Maximizing System Coordination with Self-Healing Technology

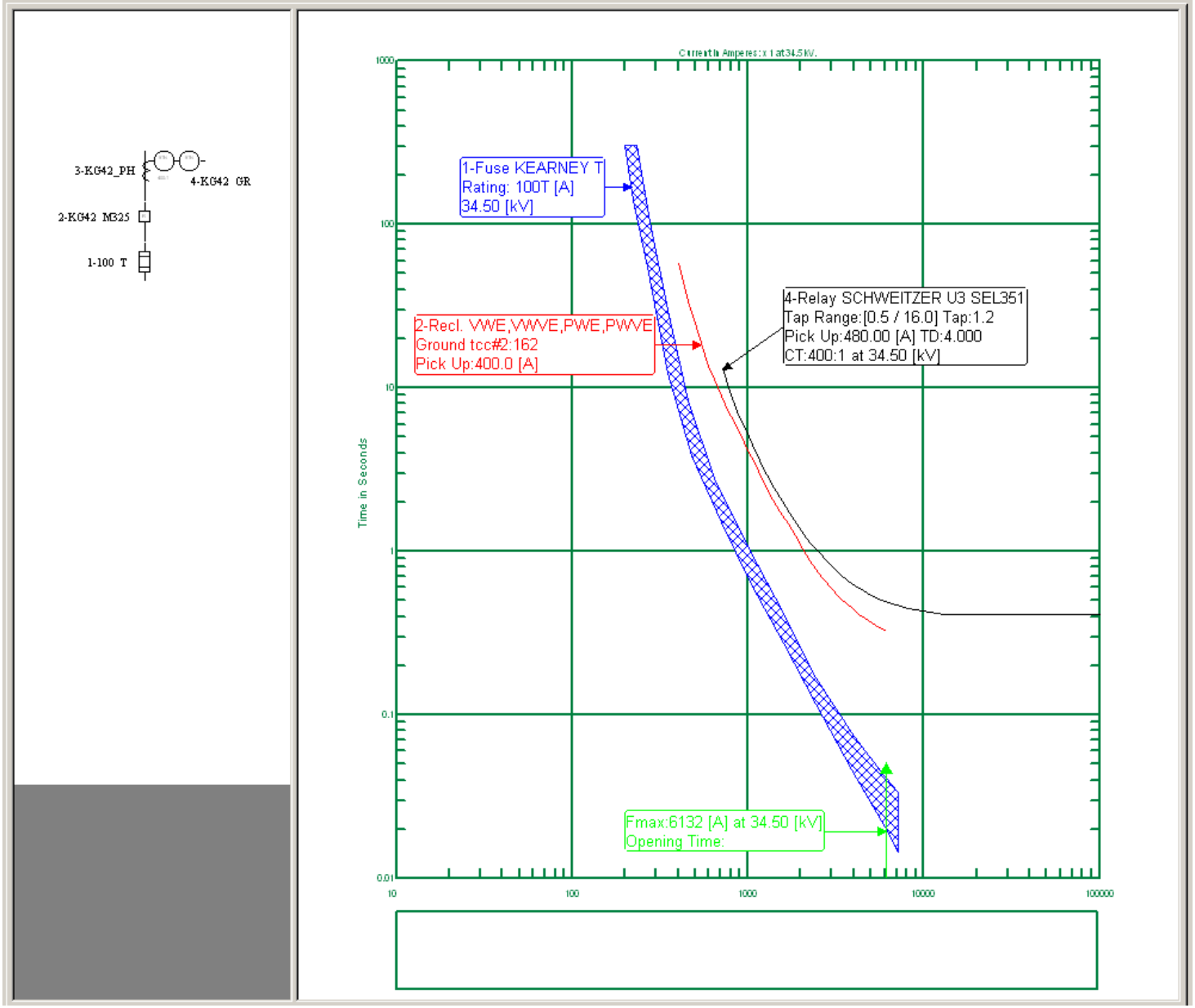
Yukon Feeder Automation Presentation

COOPER Power Systems

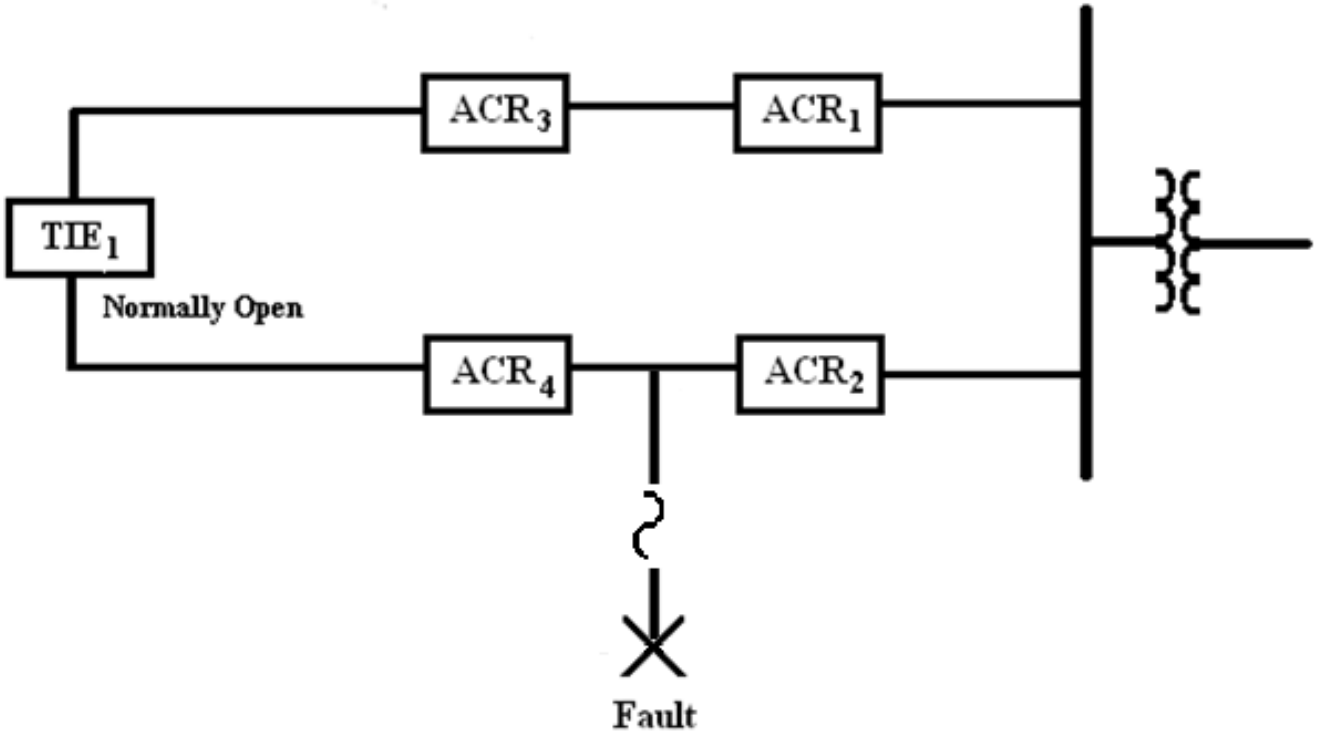
Objective

- Discuss Challenges with TCC Coordination in Self Healing System
- Discuss Simple Solutions
  - Miscoordination Correction
  - Profile Management
  - Switch and Sectionalizer Mode

