1. Fast Transfer
   - Solid State Transfer Switches
2. In Phase Transfer
3. Residual Voltage

Loaders
Motors
Bus Protection

- CT saturation for differential elements
  - External
    - Trip when should not
    - False trip
      - Much bigger impact on system
    - Restrained differential
    - High Impedance Differential
High Impedance Differential

1. Expect a CT to saturate for external fault

2. If it saturates, drive it deep into saturation
- matched CTs

- Once CT starts to saturate, drive all current mismatch into its saturation branch - due to \( R_{\text{comp}} \)
as soon as voltage securely above threshold → trip
in the zone
- current path without measurement
- CT very near
- few or possible
- correctly accounting
- variable configurations
- protection
- other challenges for bus

5/16 5/27
- not much 60Hz current

mov Breakover
\begin{align*}
R_T & \rightarrow jX_m || Z_{\text{load}} \\
G_V &= \frac{R_T - Z_c}{R_T + Z_c} \\
\text{open circuit} & \quad R_T = \infty \\
G_V &= 1 \\
\text{SC} & \quad R_T = 0 \\
G_V &= -1
\end{align*}
Broader Failure Schemes

Historically, BF relay was a separate device that generates a trip signal. BF function checks if the CB actually tripped.
1 - activate 2nd trip coil
2 - if still failed - trip next devices out...
Breaker Failure Logic - Option

- BF_A
- BF_B
- BF_C

Trip → dolg to account for breaker response + resets + fault detection

BF_init +
Transformer Protection

- Fault protection of transformer itself

- Protecting transformer from external conditions and through faults