

System Reliability Improvement through Lateral Reclosing and Transformer Self-resetting Interrupters

30th PPA Annual Conference – Saipan

Presented by

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Our Company Story

- Over a century of **INNOVATION** focused on improving grid **RELIABILITY**

S&C's Vision: Empower People to Transform the Grid

Objectives:

- Reduce the duration of power outages from hours to seconds — or to no outage at all
- Design systems to withstand the impacts of major weather events

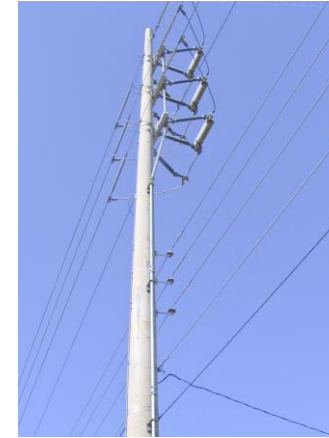
S&C solutions **save 2.9B customer-outage minutes** each year



Our Products and Services



Medium and
High Voltage
Fuses



Circuit-Switchers



Overhead Distribution Switches



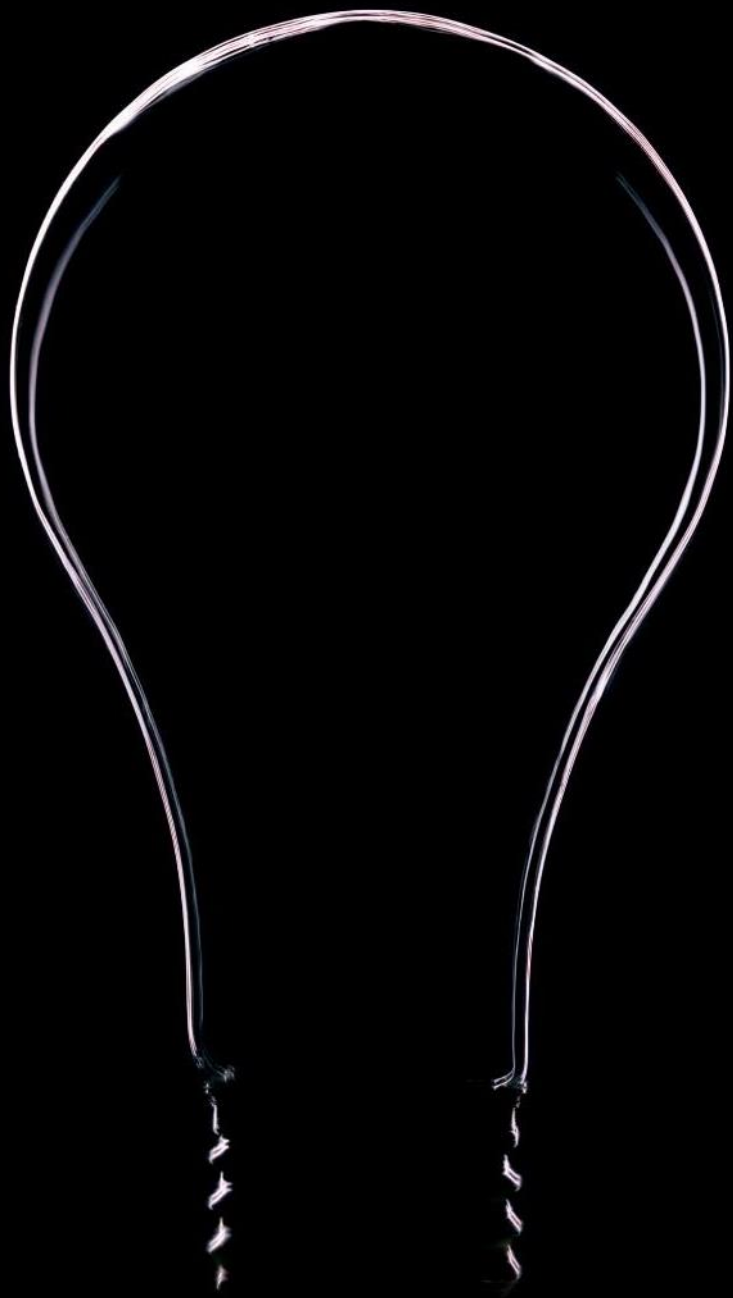
IntelliRupters,
TripSavers, Underground
Distribution Switchgear



Engineering Services
(Utility, Renewable, and Industrial
Substations, Energy Storage Systems,
Microgrids)