Basic Overcurrent **Protection Coordination**

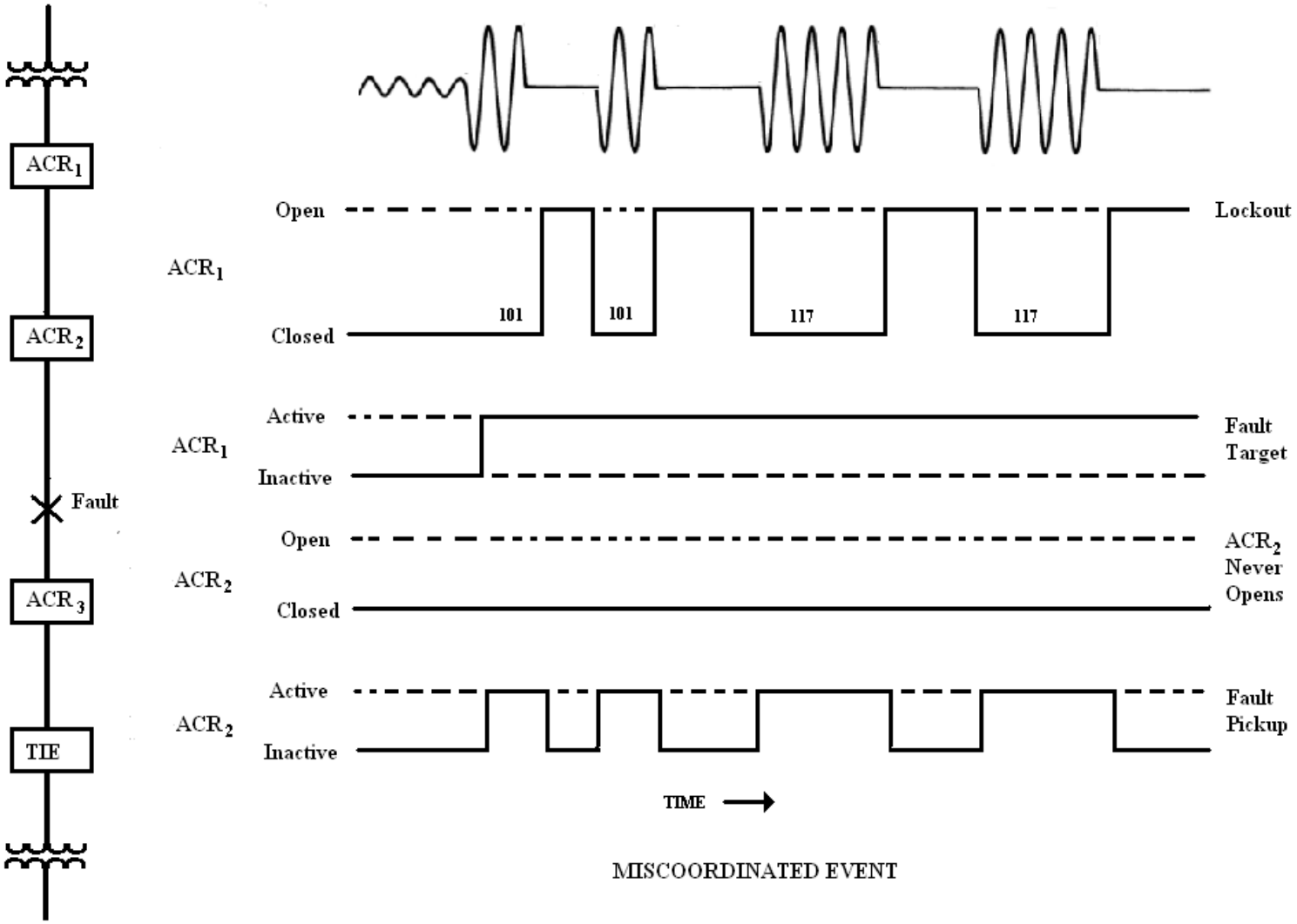


Self Healing System **Coordination Challenge**



Normal Power Flow, ACR_2 coordinates with Fuse/Breaker. In reverse, ACR_1, ACR_3 , ACR_4 and Tie must all coordinate.

Miscoordination Correction



Miscoordination Correction

Device ACR2: Fault Pickup indication latched.

Device ACR1: Fault Pickup indication latched.

Device ACR1: Fault Target indication received.

Device ACR1: OPENED

Device ACR1: RECLOSED.

Device ACR1: OPENED

Device ACR1: RECLOSED.

Device ACR1: OPENED

Device ACR1: Lockout indication received.

Device ACR1: New Fault Event

Who saw this fault down-load of device ACR1:

Device ACR3: No!

Device ACR2: Yes! (Fault maybe downstream from this device)

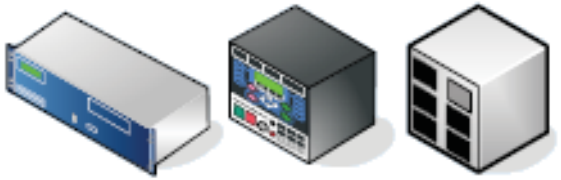
Device ACR2 should have tripped. Probable miscoordination

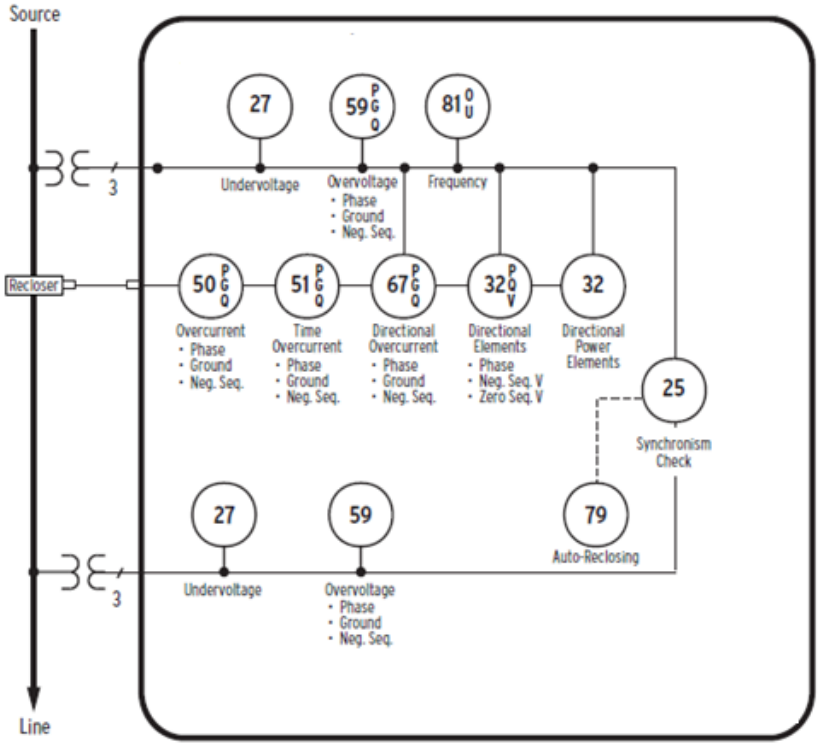
Transferring logical fault location down-load of device ACR2

Magic Bullet?!!!

