

Transient Stability Analysis with PowerWorld Simulator



T5: Transient Contingencies



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Transient Stability Analysis: PowerWorld's Design Goal



- Traditional transient stability
 - Create one set of events which define your transient stability simulation
 - Similar to having a tool to solve one power flow solution
- PowerWorld's Design Goal
 - Mimic the processing of Simulator's Contingency Analysis
 - Define multiple contingencies and process them all
 - This section will concentrate on defining a single transient contingency
- This leads to creating a new object in Simulator called a *Transient Contingency*
 - Similar to Contingency records except a different set of actions are available
 - Also timing inputs are important

Transient Contingencies



- Goal - to simulate a particular contingency and see if it causes any problems for the system
- A transient contingency will consist of one or more events
- One contingency might be the outage of a generator to gauge the response of the governors of the remaining generators
- Another contingency might simulate a bus fault, which has events to both initiate and clear the fault

Defining a Transient Contingency



- A new contingency will automatically be given an unused name starting with “My Transient Contingency”
- Several buttons are normally available at the top of the dialog regardless of the page which are used for processing transient contingencies
- More than one contingency may be specified



- Use Add, Delete, and Rename buttons to manage the transient contingencies
- Use the drop-down menu to choose the presently active contingency from a list of available contingencies

Transient Contingency



- Specify Start and End Time
- Specify Time Step (seconds or cycles)
 - Recommend either 0.5 cycles or 0.25 cycles
- Transient Contingencies have one or more Transient Contingency Elements to specify the events that occur during the simulation
 - Fault Bus
 - Open Line
 - Etc...

A Transient Contingency with two Transient Contingency Elements

Contingency elements are associated with time

Time (Seconds)	Enabled	Object	Object Pretty	Description
1.0000	ES	GEN 'PALOVRDE_24_G02'	Gen PALOVRDE_24_1021 #1	OPEN
2.0000	ES	GEN 'PALOVRDE_24_G01'	Gen PALOVRDE_24_1011 #1	OPEN

Transient Contingency Elements



- Insert Elements Button
 - Opens the Transient Stability Contingency Element Dialog
- Clear All Elements
 - Deletes all currently defined events
- Insert Apply and Clear Fault
 - Quickly apply/clear a fault by specifying both its fault time and its clearing time in one dialog
- Element Table
 - A case information display which lists all transient stability elements currently defined for the Transient Contingency
 - Clicking on an event and choosing “Show Dialog” option will open the Transient Stability Contingency Element Dialog

Transient Contingency Element Actions

Types



- Bus
 - Apply Fault
 - Apply the specified fault type (Balanced 3 phase, Single Line to Ground, Line to Line, or Double Line to Ground)
 - Fault Across – (Solid, with Impedance and specifying PU Resistance and PU Reactance, or with Admittance specifying PU Conductance and PU Susceptance)
 - Clear Fault
- Generator
 - Open the generator.
 - Close the generator.
 - Ramp Values : Output , Exciter Setpoint (Vref), Governor Setpoint (Pref) Set Values
 - Set Value: Output , Exciter Setpoint (Vref), Governor Setpoint (Pref)
- Load
 - Open
 - Close
 - Set Values

Transient Contingency Element Actions

Types



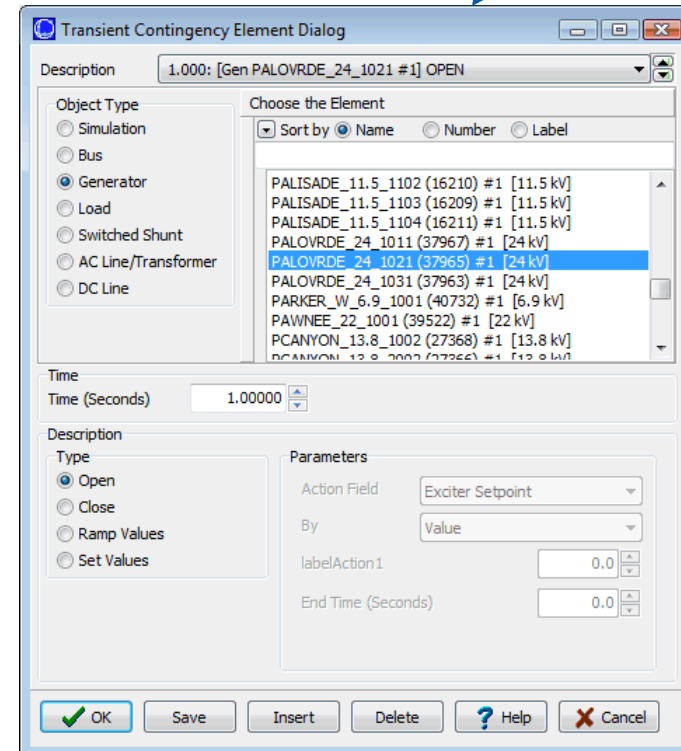
- Switched Shunt
 - Open
 - Close
- AC Line/Transformer
 - Apply Fault
 - Apply the specified fault type (Balanced 3 phase, Single Line to Ground, Line to Line, or Double Line to Ground)
 - Fault Across – (Solid, with Impedance and specifying PU Resistance and PU Reactance, or with Admittance specifying PU Conductance and PU Susceptance)
 - Percent Location
 - Clear Fault
 - Open : Both Ends, From End Only, To End Only, One Phase Open
 - Close : Both Ends, From End Only, To End Only
 - Bypass, and Not Bypass: intended for series capacitors
- DC Line
 - Open

Creating Transient Contingency Elements



- Click **Insert Elements**, or Choose **Records, Insert**
- Transient Contingency Elements involve specifying the following:
 - Object element is applied to
 - Time element occurs
 - Event Type
 - Parameters for element

Transient Contingency
Element Dialog



TS9Bus Example



- Open **TS9BusNoModels.pwb**
- With PowerWorld Simulator, a power flow case can be quickly transformed into a transient stability case
 - This requires the addition of at least one dynamic model
- We will now go through how to transform a power flow case into a transient stability case
- Add a dynamic generator model to an existing “no model” power flow case by:
 - In run mode, right-click on the generator symbol for bus 1, then select “Generator Information Dialog” from the local menu
 - This displays the Generator Information Dialog, select the “Stability” tab to view the transient stability models; none are initially defined.