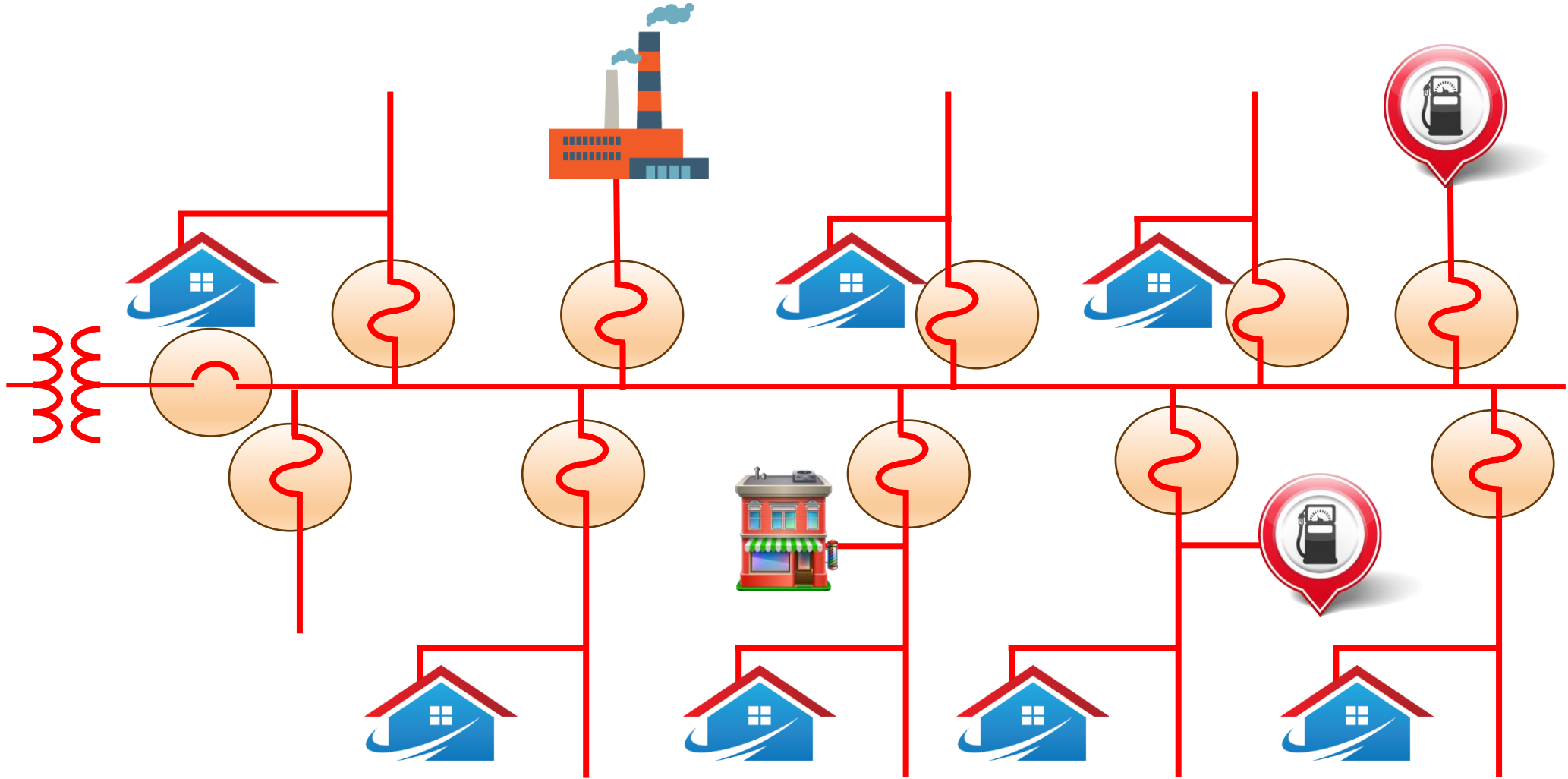


Consulting &
Analytical Services