1. Simultaneous faults can trick Miscoordination Algorithm.
2. Communication failures inhibit system from correcting coordination issues.
3. Miscoordination on system still causes unnecessary customer “blinks”

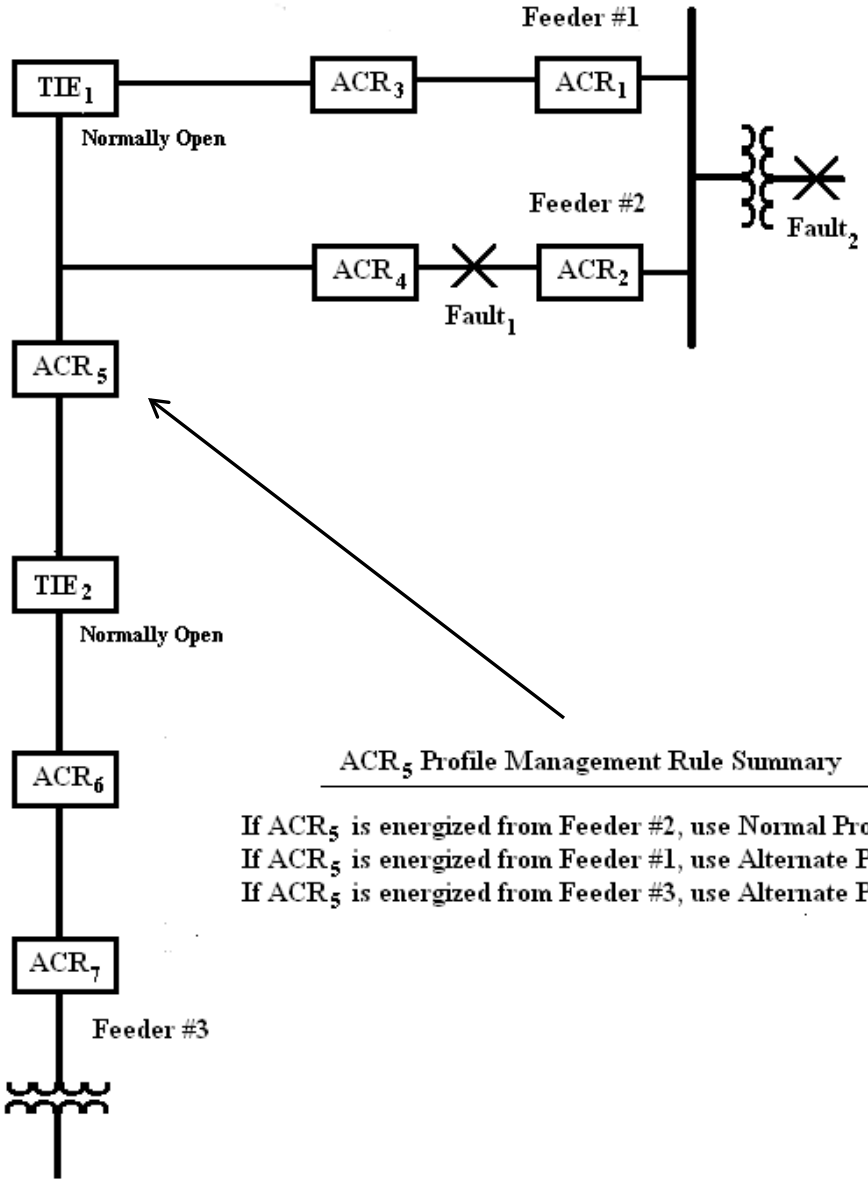
Alternate Profiles or Setting Groups





Vs.

Topology Driven Profile Changes



ACR_5 Profile Management Rule Summary

If ACR_5 is energized from Feeder #2, use Normal Profile
If ACR_5 is energized from Feeder #1, use Alternate Profile 1 (True for $Fault_1$)
If ACR_5 is energized from Feeder #3, use Alternate Profile 2 (True for $Fault_2$)

Topology Driven Profile Changes

Evaluating best reconnect option:

Normal source for device ACR4 is Feeder #2.

Preferred alternate source is Feeder #1

Entire load can be picked up by normal or preferred source via TIE1

Targets and protection profiles will be reset as needed before reconnection.

Device ACR5: Select Alternate Profile 1 request issued.

Device TIE1: Select Alternate Profile 1 request issued.

