NERC Lessons Learned:

“Initiatives to Address and Reduce Misoperations”

“Avoiding IROL Exceedances with Rigorous Inspections during Commissioning, Consistent IROL Alarms, and Improved Training”

“Cascading Analysis Identifies Need for Pre-Contingent Load Shed”

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• **Title**
  – Initiatives to Address and Reduce Misoperations

• **Source of Lesson Learned**
  – ReliabilityFirst

• **Date Published**
  – December 17, 2018
Problem Statement

- A registered entity experienced a high rate of BES misoperations
- Over last 15 months, the most prominent categories of misoperations were:
  - 24.5%: relay failure or relay condition related
  - 22%: communication equipment or communication path related
  - 18%: relay setting or schematic design related
Lesson Learned

• Established several initiatives to address those top causes of misoperations:
  – Target Worst Performing Communication Assisted Schemes
  – Identify Solutions for “Holes” in Carrier DCB Carrier Schemes and Misapplied Directional Settings
  – Identify Legacy Relay Settings that Are too Sensitive for Present Transmission System Short Circuit Conditions and Topology
  – Obtain Industry Peer Review and Assistance

• NERC provides recommendations for improvements in these areas
• **Title**
  – Avoiding IROL Exceedances with Rigorous Inspections during Commissioning, Consistent IROL Alarms, and Improved Training

• **Source of Lesson Learned**
  – Northeast Power Coordinating Council

• **Date Published**
  – December 17, 2018
Problem Statement

• One of three transformers at a substation tripped via differential protection because of a miswiring on its protection panel

• Remaining two transformers picked up the load and the system operator immediately received critical alarms in EMS
  – Alarms indicated IROL exceedance for a transformer trip because the last remaining transformer would then overload and also trip

• 30-minute IROL countdown timer did not activate because this particular case was not programmed to flag an IROL
  – Without the countdown timer, the system operator was slow to act due to being unaware there was an IROL exceedance

• Operator’s mitigating instructions given 32 minutes after the IROL exceedance
Miswiring on the differential protection was quickly detected and fixed and the transformer was back in-service after 60 minutes mitigating the IROL

- Improved post-contingency thermal limit monitoring/mitigation training
- IROL countdown timer programming updated
- More rigorous on-site inspections to prevent protection miswirings
- Ensure alarm response procedures provide clear guidance for analyzing/mitigating IROLs/SOLs
- Reevaluate monitoring/analysis tools for consistency in alarm management
  - IROL exceedances should be clearly identified on EMS screens
- Perform commissioning tests to detect miswirings on pre-fabricated panels
• **Title**
  – Cascading Analysis Identifies Need for Pre-Contingent Load Shed

• **Source of Lesson Learned**
  – ReliabilityFirst

• **Date Published**
  – December 17, 2018
Problem Statement

- A 138 kV line tree contact followed by the misoperation of a 345/138 kV transformer resulted in two contingency overloads
- Upon performing cascading analysis, the entity realized that one of the contingencies could cascade if left unmitigated
- The operator took action to shed 21 MW load pre-contingent to prevent the possible cascade
- Transformer was able to be returned to service and then load restored
- Recallable outages in the area also returned
Lesson Learned

- Enhance vegetation management
- Review auto-calculated relay settings that may have a forward-looking bias
- Identify additional controls to ensure the TOP’s and RC’s EMS models align
- Work with the EMS vendor to enhance cascade analysis alarming, visualization, and (if possible) automation
- Consider running additional studies (beyond N-1 criteria) during a hot weather alert before taking non-emergency outages
  - Consider pre-staging personnel and equipment needed for recovering from the outages