Inserting a Model



- From the Generator Information Dialog, insert a GENSAL model (represents a salient pole machine)

Click to insert a machine model

Generator Information for Current Case

Bus Number: 1
Bus Name: Bus1
ID: 1
Area Name: 1 (1)
Labels: no labels

Fuel Type: Unknown
Unit Type: UN (Unknown)
Generator MVA Base: 100.00

Machine Models: **Insert** Delete Gen MVA Base: 100.0 Show Diagram Set to Default

Type: none defined Active Defaults:

Parameters: PU values shown/entered using device base of 100.0 MVA

Choose GENSAL

Model Type

Select Model from the Below List

- GENROE
- GENROU
- GENSAE
- GENSAL**
- GENTPF
- GENTPJ
- GENTRA
- GENWRI
- GEWTG
- MOTOR1
- STCON
- SVCWSC
- VWSCC
- WT1G

Show Models Supported By

PW Only PTI
 BPA GE

OK Cancel

Click "OK"

Inserting a Model



- GENSAL Dialog for Bus 1 now looks like this-

GENSAL is the only machine model inserted for this generator, so it was automatically made active

If you add more models, you need to select which to make active

Generator Information for Current Case

Bus Number: 1
Bus Name: Bus1
ID: 1
Area Name: 1 (1)
Labels: no labels

Status: Open Closed
Generator MVA Base: 100.00

Fuel Type: Unknown
Unit Type: UN (Unknown)

Power and Voltage Control | Costs | OPF | Faults | Owners, Area, etc. | Custom | Stability

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

Insert Delete Gen MVA Base: 100.0

Type: Active - GENSAL Active (only one may be active) Defaults: []

Parameters
PU values shown/entered using device base of 100.0 MVA

H	3.0000	XI	0.1500	XComp	0.0000
D	0.0000	Tdop	7.0000		
Ra	0.0000	Tdopp	0.0350		
Xd	2.1000	Tqopp	0.0500		
Xq	0.5000	S(1.0)	0.0000		
Xdp	0.2000	S(1.2)	0.0000		
Xdpp=Xqpp	0.1800	RComp	0.0000		

OK Save Cancel Help Print

Default parameters are present

Inserting a Model



- Modify the machine parameters at Bus 1 to match those shown here

Generator Information for Current Case

Bus Number: 1
Bus Name: Bus1
ID: 1
Area Name: 1 (1)
Labels: no labels

Status: Open Closed
Generator MVA Base: 100.00

Fuel Type: Unknown
Unit Type: UN (Unknown)

Power and Voltage Control | Costs | OPF | Faults | Owners, Area, etc. | Custom | Stability

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

Insert | Delete | Gen MVA Base: 100.0 | Show Diagram | Set to Default

Type: Active - GENSAL Active (only one may be active) Defaults: []

Parameters
PU values shown/entered using device base of 100.0 MVA

H	23.6400	XI	0.0304	XComp	0.0000
D	4.7280	Tdop	8.9600		
Ra	0.0000	Tdopp	0.3100		
Xd	0.1460	Tqopp	0.3100		
Xq	0.0969	S(1.0)	0.0000		
Xdp	0.0608	S(1.2)	0.0000		
Xdpp=Xqpp	0.0608	RComp	0.0000		

OK | Save | Cancel | Help | Print

Inserting a Model



- Repeat for Generators 2 and 3

Generator Information for Current Case

Bus Number: 2
Bus Name: Bus 2
ID: 1
Area Name: 1 (1)
Labels: no labels

Status: Open Closed
Generator MVA Base: 100.00

Fuel Type: Unknown
Unit Type: UN (Unknown)

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

Type: Active - GENSAL Active (only one may be active)

Parameters (PU values shown/entered using device base of 100.0 MVA):

H	6.4000	XI	0.0599	XComp	0.0000
D	1.2800	Tdop	6.0000		
Ra	0.0000	Tdopp	0.5350		
Xd	0.8958	Tqopp	0.5350		
Xq	0.8645	S(1.0)	0.0000		
Xdp	0.1198	S(1.2)	0.0000		
Xdpp=Xqpp	0.1198	RComp	0.0000		

Generator Information for Current Case

Bus Number: 3
Bus Name: Bus 3
ID: 1
Area Name: 1 (1)
Labels: no labels

Status: Open Closed
Generator MVA Base: 100.00

Fuel Type: Unknown
Unit Type: UN (Unknown)

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

Type: Active - GENSAL Active (only one may be active)

Parameters (PU values shown/entered using device base of 100.0 MVA):

H	3.0100	XI	0.0906	XComp	0.0000
D	0.6020	Tdop	5.8900		
Ra	0.0000	Tdopp	0.6000		
Xd	1.3125	Tqopp	0.6000		
Xq	1.2578	S(1.0)	0.0000		
Xdp	0.1813	S(1.2)	0.0000		
Xdpp=Xqpp	0.1813	RComp	0.0000		

Model Explorer – Machine Models



Model Explorer: Machine Models

Explore Fields

- Mismatches
- Multi-Terminal DC
- Switched Shunts
- Three-Winding Tra
- Transformer Cont
- Aggregations
- Areas
- Injection Groups
- Interfaces
- Islands
- Multi-Section Lines
- MW Transactions
- Nomograms
- Owners
- Substations

Machine Model

- All (3)
- CBEST
- CIMTR.1
- CIMTR.2
- CIMTR.3
- CIMTR.4
- CSVGN1
- CSVGN3
- CSVGN4
- CSVGN5
- CSVGN6
- GENCC

Machine Model: GENSA

Number of Bus	ID	Name_Nominal kV of Bus	Name of Bus	Type	MVA Base	Device Status	Sub-Intervals	H	D	Ra	Xd	Xq	Xdp	Xdpp
1	1	Bus1_ 16.50	Bus1	GENSAL	100	Active		23.64	4.728	0	0.146	0.0969	0.0608	0.0608
2	1	Bus_2_ 18.00	Bus 2	GENSAL	100	Active		6.4	1.28	0	0.8958	0.8645	0.1198	0.1198
3	1	Bus_3_ 13.80	Bus 3	GENSAL	100	Active		3.01	0.602	0	1.3125	1.2578	0.1813	0.1813

s	H	D	Ra	Xd	Xq	Xdp	Xdpp	Xl	Tdop	Tdopp	Tqopp	S(1.0)	S(1.2)	Rcomp	Xcomp
	23.64	4.728	0	0.146	0.0969	0.0608	0.0608	0.0304	8.96	0.31	0.31	0	0	0	0
	6.4	1.28	0	0.8958	0.8645	0.1198	0.1198	0.0599	6	0.535	0.535	0	0	0	0
	3.01	0.602	0	1.3125	1.2578	0.1813	0.1813	0.0906	5.89	0.6	0.6	0	0	0	0

Can verify or change parameters here

DC Line Models

- Exciter
- Generator Other M
- Governor
- Line Relay Models
- Load Characteristi
- Load Relays
- Machine Models
- Stabilizer
- Switched Shunt Re
- User-Defined

GENWRI

- GEWTG
- MOTOR.1
- STCON
- SVCWSC
- VWSCC

Show Models Supported By

- PW Only
- PTI
- BPA
- GE

Save Load

Search Search Now Options

Adding a Generator Exciter



- The purpose of the generator excitation system (exciter) is to adjust the generator field current to maintain a constant terminal voltage.
- PowerWorld Simulator includes many different types of exciter models. One simple exciter is the IEEET1. To add this exciter to the generator dialog, “Stability” tab, “Exciters” page. Click Insert and then select IEEET1 from the list.
- The IEEET1 is by far the most common exciter used in the 2006 MMWG case; the next most common is its close relative, the IEEEX1.