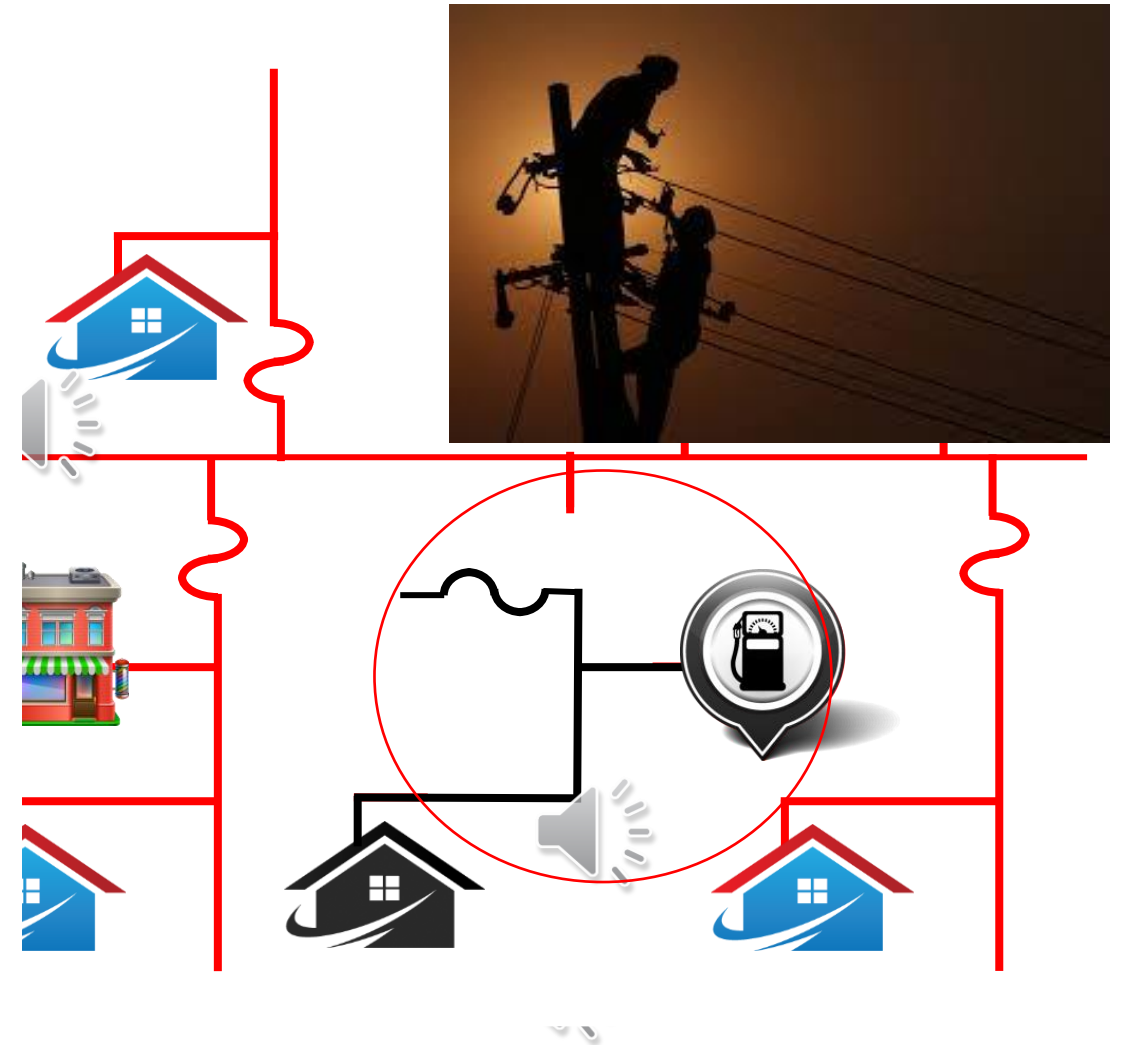
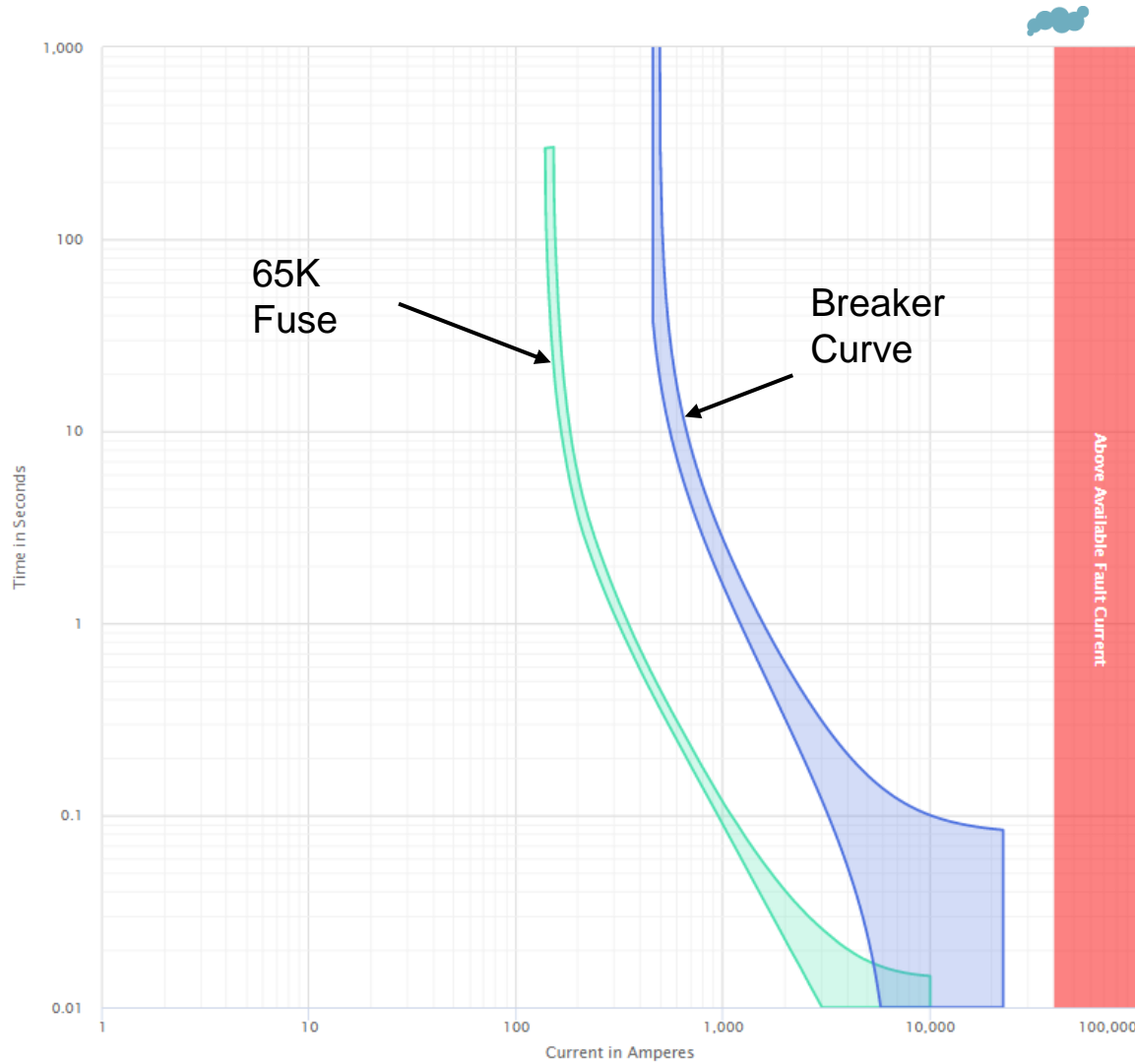
Traditional Distribution Grid

