



NATF Protection System Misoperation Reduction Initiative

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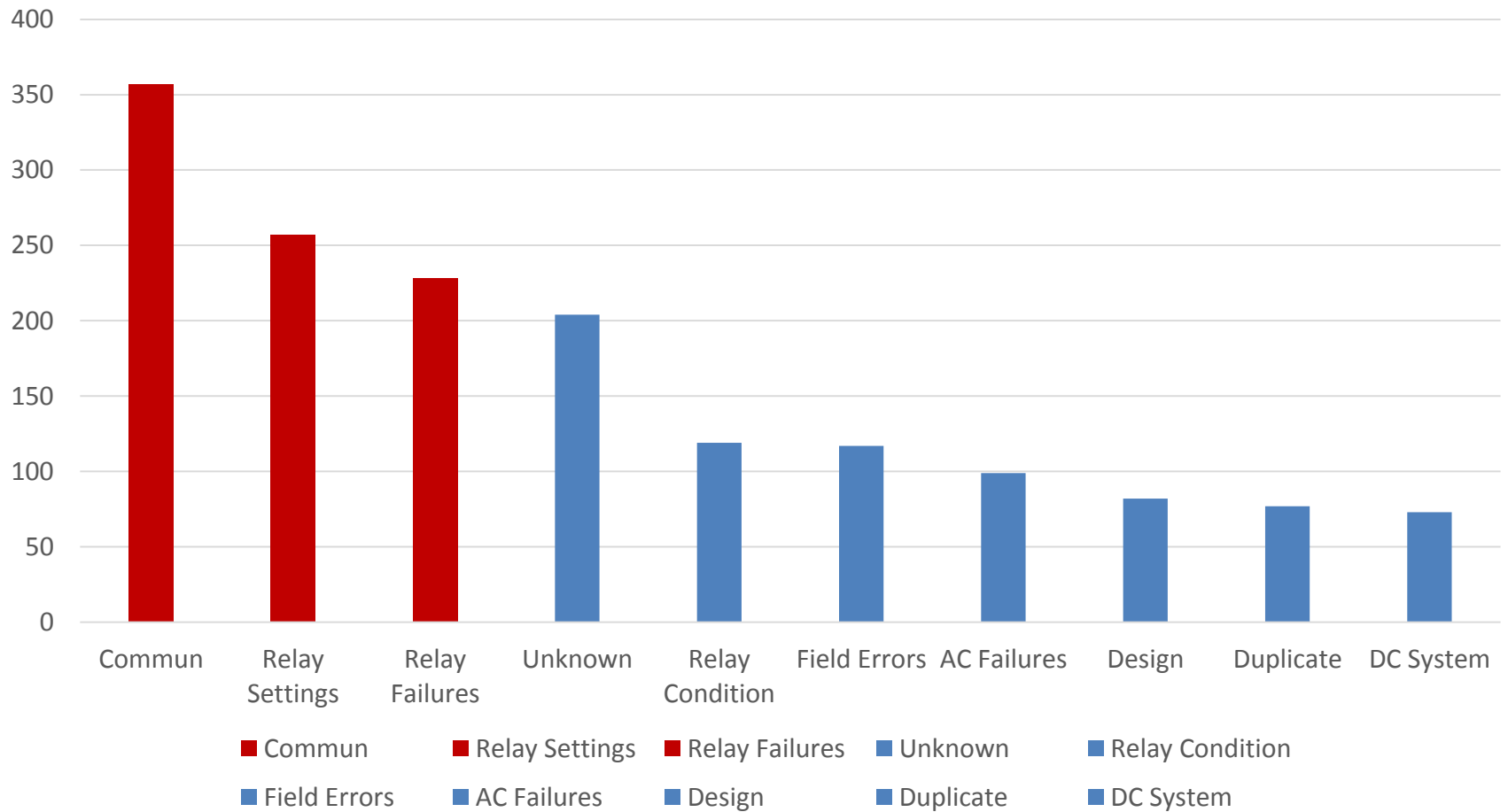
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Where we Started