Insert Exciter Models



Add IEEE11
Exciter
models to all
three
generators

Change
settings for all
three exciters
to match
these

Generator Information for Current Case

Bus Number: 1
Bus Name: Bus1
ID: 1
Area Name: 1 (1)
Labels: no labels

Status: Open Closed
Generator MVA Base: 100.00

Fuel Type: Unknown
Unit Type: UN (Unknown)

Power and Voltage Control | Costs | OPF | Faults | Owners, Area, etc. | Custom | Stability

Machine Models | **Exciters** | Governors | Stabilizers | Other Models | Step-up Transformer | Terminal and State

Insert Delete Gen MVA Base: 100.0 Show Diagram Set to Default

Type: Active - IEEE11 Active (only one may be active) Defaults:

Parameters
PU values shown/entered using device base of 100.0 MVA

Tr	0.0000	Kf	0.0630
Ka	20.0000	Tf	0.3500
Ta	0.2000	Switch	0.0000
Vrmax	3.0000	E1	2.8000
Vrmin	-3.0000	SE(E1)	0.3034
Ke	1.0000	E2	3.7300
Te	0.3140	SE(E2)	1.2884

OK Save Cancel Help Print

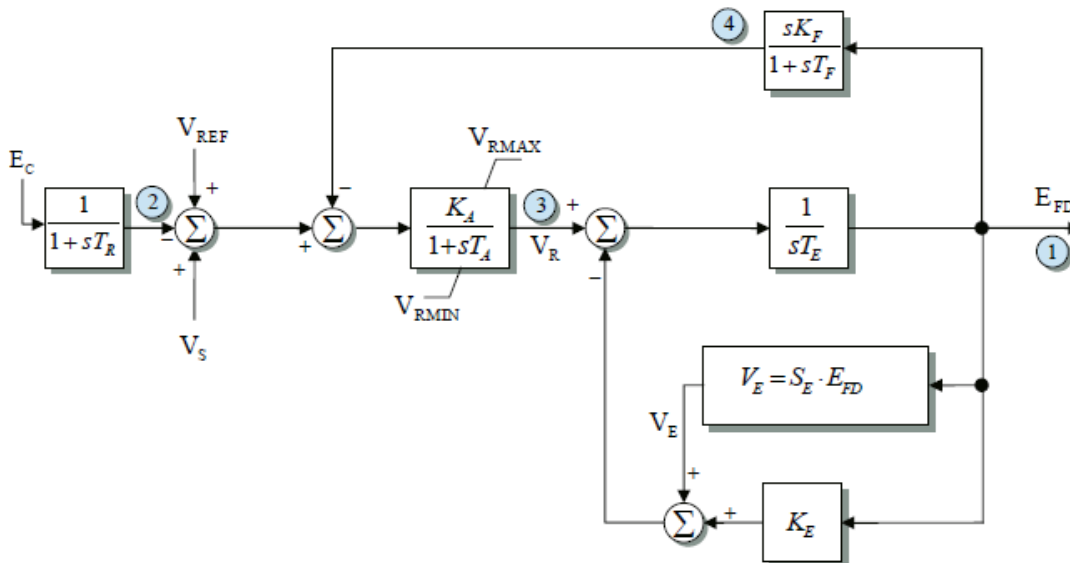
Click to show block diagram

IEEET1 Exciter



- You can view the block diagram for the IEEET1 exciter by clicking on the “Show Diagram” button.
- This opens a PDF file in Adobe Reader to the page with the appropriate block diagram (shown below).

Exciter IEEET1
IEEE Type 1 Excitation System Model



The input to the exciter, E_C , is usually the terminal voltage. The output, E_{FD} , is the machine field voltage.

Model Explorer - Exciters



Model Explorer: Exciter

Explore Fields

Records Geo Set Columns Options

Filter Advanced Exciter: IEEE1 Find... Remove

Exciter

- EXAC8B
- EXBAS
- EXBBC
- EXDC1
- EXDC2_GE
- EXDC2_PTI
- EXDC2A
- EXDC4

Number of Bus	ID	Name_Nominal kv of Bus	Name of Bus	Type	MVA Base	Device Status	Sub-Interval	Tr	Ka	Ta	Vrmax	Vrmin	Ke	Te	Kf	Tf	Switch	E1	SE(E1)
1	1	Bus1_ 16.50	Bus1	IEEE1	100	Active		0	20	0.2	3	-3	1	0.314	0.063	0.35	0	2.8	0.3034
2	1	Bus 2_ 18.00	Bus 2	IEEE1	100	Active		0	20	0.2	3	-3	1	0.314	0.063	0.35	0	2.8	0.3034
3	1	Bus 3_ 13.80	Bus 3	IEEE1	100	Active		0	20	0.2	3	-3	1	0.314	0.063	0.35	0	2.8	0.3034

Tr	Ka	Ta	Vrmax	Vrmin	Ke	Te	Kf	Tf	Switch	E1	SE(E1)	E2	SE(E2)
0	20	0.2	3	-3	1	0.314	0.063	0.35	0	2.8	0.3034	3.73	1.2884
0	20	0.2	3	-3	1	0.314	0.063	0.35	0	2.8	0.3034	3.73	1.2884
0	20	0.2	3	-3	1	0.314	0.063	0.35	0	2.8	0.3034	3.73	1.2884

Summary

- DC Line Models
- Exciter
- Generator Other M
- Governor
- Line Relay Models
- Load Characteristi
- Load Relays
- Machine Models
- Stabilizer
- Switched Shunt Re
- User-Defined