- Feeder Circuit Breaker and Lateral Fuses Provide Protection



Traditional Grid

■ Fuse Blow Protection Strategy



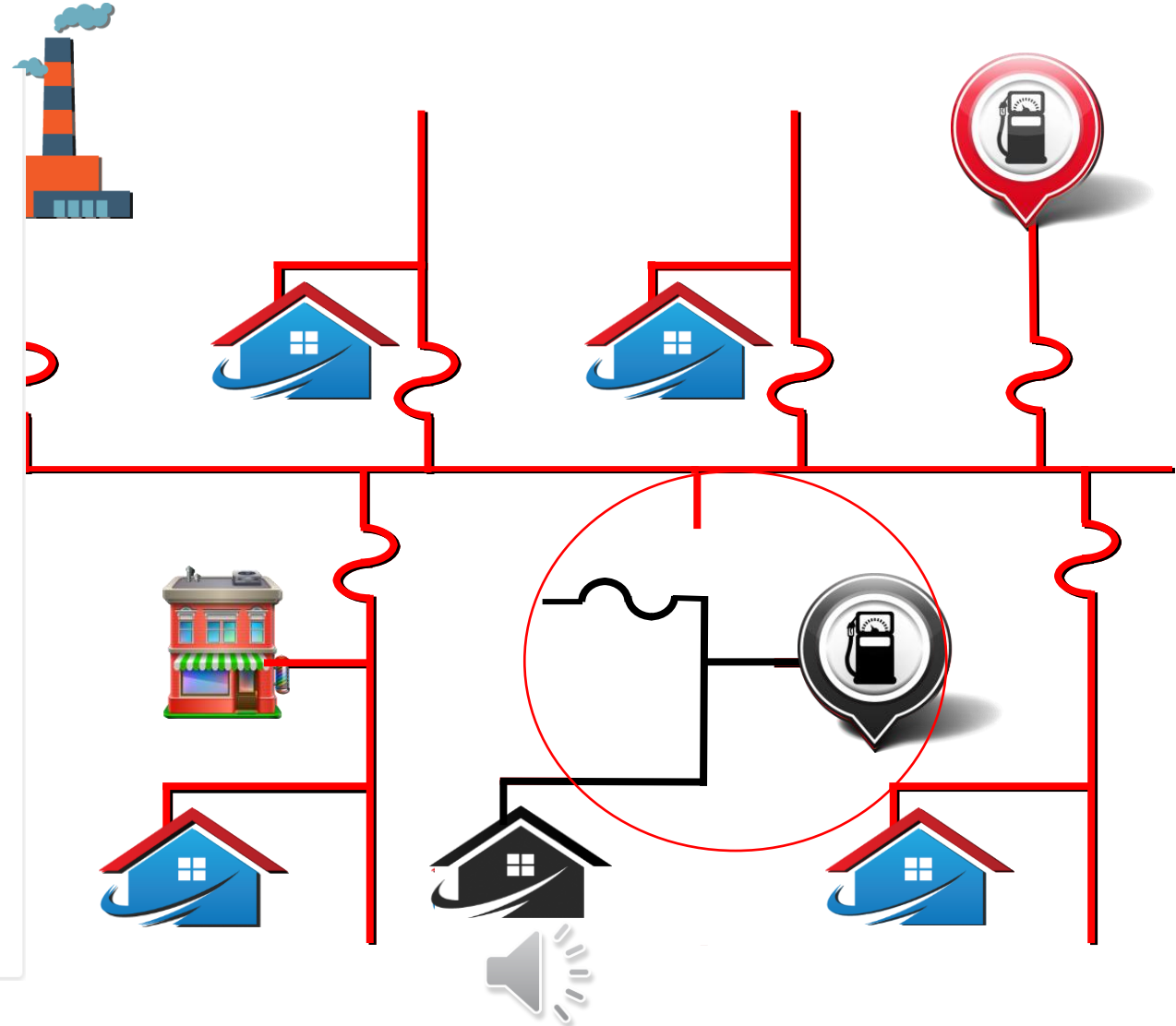
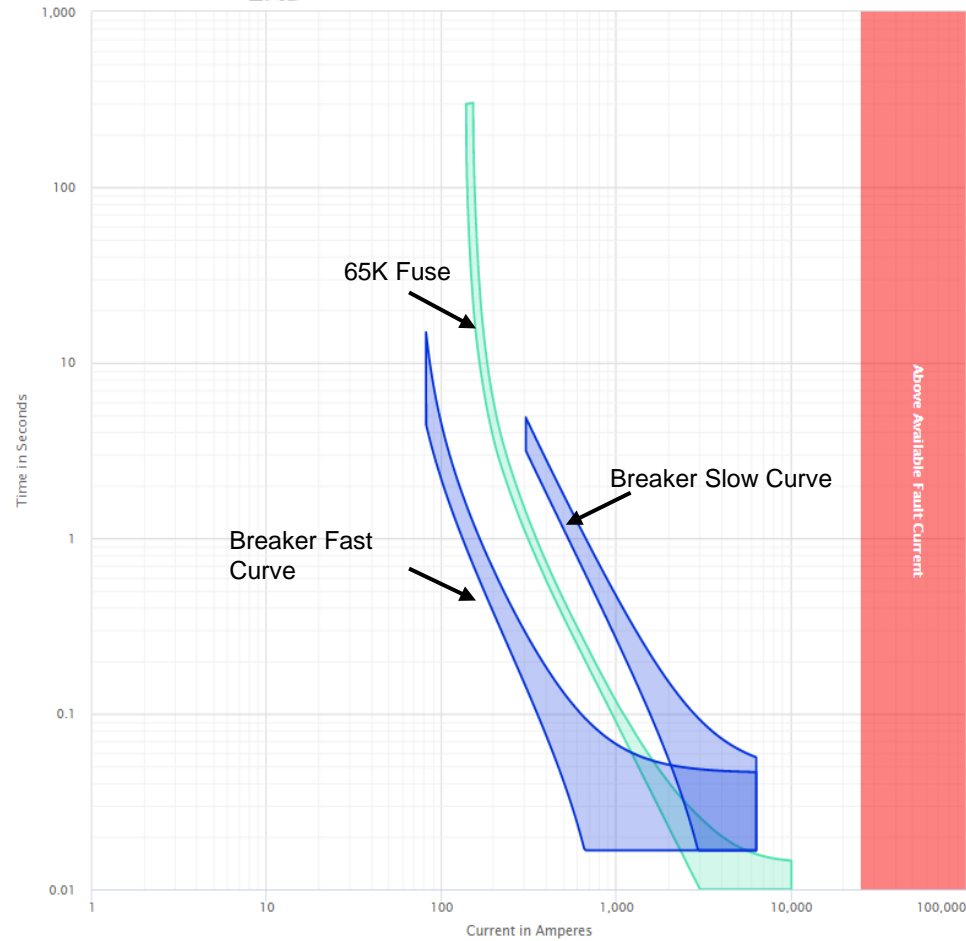
Traditional Grid

