

Transient Stability Analysis with PowerWorld Simulator



T10: Transient Limit Monitors



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Traditional Transient Stability Analysis



- For decades, transient stability analysis has consisted of the following general steps
 - 1. Setup a stability run
 - 2. Save results to a file – a really large file
 - 3. Query the results through the use of plots and other post-processing to determine if any reliability criteria were violated.
 - PowerWorld Simulator supports this through Results Storage to RAM and to Storage to Hard Drive as well as the integrated plotting tools

Pros and Cons



- Pros
 - All the results are available in your results files to look at later
 - Plots reaffirm that the software (and you) are doing something
 - Plots are needed for displaying your results when violations occur
- Cons
 - Storing all these results can get a little large extreme
 - What if we run 1000 stability runs?
 - Terabit hard-drives
 - Reduce storage by only saving results every 10 time-steps
 - May miss something
 - Frequency dip for only 2 time steps may be missed.

Analogy to Contingency Analysis



- Keeping all these results is like storing every branch flow and every bus voltage for every contingency solution
- Is this really necessary?
- Alternative: run transient stability and only store violations (like contingency analysis)
 - Options: Generic Limit Monitors
 - Transient Limit Monitors

Generic Limit Monitors: Synchronous Generators



- Synchronous Generators Limit Monitors
 - **Absolute Angle Deviation**
 - Monitors change in rotor angle change relative to initial rotor angle
 - Crude attempt to monitor for out-of-step generators
 - **Over Frequency Action**
 - Monitors high bus frequency
 - **Under Frequency**
 - Monitors low bus frequency
 - Can specify that they not be applied to generators which already have relay models

Generic Limit Monitors



- Available under Options\Generic Limit Monitors

Options

Note: Changes made to option entries are saved immediately and will be applied during the next transient stability run.

General Power System Model Result Options Generic Limit Monitors

Synchronous Generator Limit Monitors

Only Apply to Generators Without Relays

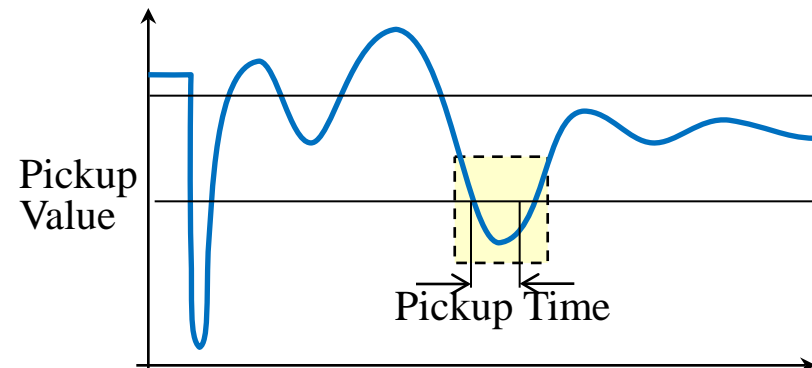
Monitor Type	Action to Take	Pickup Value	Pickup Time
Absolute Angle Deviation	Ignore	180.0 Deg	0.000 Seconds
Over Frequency	Trip	62.40 Hz	2.000 Seconds
Under Frequency	Trip	57.60 Hz	2.000 Seconds

Breaker Delay Time (Cycles) 0.0

Generic Limit Monitors: Action to Take



- **Pickup Value, Pickup Time**
 - For Under Frequency, value must fall below the pickup value and stay below the pickup value for a duration of Pickup Time
 - For Over Frequency and Absolute Angle Deviation are same except they must go above the pickup value.
 - This will cause the monitor to be violated and the **Action to Take** will be used