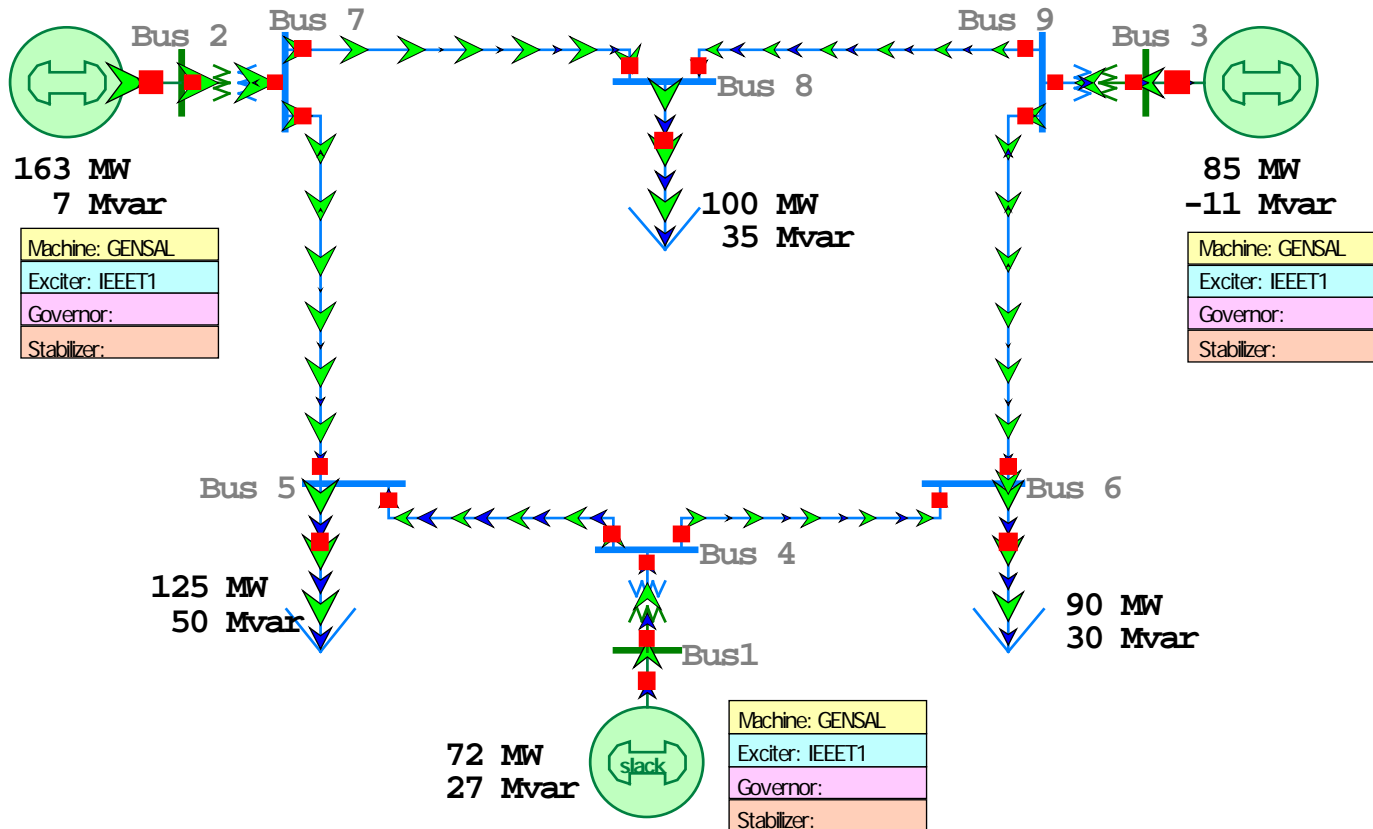
Show Models Supported By

- PW Only
- PTI
- BPA
- GE

Save Load

Open New Explorer Search Search Now Options

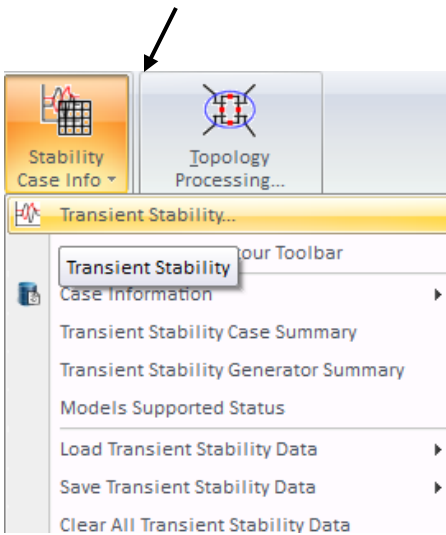
TS9Bus System with Machine and Exciter Models



Define a Transient Contingency



Go to the **Add Ons** ribbon tab and select **Transient Stability**



Specify Start and End Time

Specify Time Step (seconds or cycles)

Click to Insert Elements

Specify the events that occur during the simulation

Object	Enabled	Time (Seconds)	Object	Description	Contingency Name
None					

Transient Stability Contingency Element Dialog



- Clicking “Insert” opens the Transient Stability Contingency Element Dialog shown below
- This dialog is used to specify transient stability events and when they occur

No events have been defined yet

Object Type

- Changes the type of events that can occur

Time

- When the event occurs

Event Type and Parameters

- Depends on Object Type

Description

- A drop-down list of all currently defined events
- May be used to switch between events and modify them as necessary
- Appears once the event is saved