- Fuse Blow Protection Strategy

Impacts of Fuse Blow Protection Strategy
1. Outage for customers on lateral even if a temporary fault
2. System reliability worsens (SAIDI and SAIFI increase)
3. Operational expenses increase due to unnecessary truck rolls

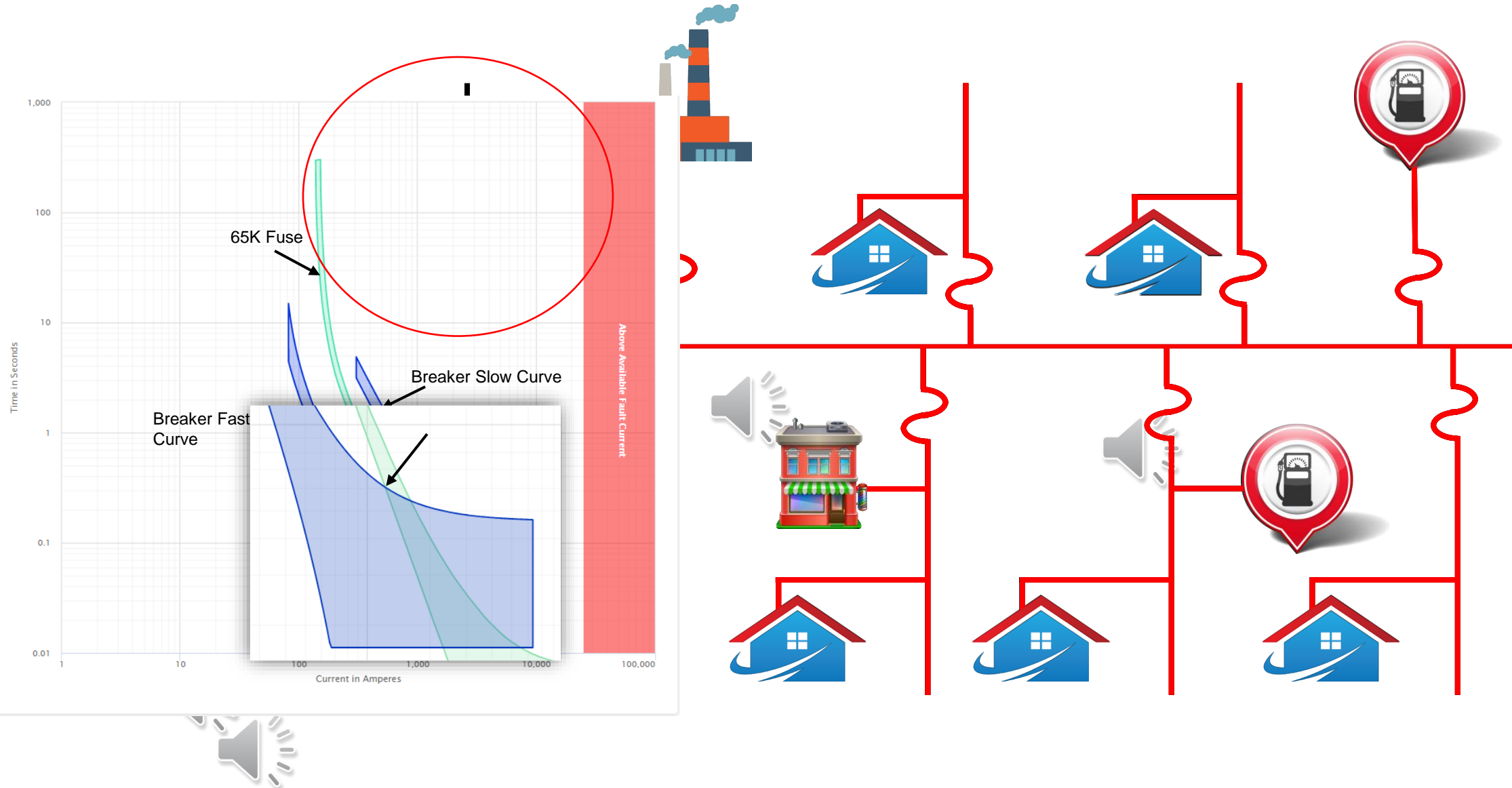
Traditional Grid

■ Fuse Saving Protection Strategy



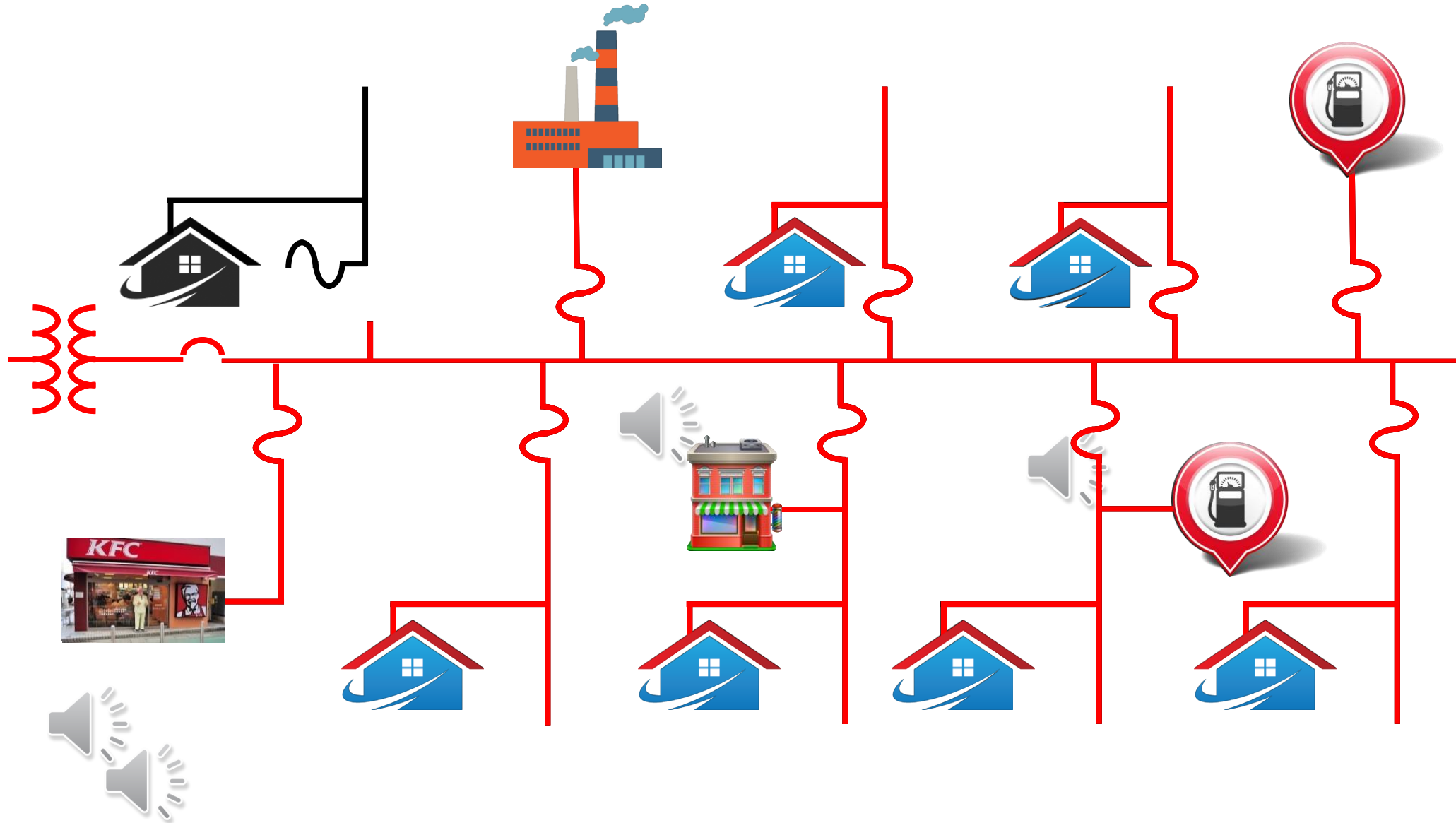
Traditional Grid

- Fuse Saving Protection Strategy: Coordination Limitation at Higher Fault Currents



