

# Transient Stability Analysis with PowerWorld Simulator

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## T2: Transient Stability Data Management



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# Transient Stability Data Management

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- The Transient Stability tool makes it possible to deal with a large amount of input data (and result data, discussed later)
- Reading/writing to various file formats
  - Input data can be used to define the dynamic models of the system as well as the steady-state model of the system
  - Simulator also makes it easy to save out transient stability information to files
- Navigating available models
  - Model explorer
  - Stability tab of dialog for individual models
- Additional resources are available, including
  - Block diagrams
  - Simulator Help documentation

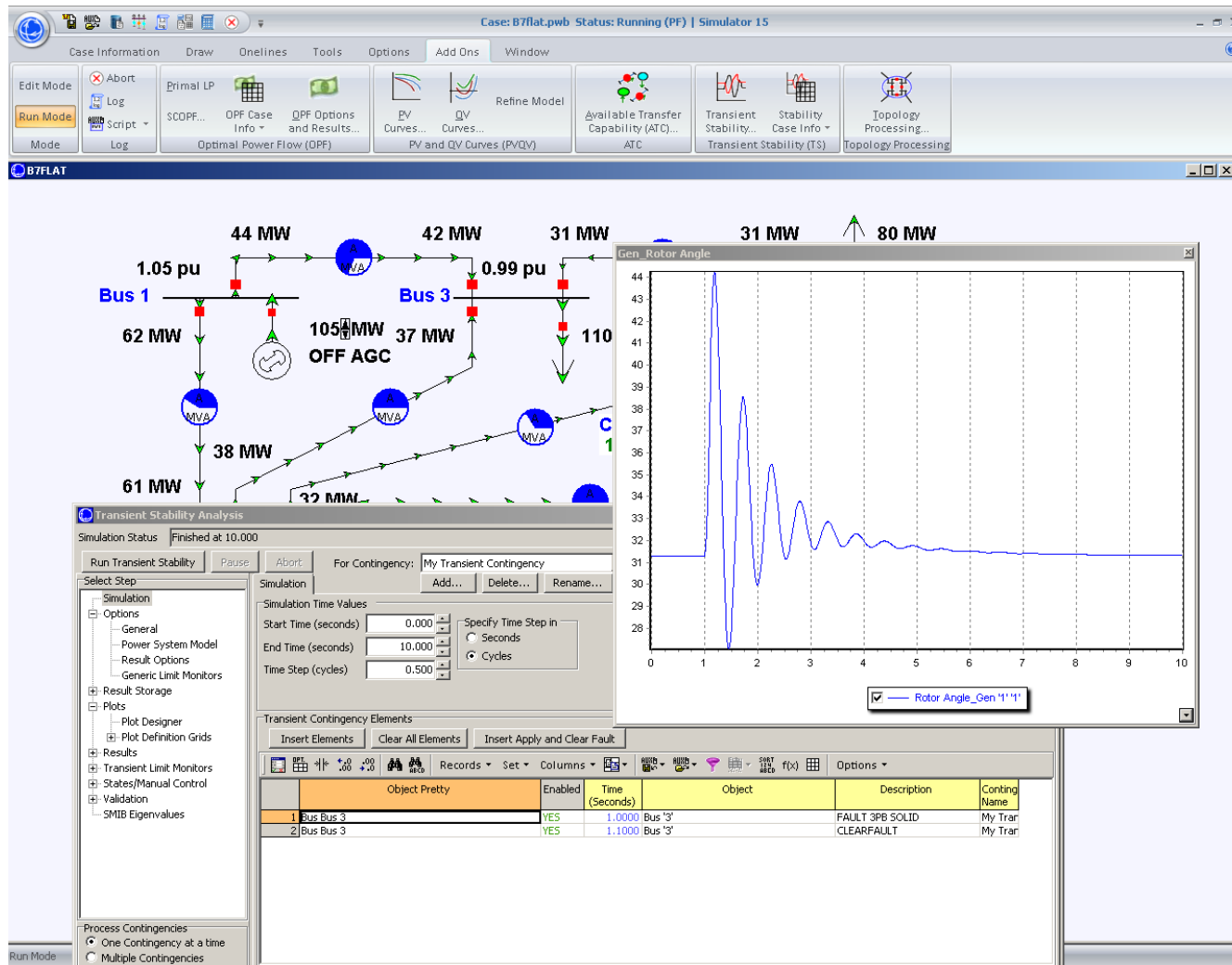
# Design Philosophy

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- PowerWorld's design philosophy is to make power system analysis as easy as possible.
  - This holds true in the transient stability domain. Our goal is to reduce the entry barrier to allow more power system professions access to transient stability
- As much as possible we have leveraged our existing methods for data interaction
- Transient stability data augments the power flow model data.

# Example: Running Transient Stability on the B7Flat Case



Our Philosophy:  
While doing transient stability solutions on large cases can certainly require large amounts of engineering expertise, the barriers of entry in learning to do such studies should not arise because of the software.

# External Data Files

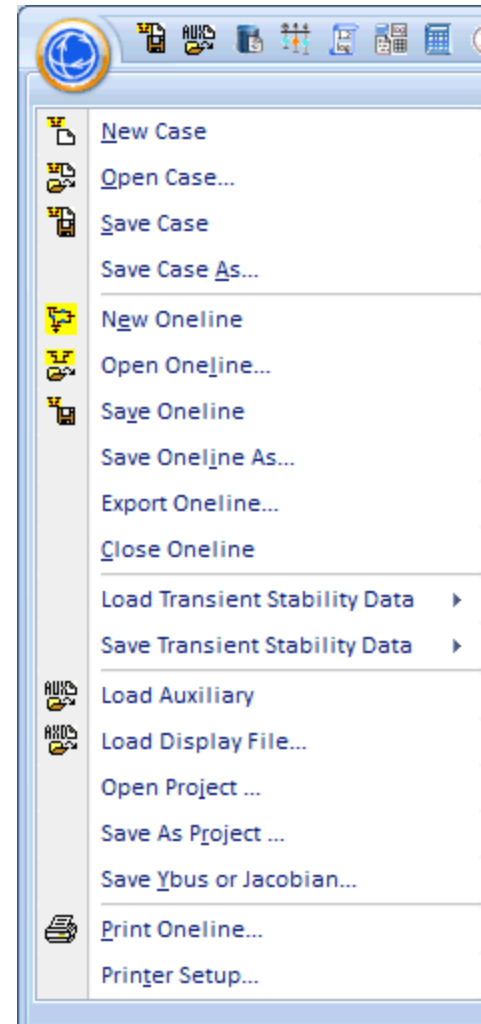


- A particular pwb case may or may not already have dynamic models saved in it, and there must be at least one model to do a transient stability simulation
- Models may be read in from an input file or manually entered
- Several external file types including
  - PowerWorld Auxiliary File (AUX)
  - PTI File (DYR)
  - GE File (DYD)
  - BPA File (SWI)
- PowerWorld Simulator can **read** and **write** Transient Stability data to these formats
- Only models which are supported by the specific format can be saved back into that format

# External Data Files



- Access for loading and saving these files can be found in several places within Simulator
- Application File Menu by clicking the PowerWorld icon in the top left corner of Simulator
- At the bottom of the specific model pane in the Transient Stability portion of the Model Explorer
- Stability Case Info Menu buttons
- Transient Stability Dialog buttons

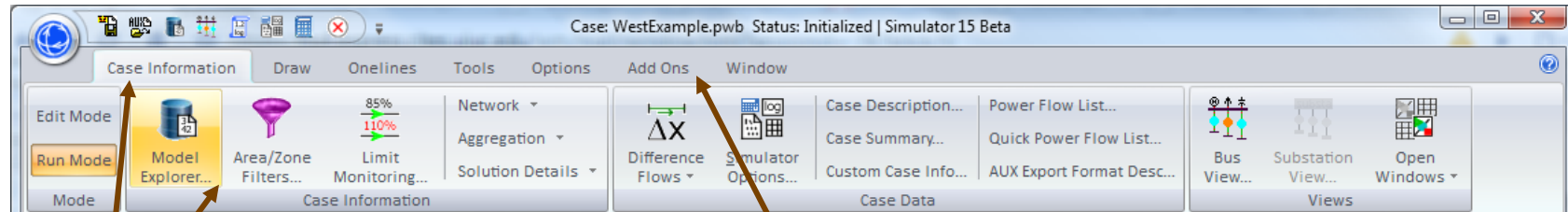


# Auxiliary Files (AUX)



- The ability to use AUX files exists throughout Simulator, and it is something that is supported by Transient Stability as well
- Another training course covers AUX files in more detail
- Save to Auxiliary
  - Store any results and settings that need to be retained for future use
  - Easily loaded into different power flow cases
- Load Auxiliary
  - Load relevant option settings to be used during the transient stability analysis
  - Can load the same AUX file into many cases
- Transient-stability specific results and options can also be saved with the pwb case

# Transient Stability Case Information and Model Explorer



Model Explorer from Case Information Toolbar

Stability Case Info, Case Information from Add-Ons Toolbar

Transient Stability -  
Opens the Transient Stability Analysis Dialog

Case Information -  
Opens the Model Explorer to the appropriate page

Transient Stability Summary

Load/Save Transient Stability Data

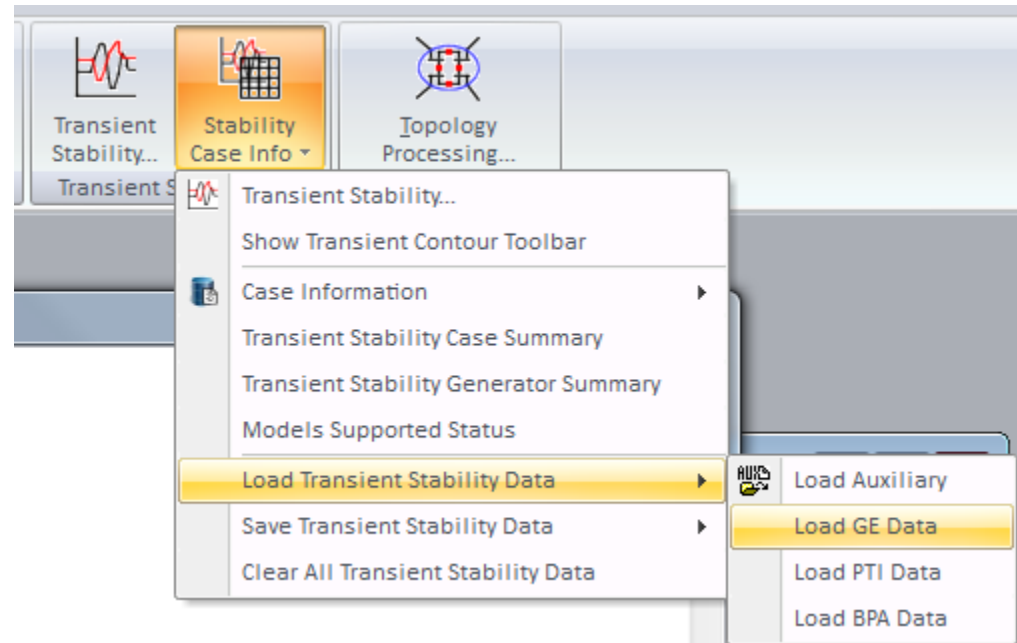
Make the Transient Contour Toolbar visible