Generic Limit Monitors: Action to Take

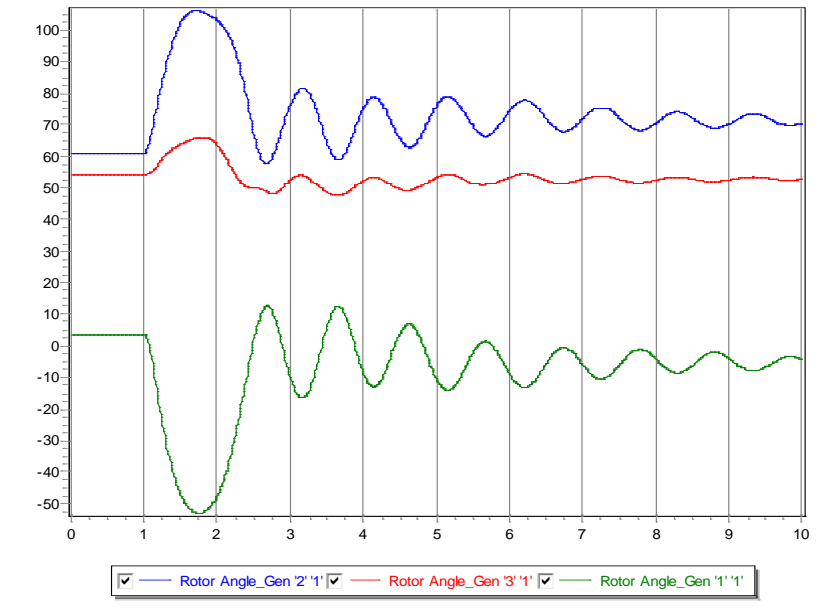
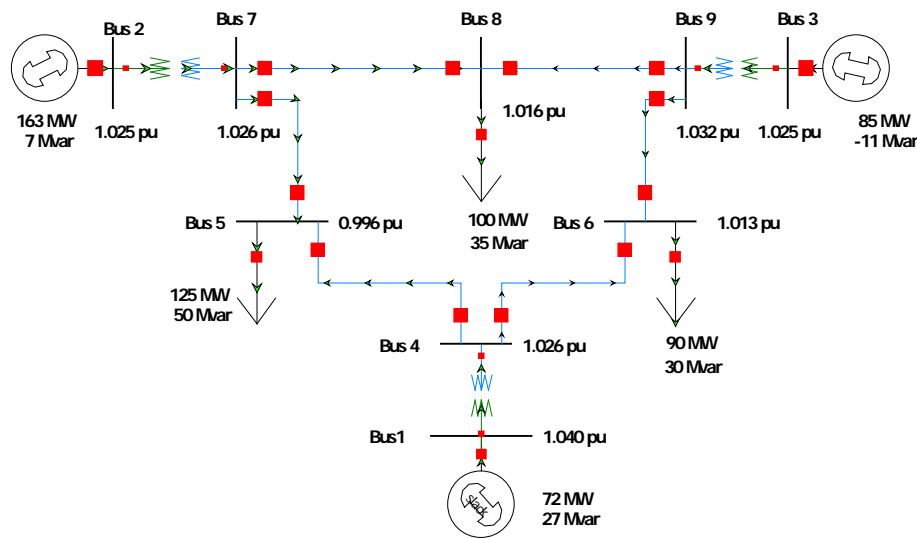


- **Action to Take**
 - *Ignore*
 - Don't do anything. Disable the Monitor.
 - Default for Absolute Angle Deviation monitor
 - Default for Over Frequency and Under Frequency monitors for systems smaller than 100 buses
 - *Log Warning*
 - Will create an Event in the Transient Stability Results indicating that a violation occurred and when it occurred
 - *Trip*
 - Will cause the generator to trip after a time delay specified by **Breaker Delay Time**
 - Default for Over Frequency and Under Frequency for system larger than or equal to 100 buses
 - *Abort*
 - Will immediately abort the simulation

Example: Generic Limit Monitors

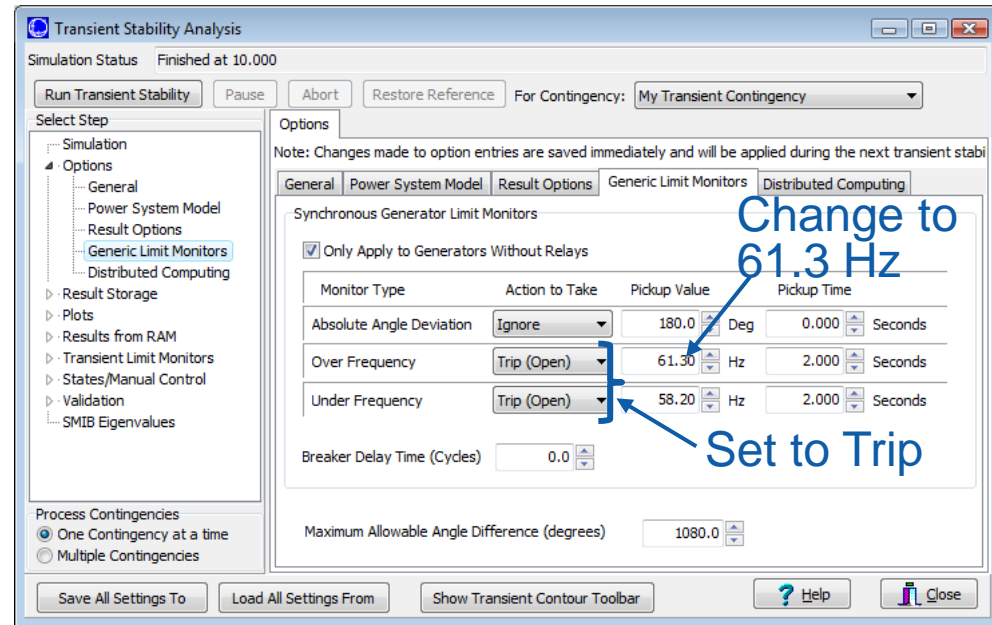
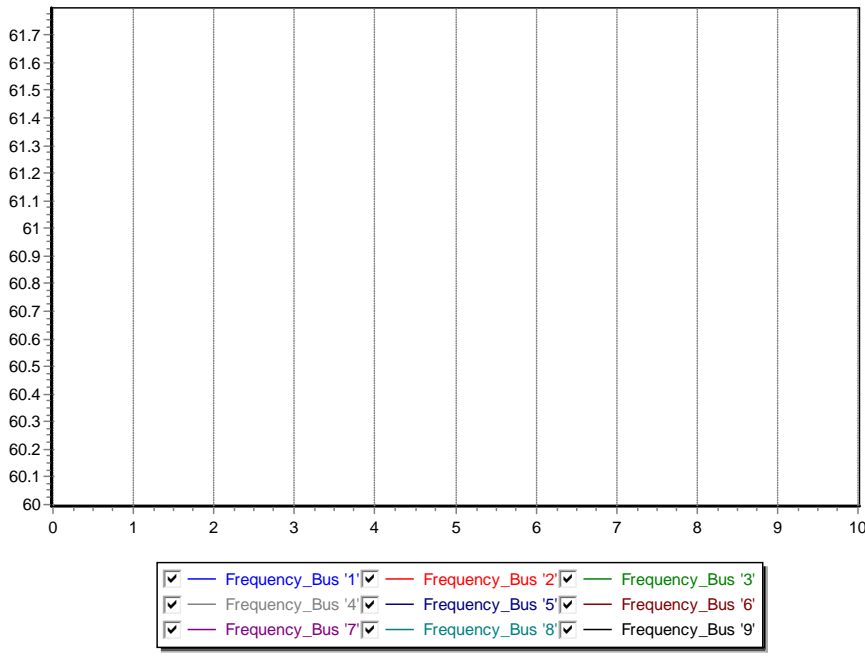