Traditional Grid

- Fuse Saving Protection Strategy



Traditional Grid

■ Fuse Saving Protection Strategy

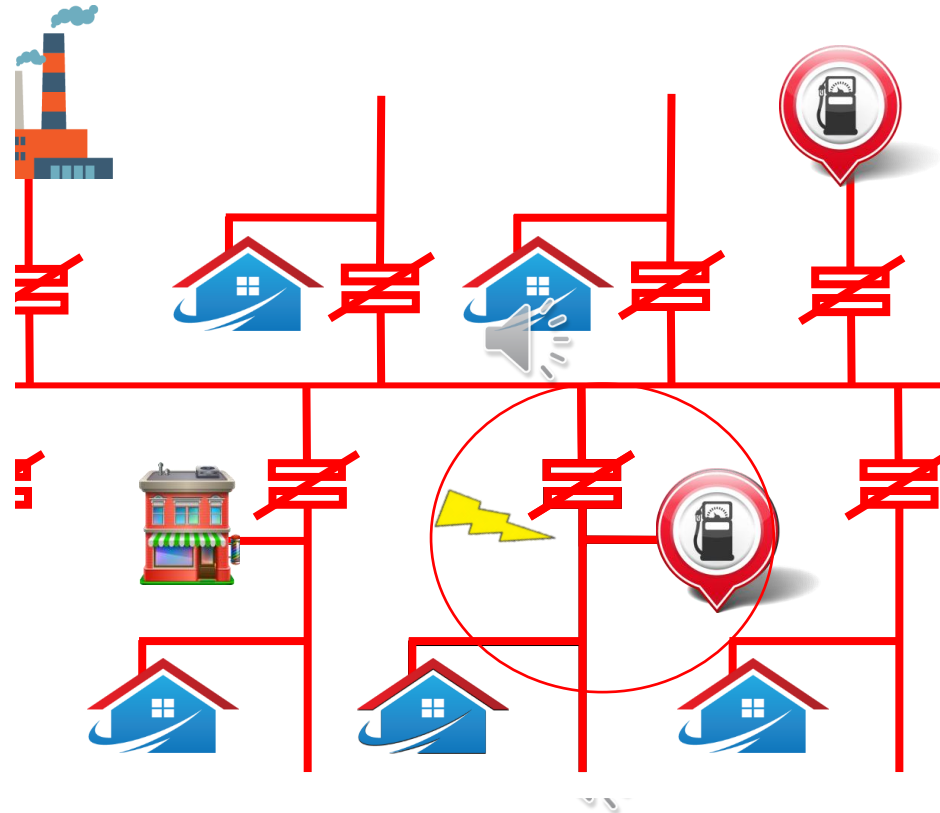
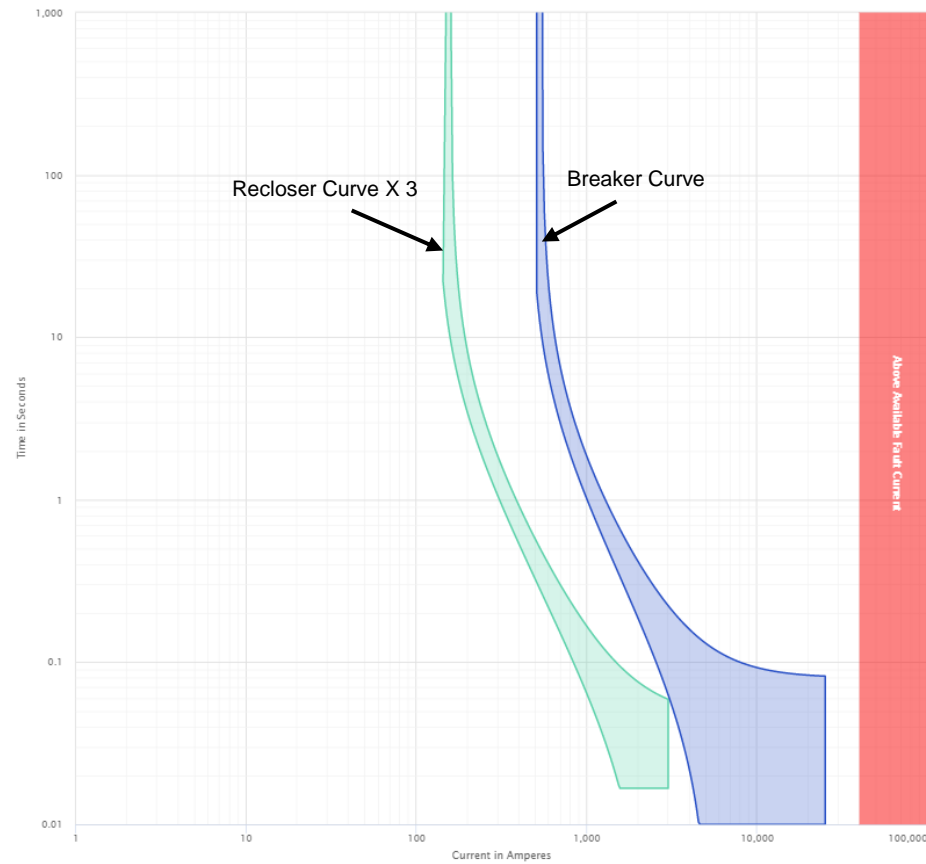
Impacts of Fuse Saving Protection Strategy
1. Outage for customers on lateral if temporary fault persists after 1 st CB trip
2. Momentary outage for all customers on feeder after 1 st CB trip
3. System reliability worsens (SAIFI and MAIFI increases)
4. Operational expenses increase due to unnecessary truck rolls



**Disrupt the
status quo.**

New Grid

- Lateral Reclosing with S&C's TripSaver® II Cutout-Mounted Recloser



New Grid

■ S&C's TripSaver II Cutout-mounted Recloser

1. Self-powered
2. Electronically-controlled vacuum interrupter
3. Mounted in a standard S&C cutout
4. No batteries required
5. No replaceable parts
6. No to very little maintenance

TripSaver II Ratings	
Amperes Continuous Current	40, 100, and 200 A
Amperes Interrupting	6300 A
Voltage	15 and 25 kV
Frequency	50 and 60 Hz



New Grid

- Lateral Reclosing with S&C's TripSaver® II Cutout-Mounted Recloser



PUC installed TripSaver IIs to
improve reliability

PUC avoided 59 outages in just
1 year!

New Grid

■ Lateral Reclosing with TripSaver II

Impacts of Lateral Reclosing with TripSaver II

1. No outages on laterals due to temporary faults
 - Recloses up to 3 times on lateral faults
 - For temporary faults, automatically restores power to lateral
2. For persistent faults, drops open to indicate problem location
3. System reliability improves (SAIFI decreases)
4. Operational expenses decrease due to elimination of unnecessary truck rolls for temporary faults

New Grid

■ The Business Case for Lateral Reclosing with TripSaver II

1. Reduce truck roll cost	Eliminate truck rolls due to temporary faults
2. Reduce electricity user interruption costs	Eliminate outages/interruptions due to temporary faults
3. Reduce carbon emissions	Eliminate truck rolls due to temporary faults

Because of the **59 outages** avoided in 1 year, we estimate PUC:

- (1) Avoided truck rolls and realized operational savings effectively paying for the TripSaver II deployment in **less than 1 year**
- (2) Saved customers **thousands of dollars** of interruption costs
- (3) Avoided nearly **456 kg of CO₂** emissions using a light commercial vehicle or Ute for truck rolls