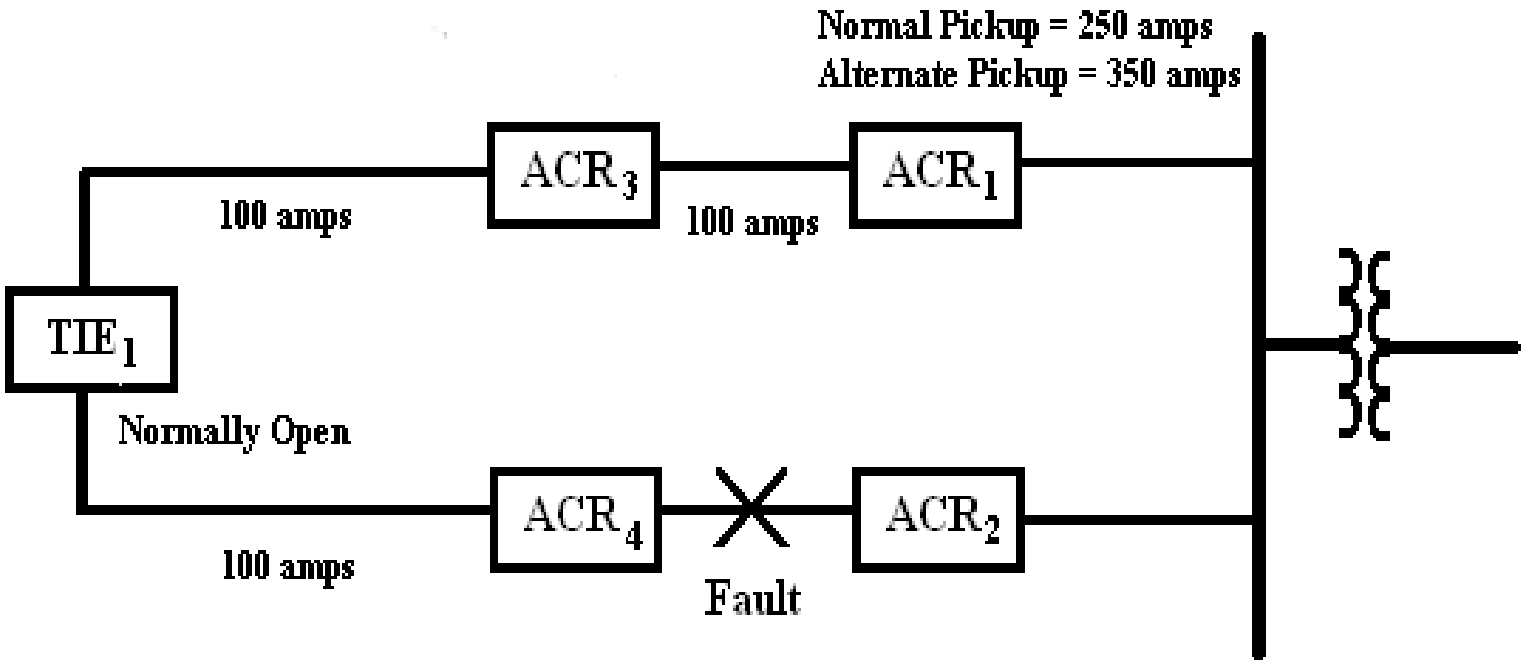
ACR5_NormalProfileSelected' --> 0

ACR5_AltProfile1Selected' --> 1

TIE1_NormalProfileSelected' --> 0

TIE1_AltProfile1Selected' --> 1

Load Driven Profile Changes



Load Driven Profile Changes

Device ACR4: Lockout indication received.

Evaluating best reconnect option:

Total load: 100.0/100.0/100.0 Amps.