Open “WSCC_9Bus”



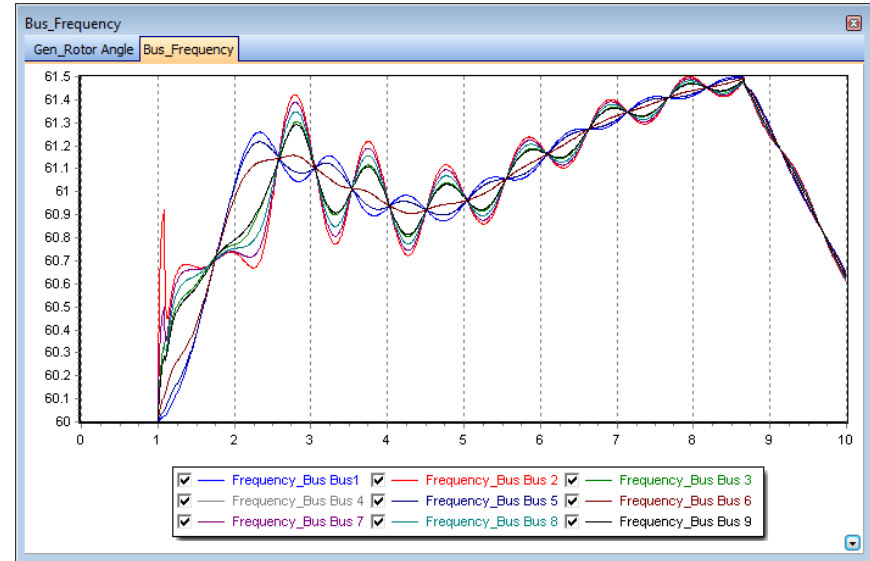
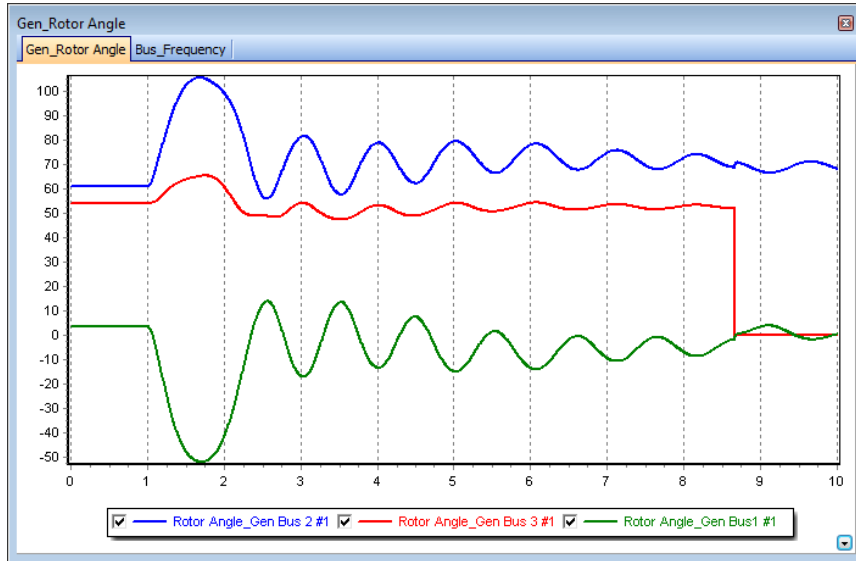
The left figure shows the initial power flow solution for the WSCC 9 bus case. The right figure shows the generator angles for a fault on the line between buses 5 and 7 near the bus 7 terminal, which is cleared after 0.077 seconds by opening the bus 5 to 7 line. Change the fault clearing time to verify that system loses stability for a clearing time between 0.079 and 0.08. **This fault and the associated plots are already set up in the case, starting with a clearing at 0.077 seconds.**

Example: Generic Limit Monitors



- Because this case has no governors and no infinite bus, the bus frequency keeps rising throughout the simulation, even though the rotor angles are stable.
- Go to the Generic Limit Monitors tab of the Options page. Set the generators to automatically trip as above.