**Trailblazers
wanted.**

New Grid

**New Grid Edge
Protection Solution:**

**VacuFuse[®] II
Self-Resetting Interrupter**



SCENARIO 1

Place arrester on the transformer

BUT

Risk fuse link damage caused by repeated surges, resulting in sneakouts



SCENARIO 2

Connect arrester upstream of fuse

BUT

Expose transformer to potential surges caused by longer arrester lead lengths

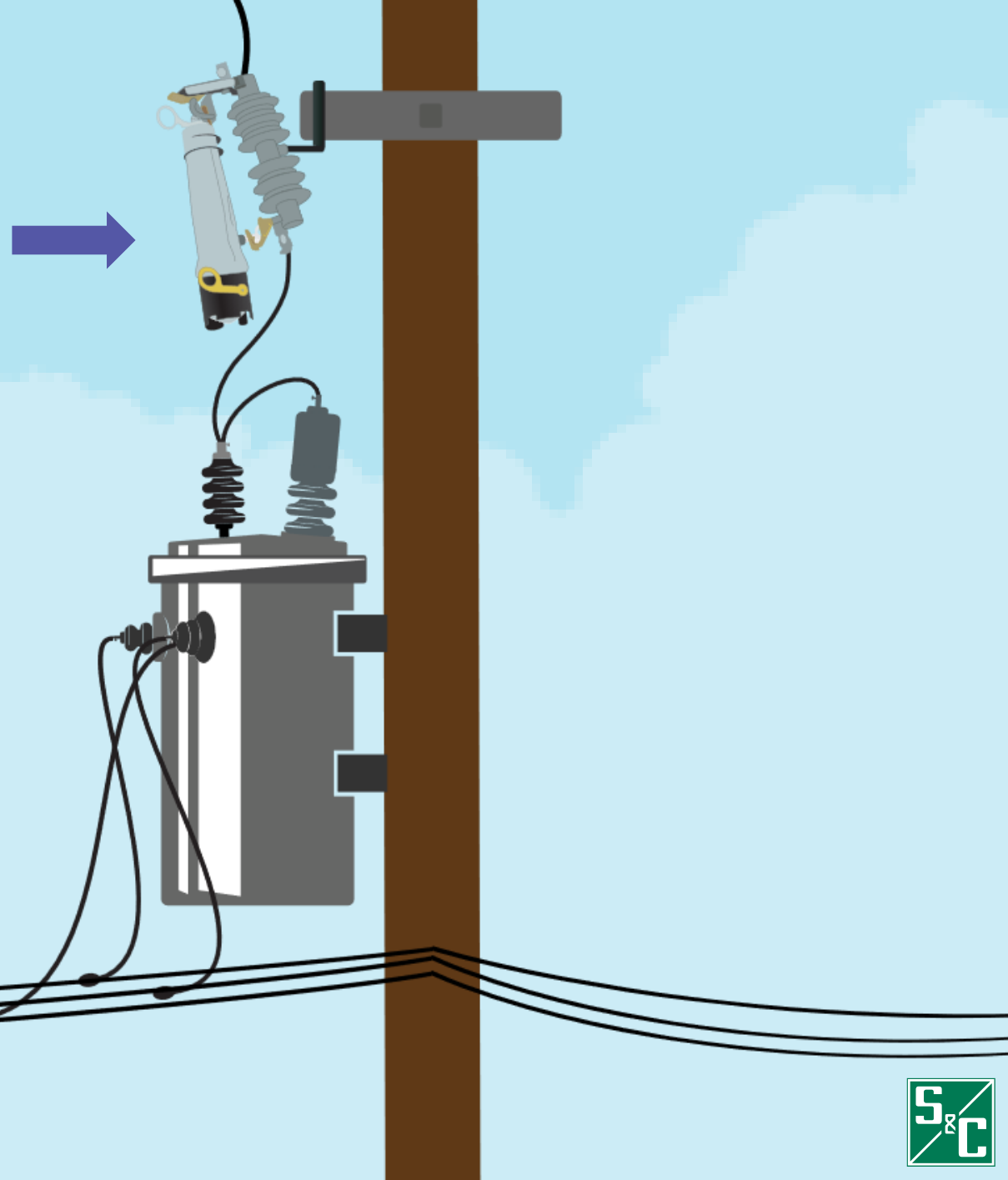


Solution

Replace your transformer fuse with a VacuFuse II interrupter

- Won't cause sneakouts!
- Automatically resets after a fault
- Helps protect your transformer

**PROBLEM
SOLVED!**



New Grid

■ VacuFuse II Self-Resetting Interrupter

1. Self-powered
2. Electronically-controlled vacuum interrupter
3. Mounted in a standard S&C cutout
4. No batteries required
5. No replaceable parts
6. No to very little maintenance

Vacufuse II Ratings

Amperes Continuous Current	20 A	
Amperes Interrupting	6300 A	
Phase-to-Neutral Voltage	7.2–9.0 kV	7.2–15.5 kV
Frequency	50 and 60 Hz	



