CIP-014-2 R1
Risk Assessments

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Technical Talk with RF

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Background

CIP-014-2 R1 ERO Enterprise CMEP Practice Guide

Why?

Mature oversight of CIP-014-2

Develop guidance for consistent audit approach across the ERO

Meant to supplement the endorsed Implementation Guidance
https://www.nerc.com/pa/comp/guidance/Pages/default.aspx

Overview

When developing an approach to CIP-014-2 R1, consideration should be provided for the following factors:

- Determination of *Applicability List*
- *Model* Selection
- Types of *Technical Analyses* to Consider

Applicability List Determination

- Transmission Facilities operated at 500 kV or higher
- Transmission Facilities operating between 200 kV and 499 kV meeting the Applicability Criterion 4.1.1.2

Voltage Value of a Line	Weight Value per Line
less than 200 kV (not applicable)	(not applicable)
200 kV to 299 kV	700
300 kV to 499 kV	1300
500 kV and above	0

- Transmission Facilities at a single Transmission station or Transmission substation identified by their RC, PC or TP as critical to the derivation of IROLs and their associated contingencies
- Transmission Facilities identified as essential to meeting Nuclear Plant Interface Requirements

Applicability List – Additional Guidance

- **Electrically disconnected buses counted as a single Transmission station or substation**

- **Physical proximity:**
  - Line-of-sight between all of the substation yards from a single site
  - Access from a common public roadway that exists between all of the substation yards
  - Close enough proximity that a single event can impact both substations

Physical proximity should include physically adjacent elements regardless of ownership – not limited by substation fence, roads, streets or highways

- **Transmission line taps outside the physical boundary of a Transmission station/substation should be aggregated to line weighting in Applicability Criterion 4.1.1.2**

Models

- **R1 provides the following regarding the model(s) used to perform the risk assessment:**

  “Each Transmission Owner shall perform an initial risk assessment and subsequent risk assessments of its Transmission stations and Transmission substations (existing and planned to be in service within 24 months) that meet the criteria specified in Applicability Section 4.1.1.”

- **Subsequent risk assessments shall be performed:**
  - 30 calendar months for a TO that has identified…
  - 60 calendar months for a TO that has ***not*** identified…

Model Selection

- Recommended to select a model that most closely aligns with the timing in R1 (i.e., 30 or 60 months)
- Model that includes projects that may or may not be in-service prior to the next required risk assessment

Entity should be aware of these type of projects and able to explain impacts to risk assessment results

- Comparison of results from previous risk assessment or scenarios that include/exclude projects

Models – Additional Guidance

- Converge for base case solution with results within the Entity's documented criteria
- Review and incorporate planned projects in each risk assessment, including those of neighboring Entities.
- Consider atypical system conditions on the transmission system. Examples include:
  - Summer peak and winter peak load levels
  - Shoulder peak load levels with system transfers
  - Alternative generation dispatch assumptions or scenarios (such as outages of natural gas resources sourced from a common pipeline)
  - Alternative load models (e.g., different penetration of inductive load, DER models, Power Factor)
  - Unavailability of BES Facility that has impact on risk assessment
  - Off-Peak Load models
  - High Transfer models

Technical Analyses

R1 states the following:

> *"The initial and subsequent risk assessments shall consist of a transmission analysis or transmission analyses designed to identify the Transmission station(s) and Transmission substation(s) that if rendered inoperable or damaged could result in* ***instability****,* ***uncontrolled separation****, or* ***Cascading*** *within an Interconnection."*

System Stability, uncontrolled separation, and Cascading cannot be sufficiently assessed through Steady-State studies alone.