Example: Generic Limit Monitors



Results from RAM

Contingency Name	Time (Seconds)	Object	Model Type	Description	Level
1 My Transient Contingency	1.0000	Branch '7 '5' '1' TXLine		Apply Solid Fault	Info
2 My Transient Contingency	1.8770	Branch '7 '5' '1' TXLine		Open	Info
3 My Transient Contingency	8.6583	Gen '3' '1'	TXGenericGen	GENROU Over Frequency: Open	Info

- Now, Generators 2 and 3 to trip out between 7 and 8 seconds (with a 0.077 seconds clearing).
- If all generators trip out (as will happen if this simulation keeps running), the simulation aborts as there are no longer any viable islands.

Example: Generic Limit Monitors



- Change the End Time of the simulation to 20 seconds and re-run the analysis
- Now all three generators will trip out
- The simulation aborts at 15.85 seconds
- View the **Events** tab on the **Results** page for details

The screenshot shows the 'Transient Stability Analysis' window. The simulation status is 'Aborted with error at 15.850'. The 'Results from RAM' tab is active, displaying a table of events. A red circle highlights the 'Events' tab and the table content.

	Contingency Name	Time (Seconds)	Object	Model Type	Description	Level
1	My Transient Contingency	1.0000	Branch '7 '5' '1'	TXLine	Apply Solid Fault	Info
2	My Transient Contingency	1.0770	Branch '7 '5' '1'	TXLine	Open	Info
3	My Transient Contingency	8.6583	Gen '3' '1'	TXGenericGen	GENROU Over Frequency: Open	Info
4	My Transient Contingency	15.8250	Gen '2' '1'	TXGenericGen	GENROU Under Frequency: Open	Info
5	My Transient Contingency	15.8417	Gen '1' '1'	TXGenericGen	GENROU Under Frequency: Open	Info
6	My Transient Contingency	15.8417	Bus '1'	Bus	Topology Processing Open	Info
7	My Transient Contingency	15.8417	Bus '2'	Bus	Topology Processing Open	Info
8	My Transient Contingency	15.8417	Bus '3'	Bus	Topology Processing Open	Info
9	My Transient Contingency	15.8417	Bus '4'	Bus	Topology Processing Open	Info
10	My Transient Contingency	15.8417	Bus '5'	Bus	Topology Processing Open	Info
11	My Transient Contingency	15.8417	Bus '6'	Bus	Topology Processing Open	Info
12	My Transient Contingency	15.8417	Bus '7'	Bus	Topology Processing Open	Info
13	My Transient Contingency	15.8417	Bus '8'	Bus	Topology Processing Open	Info
14	My Transient Contingency	15.8417	Bus '9'	Bus	Topology Processing Open	Info
15	My Transient Contingency	15.8417	Island	Island	Number of Viable Islands Changed from 1 to 0	Info
16	My Transient Contingency	15.8500			No Viable Islands -- Solution Aborted	Error

Transient Limit Monitors



- Transient Limit Monitors in Simulator provide a great deal of flexibility for automatic monitoring during the simulation without having to store much data
- Similar to Limit Monitoring in traditional power-flow-based contingency analysis, only violations of limits will be reported
- Monitor a particular field for all objects of a type to meet a specified transient performance requirement
 - You will choose a field of a type of object
 - Then build a description of what is considered a limit violation

On the
Transient Limit
Monitors page
of the
Transient
Stability
Analysis
dialog

Simulation Status: Not Initialized

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

Select Step

- Simulation
- Options
- Results to View
- Plots
- Results
- Transient Limit Monitors
 - Transient Limit Monitors
 - Monitor Violations
- States/Manual Control
- Validation
- SMIB Eigenvalues