# Example: Loading Data from External File Formats



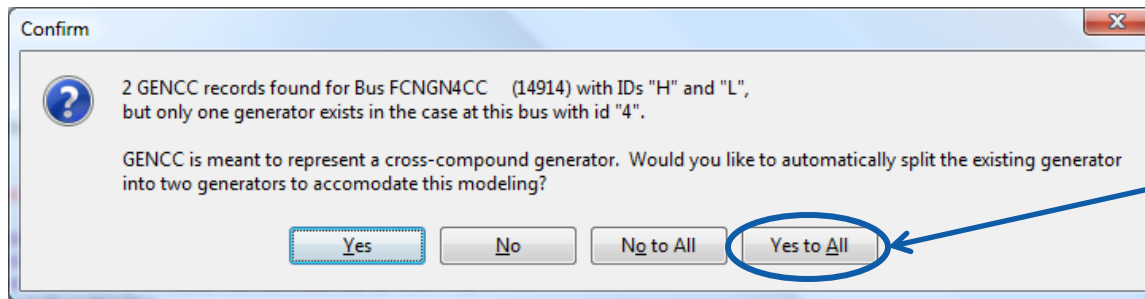
- Open **WestExample.epc**
- This contains power flow model data
- Go to “Load Transient Stability Data” and “Load GE Data” from the Stability Case Info drop down menu on the main ribbon
- Load in **WestExample.dyd**
- This contains dynamic model data



# Example: Loading Data from External File Formats

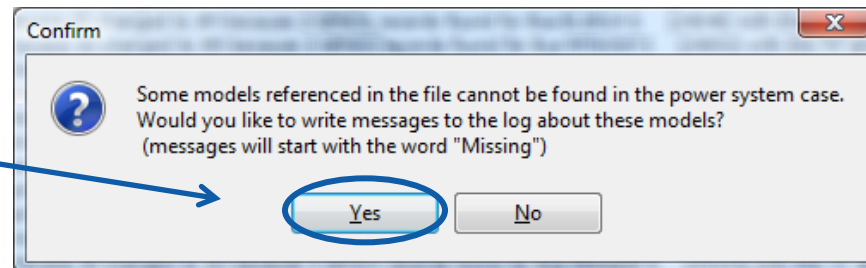


- The following information dialogs will appear
- This has to do with the modeling of combined cycle units, represented by the **GENCC** model- there is a low pressure unit and a high pressure unit which are two different machines, but in the power flow case they are modeled as a single unit
- Several of the largest units in the West have this model



You should click "Yes to All" to have Simulator automatically split into two generators

Click Yes to write messages for models that exist in the dynamic data but not in the power system case



# GE DYD Special Handling: Cross-Compound Units

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- Cross-compound units are two generators which both operate off the same steam plant
- Often represented in a DYD file
  - 2 machine models
  - 2 exciters
  - 2 stabilizers
  - 1 governor which is either **IEEEG1** or **CRCMGV**
- Ideally, the power flow model represented by the EPC file will model these two generators separately and will easily link to the DYD models

# GE DYD Special Handling: GENCC model

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- The **GENCC** model is often modeled as one generator but signals that two generators in the DYD file may be represented by one in the EPC file
- When this situation is found, Simulator will ask the user to automatically split the existing generator into two
  - You should select “Yes”
  - An appropriate log message will be written
- Parameters  $P_{fac}$  and  $Q_{fac}$  determine the percentage of MW and MVAR assigned to each of the two generators

# Example: Loading Data from External File Formats



- Informational messages, warnings, and errors created by reading in the data will appear in the log
- Save the case as **WestExample.pwb** for future use

Message Log: WestExample.epc

Warning - Switched Shunt at Bus 10931 must have VHigh > VLow when on automatic control. Control mode set to fixed.  
Warning - Switched Shunt at Bus 12020 must have VHigh > VLow when on automatic control. Control mode set to fixed.  
Warning - Switched Shunt at Bus 12062 must have VHigh > VLow when on automatic control. Control mode set to fixed.  
Warning - Switched Shunt at Bus 12138 must have VHigh > VLow when on automatic control. Control mode set to fixed.  
Validation of G:\pw\version.150\COURSE\_Transient\Cases\WestExample.epc ended at June 08, 2010 11:25:31  
Initializing Solution Data Structures  
Initialization Complete  
Reading DYD GE Data Format

(14914) #L and existing generator ID changed to #H because 2 GENCC records found for Bus FCNGN4CC  
(14915) #L and existing generator ID changed to #H because 2 GENCC records found for Bus FCNGN5CC  
(24003) #L and existing generator ID changed to #H because 2 GENCC records found for Bus ALAMT3 G  
(24004) #L and existing generator ID changed to #H because 2 GENCC records found for Bus ALAMT4 G  
(24005) #L and existing generator ID changed to #H because 2 GENCC records found for Bus ALAMT5 G  
(24047) #L and existing generator ID changed to #H because 2 GENCC records found for Bus ELSEG3 G  
(24048) #L and existing generator ID changed to #H because 2 GENCC records found for Bus ELSEG4 G  
(24052) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MTNVIST3  
(24053) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MTNVIST4  
(24066) #L and existing generator ID changed to #H because 2 GENCC records found for Bus HUNT1 G  
(24067) #L and existing generator ID changed to #H because 2 GENCC records found for Bus HUNT2 G  
(24089) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MANDLY1G  
(24090) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MANDLY2G  
(24095) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MOHAV1CC  
(24096) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MOHAV2CC  
(24123) #L and existing generator ID changed to #H because 2 GENCC records found for Bus REDON7 G  
(24124) #L and existing generator ID changed to #H because 2 GENCC records found for Bus REDON8 G  
(24161) #L and existing generator ID changed to #H because 2 GENCC records found for Bus ALAMT6 G  
(24167) #L and existing generator ID changed to #H because 2 GENCC records found for Bus HUNT3 G  
(24168) #L and existing generator ID changed to #H because 2 GENCC records found for Bus HUNT4 G  
(26030) #L and existing generator ID changed to #H because 2 GENCC records found for Bus HAYNESSG  
(33105) #L and existing generator ID changed to #H because 2 GENCC records found for Bus PTSB 5  
(33106) #L and existing generator ID changed to #H because 2 GENCC records found for Bus PTSB 6  
(33116) #L and existing generator ID changed to #H because 2 GENCC records found for Bus C.COS 6  
(33117) #L and existing generator ID changed to #H because 2 GENCC records found for Bus C.COS 7  
(36405) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MOSSLND6  
(36406) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MOSSLND7  
(36409) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MORRO 3  
(36410) #L and existing generator ID changed to #H because 2 GENCC records found for Bus MORRO 4  
(70777) #L and existing generator ID changed to #H because 2 GENCC records found for Bus COMAN\_3

Messages related to the splitting of the GENCC models

# Transient Stability Case Information and Model Explorer



- Model Explorer contains a Transient Stability Folder
- The first item is the Summary sub-folder
- Also, pages are listed for each class of available model
- The same options and Model Explorer pages can also be accessed from the Stability Case Info menu

Model Explorer: Generator Model Use

Generator Transient Stability Model Summary

|    | Number of Bus | Name of Bus | ID | Status | Gen MW |
|----|---------------|-------------|----|--------|--------|
| 1  | 10246         | PERSONG1    | 1  | Open   | 0.00   |
| 2  | 10261         | REEVE_G1    | 1  | Closed | 22.00  |
| 3  | 10262         | REEVE_G2    | 1  | Open   | 0.00   |
| 4  | 10263         | REEVE_G3    | 1  | Closed | 25.00  |
| 5  | 10318         | SJUAN_G1    | 1  | Closed | 360.00 |
| 6  | 10319         | SJUAN_G2    | 1  | Closed | 350.00 |
| 7  | 10320         | SJUAN_G3    | 1  | Closed | 544.00 |
| 8  | 10321         | SJUAN_G4    | 1  | Closed | 444.68 |
| 9  | 10394         | LEF_G1      | 1  | Closed | 142.50 |
| 10 | 10395         | LEF_G2      | 1  | Closed | 142.50 |
| 11 | 10396         | LEF_S1      | 1  | Closed | 285.00 |
| 12 | 10415         | LVGT        | 1  | Open   | 0.00   |
| 13 | 10485         | AFTONS      | 1  | Closed | 94.00  |
| 14 | 10486         | AFTONG      | 1  | Closed | 140.80 |
| 15 | 10491         | LRDSBGG1    | 1  | Closed | 20.00  |
| 16 | 10492         | LRDSBRG2    | 1  | Closed | 20.00  |
| 17 | 10903         | VEF         | 1  | Open   | 0.00   |
| 18 | 10933         | HI WR 4     | 1  | Closed | 5.00   |



