



# Dynamics & Transients

Simulate Sequence-of-Events

Evaluate System Stability

Simulate Power System Disturbances



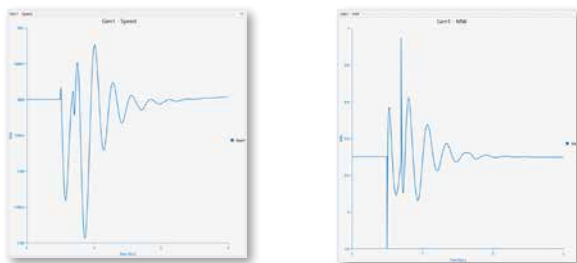
# Dynamics & Transients Analysis

Simulate sequence-of-events, actions, and disturbances to evaluate system stability and transients by utilizing accurate power system dynamic models with complex machine control block diagrams and systems.

## Transient Stability

Perform, fast bus transfer, motor dynamic acceleration/re-acceleration, critical fault clearing time, load shedding studies and more.

- Typical & common disturbances & operations actions
- Transient simulation action for various fault types
- Simulate split system & combine multiple subsystems
- Automatic relay actions per settings & system dynamics
- Auto-sync-check action
- Transformer inrush simulation



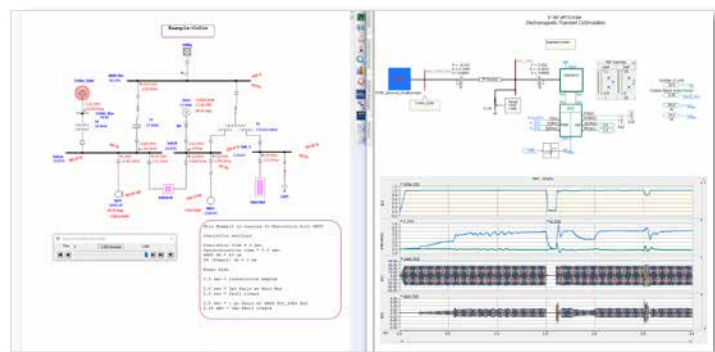
## Electromagnetic Transients

**eMT™** - A dedicated Electromagnetic Transient Program for simulation and analysis of power system transients.

- Switching transients & surges
- Insulation coordination
- Lightning surges & protection
- Torsional stress & sub-synchronous oscillations
- Transient Recovery Voltage studies
- FACTS & electronic converters

**eMTCoSim™** - Co-simulation of Electromagnetic and Phasor domains

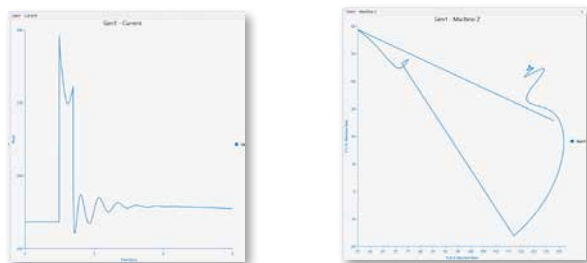
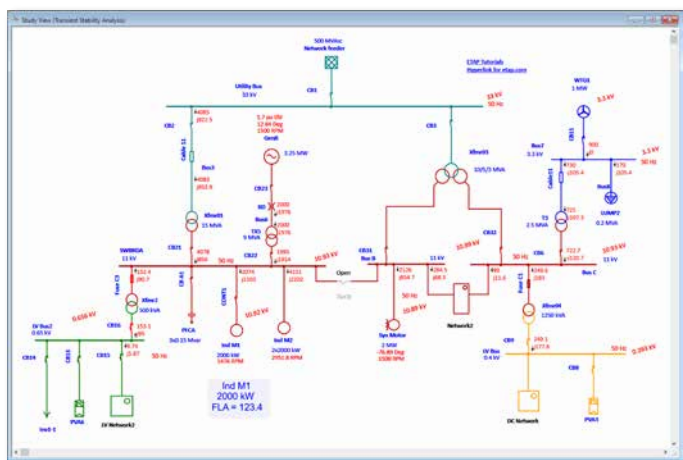
- Hybrid simulation of Transient Stability & eMT
- Simulate large network sections with high-fidelity
- Co-simulate at msec &  $\mu$ sec time steps
- Analyze coupling between phasor & EMT domain
- Live Plots for Transient Stability & EMT simulation
- Automatic Network & Components Mapping to eMT



## Generator Start-Up

Analyze cold-state starting of generators under normal and emergency conditions using full frequency-dependent machine and network models.