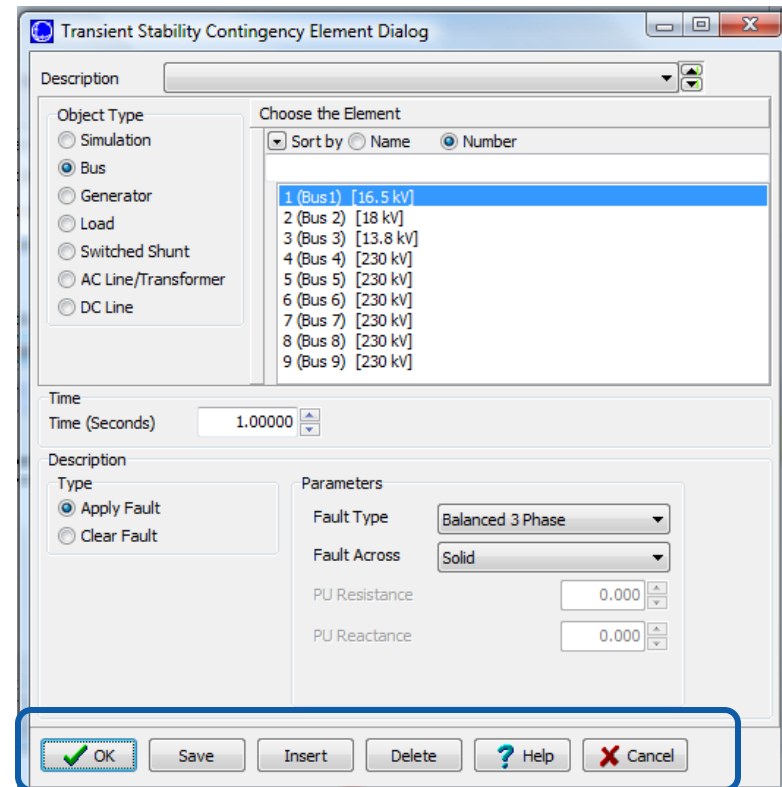
Choose the Element

- Apply the event to this element
- List is updated as Object Type is changed

Transient Stability Contingency Element Dialog

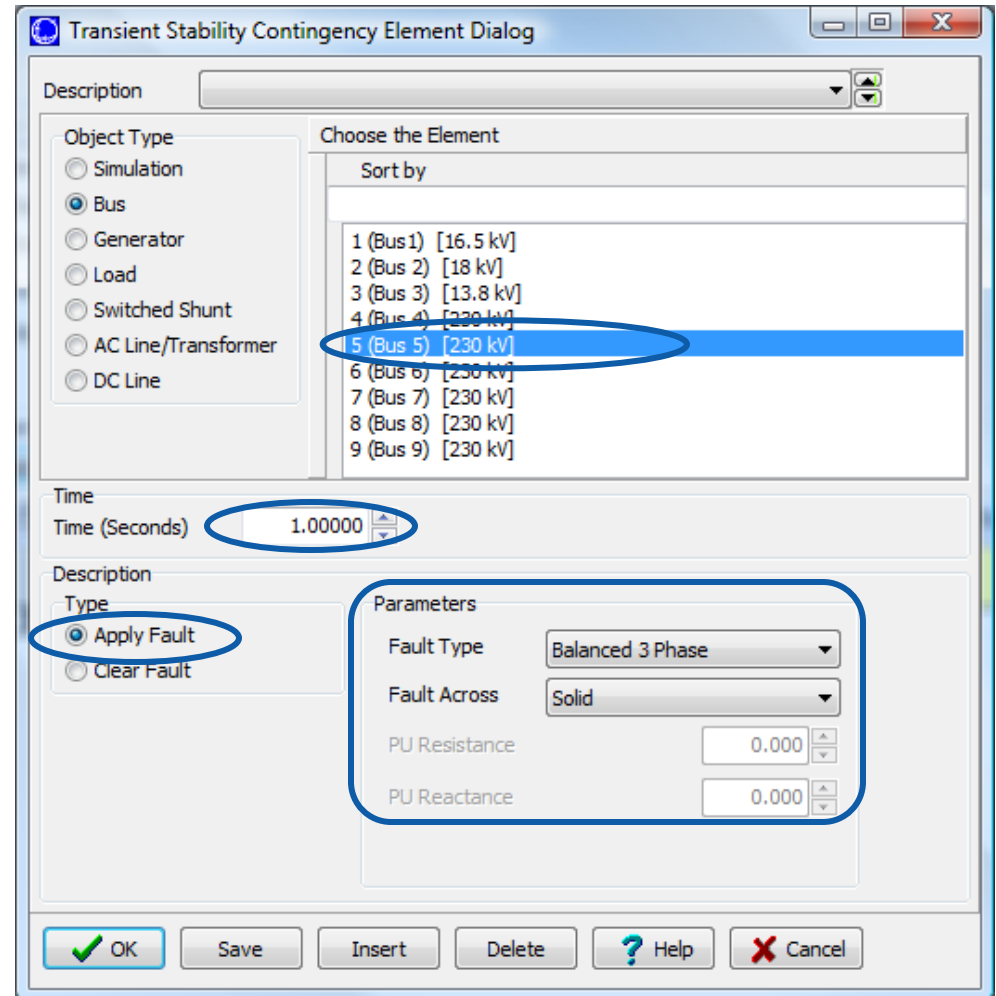


- “Save” will save any modifications but leave the dialog open
- “Insert” creates a new event with the specified parameters
- “OK” will accept changes and close the dialog
- “Delete” will delete the event defined by the event Description
- “Cancel” closes the dialog without saving



Add a Fault at Bus 5

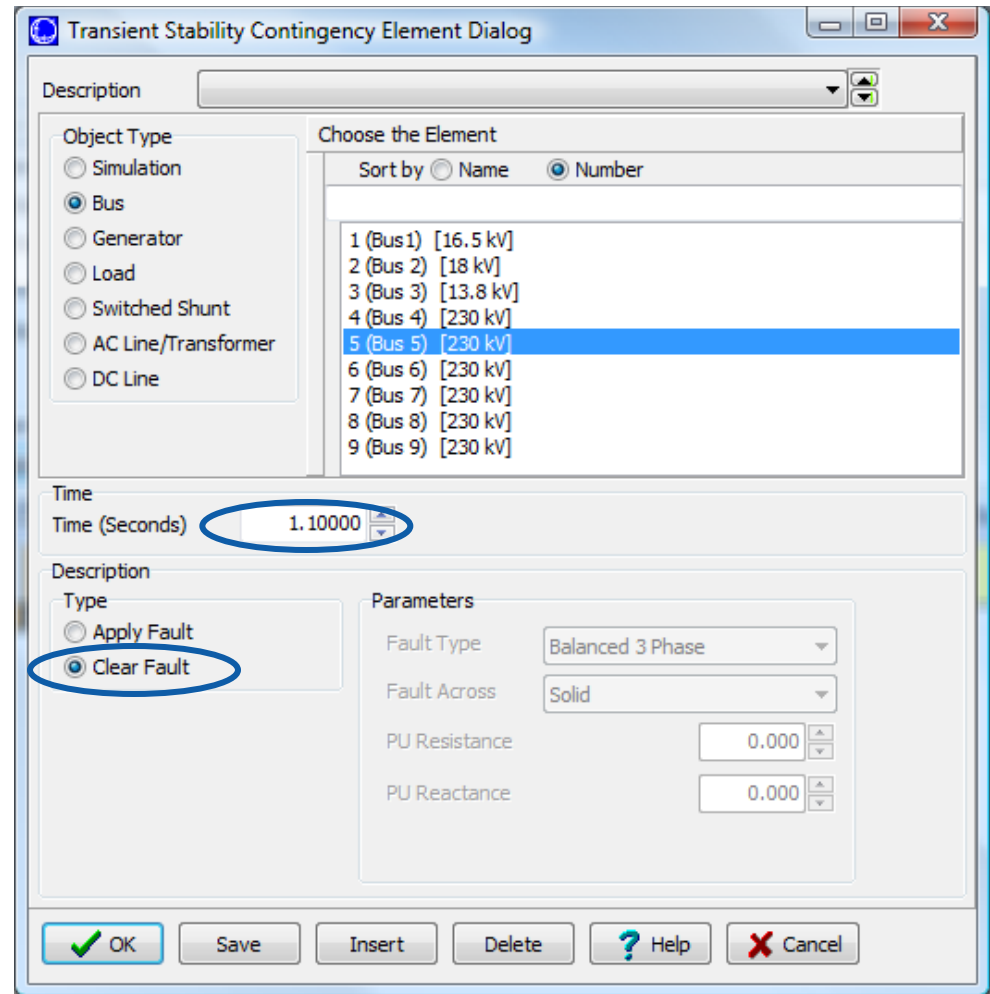
- Apply a balanced solid three-phase fault on Bus 5 at time = 1.00 seconds



Clear Fault at Bus 5

- Clear the Bus 5 fault at time = 1.10 seconds

Note: could have also used the **Insert Apply and Clear Fault** button



Transient Contingency Elements

Insert Elements

Clear All Elements

Insert Apply and Clear Fault

Transient Contingency Definition



The screenshot displays the 'Transient Stability Analysis' software interface. The main window shows simulation parameters and a table of contingency elements. A dialog box titled 'Transient Stability Contingency Element Dialog' is open, showing options for 'Apply Fault' and 'Clear Fault'. Red arrows point from the text 'Right click here And select "show dialog" To reopen this Dialog box' to the 'Bus Bus 5' entry in the table and the 'Clear Fault' radio button in the dialog box.

Object Pretty	Enabled	Time (Seconds)
1 Bus Bus 5	YES	1.0000
2 Bus Bus 5	YES	1.1000

Right click here
And select "show dialog"
To reopen this
Dialog box

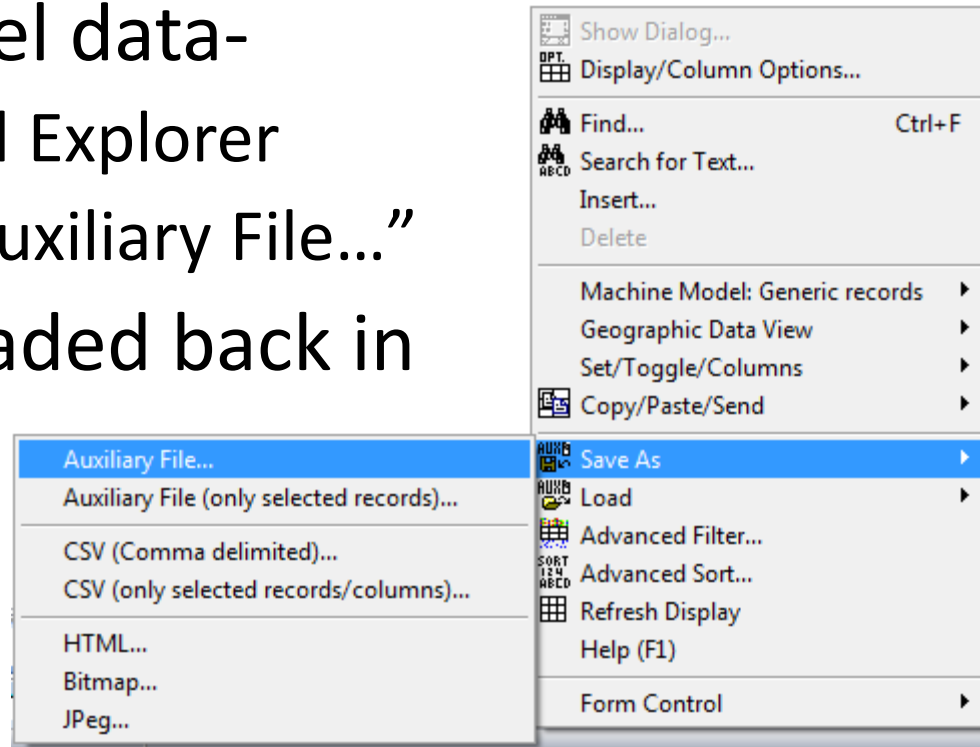
Summary of all elements in contingency and time of action