Process Contingencies

- One Contingency at a time
- Multiple Contingencies

Save | Load

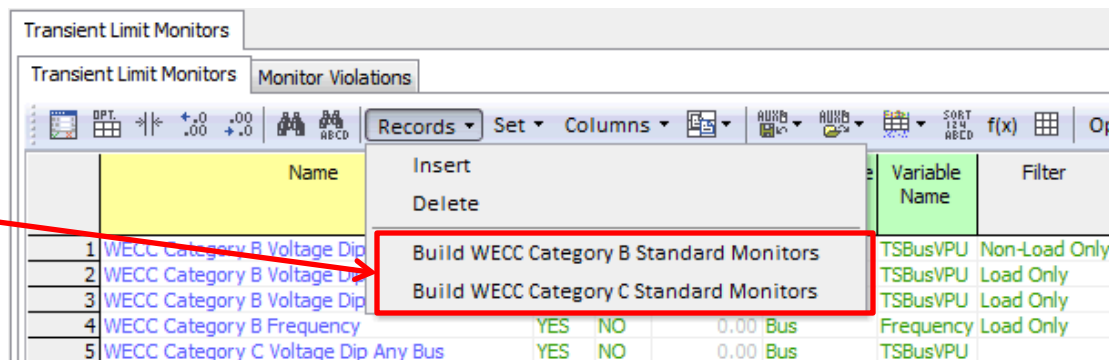
Close

	Name	Active	Abort	Abort Delay	Object Type	Variable Name	Filter	Limit Value	Limit Duration	Side	Type
1	WECC Category B Voltage Dip Non-Load Bus	YES	NO	0.00	Bus	TSBusVPU	Non-Load Only	-30.000	0.00000	Lower	Percent Deviation
2	WECC Category B Voltage Dip Load Bus	YES	NO	0.00	Bus	TSBusVPU	Load Only	-25.000	0.00000	Lower	Percent Deviation
3	WECC Category B Voltage Dip Load Bus Duration	YES	NO	0.00	Bus	TSBusVPU	Load Only	-20.000	0.33333	Lower	Percent Deviation
4	WECC Category B Frequency	YES	NO	0.00	Bus	Frequency	Load Only	59.600	0.10000	Lower	Actual
5	WECC Category C Voltage Dip Any Bus	YES	NO	0.00	Bus	TSBusVPU		-30.000	0.00000	Lower	Percent Deviation
6	WECC Category C Voltage Dip Any Bus Duration	YES	NO	0.00	Bus	TSBusVPU	Load Only	-20.000	0.66667	Lower	Percent Deviation
7	WECC Category C Frequency	YES	NO	0.00	Bus	Frequency	Load Only	59.000	0.10000	Lower	Actual

Built-In Transient Limit Monitors



- Under **Records** menu, choices are available to **Build WECC Category B Standard Monitors (also C)**



- WECC Category B Voltage Dip for Non-Load Buses
 - Monitor all non-load buses for any voltage dip of 30% below the initial voltage value at any time
- WECC Category B Voltage Dip for Load Bus
 - Monitor all load buses for a voltage dip of 25% below the initial voltage at any time
- WECC Category B Voltage Dip for Load Bus Duration
 - Monitor all load buses for a voltage dip of 20% below the initial voltage for a duration of 0.3333 seconds (20 cycles)
- WECC Category B Frequency
 - Monitor all load buses for a frequency dip below 59.6 Hz for a duration of 0.10 seconds (6 cycles)

Built-In

Transient Limit Monitors



- Differences as compared to Category B standards are highlighted in Red.
- WECC Category C Voltage Dip for Any Bus
 - Monitor all buses for any voltage dip of 30% below the initial voltage value at any time
- WECC Category C Voltage Dip for Any Bus Duration
 - Monitor all buses for a voltage dip of 20% below the initial voltage for a duration of 0.66667 seconds (40 cycles)
- WECC Category C Frequency
 - Monitor all load buses for a frequency dip below 59.0 Hz for a duration of 0.10 seconds (6 cycles)

Example: Transient Limit Monitors



- Open “GSO_37Bus”
- Open the Transient Stability Analysis dialog to the Transient Limit Monitors page
- In the current case, there are several Transient Limit Monitors which are all initially inactive
- Toggle all items in the Active column to YES

This case has Bus and Gen Object monitors

Transient Limit Monitors

Monitor Violations

Records Set Columns Options

	Name	Active	Abort	Abort Delay	Max Violations	Object Type	Variable Name	Filter	Limit Value	Limit Duration	Side	Type	HDR
1	WECC Category B Voltage Dip Non-Load Bus	YES	NO	0.00	100	Bus	TSBusVPU	Non-Load Only	-30.000	0.00000	Lower	Percent Deviation	NO
2	WECC Category B Voltage Dip Load Bus	YES	NO	0.00	100	Bus	TSBusVPU	Load Only	-25.000	0.00000	Lower	Percent Deviation	NO
3	WECC Category B Voltage Dip Load Bus Duration	YES	NO	0.00	100	Bus	TSBusVPU	Load Only	-20.000	0.33333	Lower	Percent Deviation	NO
4	WECC Category B Frequency	YES	NO	0.00	100	Bus	Frequency	Load Only	59.600	0.10000	Lower	Actual	NO
5	Generator Out-of-Step	YES	NO	0.00	100	Gen	TSGenDeltaNoshift		180.000	0.00000	Lower	Actual Deviation	YES

Toggle to YES to enable the Transient Limit Monitors

Field that the limit monitor applies to

Object filters in use

Transient Limit Monitors Dialog



- Right click on a Transient Limit Monitor and select “Show Dialog”
- Same options are available here as on the case information display
- **Meaning of values specified (Examples)**
 - For a system with 60 Hz nominal frequency, the following are equivalent
 - *Actual value, Limit Value = 59.6 Hz*
 - *Deviation from initial value, Limit Value = -0.4 Hz*
 - When monitoring voltage, the following are equivalent
 - *Percent of initial value, Limit Value = 70%*
 - *Percent deviation from initial value, Limit Value = -30%*

Transient Limit Monitoring Dialog



- When does transient limit monitoring start?
 - Normally transient limit monitoring does not start until AFTER the last user contingency event
 - Special options can be specified to start or stop limit monitoring as well
 - Click **Show Special Triggers to Start or Stop Transient Limit Monitoring**
 - Values specified in special triggers obey the **Meaning of values specified**

Transient Limit Monitoring Dialog

Name: WECC Category B Voltage Dip Non-Load Bus

Save Save As Rename Delete

Active

Objects and Field Monitored

Device Type: Bus

Field: V (pu)

Filter objects for monitoring

All

Meets Filter

Load Buses Only

Non Load Buses Only

Area/Zone Filters

Define Filter...