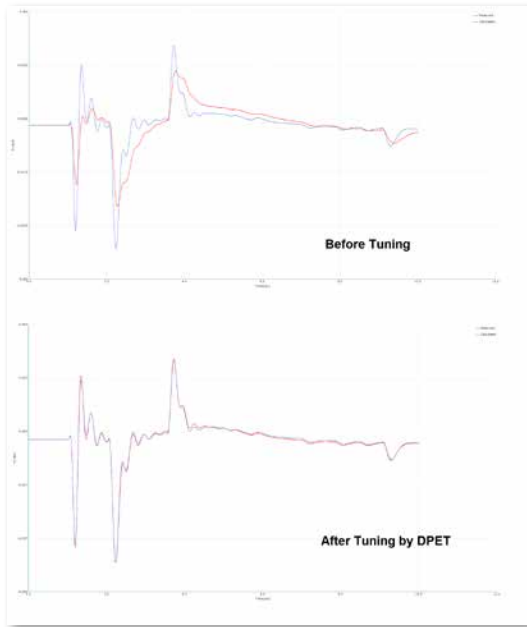
- Cold-state generator starting
- Load generators prior to synchronous speed
- Frequency-dependent machine & network models



## Dynamic Parameter Estimation & Tuning

Intelligent time-saving and validation tool to automatically adjust and tune control system parameters to match actual field measurements.

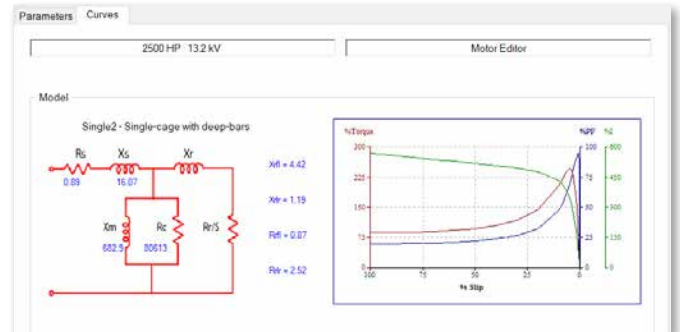
- Compliance with NERC MOD-026 & MOD-027 standards
- Obtain best-fit model parameters to measured data
- Plot sensitivity, measured vs. calculated values
- Result analyzer & input / output data comparator



## Machine Parameter Estimation

Calculate equivalent circuit model parameters for machines at starting condition based on advanced mathematical estimation and curve fitting techniques.

- Estimate induction machine equivalent circuit models
- Parameters based on manufacturer data & curves
- Single-cage models with rotor deep-bar effects



## Dynamic Modeling

Dynamic models with User-Defined Dynamic Models (UDM) or Manufacturer Black Box Models (DLL).

- Built-in & User-defined dynamic models
- Frequency-dependent models
- Generator, WTG, Motor, Load
- Governor, Exciter, PSS
- HVDC, SVC, FACTS
- Converters
- Energy Storage Devices
- DLL-based dynamic models

## User-Defined Dynamic Modeling

Build custom control block diagrams needed to simulate the dynamic behaviors of machines and loads.

- Graphical model builder
- Wide variety of blocks for building models
- Fast & accurate model initialization & testing methods
- Plant level control system simulation
- Hardware-in-the-Loop integration & testing
- Self-testing for model validation
- Dynamic responses to power system disturbances
- Library of verified & validated UDM models