Available element type will vary with different objects

AUX files to Save/Load Model Data



- Any of the model data can be saved into AUX files
- Save machine model data-
 - Right click in Model Explorer
 - Select “Save As” “Auxiliary File...”
- This data can be loaded back in



Save Stability Settings



Simulation Status: Not Initialized

Run Transient Stability | Pause | Abort | For Contingency: My Transient Contingency

Select Step

- Simulation
- Options
- Result Storage
- Plots
- Results
- Transient Limit Monitors
- States/Manual Control
- Validation
- SMIB Eigenvalues

Simulation Time Values

Start Time (seconds): 0.000 | Specify Time Step in: Seconds Cycles

End Time (seconds): 10.000

Time Step (seconds): 0.020000

Transient Contingency Elements

Insert Elements | Clear All Elements | Insert Apply and Clear Fault

Object Pretty	Enabled	Time (Seconds)	
1 Bus Bus 5	YES	1.0000	Bus '5'
2 Bus Bus 5	YES	1.1000	Bus '5'

Process Contingencies

One Contingency at a time Multiple Contingencies

Save All Settings To | Load All Settings From | Show Transient Contour Toolbar

Save Auxiliary...
Save GE DYD...
Save PTI DYR...
Save BPA SWI...

Stability Settings

There are several settings which affect the Transient Stability calculations. Choose which settings you would like to save.

- Save Dynamic Models
- Save Transient Stability Options
- Save Transient Stability Events
- Save Results to Save
- Save Plot Definitions

Save Data Using

- Number (Primary Key)
- Name and Nominal kV (Secondary Key)
- Label (Use Primary if no label)

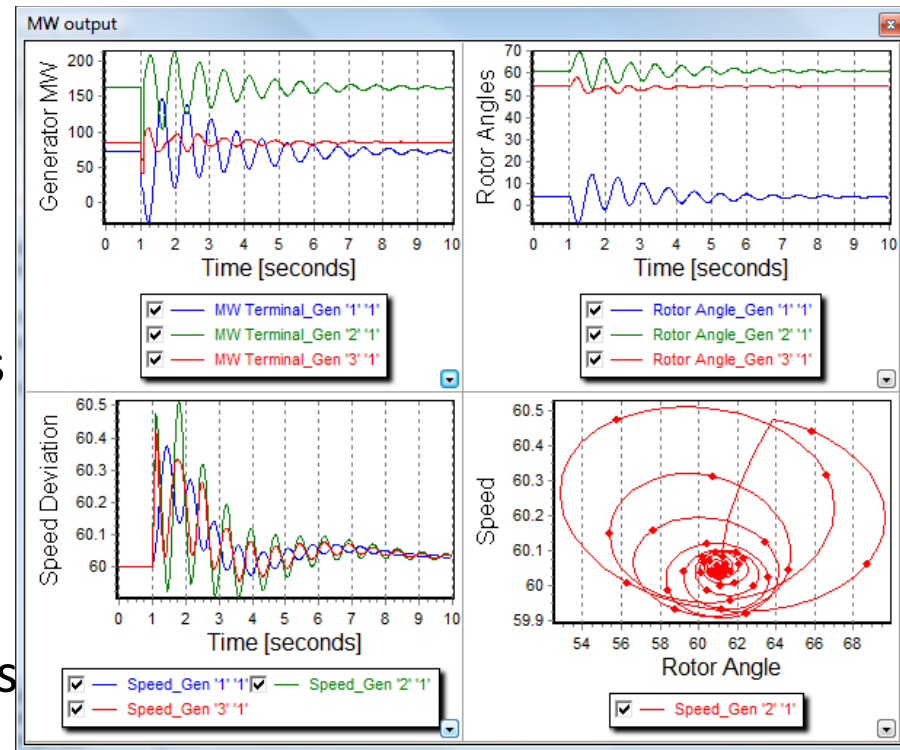
OK | Cancel

Can save transient stability settings from here

Load in Plot Settings



- The machine models and exciter models for this example can also be loaded in from **TS9ExciterModels.aux** and **TS9MachModels.aux**
- Save the case with the models and events as **TS9Bus Bus Fault NoPlot**
- Go to Stability Case Info, Load Transient Stability Data, Load Auxiliary
- Load in the AUX file **TS9Bus Bus FaultPLOTDEFN.aux** which contains some plot settings that we will talk about in detail in a later section
- Save the case as **TS9BusCtgEx**
- Click “Run Transient Stability” to simulate the models and the events that you inserted



Example: Changing Contingency Elements



- Suppose you want to change the events that are simulated for a particular contingency
- We will change the elements of this Transient Contingency from a bus fault at Bus 5 to a fault between Bus 4 and Bus 5 near bus 5
- There are several ways this can be done
 - On the Simulation page, clicking “Clear All Elements” will remove the existing elements; you can then add new ones
 - You can right-click on an existing element and open the Transient Contingency Element Dialog and change the events directly

Example: Changing Contingency Elements



Simulation Time Values

Start Time (seconds) 0.000 Specify Time Step in Seconds Cycles

End Time (seconds) 10.000

Time Step (seconds) 0.020000

Transient Contingency Elements

Object Pretty	Enabled	Time (Seconds)	Object	Description	Con
1 Bus Bus 5	YES	1.0000	Bus '5'	FAULT 3PB SOLID My Tra	
2 Bus Bus 5	YES	1.1000	Bus '5'	CLEARFAULT My Tra	

Transient Stability Contingency Element Dialog

Description 1.000: [Bus Bus 5] FAULT 3PB SOLID

Object Type Simulation Bus Generator Load Switched Shunt AC Line/Transformer DC Line

Choose the Element

Sort by Name Number

- 1 (Bus 1) [16.5 kV]
- 2 (Bus 2) [18 kV]
- 3 (Bus 3) [13.8 kV]
- 4 (Bus 4) [230 kV]
- 5 (Bus 5) [230 kV]
- 6 (Bus 6) [230 kV]
- 7 (Bus 7) [230 kV]
- 8 (Bus 8) [230 kV]