Action To Take

Log Violation Only

Abort Simulation

Trip (Open) Device

Use a time delay of: 0.00 Seconds

Maximum number of violations of this limit monitor to store: 100

Limit Value: -30.00 %

Limit Duration: 0.0000 Seconds

Limit Duration Units: Seconds Cycles

Limit Type: Lower Upper

Meaning of the values specified

Actual value

Percent of initial value

Deviation from initial value

Percent deviation from initial value

ABS: After using meaning, take absolute value

Hide Special Triggers to Start or Stop Transient Limit Monitoring

Special Triggers to Start or Stop Transient Limit Monitoring

	Use	Value
Stop monitoring if a value is above	<input type="checkbox"/>	0.00 %
Start monitoring if a value is above	<input type="checkbox"/>	0.00 %
Stop monitoring if a value is below	<input type="checkbox"/>	0.00 %
Start monitoring if a value is below	<input type="checkbox"/>	0.00 %

OK Help Cancel

Defining Transient Limit Monitors



- When creating a new Transient Limit Monitor, give it a name and check the “Active” checkbox to make it active
- Set a particular object type and a particular field or variable name to which the limit should apply
- Set the value and type of the limit (Actual, Deviation, Percent Actual, Percent Deviation)
- Optionally, set the simulation to stop when limits are violated
- Optionally, set when monitoring of the limit should start and stop
 - “Stop below,” “Start below,” “Stop above,” “Start above” values, plus YES/NO fields to enable each
 - This allows the monitoring of a limit to be used for customizable situations

Stop Below Use	Stop Below	Start Below Use	Start Below	Stop Above Use	Stop Above	Start Above Use	Start Above
NO	0.000	NO	0.000	NO	0.000	NO	0.000
NO	0.000	NO	0.000	NO	0.000	NO	0.000
NO	0.000	NO	0.000	NO	0.000	NO	0.000
NO	0.000	NO	0.000	NO	0.000	NO	0.000
NO	0.000	NO	0.000	NO	0.000	NO	0.000

Transient Limit Monitoring Dialog



Define what is monitored

Uncheck to ignore monitoring temporarily

Choose a particular Field and Device Type

Can abort the simulation or trip device a specified time after violation

Choose Filter for which devices to monitor
Filter decision is based on the power flow solution (initial steady state)

Maximum number of violations to store

Transient Limit Monitoring Dialog



Define what is considered a limit violation

Specify Limit Value and Duration

Is this an Upper or Lower Limit?

Specify how the Limit Value and special triggers are interpreted

Absolute Value

Transient Limit Monitoring Dialog

Name: WECC Category B Voltage Dip Non-Load Bus

Buttons: Save, Save As, Rename, Delete

Active

Objects and Field Monitored

Device Type: Bus

Field: V (pu)

Filter objects for monitoring

All

Meets Filter

Load Buses Only

Non Load Buses Only

Area/Zone Filters

Define Filter...

Action To Take

Log Violation Only

Abort Simulation

Trip (Open) Device

Use a time delay of: 0.00 Seconds

Maximum number of violations of this limit monitor to store: 100

Limit Value: -30.00 %

Limit Duration: 0.0000 Seconds

Limit Duration Units: Seconds, Cycles

Limit Type: Lower, Upper

Meaning of the values specified

Actual value

Percent of initial value

Deviation from initial value

Percent deviation from initial value

ABS: After using meaning, take absolute value

Show Special Triggers to Start or Stop Transient Limit Monitoring

Buttons: OK, Help, Cancel

Graph: Initial Value, Violation, Limit Value, Limit Duration

Transient Limit Monitors: Monitor Violations



- As a transient stability run is processed, any violations of the Transient Limit Monitors will be shown in the Monitor Violations table
 - Shows which Limit Monitor was violated
 - Shows contingency under which violation occurs
 - Shows violated device
- If violations are found, you can revisit the run and store appropriate results
- Option to “Make a New Plot” on the Records Menu and right-click menu, will automatically generate a new Plot Definition