# Navigating Available Models



Model Explorer lists the supported models

Model Explorer: Machine Models

Explore Fields

Mismatches

Multi-Terminal DC

Switched Shunts

Three-Winding Transformers

Transformer Controls

Aggregations

Areas

Injection Groups

Interfaces

Islands

Multi-Section Lines

MW Transactions

Nomograms

Owners

Substations

Super Areas

Tielines between Areas

Tielines between Zones

Transfer Directions

Zones

Solution Details

Case Information and Auxiliary

Contingency Analysis

Fault Analysis

Optimal Power Flow

Transient Stability

Summary

DC Line Models

Exciter

Generator Other Models

Governor

Line Relay Models

Load Characteristics

Load Relays

Machine Models

Stabilizer

Switched Shunt Relay Models

Open New Explorer

Transient Stability Data - Machine Model

Records Geo Set Columns

Filter Advanced Machine Model: Gen

Find... Remove

Machine Model

CBEST

CIMTR1

CIMTR2

CIMTR3

CIMTR4

CSVGN1

CSVGN3

CSVGN4

CSVGN5

CSVGN6

GENCC

GENCLS

GENCLS\_PLAYBACK

GENDCO

GENIND

GENPWTwoAxis

GENROE

GENROU

GENSAE

GENSAL

GENTPF

GENTPJ

GENTRA

GENWRI

GEWTG

MOTOR1

STCON

SVCWSC

VWSCC

Show Models Supported By

☒ PW Only ☒ PTI

☐ BPA ☒ GE

Save Load

| Fully Supported | Number of Bus | ID | Name_Nominal<br>kv of Bus | Name of Bus | Type | MVA Base | Device Status | Sub-Intervals |
|-----------------|---------------|----|---------------------------|-------------|------|----------|---------------|---------------|
| None            | Defined       |    |                           |             |      |          |               |               |

Classes of models

List of specific model names for the particular model type

Names will appear in black if the model is in the case  
Add a model by right-clicking

Model support status

# Navigating a List of Models



- Choose “All” to get a list of all Stabilizers
- Choose specific type to get a list of all the parameters
- **Bold** values represent non-default values

The screenshot illustrates the navigation process in PowerWorld. It shows the 'Stabilizer' list on the left, where 'All (1047)' is selected. The main window displays a table of stabilizers, with 'GENROU (882)' highlighted. The bottom window shows the parameters for the selected GENROU model, with a red box highlighting the parameters for the first row (ID 10246).

| Stabilizer | Fully Supported | Number of Bus | ID | Name_Nominal kV of Bus | Name of Bus | Type   | MVA Base | Device Status |
|------------|-----------------|---------------|----|------------------------|-------------|--------|----------|---------------|
| 1          | YES             | 10246         | 1  | PERSONG1_18.00         | PERSONG1    | PSS2A  | 170      | Active        |
| 2          | YES             | 10261         | 1  | REEVE_G1_13.80         | REEVE_G1    | PSS2A  | 58.822   | Active        |
| 3          | YES             | 10262         | 1  | REEVE_G2_13.80         | REEVE_G2    | PSS2A  | 58.822   | Active        |
| 4          | YES             | 10263         | 1  | REEVE_G3_13.80         | REEVE_G3    | PSS2A  | 88.235   | Active        |
| 5          | YES             | 10318         | 1  | SJUAN_G1_22.00         | SJUAN_G1    | WSCCST | 410      | Active        |
| 6          | YES             | 10319         | 1  | SJUAN_G2_24.00         | SJUAN_G2    | IEEEST | 410      | Active        |
| 7          | YES             | 10320         | 1  | SJUAN_G3_22.00         | SJUAN_G3    | WSCCST | 616.7    | Active        |
| 8          | YES             | 10321         | 1  | SJUAN_G4_22.00         | SJUAN_G4    | WSCCST | 616.7    | Active        |
| 9          | YES             | 10394         | 1  | LEF_G1_18.00           | LEF_G1      | PSS2A  | 234      | Active        |
| 10         | YES             | 10395         | 1  | LEF_G2_18.00           | LEF_G2      | PSS2A  | 234      | Active        |
| 11         | YES             | 10396         | 1  | LEF_S1_18.00           | LEF_S1      | PSS2A  | 373      | Active        |
| 12         | YES             | 10485         | 1  | AFTONS_18.00           | AFTONS      | PSS2A  | 143.6    | Active        |
| 13         | YES             | 10486         | 1  | AFTONG_18.00           | AFTONG      | PSS2A  | 189      | Active        |
| 14         | YES             | 10491         | 1  | LRDSBGG1_13.80         | LRDSBGG1    | PSS2A  | 60       | Active        |
| 15         | YES             | 10492         | 1  | LRDSBRG2_13.80         | LRDSBRG2    | PSS2A  | 60       | Active        |
| 16         | YES             | 10903         | 1  | VEF_18.00              | VEF         | PSS2A  | 189      | Active        |
| 17         | YES             | 11208         | 1  | NEWMNSG1_13.80         | NEWMNSG1    | PSS2A  | 114      | Active        |
| 18         | YES             | 11209         | 1  | NEWMNSG2_13.80         | NEWMNSG2    | PSS2A  | 114      | Active        |
| 19         | YES             | 11261         | 1  | NEWMNSS1_18.00         | NEWMNSS1    | PSS2A  | 198      | Active        |
| 20         | YES             | 13311         | 2  | TA-3-BL_13.80          | TA-3-BL     | PSS2A  | 30       | Active        |
| 21         | YES             | 14531         | 1  | WPHX ST6_12.50         | WPHX ST6    | PSS2A  | 75       | Active        |
| 22         | YES             | 14800         | 1  | GIL-CT1_18.00          | GIL-CT1     | PSS2A  | 205      | Active        |
| 23         | YES             | 14801         | 1  | GIL-CT2_18.00          | GIL-CT2     | PSS2A  | 205      | Active        |
| 24         | YES             | 14802         | 1  | GIL-ST1_18.00          | GIL-ST1     | PSS2A  | 319      | Active        |
| 25         | YES             | 14803         | 1  | GIL-CT3_18.00          | GIL-CT3     | PSS2A  | 205      | Active        |
| 26         | YES             | 14804         | 1  | GIL-CT4_18.00          | GIL-CT4     | PSS2A  | 205      | Active        |
| 27         | YES             | 14805         | 1  | GIL-ST2_18.00          | GIL-ST2     | PSS2A  | 319      | Active        |
| 28         | YES             | 14806         | 1  | GIL-CT5_18.00          | GIL-CT5     | PSS2A  | 205      | Active        |

| Number of Bus | ID    | Name_Nominal kV of Bus | Name of Bus    | Type     | MVA Base | Device Status | H      | D    | Ra | Xd     | Xq    | Xdp   | Xqp   | Xdpp   | Xl     | Tdop   | Tqop | Tdopp | Tqopp | S(1.0) | S(1.2) |        |
|---------------|-------|------------------------|----------------|----------|----------|---------------|--------|------|----|--------|-------|-------|-------|--------|--------|--------|------|-------|-------|--------|--------|--------|
| 1             | 10246 | 1                      | PERSONG1_18.00 | PERSONG1 | GENROU   | 170           | Active | 4.2  | 0  | 0      | 1.65  | 1.55  | 0.2   | 0.6    | 0.19   | 0.15   | 8.5  | 0.5   | 0.02  | 0.12   | 0.076  | 0.317  |
| 2             | 10261 | 1                      | REEVE_G1_13.80 | REEVE_G1 | GENROU   | 58.822        | Active | 4.22 | 0  | 0      | 1.73  | 1.6   | 0.285 | 0.8    | 0.2036 | 0.1    | 7.1  | 2     | 0.03  | 0.2    | 0.194  | 0.4597 |
| 3             | 10262 | 1                      | REEVE_G2_13.80 | REEVE_G2 | GENROU   | 58.822        | Active | 4.22 | 0  | 0      | 1.73  | 1.6   | 0.285 | 0.8    | 0.2036 | 0.1    | 7.1  | 2     | 0.03  | 0.2    | 0.194  | 0.4597 |
| 4             | 10263 | 1                      | REEVE_G3_13.80 | REEVE_G3 | GENROU   | 88.235        | Active | 3.48 | 0  | 0      | 1.76  | 1.52  | 0.24  | 0.7    | 0.2036 | 0.1    | 7    | 2     | 0.03  | 0.1    | 0.2196 | 0.6399 |
| 5             | 10394 | 1                      | LEF_G1_18.00   | LEF_G1   | GENROU   | 234           | Active | 4.87 | 0  | 0      | 2.25  | 1.825 | 0.275 | 0.85   | 0.2264 | 0.15   | 9    | 0.9   | 0.036 | 0.07   | 0.09   | 0.2687 |
| 6             | 10395 | 1                      | LEF_G2_18.00   | LEF_G2   | GENROU   | 234           | Active | 4.87 | 0  | 0      | 2.25  | 1.825 | 0.275 | 0.85   | 0.2264 | 0.15   | 9    | 0.9   | 0.036 | 0.07   | 0.09   | 0.2687 |
| 7             | 10396 | 1                      | LEF_S1_18.00   | LEF_S1   | GENROU   | 373           | Active | 2.91 | 0  | 0      | 2.27  | 1.7   | 0.33  | 0.85   | 0.27   | 0.231  | 7.5  | 0.9   | 0.036 | 0.07   | 0.065  | 0.5795 |
| 8             | 10415 | 1                      | LVGT_13.80     | LVGT     | GENROU   | 29.6          | Active | 7.4  | 0  | 0.0017 | 1.865 | 1.6   | 0.215 | 0.8    | 0.205  | 0.11   | 8    | 0.5   | 0.023 | 0.05   | 0.0992 | 0.348  |
| 9             | 10485 | 1                      | AFTONS_18.00   | AFTONS   | GENROU   | 143.6         | Active | 4.5  | 0  | 0.0038 | 1.744 | 1.6   | 0.256 | 0.4    | 0.17   | 0.1    | 7    | 0.75  | 0.03  | 0.05   | 0.05   | 0.3    |
| 10            | 10486 | 1                      | AFTONG_18.00   | AFTONG   | GENROU   | 189           | Active | 5.78 | 0  | 0.0025 | 1.715 | 1.615 | 0.22  | 0.4007 | 0.18   | 0.1216 | 8.5  | 0.539 | 0.055 | 0.083  | 0.0745 | 0.3077 |



# Load Characteristic Models



- Load models apply to either a load, bus, owner, area, or the entire case

Precedence:  
Load-specific,  
Bus-specific,  
Owner-specific,  
Zone-specific,  
Area-specific,  
System-specific

Transient Stability Data - Load Characteristic

Filter: Advanced Load Characteristic: Gene Find... Remove

Load Characteristic

- All (5725)
- CIM5
- CIM6
- CIMW
- CLOD
- CMPLD
- CMPLDW
- DLIGHT
- EXTL
- IEEL
- LDFR
- MOTORW (5098)
- WSCC (627)
- Load-Specific (5098)**
- Bus-Specific (604)**
- Owner-Specific
- Zone-Specific (1)
- Area-Specific (21)
- System-Specific (1)