Time

Time (Seconds) 1.00000

Description

Type Apply Fault Clear Fault

Parameters

Fault Type Balanced 3 Phase

Fault Across Solid

PU Resistance 0.000

PU Reactance 0.000

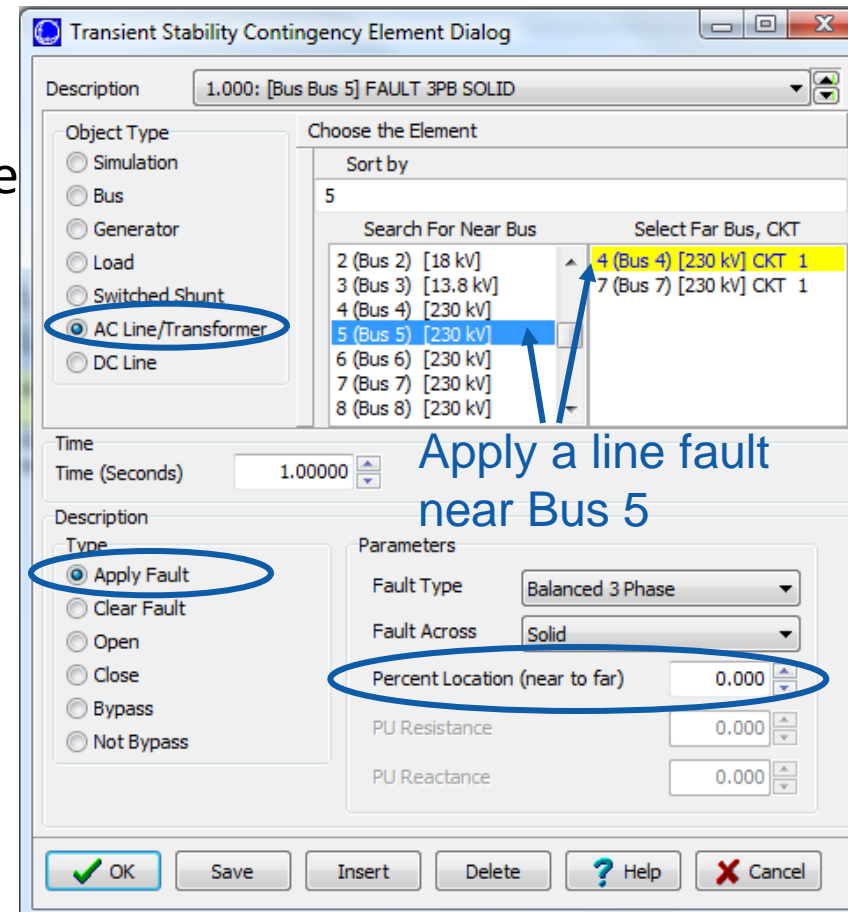
OK Save Insert Delete Help Cancel

- Right-click on the first Transient Contingency Element and open the Transient Stability Contingency Element dialog
- First, change “Object Type,” from Bus to AC Line/Transformer to view choices for that object type

Example: Changing Contingency Elements



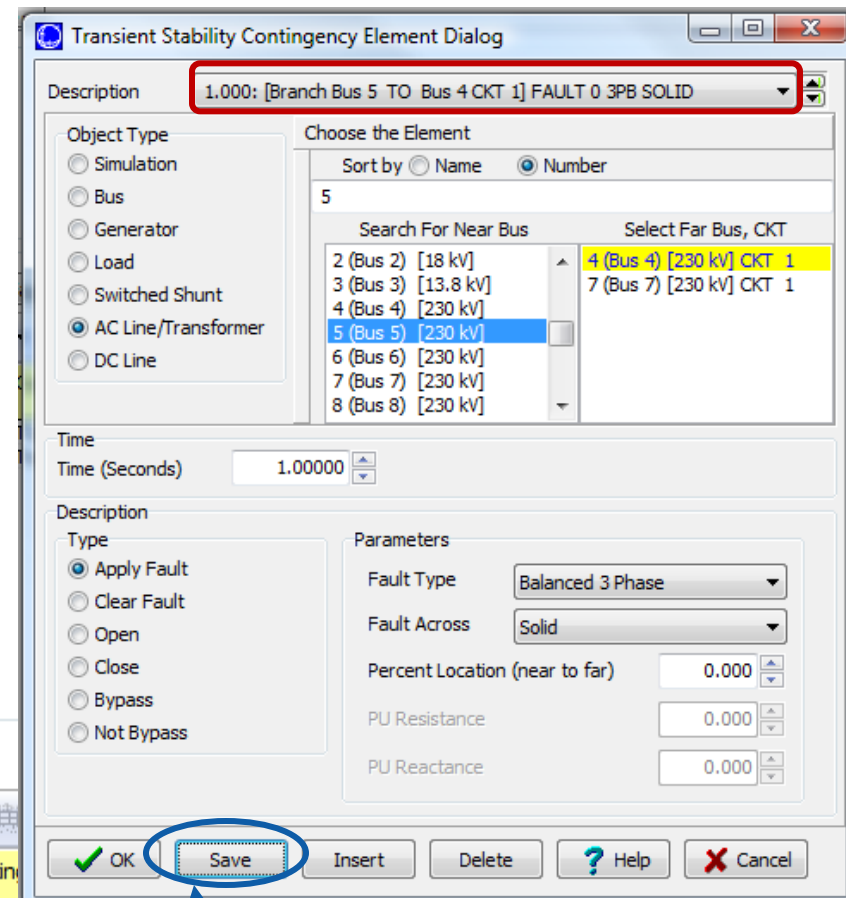
- “Choose the Element”
 - Make sure the Near Bus is selected to be 5 and Far Bus is selected to be 4
- “Time”
 - Time (Seconds) – set to 1.00
- “Description”
 - “Apply Fault” should be selected
- “Parameters”
 - Fault Type – set to Balanced 3 Phase
 - Fault Across – set to Solid
 - Percent Location (near to far) – set to 0.00



Example: Changing Contingency Elements



- After verifying these changes, click “Save”
- Once you click save, the Description at the top changes to reflect that this is now a branch fault
- Then, click OK to close the dialog
- Now the first Transient Contingency Element in the case information display has changed



Transient Contingency Elements

Insert Elements Clear All Elements Insert Apply and Clear Fault

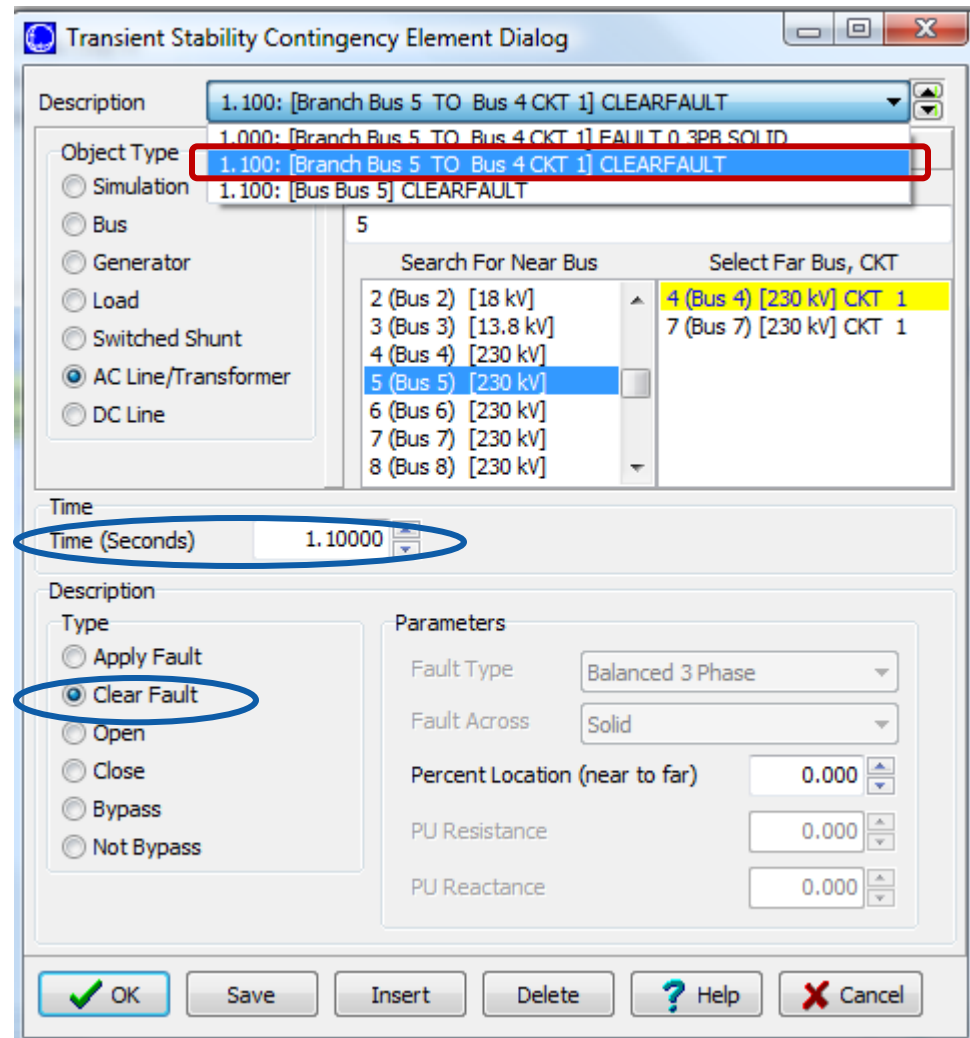
Object Pretty	Enabled	Time (Seconds)	Object	Description	Contingency
1 Branch Bus 5 TO Bus 4 CKT 1	YES	1.0000	Branch '5' '4' '1'	FAULT 0 3PB SOLID	My Transient Contingency
2 Bus Bus 5	YES	1.1000	Bus '5'	CLEARFAULT	My Transient Contingency