- NATF commenced an initiative to review protection system misoperation data and formulate associated corrective actions
- Detailed data was obtained from a member subset
- Many NATF findings matched those of NERC's Misoperations Task Force
- Most common causes for misoperations were:
 - Communication Channel Problems
 - Relay Setting Errors
 - Relay Failures

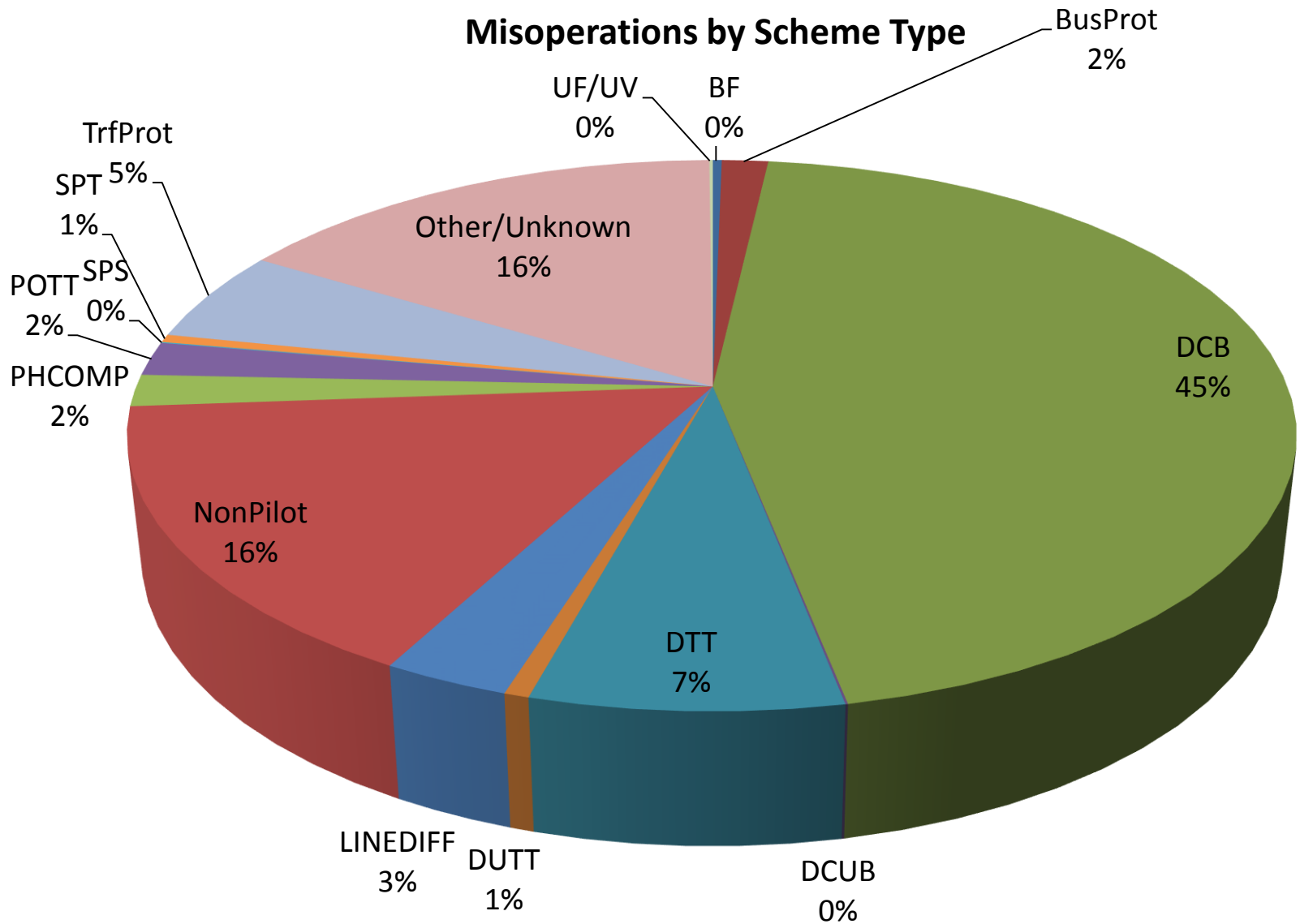
