



# Transmission Planning Technical Guide Update

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## *Short Circuit Requirements*

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# Purpose

- To review the proposed set of standard assumptions for conducting short circuit analyses using ASPEN OneLiner
  - This single set of prescribed study conditions and solution parameters will apply to all short circuit analyses



# Background

- All of the study types that incorporate short circuit analysis were reviewed to identify the appropriate practice:
  - Generator interconnection studies
  - System impact studies for transmission system changes
  - Needs Assessments and Solution Studies
  - NERC and NPCC compliance studies



# Benefits

- A single set of prescribed study conditions and solution parameters will ensure consistency across the various study efforts and will provide clarity regarding the specific impact of proposed changes
- The proposed conditions and parameters were tested and benchmarked to ensure acceptable reflection of the current and planned power system performance



# Transmission Planning Technical Guide Updates

- The following sections in the Transmission Planning Technical Guide (TPTG) were modified to incorporate these changes:
  - Section 2.1 – Base Case Topology
  - Section 3.2 – Short Circuit Criteria
  - Section 4.1.3 – Short Circuit Analysis
- The ASPEN OneLiner specific changes have also been included in Appendix A of this presentation



# Conclusion

- Proposed Short Circuit settings
  - Establish a standard solutions profile
  - More accurately reflect the short circuit case and the system it represents

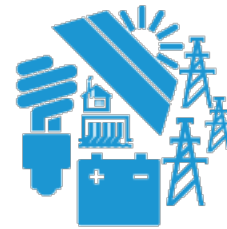


# Next Steps

- The draft changes to the TPTG have been provided along with this presentation
- Please provide comments related to these changes to [pacmatters@iso-ne.com](mailto:pacmatters@iso-ne.com) by October 1, 2019



# Questions





# APPENDIX A – ASPEN OneLiner (14.7) Settings



# ASPEN OneLiner Settings

## Fault Simulation

Preferences ×

Network | Diagram | Relay | **Fault Simulation** | X/R

**Prefault Voltage**

- Assumed "Flat" with  
V (pu) =
- From a linear network solution
- From a Power Flow solution

**Ignore in Short Circuits**

- Loads
- Transmission line G+jB
- Shunts with + seq values
- Transformer line shunts

**Generator Impedance**

**MOV-Protected Series Capacitors**

- Iterate short circuit solutions

Acceleration factor =

**Define Fault MVA As Product of**

**Current Limited Generators**

**Ignore Mutuals < This Threshold**

pu

- Simulate voltage-controlled current sources

Do not change display quantity when browsing fault results

Include outaged branches in solution summary in TTY Window

OK Cancel

# ASPEN OneLiner Settings

X/R

The screenshot shows the 'Preferences' dialog box with the 'X/R' tab selected. The dialog has a title bar with a close button. Below the title bar are tabs for 'Network', 'Diagram', 'Relay', 'Fault Simulation', and 'X/R'. The 'X/R' tab contains the following settings:

- Compute ANSI x/r ratio
- Assume Z2 equals Z1 for ANSI x/r calculation
- X-only calculation**  
If X is 0 use: X =  p.u.
- R-only calculation**  
If R is 0 use:
  - Method 1:  $R = \max(X/g, R_c)$
  - Method 2:  $R = R_c$
  - Method 3:  $R = \min(X/g, R_c)$
- Where:
  - $R_c =$   p.u.
  - Typical X/R ratio (g) =  for generators
  - for transformers
  - for reactors
  - for all others

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

# ASPEN OneLiner Settings

## ANSI/IEEE Breaker Checking Options

ANSI/IEEE Breaker Checking Options

<b>Fault Types</b> <input checked="" type="checkbox"/> 3LG <input checked="" type="checkbox"/> 2LG <input checked="" type="checkbox"/> 1LG <input checked="" type="checkbox"/> LL	<b>Network Options</b> Switch impedance: 1e-005 + j 0.0001 Line capacitance emulation level: Normal Ignore phase shift: No <input type="button" value="Edit"/>
For X/R Calculation, use <input checked="" type="radio"/> Separate X-only, R-only networks <input type="radio"/> Complex impedance network	<b>Fault Options</b> Prefault Voltage: Flat <input type="checkbox"/> p.u. Generator reactance: Subtransient MOV iteration: Yes Enforce gen. curr. limit: No Ignore in short circuit: shunt, load, line GB, xformer line shunt <input type="button" value="Edit"/>
In 1LG faults, allow up to 15% higher rating for <input checked="" type="checkbox"/> Symmetrical current rated breakers <input type="checkbox"/> Total current rated breakers	<b>ANSI X/R Ratio Parameters</b> Assume Z2=Z1: Yes If X is 0 use: 0.0001 If X is 0 use: max ( X / g, Rc ) Rc = 0.0001 Typical X/R ratio (g) = 80 for generator 60 for transformers 80 for reactors 10 for others <input type="button" value="Edit"/>
Force voltage range factor K=1 in checking <input checked="" type="checkbox"/> Symmetrical-current rated breakers with max design kV 121. or higher <input type="checkbox"/> Total-current rated breakers with max design kV 121. or higher	
<b>Misc. Options</b> <input type="checkbox"/> Apply scaling factor F to the calculated breaker interrupting duty: <input type="radio"/> F = operating kV / nominal bus kV <input type="radio"/> F = operating kV / pre-fault bus kV <input type="checkbox"/> Set breaker operating kV equal to flat pre-fault voltage profile p.u. <input checked="" type="checkbox"/> Treat all sources as "Remote" <input type="checkbox"/> Ignore all reclosing settings <input type="checkbox"/> Show in report all faults simulated for breaker duty calculation <input type="checkbox"/> Compute breaker duty for out-of-service protected equipment	