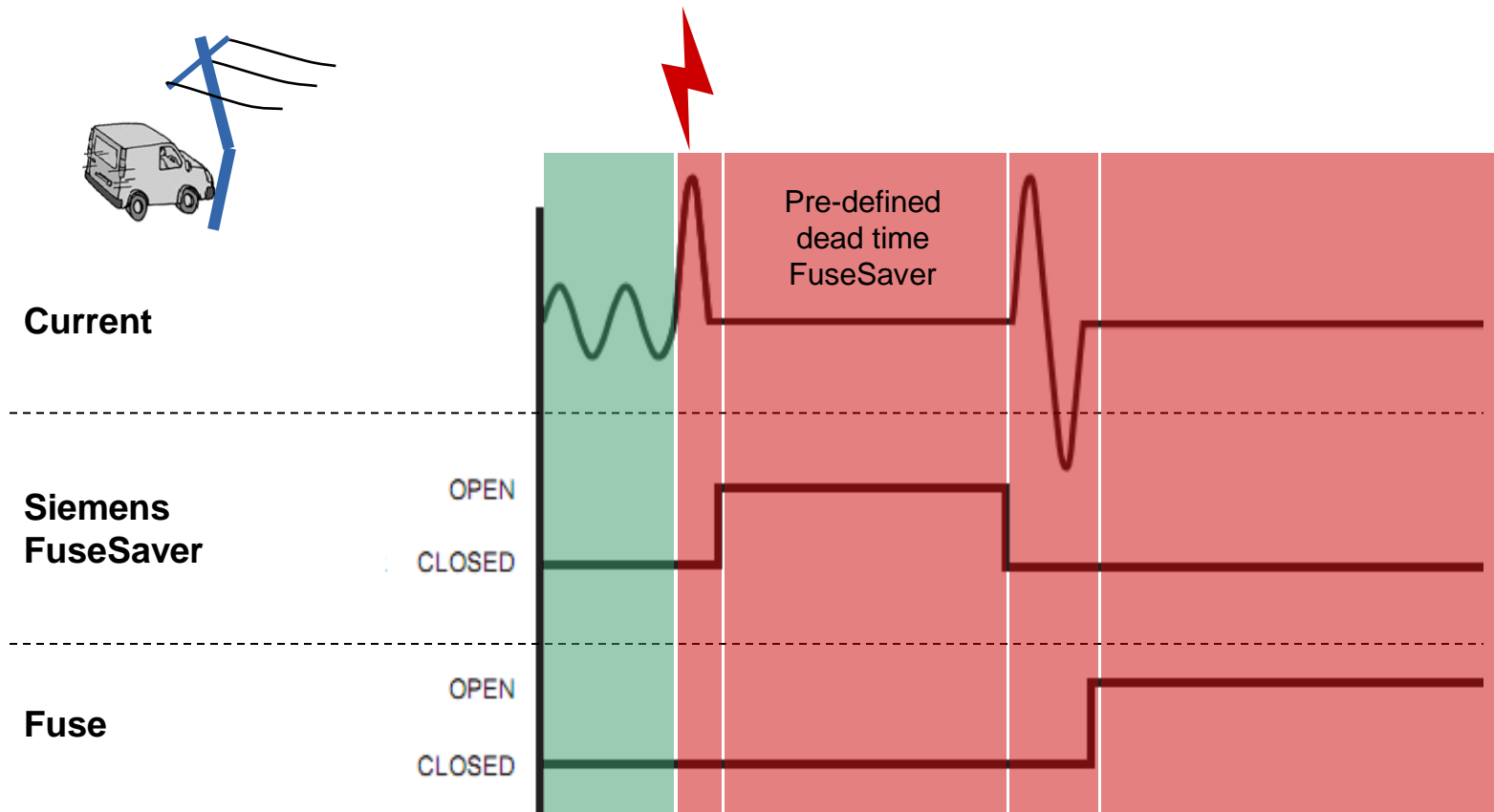
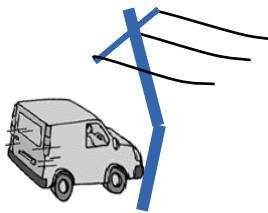
The fuse protects the spur line from permanent faults and
... the Siemens Fuse Guard protects the fuse from being blown by transient faults



Siemens FuseSaver: Introduction

Performance with FuseSaver - permanent faults

The fuse protects the spur line from permanent faults and
... the Siemens Fuse Guard protects the fuse from being blown by transient faults



Performance Comparison

Performance Capability	Fuse	Sectionalizer	FuseSaver
Improve operator safety	NO	NO	YES
Interrupt Fault Currents	YES	NO	YES
Only spur line customers affected by fault	YES	NO	YES
Transient faults only cause momentary outage	NO	YES	YES
Point of visible isolation of the line	YES	YES	YES
Visible indicator of permanent fault on line	YES	YES	YES
Provides data on fault and line operation	NO	NO	YES
Communicate location of fault	NO	NO	YES
Event history for the line	NO	NO	YES
SCADA integration	NO	NO	YES

Siemens FuseSaver

Introduction: Product overview



Product overview					
Rated voltage	12 kV	15.5 kV	24 kV		27 kV
Fuse ratings	Up to 50 A	Up to 50 A	Up to 16 A	Up to 50 A	Up to 50 A
Rated indefinite overload current	100 A	100 A	32 A	100 A	100 A
Rated short-circuit breaking current	4 kA RMS	4 kA RMS	1 kA RMS	4 kA RMS	4 kA RMS
Rated short-circuit making current	10 kA peak	10 kA peak	2.5 kA peak	10 kA peak	10 kA peak
Rated lightning impulse withstand voltage	75 kV	110 kV	125 kV	125 kV	125 kV
Minimum line current for operation	0.5 A	0.5 A	0.15 A	0.5 A	0.5 A
Fault break operations at 100 %	30				
Minimum tripping current (configurable)	x 2 fuse rating				
Mechanical operations	2,000				
Rated frequency	50/60 Hz				
Weight	5.5 kg				

Parameters	
Maximum operating ambient temperature	+50 °C
Minimum operating ambient temperature	-30 °C
Solar radiation	1.1 KW/m ²
Maximum altitude	3000 m
Humidity	0 to 100 %

FuseSaver – Benefits

Handling

- Lightweight (5.5 kg)
- Fast and easy installation – plug and play
- No change in protection scheme needed
- Simple line installation
- Safety benefits for live-line crew thanks to half-cycle switching

Technology

- Smart grid-ready with communications module
- Highly integrated and innovative technology
- Protection, monitoring, metering, and control in a single unit
- Self-powered
- Half-cycle switching – fastest vacuum circuit breaker on the market

FuseSaver – Benefits

Costs

- Typical return on investment is less than two years
- Improved network reliability means fewer penalty payments for
 - SAIFI, SAIDI etc.
- Reduced operating costs thanks to reduced maintenance callouts