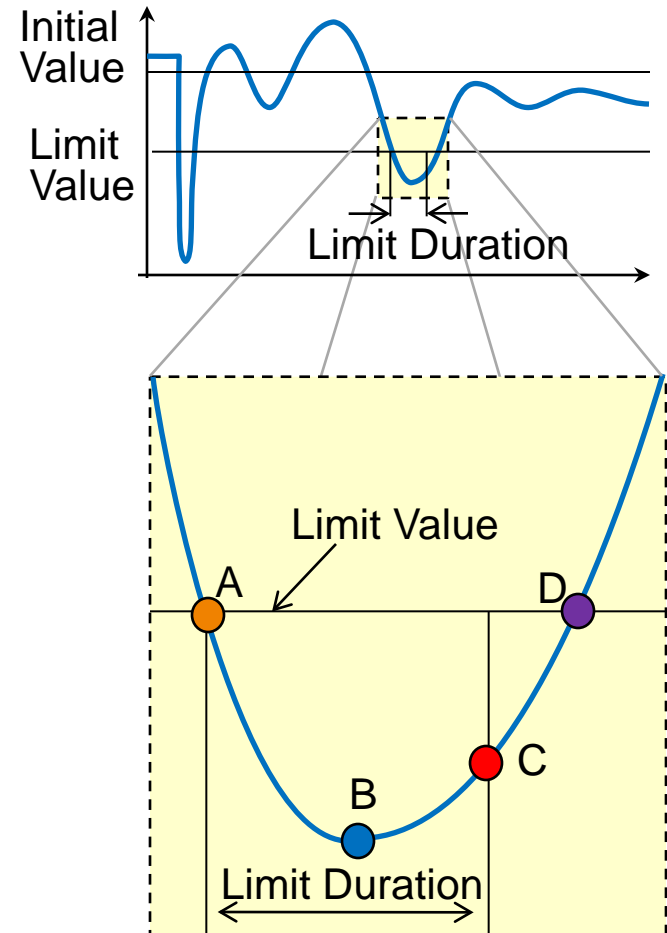
	Limit Monitor Name	Contingency Name	Violated Device	Limit Monitor Variable	Value	Time of Value	Value Start	Time of Value Start	Value Extreme	Time of Value Extreme
1	WECC Category B Frequency	My Transient Contingency 1	Bus '6'	Frequency	59.957	1.1600	59.623	1.1200	59.623	1.1200
2	WECC Category B Frequency	My Transient Contingency 1	Bus '8'	Frequency	59.968	3.5400	59.984	3.5000	59.954	3.6000
3	WECC Category B Frequency	My Transient Contingency 1	Bus '5'	Frequency	59.982	3.5800	59.988	3.5400	59.980	3.6000
4	WECC Category B Frequency	My Transient Contingency	Bus '5'	Frequency	59.985	1.1600	59.641	1.1200	59.641	1.1200
5	WECC Category B Frequency	My Transient Contingency	Bus '8'	Frequency	59.977	3.5800	59.989	3.5400	59.973	3.6000

When running multiple contingencies, you can see which one caused the violation

Transient Limit Monitors: Monitor Violations



- Values reported by Monitor Violations
 - Violation (Point C)
 - Value
 - Time of Value
 - Extreme (Point B)
 - Extreme Value
 - Time of Extreme Value
 - Note: could be after point C also
 - Start of Violation (Point A)
 - Value Start
 - Time of Value Start
 - Value no longer violating (Point D)
 - Value No Violation
 - Time of Value No Violation
 - Note: Point may not exist



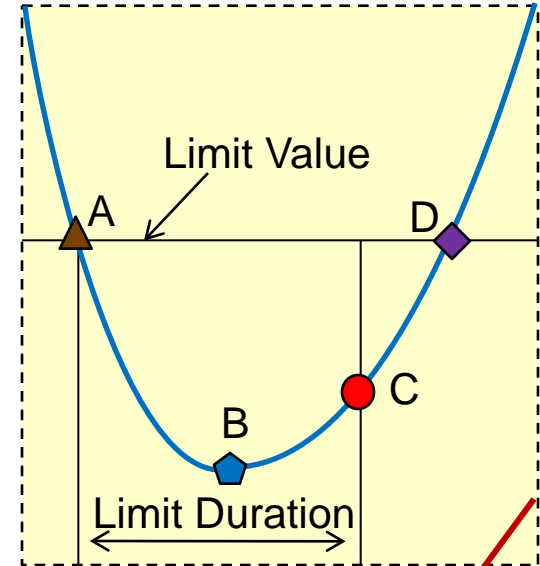
Monitor Violations: Example



- Run the simulation
- Open the Transient Limit Monitors page and view the violations
- The “Generator Out-of-Step” limit monitor has several violations

Monitor Violations Tab-
View the violations

For this example, points A and C are the same because the Limit Duration is 0



Transient Limit Monitors

Monitor Violations

	Limit Monitor Name	Contingency Name	Violated Device	Limit Monitor Variable	Actual Value	Time of Value	Actual Value Start	Time of Value Start	Actual Value Extreme	Time of Value Extreme	Actual Value No Longer	Time of No Longer
1	Generator Out-of-Step	My Transient Contingency	Gen '53' '1'	TSGenDeltaNoshift	-162.646545	3.341667	-162.646545	3.3417	-1981.796875	20.0000		
2	Generator Out-of-Step	My Transient Contingency	Gen '44' '1'	TSGenDeltaNoshift	-157.619003	3.350000	-157.619003	3.3500	-1974.850098	20.0000		
3	Generator Out-of-Step	My Transient Contingency	Gen '48' '1'	TSGenDeltaNoshift	-177.951309	3.350000	-177.951309	3.3500	-1995.511353	20.0000		
4	Generator Out-of-Step	My Transient Contingency	Gen '28' '1'	TSGenDeltaNoshift	-155.887604	3.358333	-155.887604	3.3583	-1972.189941	20.0000		
5	Generator Out-of-Step	My Transient Contingency	Gen '28' '2'	TSGenDeltaNoshift	-155.887604	3.358333	-155.887604	3.3583	-1972.189941	20.0000		
6	Generator Out-of-Step	My Transient Contingency	Gen '14' '1'	TSGenDeltaNoshift	-177.231720	3.366667	-177.231720	3.3667	-1992.630859	20.0000		
7	Generator Out-of-Step	My Transient Contingency	Gen '50' '1'	TSGenDeltaNoshift	-169.956482	3.366667	-169.956482	3.3667	-1985.413574	20.0000		
8	Generator Out-of-Step	My Transient Contingency	Gen '31' '1'	TSGenDeltaNoshift	-172.705673	3.383333	-172.705673	3.3833	-1988.474609	20.0000		

