NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Failure Modes and Mechanisms Task Force Scope

Purpose

The joint 2013 NERC Operating and Planning Committees' AC Substation Equipment Task Force (ACSETF) report recommended that information on station equipment failures be collected through the NERC Event Analysis Process. The data is intended to aid in analysis of station equipment failures to identify threat trends to the reliability of the Bulk Electric System (BES) and potential ways to improve reliability. The purpose of the Failure Modes and Mechanisms Task Force (FMMTF) is to:

- Analyze the common types of BES substation equipment listed in the Addendum for Events with Failed Station Equipment and their failures to determine their failure modes and mechanisms (FMM), FMM trends and patterns, and improve BES reliability by providing information useful for reducing station equipment failures.
  - Improve the Addendum for Events with Failed Station Equipment and processes to collect data associated with failure of station equipment;
  - Investigate and identify FMM of station equipment;
  - Derive solutions from FMM studies to
    - Detect and measure the progress of active FMM in station equipment;
    - Avoid, prevent or delay the progression of station equipment failures;
    - Promote development of “good industry practices’.
- Support the Energy Management System Working Group (EMSWG) in their development of energy management system FMM, and provide FMM information and support to other Electric Reliability Organization groups as needed.
- Maintain liaison with regional work groups, user groups, vendors, contractors, forums and agencies investigating BES substation equipment failure issues.

Deliverables

- Develop new (and improve existing) FMM diagrams for common substation equipment listed in the Addendum for Events with Failed Station Equipment:
  - Oil-Filled Power Transformer
  - Instrument Transformers (PTs & CTs)
    - Wire Wound Electromagnetic Potential Transformer
    - Coupling Capacitor Voltage Transformer
    - Optical Voltage Transformer

    - Wire Wound Electromagnetic Current Transformer
    - Optical Current Transformer
  - Circuit Breakers
    - SF6 Breaker
    - Air Blast Breaker
    - Oil Breaker
  - Switch
  - Oil-Filled Reactor (Inductor)
  - Capacitor Bank
  - Surge Arrester
  - Relays
    - Electromagnetic Relays
    - Static Relays
    - Microprocessor Relays
- The FMM diagrams and revisions to improve the Addendum for Events with Failed Station Equipment will be submitted to the Event Analysis Subcommittee (EAS) for publishing and release approval.
- The Task Force will provide FMM related input into NERC Lessons Learned as appropriate

Membership

The major goal of forming the FMMTF is to leverage industry technical expertise from a broad spectrum of registered entities across all the NERC regions. There is an expectation for ad hoc membership depending on the task/equipment being researched and the task force expertise available. A NERC representative will facilitate the task force with NERC staff coordination and conduct of assigned business tasks.

The task force should be assembled from professionals experienced in station equipment subject areas such as:

- Substation Design & Equipment Selection
- Construction & Installation
- Testing
- Operation
- Condition Monitoring
- Corrective Maintenance & Repair

- Failure Investigation
- Obsolescence management & Replacement Selection

Reporting

The Task Force will report to the NERC EAS.

Meetings

The Task Force will conduct assigned and regular/normal business using phone conferences, webinars and other digital means. Physical meetings are subject to approval and at the discretion of the EAS.

Approved by the EAS: December 9, 2019

Version History			
Rev	**Date**	**Reviewers/Approval**	**Revision Description**
Initial Draft	08/26/2019	Draft by Richard Hackman for review by the EAS	Draft proposal for Failure Modes and Mechanisms Task Force (FMMTF)
Comment Resolution Draft	11/4/2019	Draft by Richard Hackman for review by the EAS	Revised Draft to incorporate comments to date. Main changes were to limit proposed equipment scope.
Release Revision 0	12/9/2019	Approved by the EAS	Prior Draft was approved by the EAS on 12/9/2019