TIE1 Transfer capacity = 300.0/300.0/300.0 Amps

ACR1 Profile Threshold 250.0/250.0/250.0 Amps

ACR3 Profile Threshold 150.0/150.0/150.0 Amps

Entire load can be picked up by normal or preferred source via TIE1

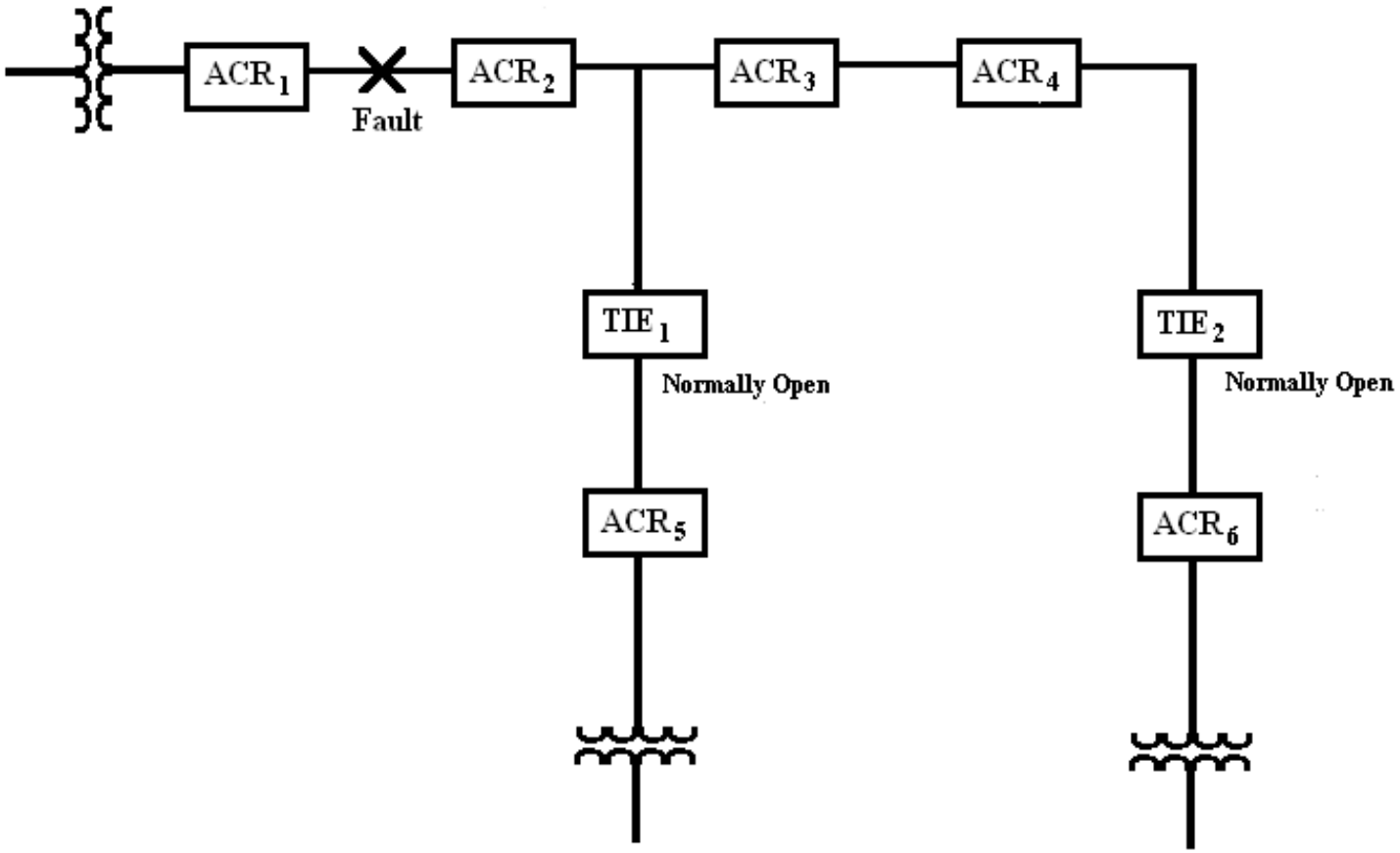
Targets and protection profiles will be reset as needed before reconnection.

Device ACR1: Select Alternate Profile 1 request issued.

Device ACR3: Select Alternate Profile 1 request issued.

Device TIE1: Select Alternate Profile 1 request issued.

Maximum Link Fragmentation



Maximum Link Fragmentation

Evaluating best reconnect option:

Total load: 300.0/300.0/300.0 Amps.

Disconnected link has 2 ties:

TIE2 Transfer capacity = 400.0/400.0/400.0 Amps - Limited to pickup 2 zones)

Zone load = 236.0/236.0/236.0 Amps [priority: 0]

Device TIE2: Could potentially close.

TIE1 Transfer capacity = 400.0/400.0/400.0 Amps - Limited to pickup 2 zones)

Zone load = 39.0/39.0/39.0 Amps [priority: 0]

Device TIE1: Could potentially close.