Misoperations by Cause Code



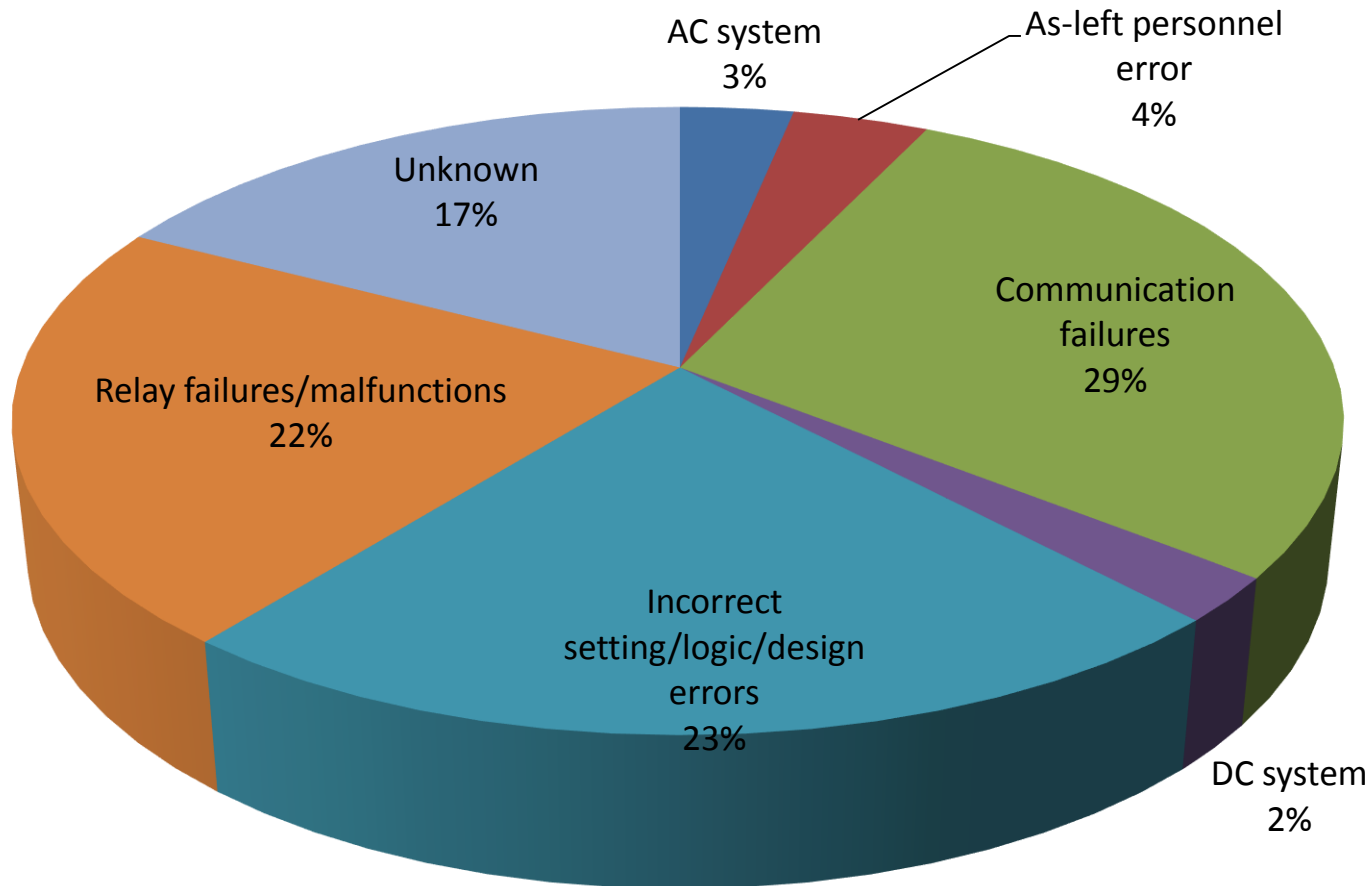
What NATF Did and Discovered

- NATF added detailed sub cause codes (relay scheme, model, etc.) and communications failure types
- This data enabled some new conclusions:
 - Directional Comparison schemes accounted for about half of the misoperations
 - Short Circuit modeling errors were noticeable
 - Electromechanical relay failures remain significant