Show Models Supported By

☒ PW Only ☒ PTI

☐ BPA ☒ GE

Save Load

|      | Fully Supported | Element Type | Number | Name_Nominal kV | ID | Name     | Type   | Device Sta |
|------|-----------------|--------------|--------|-----------------|----|----------|--------|------------|
| 3863 | YES             | Bus          | 50865  | FHS 25_25.20    |    | FHS 25   | WSCC   | Active     |
| 3864 | YES             | Bus          | 50866  | AWT 60T2_60.00  |    | AWT 60T2 | WSCC   | Active     |
| 3865 | YES             | Load         | 50868  | WAH 25_25.20    | 1  | WAH 25   | MOTORW | Active     |
| 3866 | YES             | Bus          | 50868  | WAH 25_25.20    |    | WAH 25   | WSCC   | Active     |
| 3867 | YES             | Bus          | 50886  | SFU 60T2_60.00  |    | SFU 60T2 | WSCC   | Active     |
| 3868 | YES             | Bus          | 50891  | SFU 60T1_60.00  |    | SFU 60T1 | WSCC   | Active     |
| 3869 | YES             | Bus          | 50892  | AWT 60T4_60.00  |    | AWT 60T4 | WSCC   | Active     |
| 3870 | YES             | Load         | 50893  | NLV 66_66.00    | 1  | NLV 66   | MOTORW | Active     |
| 3871 | YES             | Bus          | 50893  | NLV 66_66.00    |    | NLV 66   | WSCC   | Active     |
| 3872 | YES             | Bus          | 50906  | NAK 12V1_12.60  |    | NAK 12V1 | WSCC   | Active     |
| 3873 | YES             | Bus          | 50907  | NDR 12V1_12.60  |    | NDR 12V1 | WSCC   | Active     |
| 3874 | YES             | Load         | 50910  | RVS 138_138.00  | 1  | RVS 138  | MOTORW | Active     |
| 3875 | YES             | Bus          | 50910  | RVS 138_138.00  |    | RVS 138  | WSCC   | Active     |
| 3876 | YES             | Load         | 50911  | LBH 25T1_25.20  | 1  | LBH 25T1 | MOTORW | Active     |
| 3877 | YES             | Bus          | 50911  | LBH 25T1_25.20  |    | LBH 25T1 | WSCC   | Active     |
| 3878 | YES             | Load         | 50912  | LBH 25T2_25.20  | 1  | LBH 25T2 | MOTORW | Active     |
| 3879 | YES             | Bus          | 50912  | LBH 25T2_25.20  |    | LBH 25T2 | WSCC   | Active     |
| 3880 | YES             | Load         | 50917  | DKY 66_66.00    | 1  | DKY 66   | MOTORW | Active     |
| 3881 | YES             | Bus          | 50917  | DKY 66_66.00    |    | DKY 66   | WSCC   | Active     |
| 3882 | YES             | Bus          | 50919  | IPR 25_25.20    |    | IPR 25   | WSCC   | Active     |
| 3883 | YES             | Load         | 50927  | CKY 25_25.20    | 1  | CKY 25   | MOTORW | Active     |
| 3884 | YES             | Bus          | 50927  | CKY 25_25.20    |    | CKY 25   | WSCC   | Active     |
| 3885 | YES             | Bus          | 50929  | TRK 138_138.00  |    | TRK 138  | WSCC   | Active     |

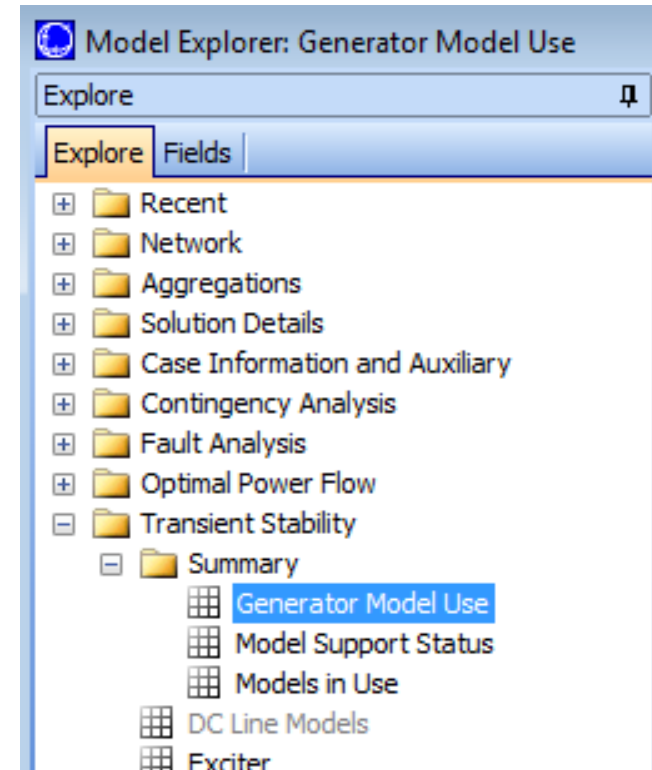
Search Search Now Options

# Model Explorer:

## Transient Stability\Summary\



- On the Model Explorer, under Transient Stability\Summary, there are three useful entries
  - Generator Model Use
    - Lists each generator along with the dynamic models it is using
  - Model Support Status
    - A list of all the models that Simulator can read/write along with which software supports them
  - Models in Use
    - A list of all the models used in this case, along with a count of each



# Generator Model Use Example



- For the example case, open the Summary folder
- On the Model Explorer, open the Transient Stability\Summary page
- Open the Generator Model Use page

Model Explorer: Generator Model Use

Explore

Fields

Interfaces

Islands

Multi-Section Lines

MW Transactions

Nomograms

Owners

Substations

Super Areas

Tielines between Areas

Tielines between Zones

Transfer Directions

Zones

Solution Details

Case Information and Auxiliary

Contingency Analysis

Fault Analysis

Optimal Power Flow

Transient Stability

Summary

Generator Model Use

Model Support Status

Models in Use

DC Line Models

Generator Transient Stability Model Summary

Governor

Exciter

Records

Geo

Set

Columns

AUX

AUX

Sort

15W

RECD

f(x)

Options

Filter

Advanced

Generator

Find...

Remove

|     | Number of Bus | Name of Bus | ID | Status | Gen MW | MVA Base | Machine | Exciter   | Governor | Stabilizer | Other Model |
|-----|---------------|-------------|----|--------|--------|----------|---------|-----------|----------|------------|-------------|
| 106 | 14958         | WPCC4CT1    | 1  | Closed | 68.00  | 107.00   | GENTPF  | EXAC2     | GGOV1    | PSS2A      |             |
| 107 | 14961         | YUCCACT1    | 1  | Closed | 19.10  | 23.00    | GENTPF  | EXST2     | IEEEG1   |            |             |
| 108 | 14962         | YUCCACT2    | 1  | Closed | 19.10  | 23.00    | GENTPF  | EXST2     | IEEEG1   |            |             |
| 109 | 14963         | YUCCACT3    | 1  | Closed | 55.00  | 72.80    | GENROU  | ESAC8B_GE | IEEEG1   | PSS2A      |             |
| 110 | 14964         | YUCCACT4    | 1  | Closed | 55.00  | 72.80    | GENROU  | EXST2     | IEEEG1   |            |             |
| 111 | 14965         | YUCCAGEN    | 1  | Closed | 75.00  | 102.00   | GENROU  | REXS      | IEEEG1   | PSS2A      | LCFB1, OEL1 |
| 112 | 14966         | WPCC5CT1    | 1  | Closed | 172.00 | 217.00   | GENROU  | EXAC2     | GGOV1    | PSS2A      |             |
| 113 | 14967         | WPCC5CT2    | 1  | Closed | 172.00 | 217.00   | GENROU  | EXAC2     | GGOV1    | PSS2A      |             |
| 114 | 14968         | WPCC5ST1    | 1  | Closed | 185.60 | 236.00   | GENROU  | EXAC2     | GGOV1    | PSS2A      |             |
| 115 | 14969         | YUCCACT5    | 1  | Closed | 50.00  | 71.20    | GENROU  | ESAC7B    | GGOV1    | PSS2A      |             |
| 116 | 14970         | YUCCACT6    | 1  | Closed | 50.00  | 71.20    | GENROU  | ESAC7B    | GGOV1    | PSS2A      |             |
| 117 | 14974         | RED-CT1     | 1  | Closed | 160.00 | 213.70   | GENROU  | EXST4B    | GGOV1    | PSS2A      |             |
| 118 | 14975         | RED-CT2     | 1  | Closed | 160.00 | 213.70   |         |           | GGOV1    | PSS2A      |             |
| 119 | 14976         | RED-CT3     | 1  | Closed | 160.00 | 213.70   |         |           | GGOV1    | PSS2A      |             |
| 120 | 14977         | RED-CT4     | 1  | Closed | 160.00 | 213.70   |         |           | GGOV1    | PSS2A      |             |
| 121 | 14982         | RED-ST1     | 1  | Closed | 172.00 | 217.00   |         |           | GGOV1    | WSCCST     |             |
| 122 | 14983         | RED-ST2     | 1  | Closed | 172.00 | 217.00   |         |           | GGOV1    | WSCCST     |             |
| 123 | 14990         | SUN G1      | 1  | Closed | 40.00  | 71.18    | GENROU  | EXST1_GE  | GGOV1    | PSS2A      |             |
| 124 | 14991         | SUN G2      | 2  | Closed | 40.00  | 71.18    | GENROU  | EXAC8B    | GGOV1    | PSS2A      |             |
| 125 | 14992         | SUN G3      | 3  | Closed | 35.00  | 71.18    | GENROU  | EXAC8B    | GGOV1    | PSS2A      |             |
| 126 | 14993         | SUN G4      | 4  | Closed | 35.00  | 71.18    | GENROU  | EXAC8B    | GGOV1    | PSS2A      |             |
| 127 | 14994         | SUN G5      | 5  | Closed | 35.00  | 71.18    | GENROU  | EXAC8B    | GGOV1    | PSS2A      |             |

Active

Inactive

If multiple models exist, they are listed separated by commas

Use Toggle to change active status of models  
Inactive models are shown in parenthesis