Eliminate Nuisance Fuse Operations with VacuFuse® II Self-Resetting Interrupter



Improves
Customer
Satisfaction



Offers Simple
Deployment &
Easy Operation

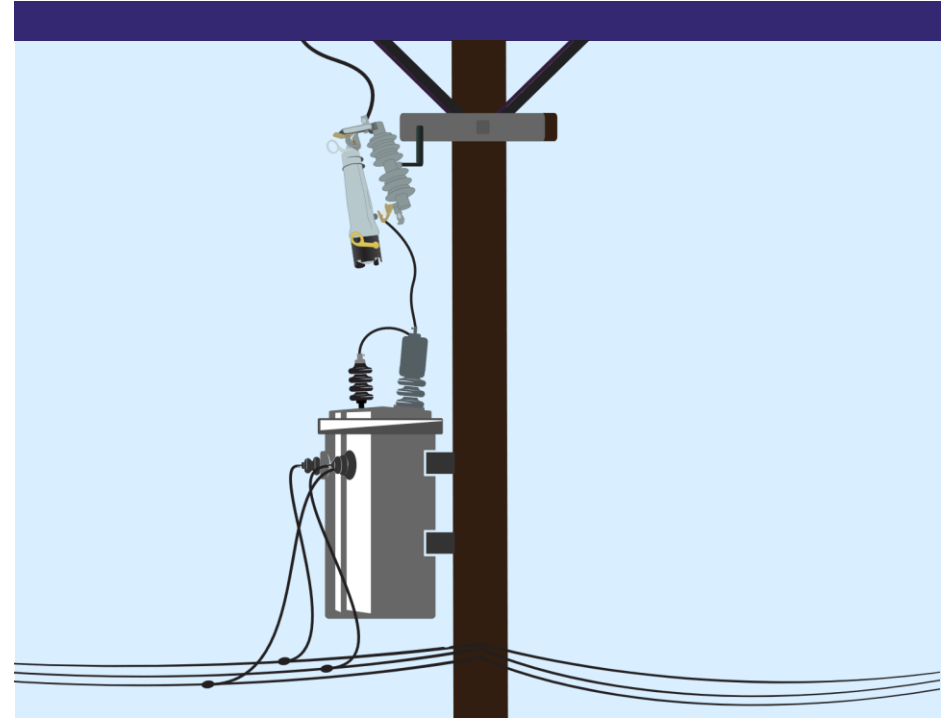


Delivers
Coordination
Stability

Improves Customer Satisfaction



Automatically Clears
Temporary Faults



No Sneakouts!
Place Arresters Where Most
Effective—on the Transformer

Easy Operation

- Added safety features

Automatic Delayed Close
After 45 Seconds



Delivers Coordination Stability & Other Advantages Over Fuses

- No degradation of TCC curves over time



Ensures
**Dependable &
Repeatable**
Operation

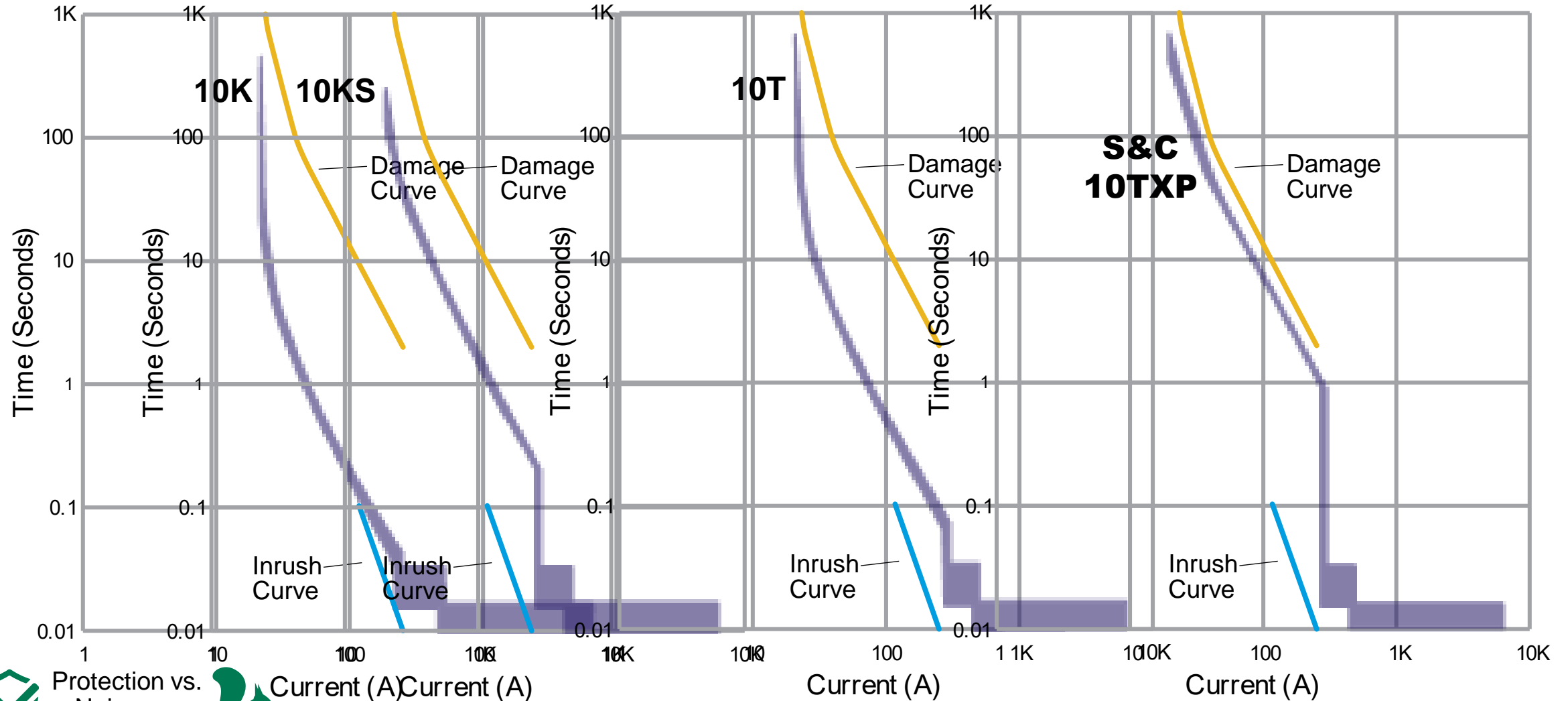
Even after **repeated
exposure** to faults
or surge events

Lets you place arresters
on the transformer tank
for the **best protection**

Delivers Coordination Stability

i 75 kVA transformer
on a 13.2 kV system

■ Emulated TCC curve



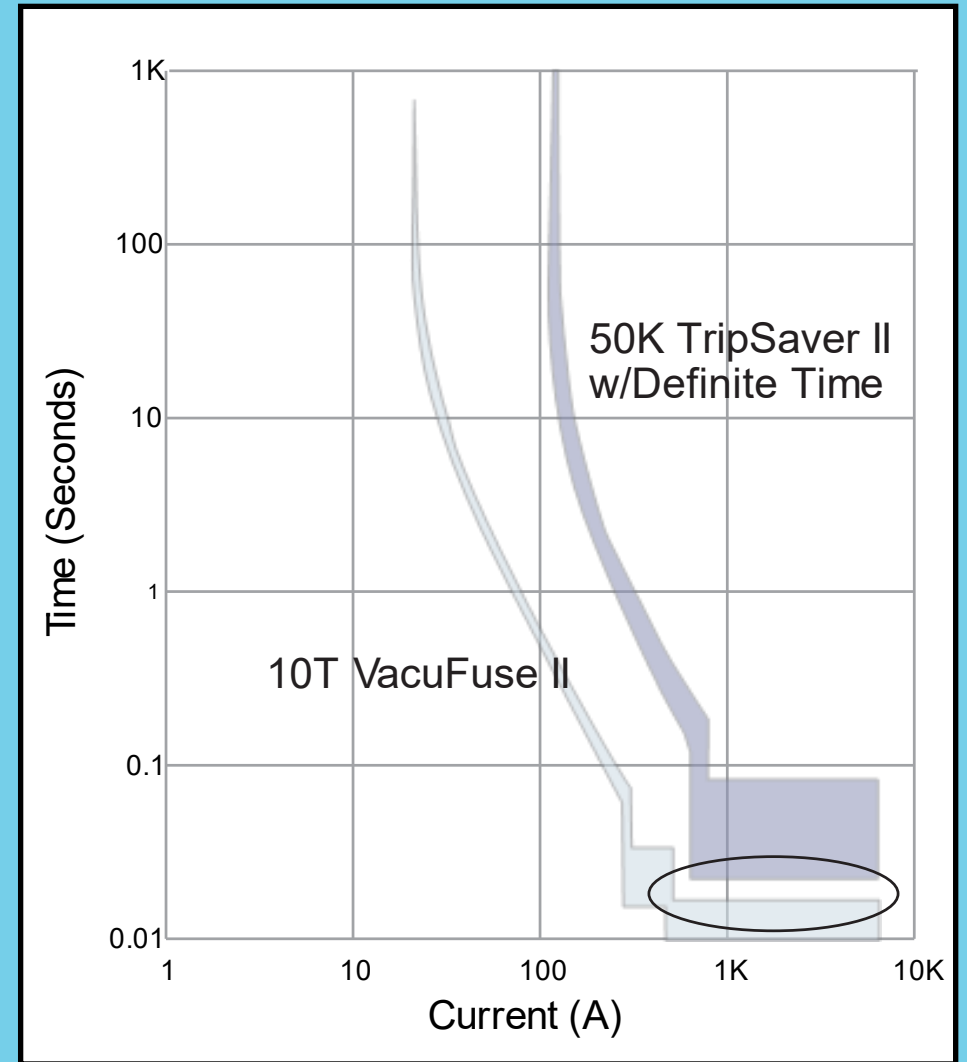
Protection vs.
Nuisance
Tripping



Current (A)



For even greater protection,
add a **Tripsaver® II**
Cutout-Mounted
Recloser upstream



In Summary...

TripSaver II and VacuFuse II



Improve
Reliability and
Customer
Satisfaction



Offer Simple
Deployment & Easy
Operation



Help You
Achieve
Your
Goals!