Monitor Violations: Example



- You can add Plot Definitions for variables which are violating the limit monitors
- Select all the violations, right click, choose “Make New Plot”

Create Plot Definitions for violating fields

Limit Monitor Name	Contingency Name	Violated Device	Limit Monitor Variable	Actual Value	Time of Value	Actual Value Start	Time of Value Start	Actual Value Extreme	Time of Value Extreme	Actual Value No Longer	Time of No Longer
1 Generator Out-of-Step	My Transient Contingency Case 'E2' '1'		TSGenDeltaNoshift	-162.646545	3.341667	-162.646545	3.3417	-1981.796875	20.0000		
2 Generator Out-of-Step			TSGenDeltaNoshift	-157.619003	3.350000	-157.619003	3.3500	-1974.850098	20.0000		
3 Generator Out-of-Step			TSGenDeltaNoshift	-177.951309	3.350000	-177.951309	3.3500	-1995.511353	20.0000		
4 Generator Out-of-Step			TSGenDeltaNoshift	-155.887604	3.358333	-155.887604	3.3583	-1972.189941	20.0000		
5 Generator Out-of-Step			TSGenDeltaNoshift	-155.887604	3.358333	-155.887604	3.3583	-1972.189941	20.0000		
6 Generator Out-of-Step			TSGenDeltaNoshift	-177.231720	3.366667	-177.231720	3.3667	-1992.630859	20.0000		
7 Generator Out-of-Step			TSGenDeltaNoshift	-169.956482	3.366667	-169.956482	3.3667	-1985.413574	20.0000		
8 Generator Out-of-Step			TSGenDeltaNoshift	-172.705673	3.383333	-172.705673	3.3833	-1988.474609	20.0000		

Monitor Violations: Example



Plots Designer | Plot Definition Grids

Device Type: Generator

Choose Fields:

- Field Current
- Field Voltage (pu)
- Mech Input
- Mvar Terminal
- MW Terminal
- Rotor Angle
- Rotor Angle, No Shift
- Speed
- Stabilizer Vs
- Term. PU
- VOEL
- VUEL

Choose Objects:

Sort by: Name Number

14 (WEBER69) #1 [69 kV]
 28 (JO345) #1 [345 kV]
 28 (JO345) #2 [345 kV]
 31 (SLACK345) #1 [345 kV]
 44 (LAUF69) #1 [69 kV]
 48 (BOB69) #1 [69 kV]
 50 (ROGER69) #1 [69 kV]
 53 (BLT138) #1 [138 kV]
 54 (BLT69) #1 [69 kV]

(1) Select the Device Type
 (2) Select a set of fields and a set of objects
 (3) Click the Add >> button

Generate Selected Plots
 Show Selected Plot Data in Case Info

Plots, Subplots, Axis Groups

- Gen_Speed_All
 - Speed _Gen '14' '1'
 - Speed _Gen '28' '1'
 - Speed _Gen '28' '2'
 - Speed _Gen '31' '1'
 - Speed _Gen '44' '1'
 - Speed _Gen '48' '1'
 - Speed _Gen '50' '1'
 - Speed _Gen '53' '1'
 - Speed _Gen '54' '1'
- Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
 - Rotor Angle, No Shift _Gen
- Add new plots here
- Add objects/field combinatic

Plot | Chart | Horizontal Axis | Vertical Axis | Plot Series List

Note: The vertical axis contains the list of plot series below

Axis Group Number: 1

	Object	Variable	Style	Visible	Color	Thickness	Dashed	Stairs	Symbol Every	Symbol	W
1	Gen '14' '1'	TSGenDeltaLine	Line	YES	Blue	1	Solid	No	0	Diamond	
2	Gen '28' '1'	TSGenDeltaLine	Line	YES	Red	1	Solid	No	0	Diamond	
3	Gen '28' '2'	TSGenDeltaLine	Line	YES	Green	1	Solid	No	0	Diamond	
4	Gen '31' '1'	TSGenDeltaLine	Line	YES	Grey	1	Solid	No	0	Diamond	
5	Gen '44' '1'	TSGenDeltaLine	Line	YES	Dark Blue	1	Solid	No	0	Diamond	
6	Gen '48' '1'	TSGenDeltaLine	Line	YES	Dark Red	1	Solid	No	0	Diamond	
7	Gen '50' '1'	TSGenDeltaLine	Line	YES	Purple	1	Solid	No	0	Diamond	
8	Gen '53' '1'	TSGenDeltaLine	Line	YES	Teal	1	Solid	No	0	Diamond	
9	Gen '54' '1'	TSGenDeltaLine	Line	YES	Black	1	Solid	No	0	Diamond	

New Plot Definitions created from Monitor Violations

Add Plot | Delete Plot
 Collapse All | Expand All
 Save Plot Definitions to Auxiliary File | Load Auxiliary File

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