Misoperations by Scheme Type

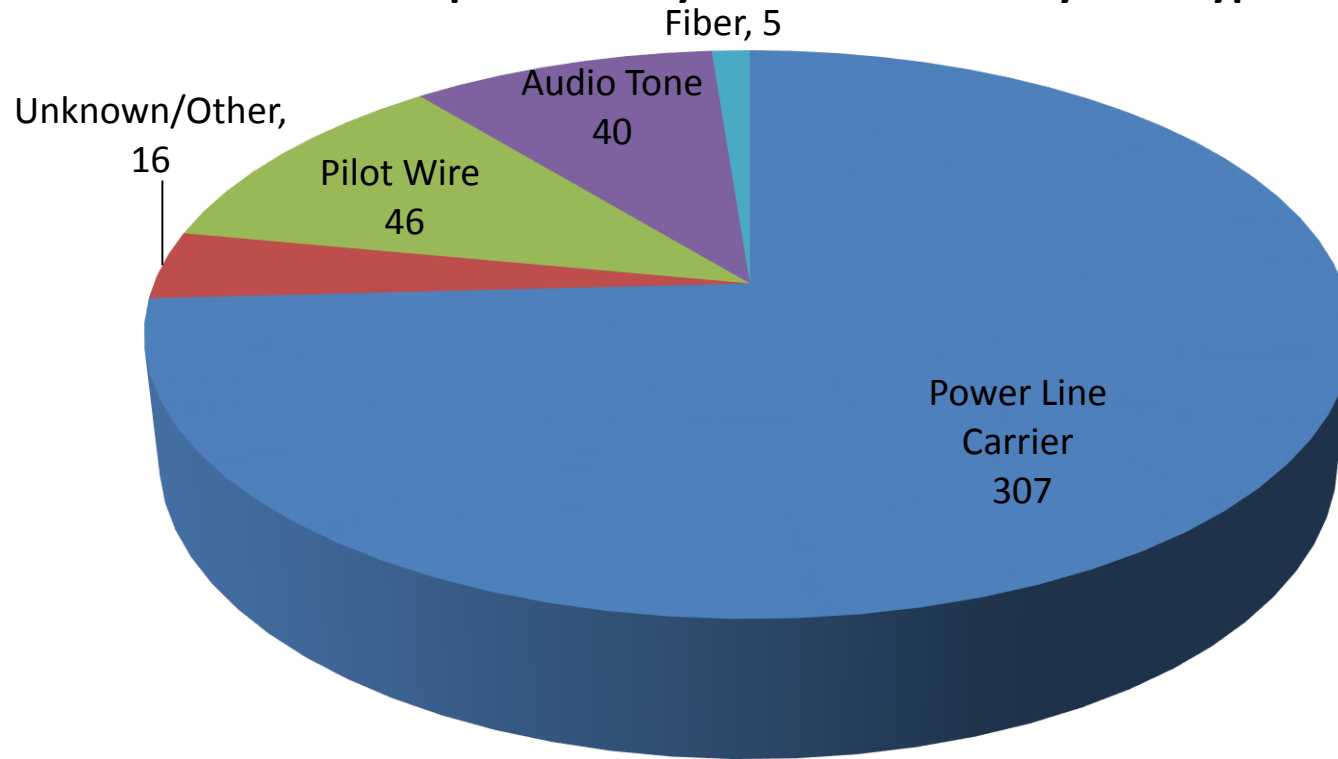


Directional Comparison Blocking: Misoperations by Failure Type



Breakdown of DCB Scheme misoperations causes

Misoperations by Communication System Type



Power line carrier is the most common communications system involving misoperations.

Next Steps

- Develop, approve, and reinforce best practices
 - Power Line Carrier maintenance
 - System Impedance Modeling
 - Electromechanical relay (maintenance/replacement)
 - Outage planning processes
 - Settings and logic
 - Setting relays to respect ratings
- Conduct relevant member training
- Develop and monitor more detailed metrics