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CIP-014-2 R1 Assessment Observations and Common Practices

ATC Assessment Practices

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American Transmission Company

- A multi-state, transmission-only electric utility

- Registered as a TO, TOP, and TP
- Own and operate more than 560 substations and more than 9,800 miles of transmission lines
- Have a peak load of about 13,000 MW
- Have about 600 employees

Overview

- Applicability Evaluation
- Model Building
- Contingency Development
- Station Identification Criteria
- Dynamic Analysis
- Steady-State Cascading Analysis

Applicability Evaluation

Supporting Evidence

- ATC BES Substation List* (about 370 substations)
- Existing ATC system diagram* and future project diagrams*
- RC, PC, and TP IROL Lists*
- NPIRs in Nuclear Plant Interface Agreement*

* Effective on the applicable July 1st cutoff date

Special Considerations

- Include partial ownership stations
- Evaluate stations within a common perimeter fence as one station
- Evaluate stations sharing a common fence as one station

Model Building

Year-2 Steady-State Model

- Summer peak
- All valid transmission interconnection and system modification projects.
- Get agreement on model with 3rd party reviewer

Year-2 Dynamic Model

- Match ATC topology and major projects in neighboring system with the steady-state model
- Get agreement on model with 3rd party reviewer

Contingency Development

Dynamic Contingency

- Severe “smoking crater” contingency
- Loss of entire station including the control house
- 3-phase faults throughout the station
- Fault clearing by delayed opening of the remote ends of all circuits

Steady-State Contingency

- Apply the dynamic end-state conditions (tripped circuits, generation, and load) as part of the initial steady state conditions

Station Identification Criteria

Total Generation at Risk > 2000 MW

- Consequential generation loss
- Subsequent angular instability generation loss
- Subsequent generator undervoltage relay tripping
- Subsequent steady state cascading generation loss

Station Identification Criteria

Total Load at Risk > 1000 MW

- Consequential Load Loss (NERC)
- Load loss due to other automatic controls
- Subsequent cascading load loss
- Non-Consequential Load Loss (NERC)

Dynamic Analysis

Step 1 - Screening Analysis

- Use conservative, remote end clearing time (30 cycles)
- Monitor angle, voltage, loading, and frequency of generating units, loads, and line relays in the ATC system and selected external systems
- Use the TSAT application with built-in angle, voltage, frequency and islanding alerts or trip functions

Step 2 - Detailed Analysis

- Only rerun simulations for stations that exceeded the >2000 MW of total generation at risk criterion
- Use actual remote end clearing times

Dynamic Analysis Tripping Thresholds

- Generator rotor angle tripping threshold
- Generator rotor phase angle damping threshold
- Generator voltage tripping threshold
- Generator frequency tripping threshold
- Transmission line relay margin tripping threshold

Steady-State Cascading Analysis

- Perform after the dynamic analysis
- Include the dynamic end-result conditions (e.g. tripped lines, transformers, generators, loads, etc.) among the steady state initial conditions
- Monitor voltage and loading in the ATC system and selected external systems
- Use the POM/OPM application with custom cascading script
- Apply the ATC steady state cascading tripping thresholds

Steady-State Cascading Tripping Thresholds

Thermal Tripping

- Short term emergency ratings (entered in the Rate C field)

Generator Low Voltage Tripping

- Use actual low voltage tripping thresholds when provided by GOs
- Otherwise, use 0.9 p.u.

Load Low Voltage Tripping

- Use 0.8 p.u. (a proxy for the dynamic response of voltage sensitive load)

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Questions?