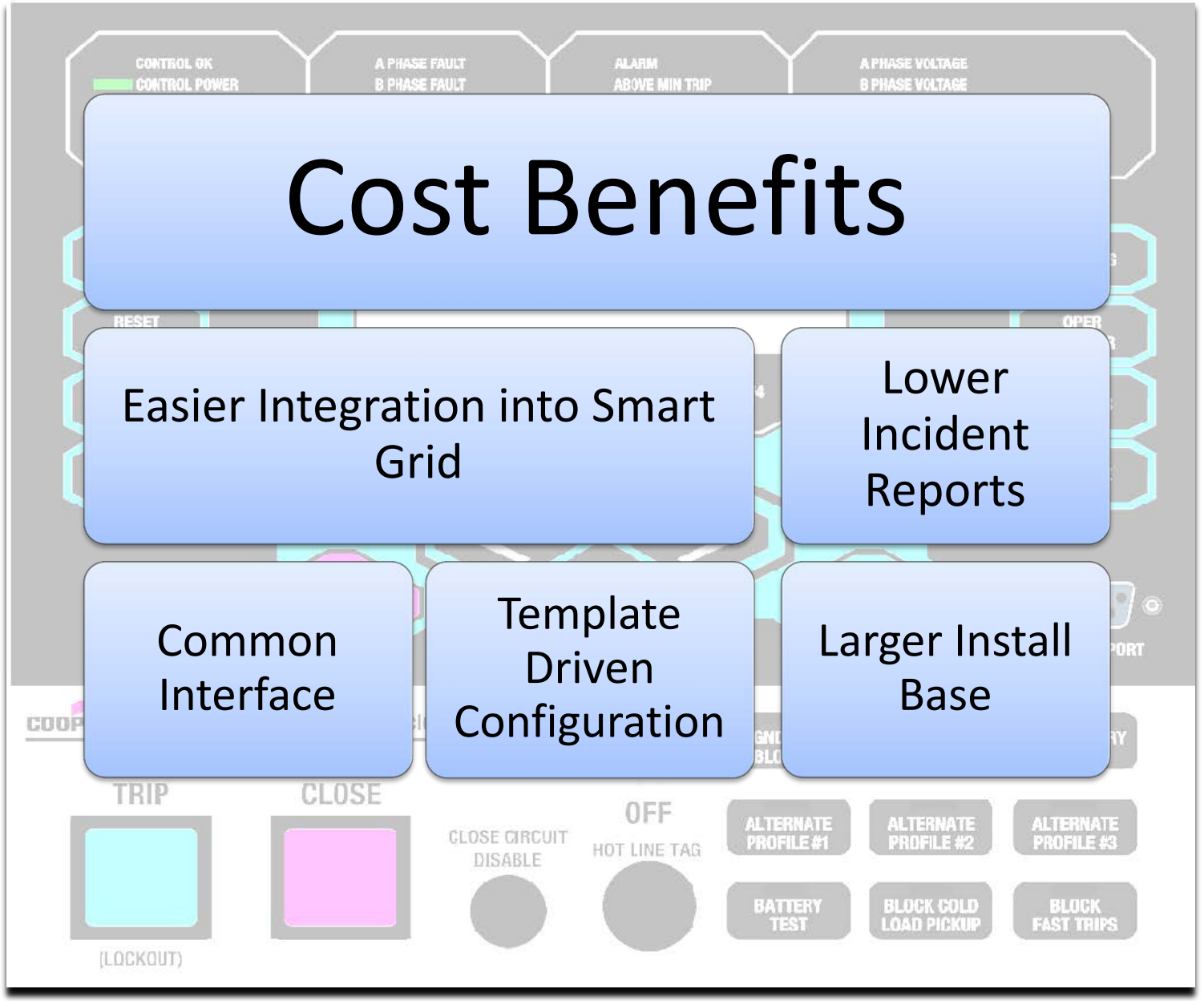
Normal or preferred source cannot pick up entire load.

No single tie device can pick up entire load.

Operation Modes

Recloser Mode	• Fault Interrupting Capabilities • Requires coordination with other equipment • Device operates on TCC's
Switch mode	• Only operates via external control request (operator or other control system) • Requires no system coordination.
Sectionalizer Mode	• Dead Line Interrupting Capabilities • Requires coordination with other equipment • Device operates on Fault Pickup with Loss of Voltage Counts or Timer.