# Model Support Status Example



- Open the Model Support Status page

Model support statuses for all models

|    | Class         | Name            | PowerWorld | GE PSLF | PTI PSS/E | BPA IPF |
|----|---------------|-----------------|------------|---------|-----------|---------|
| 1  | Machine Model | CIMTR1          | YES        | NO      | YES       | NO      |
| 2  | Machine Model | CIMTR2          | YES        | NO      | YES       | NO      |
| 3  | Machine Model | CIMTR3          | YES        | NO      | YES       | NO      |
| 4  | Machine Model | CIMTR4          | YES        | NO      | YES       | NO      |
| 5  | Machine Model | GENCC           | YES        | YES     | NO        | NO      |
| 6  | Machine Model | GENCLS          | YES        | YES     | YES       | YES     |
| 7  | Machine Model | GENCLS_PLAYBACK | YES        | YES     | NO        | NO      |
| 8  | Machine Model | GENPWTwoAxis    | YES        | NO      | NO        | NO      |
| 9  | Machine Model | GENDCO          | YES        | NO      | YES       | NO      |
| 10 | Machine Model | GENSAE          | YES        | NO      | YES       | YES     |
| 11 | Machine Model | GENSAL          | YES        | YES     | YES       | YES     |
| 12 | Machine Model | GENROE          | YES        | NO      | YES       | YES     |
| 13 | Machine Model | GENROU          | YES        | YES     | YES       | YES     |
| 14 | Machine Model | GENTPF          | YES        | YES     | NO        | NO      |
| 15 | Machine Model | GENTPJ          | YES        | YES     | NO        | NO      |
| 16 | Machine Model | GENTRA          | YES        | NO      | YES       | YES     |
| 17 | Machine Model | MOTOR1          | YES        | YES     | NO        | NO      |
| 18 | Machine Model | STCON           | YES        | YES     | NO        | NO      |
| 19 | Machine Model | GEWGT           | YES        | YES     | NO        | NO      |
| 20 | Machine Model | GENWRI          | YES        | YES     | NO        | NO      |
| 21 | Machine Model | WT1G            | YES        | YES     | NO        | NO      |
| 22 | Machine Model | GENIND          | YES        | YES     | NO        | NO      |
| 23 | Machine Model | WT1G1           | YES        | NO      | YES       | NO      |
| 24 | Machine Model | WT2G1           | YES        | NO      | YES       | NO      |
| 25 | Machine Model | WT3G            | YES        | YES     | NO        | NO      |
| 26 | Machine Model | WT3G1           | YES        | NO      | YES       | NO      |
| 27 | Machine Model | WT3G2           | YES        | NO      | YES       | NO      |
| 28 | Machine Model | WT4G1           | YES        | NO      | YES       | NO      |
| 29 | Machine Model | CBEST           | YES        | NO      | YES       | NO      |
| 30 | Machine Model | GEN_BPA_MM2     | YES        | NO      | NO        | YES     |
| 31 | Machine Model | GEN_BPA_MM3     | YES        | NO      | NO        | YES     |
| 32 | Machine Model | GEN_BPA_MM4     | YES        | NO      | NO        | YES     |
| 33 | Machine Model | GEN_BPA_MM5     | YES        | NO      | NO        | YES     |
| 34 | Machine Model | GEN_BPA_MM6     | YES        | NO      | NO        | YES     |

Listing of which models are supported by other software packages

# Models in Use Example



- Open the Models in Use page

Model Explorer: Models in Use

Explore Fields

Transient Stability Model Summary Form

Model Support Status

Gen Summary

Governor

Exciter

Filter Find... Remove

|    | Model Class     | Object Type | Active and Online Count | Active Count | Inactive Count | Fully Supported |
|----|-----------------|-------------|-------------------------|--------------|----------------|-----------------|
| 1  | Machine Model   | GENSAL      | 835                     | 1060         | 0              | YES             |
| 2  | Machine Model   | GENROU      | 874                     | 1095         | 0              | YES             |
| 3  | Machine Model   | GENTPF      | 682                     | 822          | 0              | YES             |
| 4  | Machine Model   | GENTPJ      | 4                       | 4            | 0              | YES             |
| 5  | Machine Model   | GENCC       | 48                      | 60           | 0              | YES             |
| 6  | Machine Model   | MOTOR1      | 37                      | 79           | 0              | YES             |
| 7  | Machine Model   | STCON       | 2                       | 2            | 0              | YES             |
| 8  | Machine Model   | GEWTG       | 17                      | 34           | 0              | YES             |
| 9  | Machine Model   | GENWRI      | 3                       | 19           | 0              | YES             |
| 10 | Machine Model   | SVCWSC      | 10                      | 16           | 0              | YES             |
| 11 | Machine Model   | VWSCC       | 3                       | 4            | 0              | YES             |
| 12 | Gen Other Model | OEL1        | 367                     | 418          | 0              | YES             |
| 13 | Gen Other Model | LCFB1       | 53                      | 56           | 0              | YES             |
| 14 | Gen Other Model | GP1         | 7                       | 7            | 0              | YES             |
| 15 | Exciter         | SEXS_GE     | 0                       | 1            | 0              | YES             |
| 16 | Exciter         | SCRX        | 7                       | 11           | 0              | YES             |
| 17 | Exciter         | IEEE1       | 48                      | 51           | 0              | YES             |
| 18 | Exciter         | EXAC1       | 136                     | 156          | 0              | YES             |
| 19 | Exciter         | EXAC1A      | 4                       | 5            | 0              | YES             |
| 20 | Exciter         | EXAC2       | 44                      | 49           | 0              | YES             |
| 21 | Exciter         | EXAC3A      | 4                       | 4            | 0              | YES             |
| 22 | Exciter         | EXAC4       | 9                       | 15           | 0              | YES             |
| 23 | Exciter         | EXAC6A      | 3                       | 3            | 0              | YES             |
| 24 | Exciter         | EXAC8B      | 140                     | 158          | 0              | YES             |
| 25 | Exciter         | EXWTG1      | 3                       | 19           | 0              | YES             |
| 26 | Exciter         | EXWTGE      | 17                      | 34           | 0              | YES             |
| 27 | Exciter         | EXST1_GE    | 680                     | 864          | 0              | YES             |
| 28 | Exciter         | EXST2       | 11                      | 13           | 0              | YES             |
| 29 | Exciter         | EXST2A      | 43                      | 49           | 0              | YES             |
| 30 | Exciter         | EXST3       | 5                       | 22           | 0              | YES             |
| 31 | Exciter         | EXST3A      | 28                      | 31           | 0              | YES             |

A summary of the models defined in this case

Includes whether the model is active or inactive, and whether its associated object is online

# Transient Stability Model Explorer: Model Classes



- Clicking on a particular model class opens a new pane in the right portion of the Model Explorer showing the available model types for that class
- Gray text indicates a model class or type not presently used by any device
- This pane has the following attributes
  - “All” shows all present models of the model class
  - Number in parenthesis indicates the number of models of that type which are present
  - Green icons indicate that a model is fully supported by Simulator
  - Red icons indicate that a model can be read/written but is not currently supported by the transient stability numerical integration
  - “Show Models Supported By” and a set of four check boxes- *PW Only*, *PTI*, *BPA*, and *GE* to filter the displayed list
  - At the bottom are buttons to save or load dynamic data from an external file



# Model Classes Example

- Open the Exciter page

Next to each model type states the total number of that model type in the present data set

Save or load dynamic models

The screenshot shows the 'Model Explorer: Exciter' window. The left pane lists various model types with their counts in parentheses. The right pane shows a table of supported models with columns: Fully Supported, Number of Bus, ID, Name\_Nominal kV of Bus, Name of Bus, Type, MVA Base, and Device Status.

**Model Explorer: Exciter**

**Explore** | **Fields**

- Switched Shunts
- Three-Winding Transformer
- Transformer Controls
- Aggregations
  - Areas
  - Injection Groups
  - Interfaces
  - Islands
  - Multi-Section Lines
  - MW Transactions
  - Monograms
- Owners
- Substations
- Super Areas
- Tie-lines between Areas
- Tie-lines between Zones
- Transfer Directions
- Zones
- Solution Details
  - Case Information and Auxiliary
  - Contingency Analysis
  - Fault Analysis
  - Optimal Power Flow
- Transient Stability
  - Summary
    - Generator Model Use
    - Model Support Status
    - Models in Use
  - DC Line Models
  - Exciter
  - Generator Other Models
  - Governor
  - Line Relay Models
  - Load Characteristics
  - Load Relays
  - Machine Models
  - Stabilizer

**Exciter**

- All (2711)
- DC4B (5)
- ESAC1A (5)
- ESAC2A (6)
- ESAC3A (1)
- ESAC4A
- ESAC5A (21)
- ESAC6A
- ESAC7A (45)
- ESAC8B\_GE (21)
- ESDC1A
- ESDC2A (1)
- ESDC3A
- ESST1A (22)
- ESST2A (2)
- ESST3A
- ESST4B (16)
- EWGFC
- EXAC1 (156)
- EXAC1A (5)
- EXAC2 (49)
- EXAC3
- EXAC3A (4)
- EXAC4 (15)
- EXAC6A (3)
- EXAC8B (158)
- EXBBC
- EXDC1 (311)
- EXDC2 (311)