Analyses Criteria Guidance

For steady-state and dynamic analysis

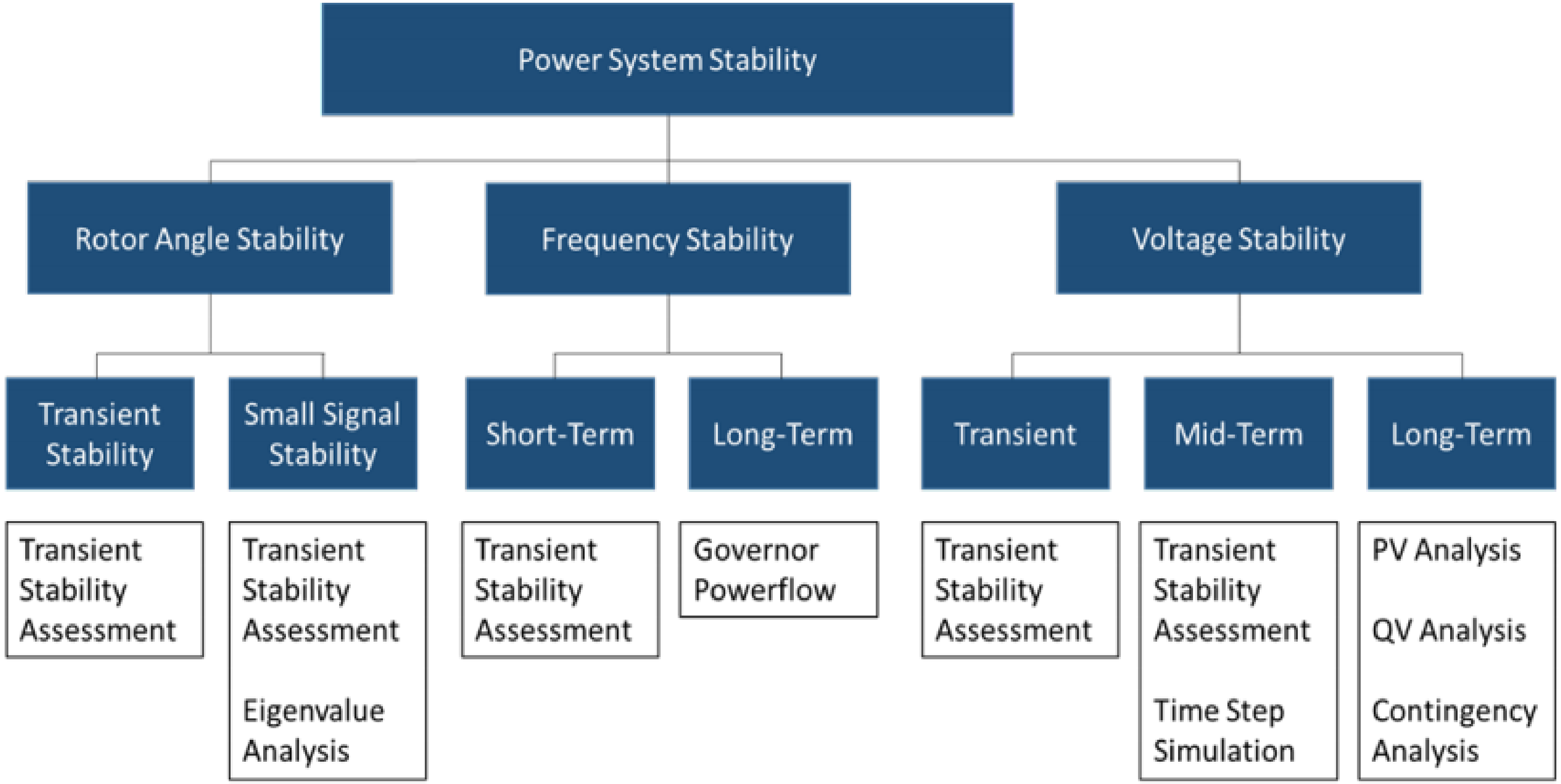
- **Be prepared to discuss technical rationale behind study assumptions**
  - Pass/fail thresholds
  - Monitored Facilities
  - Utilization of past studies/assessments
  - Model development – base case and stress scenarios
  - Clearly defined solution tolerances
  - Handling of non-convergent cases

For dynamic analysis

- Type/Location of fault
- Fault clearing times

NERC Glossary of Terms defines Stability as:

"the ability of an electric system to maintain a state of equilibrium during normal and abnormal conditions or disturbances"



Adapted from IEEE/CIGRE ©2003

Rotor Angle Stability/Uncontrolled Separation Guidance

- **Angular swings of a disturbance should return to an operating condition based on acceptable criteria**
- **Criteria should consider:**
  - Rotor mechanical speed remaining within logical boundaries
  - Loss of synchronism (tripping/loss impacts on subsequent angular swings)
  - Damping of rotor oscillations
- **Consider tripping Facilities with loading that encroaches on zonal protection settings**
- **May want to utilize rotor angle stability results to assist in monitoring for uncontrolled separation**

Voltage/Frequency Stability Guidance

Voltage Stability

- Reactive capability of the power system return to an operating point within acceptable limits
- Ensure criteria covers both voltage magnitude, deviation, and recovery limitations

Frequency Stability

- **Power system return to an operating condition within acceptable criteria**
  - Generation tripped
  - Load reduction
- **May want to utilize dynamic voltage stability or Cascading analysis results to assist in monitoring for frequency stability**

Cascade Analysis Guidance

- **Successive loss of system elements**
- **Simulated in an iterative process**
  - Base case solves
  - Contingency Event occurs
  - Effects inside and on nearby system are studied in the time-domain and if/when the system reaches a steady-state solution
  - Loop ~ The removal of overloaded elements, protection systems, RAS, etc. are simulated and the effects are studied ~ Loop
  - Thresholds/Criteria are applied to the resulting system impacts
- **Consider thresholds related to thermal overload and its impacts on equipment/protective relaying and generation tripping**

Questions & Answers

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