One Control



Cost Benefits

Easier Integration into Smart Grid

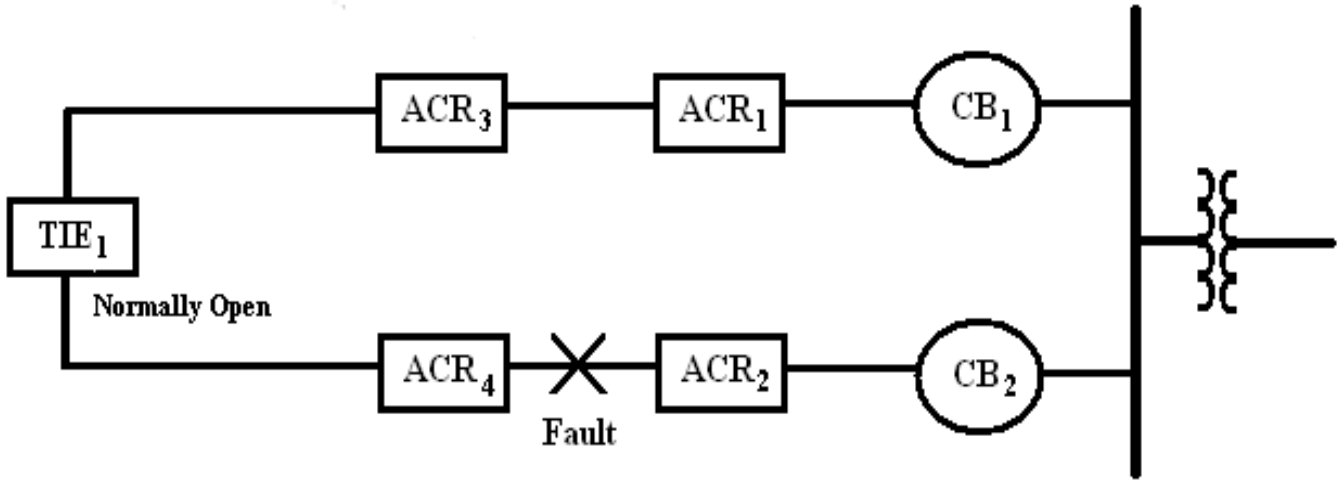
Lower Incident Reports

Common Interface

Template Driven Configuration

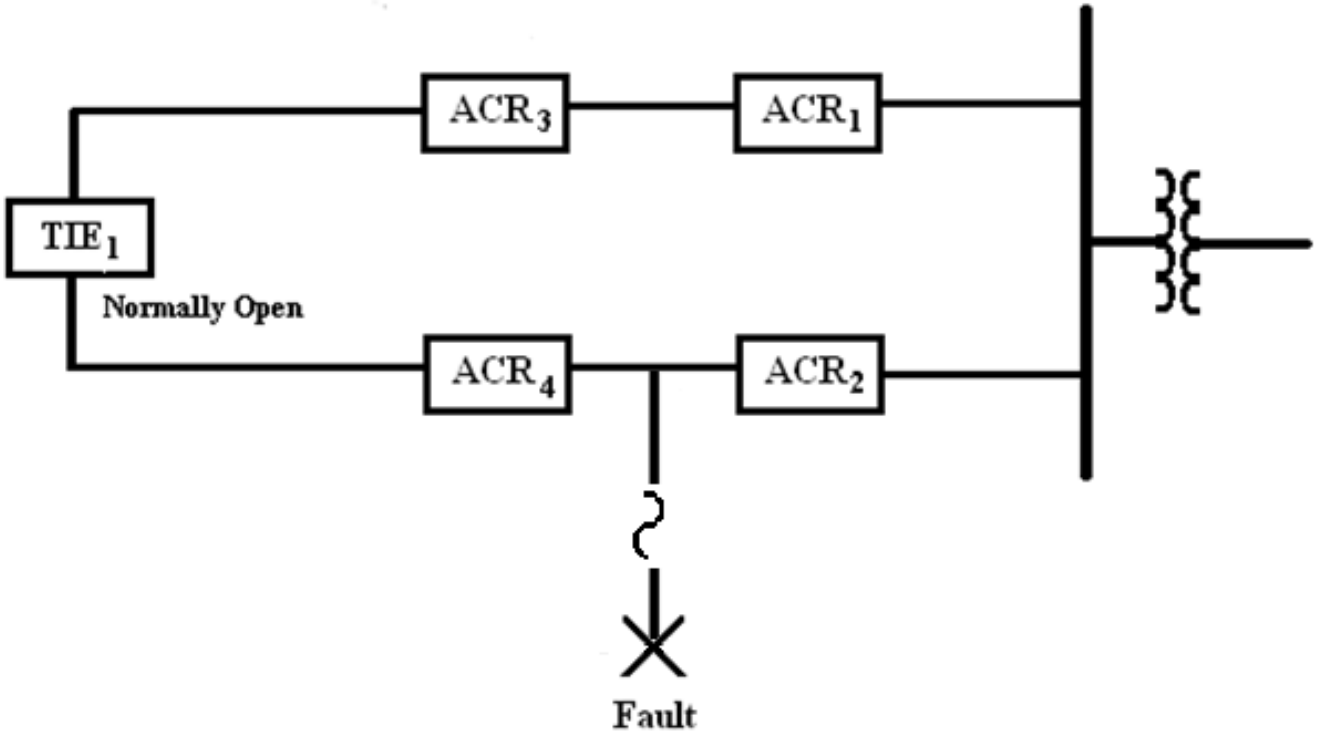
Larger Install Base

One Control



1. Each ACR operates in Switch Mode
2. Circuit Breakers Clear all Faults
3. FLISR application uses same algorithm as Miscoordination correction to properly isolate fault.

Putting it all together



1. Change ACR_3 to switch mode based on Load
2. Change ACR_4 to switch mode based on Topology
3. Change TIE protection profile to coordinate with ACR_1 and Fuse

- **Questions?**
- **Contact:**

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