**Table: Transient Stability Data - Exciter**

| Fully Supported | Number of Bus | ID    | Name_Nominal kV of Bus | Name of Bus    | Type     | MVA Base | Device Status  |
|-----------------|---------------|-------|------------------------|----------------|----------|----------|----------------|
| 1               | YES           | 10246 | 1                      | PERSONG1_18.00 | PERSONG1 | EXST4B   | 170 Active     |
| 2               | YES           | 10261 | 1                      | REEVE_G1_13.80 | REEVE_G1 | TEXS     | 58.822 Active  |
| 3               | YES           | 10262 | 1                      | REEVE_G2_13.80 | REEVE_G2 | TEXS     | 58.822 Active  |
| 4               | YES           | 10263 | 1                      | REEVE_G3_13.80 | REEVE_G3 | TEXS     | 88.235 Active  |
| 5               | YES           | 10318 | 1                      | SJUAN_G1_22.00 | SJUAN_G1 | EXAC3A   | 410 Active     |
| 6               | YES           | 10319 | 1                      | SJUAN_G2_24.00 | SJUAN_G2 | REXS     | 410 Active     |
| 7               | YES           | 10320 | 1                      | SJUAN_G3_22.00 | SJUAN_G3 | EXAC3A   | 616.7 Active   |
| 8               | YES           | 10321 | 1                      | SJUAN_G4_22.00 | SJUAN_G4 | EXAC3A   | 616.7 Active   |
| 9               | YES           | 10394 | 1                      | LEF_G1_18.00   | LEF_G1   | EXST4B   | 234 Active     |
| 10              | YES           | 10395 | 1                      | LEF_G2_18.00   | LEF_G2   | EXST4B   | 234 Active     |
| 11              | YES           | 10396 | 1                      | LEF_S1_18.00   | LEF_S1   | EXST4B   | 373 Active     |
| 12              | YES           | 10415 | 1                      | LVGT_13.80     | LVGT     | EXST2A   | 29.6 Active    |
| 13              | YES           | 10485 | 1                      | AFTONS_13.80   | AFTONS   | EXAC2    | 143.6 Active   |
| 14              | YES           | 10486 | 1                      | AFTONG_18.00   | AFTONG   | EXST4B   | 189 Active     |
| 15              | YES           | 10491 | 1                      | LRDSBGG1_13.80 | LRDSBGG1 | REXS     | 60 Active      |
| 16              | YES           | 10492 | 1                      | LRDSBRG2_13.80 | LRDSBRG2 | REXS     | 60 Active      |
| 17              | YES           | 10903 | 1                      | VEF_18.00      | VEF      | EXST4B   | 191 Active     |
| 18              | YES           | 11051 | 1                      | COPPER_G_13.80 | COPPER_G | REXS     | 89.5 Active    |
| 19              | YES           | 11112 | 1                      | NEWMANG1_13.80 | NEWMANG1 | EXST1_GE | 96 Active      |
| 20              | YES           | 11113 | 1                      | NEWMANG2_13.80 | NEWMANG2 | EXDC1    | 96 Active      |
| 21              | YES           | 11114 | 1                      | NEWMANG3_13.80 | NEWMANG3 | EXST2A   | 135.3 Active   |
| 22              | YES           | 11115 | 1                      | NEWMN4G1_13.80 | NEWMN4G1 | REXS     | 94.444 Active  |
| 23              | YES           | 11116 | 1                      | NEWMN4G2_13.80 | NEWMN4G2 | REXS     | 94.444 Active  |
| 24              | YES           | 11117 | 1                      | NEWMN4S1_13.80 | NEWMN4S1 | REXS     | 133.333 Active |
| 25              | YES           | 11133 | 1                      | RIOGD_G6_13.80 | RIOGD_G6 | EXDC1    | 58.822 Active  |
| 26              | YES           | 11134 | 1                      | RIOGD_G7_13.80 | RIOGD_G7 | EXDC1    | 58.824 Active  |
| 27              | YES           | 11135 | 1                      | RIOGD_G8_17.50 | RIOGD_G8 | EXST1_GE | 185 Active     |
| 28              | YES           | 11208 | 1                      | NEWMN5G1_13.80 | NEWMN5G1 | REXS     | 114 Active     |
| 29              | YES           | 11209 | 1                      | NEWMN5G2_13.80 | NEWMN5G2 | REXS     | 114 Active     |
| 30              | YES           | 11209 | 1                      | RIOGD_G8_17.50 | RIOGD_G8 | EXST1_GE | 100 Active     |
| 31              | YES           | 11209 | 1                      | RIOGD_G8_17.50 | RIOGD_G8 | EXST1_GE | 100 Active     |
| 32              | YES           | 11228 | 1                      | RIOGDG11_17.50 | RIOGDG11 | EXST1_GE | 100 Active     |
| 33              | YES           | 11229 | 1                      | RIOGDG11_17.50 | RIOGDG11 | EXST1_GE | 100 Active     |
| 34              | YES           | 11230 | 1                      | RIOGDG11_17.50 | RIOGDG11 | EXST1_GE | 100 Active     |

**Legend:**

- Green [G] - supported
- Red [R] - read but not implemented

**Buttons:** Save, Load, Open New Explorer

# Model Classes- Filter the Shown Formats



- Types can be further filtered to show only those models supported by other formats

Stabilizer

- ☐ All (1047)
- ☐ BPA\_SF
- ☐ BPA\_SG
- ☐ BPA\_SH
- ☐ BPA\_SHPLUS
- ☐ BPA\_SI
- ☐ BPA\_SP
- ☐ BPA\_SS

Show Models Supported By

☐ PW Only   ☐ PTI  
☒ BPA   ☐ GE

Stabilizer

- ☐ All (1047)
- ☐ IEE2ST
- ☐ IEEEEST (181)
- ☐ PSS2A (620)
- ☐ PSS2B
- ☐ PTIST1
- ☐ PTIST3
- ☐ ST2CUT
- ☐ STAB1
- ☐ STAB2A
- ☐ STAB3
- ☐ STAB4
- ☐ STBSVC

Show Models Supported By

☐ PW Only   ☒ PTI  
☐ BPA   ☐ GE

Stabilizer

- ☐ All (1047)
- ☐ IEEEEST (181)
- ☐ PFQRG (5)
- ☐ PSS2A (620)
- ☐ PSS2B
- ☐ PSSSB (83)
- ☐ WSCCST (158)

Show Models Supported By

☐ PW Only   ☐ PTI  
☐ BPA   ☒ GE



# Model Type Example



- When you choose a particular model type from a model class, additional columns will appear which show all the input parameters for that model type

GENROU Model Parameters

Specific Machine Model types

Transient Stability Data - Machine Model

Filter: Advanced Machine Model: GENROU Find... Remove

Machine Model

- All (3195)
- CBEST
- CIMTR.1
- CIMTR.2
- CIMTR.3
- CIMTR.4
- CSVGN.1
- CSVGN.3
- CSVGN.4
- CSVGN.5
- CSVGN.6
- GENCC (60)
- GENCLS
- GENCLS\_PLAYBA
- GENDCO
- GENIND
- GENPWTwoAxis
- GENROE
- GENROU (1095)
- GENSAE
- GENSAL (1060)
- GENTPF (822)
- GENTR (4)