After clicking “Save,” the Description and Case Information Displays will update

Example: Changing Contingency Elements



- Right-click on the second Transient Contingency Element and open the Transient Stability Contingency Element dialog
- From the Description drop-down menu, select the description for the element that you just created
- Change the time to 1.1
- Change Apply Fault to Clear Fault
- All other parameters are unchanged
- Click Insert – a new contingency element with a new name has been created



Example: Changing Contingency Elements



- Click OK to close the dialog
- We still need to delete the third Transient Contingency Element which had been used previously for clearing the Bus 5 fault

Transient Contingency Elements

Insert Elements Clear All Elements Insert Apply and Clear Fault

	Object Pretty	Enabled	Time (Seconds)	Object	Description	Contingency Name
1	Branch Bus 5 TO Bus 4 CKT 1	YES	1.0000	Branch '5' '4' '1' FAULT 0 3PB SOLID		My Transient Contingency
2	Branch Bus 5 TO Bus 4 CKT 1	YES	1.1000	Branch '5' '4' '1' CLEARFAULT		My Transient Contingency
3	Bus Bus 5	YES	1.1000	Bus '5'		My Transient Contingency

Right-click and choose "Delete"

Confirm the decision to delete the record

Show Dialog...
 Display/Column Options...
 Find... Ctrl+F
 Search for Text...
 Insert...
 Insert Apply and Clear Fault...
 Delete
 Transient Contingency Element records >
 Set/Toggle/Columns >
 Copy/Paste/Send >
 Save As >
 Load >
 Advanced Filter...
 Advanced Sort...
 Define Expression... f(x)
 Refresh Display
 Help (F1)
 Form Control >

Confirm

Delete 1 TSContingencyElement records?

Yes No

Table showing the new Transient Contingency Elements

Transient Contingency Elements

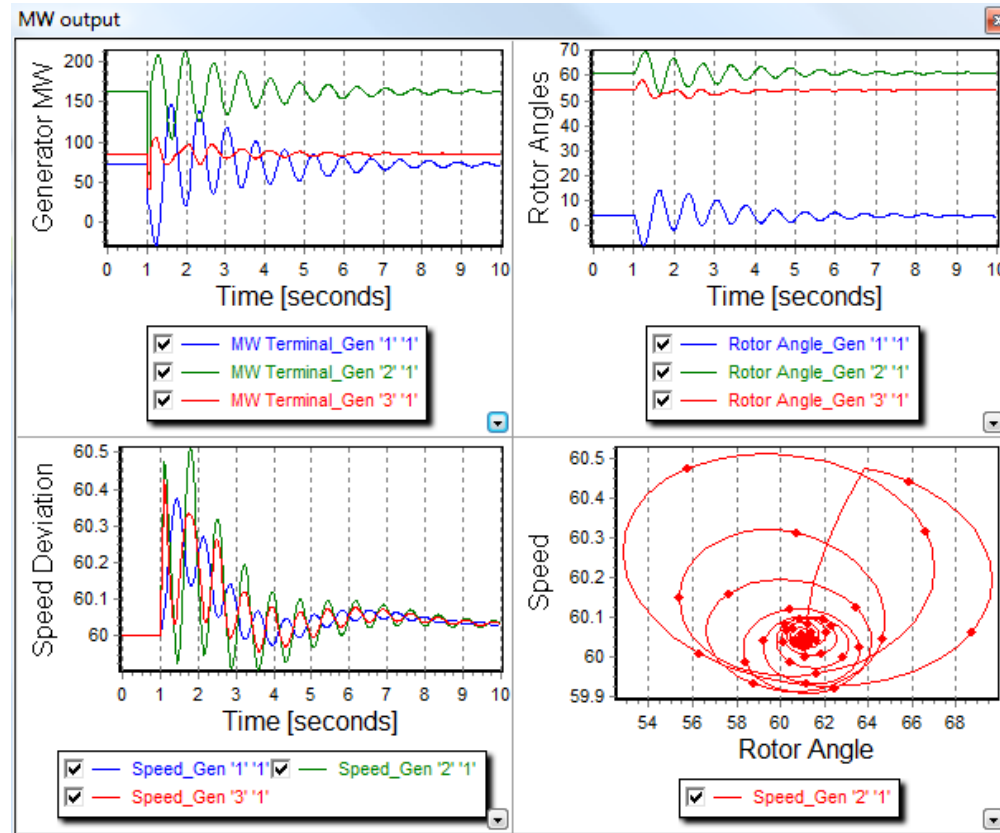
Insert Elements Clear All Elements Insert Apply and Clear Fault

	Object Pretty	Enabled	Time (Seconds)	Object	Description	Contingency Name
1	Branch Bus 5 TO Bus 4 CKT 1	YES	1.0000	Branch '5' '4' '1' FAULT 0 3PB SOLID		My Transient Contingency
2	Branch Bus 5 TO Bus 4 CKT 1	YES	1.1000	Branch '5' '4' '1' CLEARFAULT		My Transient Contingency

Example: Changing Contingency Elements



- The new events may also be loaded from **TS9ChangeCtg.aux**
- You have now changed what events will be simulated for this Transient Contingency
- Click “Run Transient Stability” to re-run the simulation to simulate a branch fault between Buses 4 and 5 fault located near Bus 5
- The plots should look the same as when you simulated this as a bus fault



Multiple Contingencies



- In most of the training, we just talk about simulating a single transient contingency event
- Simulator facilitates the definition of multiple transient contingency scenarios within the same case
- These Multiple Transient Contingencies may be defined and simulated, either individually or all together
- Changing the Process Contingencies option from “One Contingency at a time” to “Multiple Contingencies” will change the dialog in small ways throughout
- This will be discussed later

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