Show Models Supported By

☒ PW Only ☒ PTI

☐ BPA ☒ GE

Save Load

GENROU

|    | Number of Bus | ID | Name_Nominal kv of Bus | Name of Bus | Type   | MVA Base | Device Status | S | H      | D | Ra    | Xd    | Xq    | Xdp   | Xqp   | Xdpp | Xl   | Tdop | Tqop | Tdopp | Tqopp  | S(1.0) | S(1.2) | Rcomp | Xcomp |
|----|---------------|----|------------------------|-------------|--------|----------|---------------|---|--------|---|-------|-------|-------|-------|-------|------|------|------|------|-------|--------|--------|--------|-------|-------|
| 1  | 10245         | 1  | PERSONG_1              | PERSONG1    | GENROU | 170      | Active        |   | 4.2    | 0 | 0     | 1.65  | 1.55  | 0.2   | 0.6   | 0.19 | 0.15 | 8.5  | 0.6  | 0.02  | 0.12   | 0.076  | 0.317  | 0     | 0     |
| 2  | 10261         | 1  | REEVE_G1_1             | REEVE_G1    | GENROU | 58.822   | Active        |   | 4.22   | 0 | 0     | 1.73  | 1.6   | 0.285 | 0.8   | 2036 | 0.1  | 7.1  | 2    | 0.03  | 0.2    | 0.194  | .4597  | 0     | 0     |
| 3  | 10262         | 1  | REEVE_G2_1             | REEVE_G2    | GENROU | 58.822   | Active        |   | 4.22   | 0 | 0     | 1.73  | 1.6   | 0.285 | 0.8   | 2036 | 0.1  | 7.1  | 2    | 0.03  | 0.2    | 0.194  | .4597  | 0     | 0     |
| 4  | 10263         | 1  | REEVE_G3_1             | REEVE_G3    | GENROU | 88.235   | Active        |   | 3.48   | 0 | 0     | 1.76  | 1.52  | 0.24  | 0.7   | 2036 | 0.1  | 7    | 2    | 0.03  | 0.1    | 0.2196 | .6399  | 0     | 0     |
| 5  | 10318         | 1  | SJUAN_G1_2             | SJUAN_G1    | GENROU | 410      | Active        |   | 3.71   | 0 | .004  | 1.7   | 1.4   | 0.24  | 0.33  | 0.21 | 0.17 | 5.5  | 0.51 | 0.05  | 0.06   | 0.1603 | .4861  | 0     | 0     |
| 6  | 10319         | 1  | SJUAN_G2_2             | SJUAN_G2    | GENROU | 410      | Active        |   | 3.8    | 0 | .002  | 1.85  | 1.4   | .3088 | 0.33  | 2573 | 0.17 | 6.76 | 0.51 | 0.05  | 0.06   | 0.113  | .4049  | 0     | 0     |
| 7  | 10394         | 1  | LEF_G1_18.0            | LEF_G1      | GENROU | 234      | Active        |   | 4.87   | 0 | 0     | 2.25  | 1.825 | 0.275 | 0.85  | 2264 | 0.15 | 9    | 0.9  | 0.036 | 0.07   | 0.09   | .2687  | 0     | 0     |
| 8  | 10395         | 1  | LEF_G2_18.0            | LEF_G2      | GENROU | 234      | Active        |   | 4.87   | 0 | 0     | 2.25  | 1.825 | 0.275 | 0.85  | 2264 | 0.15 | 9    | 0.9  | 0.036 | 0.07   | 0.09   | .2687  | 0     | 0     |
| 9  | 10396         | 1  | LEF_S1_18.0            | LEF_S1      | GENROU | 373      | Active        |   | 2.91   | 0 | 0     | 2.27  | 1.7   | 0.33  | 0.85  | 0.27 | .231 | 7.5  | 0.9  | 0.036 | 0.07   | 0.065  | .5795  | 0     | 0     |
| 10 | 10415         | 1  | LVGT_13.80             | LVGT        | GENROU | 29.6     | Active        |   | 7.4    | 0 | .0017 | 1.865 | 1.6   | 0.215 | 0.8   | .205 | 0.11 | 8    | 0.5  | 0.023 | 0.05   | 0.0992 | .348   | 0     | 0     |
| 11 | 10485         | 1  | AFTONS_13.8            | AFTONS      | GENROU | 143.6    | Active        |   | 4.35   | 0 | .0028 | 1.445 | 1.382 | 0.22  | 0.375 | .185 | 0.11 | 5.97 | 0.52 | 0.039 | 0.086  | 0.0541 | .3602  | 0     | 0     |
| 12 | 10486         | 1  | AFTONG_18.0            | AFTONG      | GENROU | 189      | Active        |   | 4.8    | 0 | .0025 | 1.77  | 1.662 | 0.235 | 0.4   | .195 | 0.12 | 7.1  | .539 | 0.055 | 0.083  | 0.0697 | .3761  | 0     | 0     |
| 13 | 10491         | 1  | LRDSBGG1_1             | LRDSBGG1    | GENROU | 60       | Active        |   | 2.18   | 0 | .003  | 2.3   | 2.25  | 0.28  | 1.1   | .226 | 0.12 | 6.5  | 3    | 0.03  | 0.2    | 0.0727 | .3108  | 0     | -0.05 |
| 14 | 10492         | 1  | LRDSBRG2_1             | LRDSBRG2    | GENROU | 60       | Active        |   | 2.18   | 0 | .003  | 2.3   | 2.25  | 0.28  | 1.1   | .226 | 0.12 | 6.5  | 3    | 0.03  | 0.2    | 0.0727 | .3108  | 0     | -0.05 |
| 15 | 10903         | 1  | VEF_18.00              | VEF         | GENROU | 191      | Active        |   | 5.7    | 0 | .003  | 1.47  | 1.4   | 0.212 | 0.4   | 0.16 | 0.12 | 7.7  | 0.54 | 0.039 | 0.083  | 0.057  | 0.441  | 0     | 0     |
| 16 | 11051         | 1  | COPPER_G_1             | COPPER_G    | GENROU | 89.5     | Active        |   | 6.96   | 0 | 0     | 2.04  | 1.8   | 0.278 | 0.7   | .239 | 0.19 | 8.2  | 1    | 0.05  | 0.05   | 0.1    | 0.327  | 0     | 0     |
| 17 | 11112         | 1  | NEWMANG_1              | NEWMANG     | GENROU | 96       | Active        |   | 3.79   | 0 | 0     | 1.6   | 1.48  | 0.22  | 0.9   | .173 | 0.16 | 6    | 0.6  | 0.03  | 0.06   | 0.104  | 0.516  | 0     | 0     |
| 18 | 11113         | 1  | NEWMANG2_1             | NEWMANG2    | GENROU | 96       | Active        |   | 3.54   | 0 | 0     | 1.6   | 1.5   | 0.226 | 0.4   | 0.19 | 0.15 | 8    | 1    | 0.025 | 0.0255 | 0.094  | 0.43   | 0     | 0     |
| 19 | 11114         | 1  | NEWMANG3_1             | NEWMANG3    | GENROU | 135.3    | Active        |   | 3.21   | 0 | 0     | 1.56  | 1.4   | 0.255 | 0.5   | 0.22 | 0.15 | 8.5  | 1    | 0.03  | 0.09   | 0.085  | .5557  | 0     | 0     |
| 20 | 11115         | 1  | NEWMN4G1_1             | NEWMN4G1    | GENROU | 94.444   | Active        |   | 6.6    | 0 | 0     | 1.54  | 1.45  | 0.324 | 0.7   | 0.26 | 0.2  | 8    | 1    | 0.05  | 0.05   | 0.2125 | .0058  | 0     | 0     |
| 21 | 11116         | 1  | NEWMN4G2_1             | NEWMN4G2    | GENROU | 94.444   | Active        |   | 6.6    | 0 | 0     | 1.54  | 1.45  | 0.324 | 0.7   | 0.26 | 0.2  | 8    | 1    | 0.05  | 0.05   | 0.2125 | .0058  | 0     | 0     |
| 22 | 11117         | 1  | NEWMN4S1_1             | NEWMN4S1    | GENROU | 133.333  | Active        |   | 3.58   | 0 | 0     | 1.48  | 1.2   | 0.26  | 0.45  | 0.18 | .144 | 10.5 | 1    | 0.05  | 0.05   | 0.1368 | 0.676  | 0     | 0     |
| 23 | 11133         | 1  | RIOGD_G6_1             | RIOGD_G6    | GENROU | 58.822   | Active        |   | 4.7    | 0 | 0     | 1.55  | 1.3   | 0.256 | 0.4   | .181 | 0.15 | 6.7  | 1    | 0.03  | 0.1    | 0.16   | 0.5    | 0     | 0     |
| 24 | 11134         | 1  | RIOGD_G7_1             | RIOGD_G7    | GENROU | 58.824   | Active        |   | 3      | 0 | 0     | 1.7   | 1.3   | 0.25  | 0.6   | 0.22 | 0.19 | 7    | 0.4  | 0.025 | 0.05   | 0.1808 | .5848  | 0     | 0     |
| 25 | 11135         | 1  | RIOGD_G8_1             | RIOGD_G8    | GENROU | 185      | Active        |   | 4.43   | 0 | 0     | 1.5   | 1.3   | 0.16  | 0.6   | 0.14 | 0.1  | 10   | 0.7  | 0.05  | 0.08   | 0.0578 | .3644  | 0     | 0     |
| 26 | 11208         | 1  | NEWMN5G1_1             | NEWMN5G1    | GENROU | 114      | Active        |   | 6.5    | 0 | 0     | 1.94  | 1.85  | 0.21  | 0.425 | .165 | 0.12 | 7.9  | 0.56 | 0.04  | 0.083  | 0.04   | 0.3    | 0     | 0     |
| 27 | 11209         | 1  | NEWMN5G2_1             | NEWMN5G2    | GENROU | 114      | Active        |   | 6.5    | 0 | 0     | 1.94  | 1.85  | 0.21  | 0.425 | .165 | 0.12 | 7.9  | 0.56 | 0.04  | 0.083  | 0.04   | 0.3    | 0     | 0     |
| 28 | 11226         | 1  | RIOGD_G9_1             | RIOGD_G9    | GENROU | 100      | Active        |   |        |   |       |       |       |       |       |      |      |      |      |       |        |        |        |       |       |
| 29 | 11227         | 1  | RIOGD_G10_1            | RIOGD_G10   | GENROU | 100      | Active        |   | 1.9474 | 0 | .0053 | .937  | .624  | 0.302 | 0.624 | .243 | 0.13 | 2.96 | 0.35 | 0.073 | 0.07   | 0.152  | 0.59   | 0     | 0     |

Show Block Diagram

Search Search Now Options

# Transient Stability Data: Object Dialogs

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- In general, Simulator devices have Information Dialogs, and models can be edited both by using these dialogs and by using the Model Explorer
- On the various dialogs for devices such as Generators, Loads, Switched Shunts, etc., there will be a tab labeled “Stability”
- This tab can be used to define the transient stability models for the device
- Stability tab attributes
  - Insert button
  - Delete button
  - Type of model and whether it is active
  - Show Diagram (displays the model’s block diagram)
  - Parameter list

# Example Object Dialog



- Right click on a model in the Model Explorer and select “Show Dialog”
- An example of an exciter’s dialog is shown here

Generator Information for Current Case

Bus Number: 10246 Find By Number  
Bus Name: PERSONG1 Find By Name  
ID: 1 Find ...  
Area Name: NEW MEXICO (10) Fuel Type: Unknown  
Labels ...: no labels Unit Type: UN (Unknown)  
Generator MVA Base: 170.00

Power and Voltage Control Costs OFF Faults Owners, Area, etc. Custom Stability  
Machine Models Exciters Governors Stabilizers Other Models Step-up Transformer Terminal and State

Insert Delete Gen MVA Base: 170.0 Show Diagram Set to Default

Type: Active - EXST4B ☒ Active (only one may be active) Defaults:   
Parameters  
PU values shown/entered using device base of 170.0 MVA

|       |         |             |         |       |        |
|-------|---------|-------------|---------|-------|--------|
| Tr    | 0.0200  | Kim         | 0.0000  | Kc    | 0.0500 |
| Kpr   | 25.0000 | VmMax       | 5.5000  | Xl    | 0.0000 |
| Kir   | 1.2500  | VmMin       | -4.6000 | VbMax | 1.2000 |
| Ta    | 0.0250  | Kg          | 0.0000  |       |        |
| Vrmx  | 5.5000  | Kp          | 1.0000  |       |        |
| Vrmin | -4.6000 | ThetaP(Deg) | 0.0000  |       |        |
| Kpm   | 1.0000  | Ki          | 0.0000  |       |        |

OK Save Cancel Help Print

Models can be inserted or deleted here

Several model class tabs

Model parameters can be modified here for the selected type of model

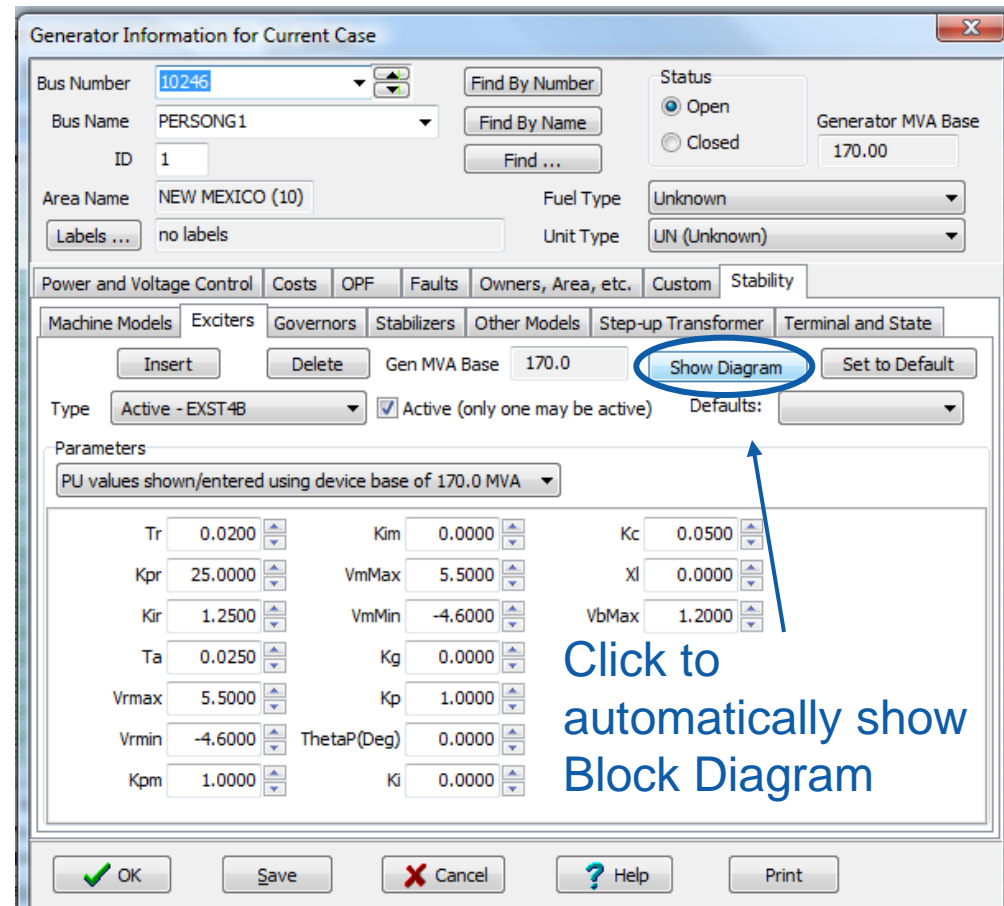
Hovering the mouse will cause a hint to appear with a description of the parameter

Checkbox indicates if the model is active

# Object Dialog: Block Diagrams



- The “Show Diagram” button is available on the Stability tab of the individual dialogs for objects with Transient Stability models
- *Block Diagrams.pdf* contains block diagrams for the models implemented in Simulator
- To view, click on the “Show Block Diagram” button
- You can also manually open the document at any time from the location where it was saved when you installed Simulator



# Block Diagrams



- The “Show Block Diagram” button is also available on the Model Explorer
- The block diagram document will be navigated to the page containing the model that is currently selected
- If “All” is selected, the pdf document will just open to the first page

Click to show Block Diagrams

Model Explorer: Exciter

Explore Fields

Contingency Analysis

Fault Analysis

Optimal Power Flow

Transient Stability

Summary

DC Line Models

Exciter

Generator Other Models

Governor

Line Relay Models

Load Characteristics

Load Relays

Machine Models

Stabilizer

Switched Shunt Relay Mode

User-Defined

Open New Explorer

Transient Stability Data - Exciter

Buses

Filter Advanced Exciter: Generic Find... Remove

Show Block Diagram

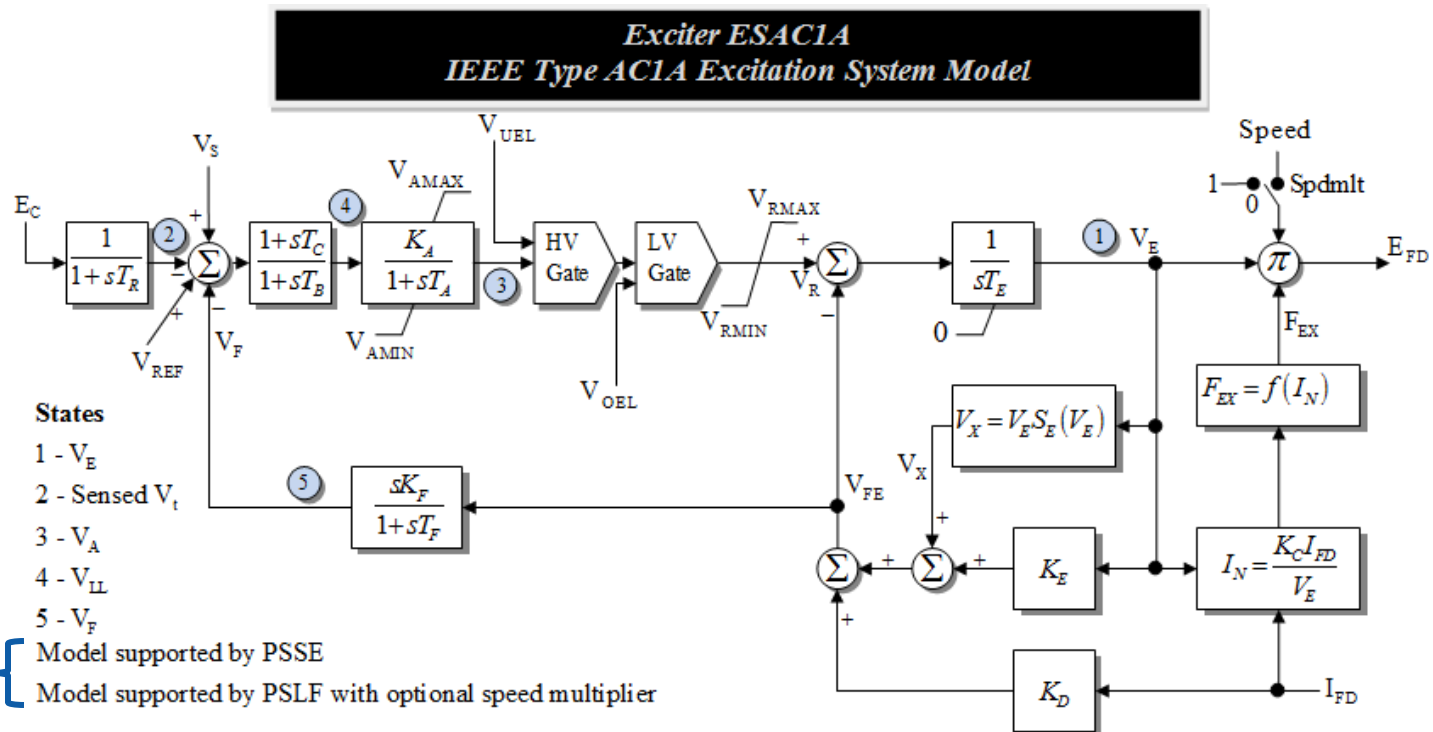
|    | Fully Supported | Number of Bus | ID | Name_Nominal kV of Bus | Name of Bus | Type   | MVA Base | Device Status | Sub |
|----|-----------------|---------------|----|------------------------|-------------|--------|----------|---------------|-----|
| 1  | YES             | 10246         | 1  | PERSONG1_18.00         | PERSONG1    | EXST4B | 170      | Active        |     |
| 2  | YES             | 10261         | 1  | REEVE_G1_13.80         | REEVE_G1    | TEXS   | 58.822   | Active        |     |
| 3  | YES             | 10262         | 1  | REEVE_G2_13.80         | REEVE_G2    | TEXS   | 58.822   | Active        |     |
| 4  | YES             | 10263         | 1  | REEVE_G3_13.80         | REEVE_G3    | TEXS   | 88.235   | Active        |     |
| 5  | YES             | 10318         | 1  | SJUAN_G1_22.00         | SJUAN_G1    | EXAC3A | 410      | Active        |     |
| 6  | YES             | 10319         | 1  | SJUAN_G2_24.00         | SJUAN_G2    | REXS   | 410      | Active        |     |
| 7  | YES             | 10320         | 1  | SJUAN_G3_22.00         | SJUAN_G3    | EXAC3A | 616.7    | Active        |     |
| 8  | YES             | 10321         | 1  | SJUAN_G4_22.00         | SJUAN_G4    | EXAC3A | 616.7    | Active        |     |
| 9  | YES             | 10394         | 1  | LEF_G1_18.00           | LEF_G1      | EXST4B | 234      | Active        |     |
| 10 | YES             | 10395         | 1  | LEF_G2_18.00           | LEF_G2      | EXST4B | 234      | Active        |     |
| 11 | YES             | 10396         | 1  | LEF_S1_18.00           | LEF_S1      | EXST4B | 373      | Active        |     |

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# Block Diagrams



- Standardized block diagram format
- States will be labeled to match how Simulator numbers them
- There will be comments regarding whether another software product supports the model



# Object Dialog: Other Special Generator Options



- Set to Default and Defaults dropdown
- Option to enter values in Device MVA base or System MVA base

Generator Information for Current Case

Bus Number: 18281, Bus Name: RG 4, ID: 4, Area Name: NEVADA (18), Fuel Type: Unknown, Unit Type: UN (Unknown), Status: Closed, Generator MVA Base: 327.60

Machine Models: Exciters, Governors, Stabilizers, Other Models, Step-up Transformer, Terminal and State

Terminal and State Tab:

Terminal Voltage and Current: Magnitude (pu), Angle (deg), Voltage, Current

Internal Angle: Internal Angle Delta (deg), Freq. Deviation omega (rad/sec), Acceleration (rad/sec^2)

Field Voltage (pu), Current (pu)

Power Values: Mechanical Input MW, Accelerating MW, Terminal MW, Terminal Mvar, Terminal MVA

Parameters: PU values shown/entered using device base of 327.6 MVA

Base and defaults

Generator Information for Current Case

Bus Number: 18281, Bus Name: RG 4, ID: 4, Area Name: NEVADA (18), Fuel Type: Unknown, Unit Type: UN (Unknown), Status: Closed, Generator MVA Base: 327.60

Machine Models: Exciters, Governors, Stabilizers, Other Models, Step-up Transformer, Terminal and State

Terminal and State Tab:

Terminal Voltage and Current: Magnitude (pu), Angle (deg), Voltage, Current

Internal Angle: Internal Angle Delta (deg), Freq. Deviation omega (rad/sec), Acceleration (rad/sec^2)

Field Voltage (pu), Current (pu)

Power Values: Mechanical Input MW, Accelerating MW, Terminal MW, Terminal Mvar, Terminal MVA

Terminal and state

- Step-up Transformer Tab
- Terminal and State Tab
  - Bus/Setpoint Values
  - Terminal Values
  - More Tabs for various classes of models



# GE DYD Special Handling



- Generator Baseload Flag
  - When loading GE EPC files, a flag for each generator record exists called the *Baseload flag* which determines how governor limits are handled during a transient stability run
  - Supported by a Simulator generator field called *Transient Stability\Governor Response Limits*- options are *Normal*, *Down Only*, or *Fixed*
  - *Baseload flag* of *0* maps to *Normal*, *Normal* means that the limits specified in the governor model will be used for the simulation
  - *Baseload flag* of *1* maps to *Down Only*, *Down Only* means that the upper limit is set equal to the initial condition value (and thus control can only go down.
  - *Baseload flag* of *2* or more maps to *Fixed*, *Fixed* means that both the upper and lower limits are set equal to the initial condition, thus control will be approximately constant
  - The *Governor Response Limits* field is shown when looking at governor case information displays



# GE DYD Special Handling



- EPCMOD models
  - Often used to represent a user-defined model of a Series Capacitor Relay and a Capacitor Relay Model
  - Since these models were so common, PowerWorld added them as two new kinds of relay models
  - CAPRELAY can be assigned to a switched shunt record which, based on voltage, can open and close a switched shunt
    - Created when “MSC01.p” is read from an EPCMOD record
    - An appropriate log message will be written upon creation
  - SERIESCAPRELAY can allow a series capacitor to be bypassed during a fault and placed back in service when appropriate
    - Created when “MSC01.p” is read from an EPCMOD record
    - An appropriate log message will be written upon creation

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