Southeastern Regional TRANSMISSION PLANNING

1

2014 SERTP

Welcome

SERTP 2014 – 1st Quarter Meeting

"First RPSG Meeting & Interactive Training Session"



The SERTP process is a transmission planning process.

Please contact the respective transmission provider for questions related to real-time operations or OATT transmission service.

Purposes & Goals of the Meeting

- 2014 SERTP Process Overview
- Form the "RPSG"
 - Regional Planning Stakeholders Group
 - Committee Structure & Requirements

Economic Planning Studies

- Review Previous Study Selections
- Review Requested Sensitivities for 2014
- RPSG to Select the Five Economic Planning Studies
- Interactive Training Session
 - Expansion Plan Development & PSS/E Basics
- Next Meeting's Activities

Southeastern Regional TRANSMISSION PLANNING

2014 SERTP

2014 SERTP Process Overview

2014 SERTP Process Overview

- Ist Quarter Meeting "First RPSG Meeting & Interactive Training Session"
 - Form RPSG
 - Select Five Economic Planning Studies
 - Interactive Training Session

2nd Quarter Meeting – "Preliminary Expansion Plan Meeting"

- Overview of Order No.1000 Implementation & SERTP Expansion
- Review Modeling Assumptions
- Discuss Preliminary 10 Year Expansion Plan
- Stakeholder Input & Feedback Regarding the Plan

2014 SERTP Process Overview

- ✤ 3rd Quarter Meeting "Second RPSG Meeting"
 - Discuss the Preliminary Results of the Five Economic Studies
 - Stakeholder Input & Feedback Regarding the Study Results
 - Discuss Previous Stakeholder Input on the Expansion Plan
- 4th Quarter Meeting "Annual Transmission Planning Summit & Assumptions Input Meeting"
 - Discuss Final Results of the Five Economic Studies
 - Discuss the Regional Transmission Plan
 - Obtain Stakeholder Input on the Transmission Model Assumptions Used in Developing Next Year's Plan

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The SERTP Stakeholder Group

RPSG – Regional Planning Stakeholder Group

Serves Two Primary Purposes

- 1) The RPSG is charged with determining and proposing up to five (5) Economic Planning Studies on an annual basis
- The RPSG serves as stakeholder representatives for the eight (8) industry sectors in interactions with the SERTP Sponsors

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RPSG Committee Structure

RPSG Sector Representation

- 1) Transmission Owners / Operators
- 2) Transmission Service Customers
- 3) Cooperative Utilities
- 4) Municipal Utilities
- 5) Power Marketers
- 6) Generation Owner / Developers
- 7) Independent System Operators (ISOs) / Regional Transmission Operators (RTOs)
- 8) Demand Side Management / Demand Side Response

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RPSG Committee Structure

- Sector Representation Requirements
 - Maximum of two (2) representatives per sector
 - Maximum of 16 total sector members
 - A single company, and all of its affiliates, subsidiaries, and parent company, is limited to participating in a single sector

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RPSG Committee Structure

Annual Reformulation

- Reformed annually at each 1st Quarter Meeting
- Sector members will be elected for a term of approximately one year
- Term ends at the start of the following year's 1st Quarter SERTP Meeting
- Sector Members shall be elected by the Stakeholders present at the 1st Quarter Meeting
- Sector Members may serve consecutive, one-year terms if elected
- There is no limit on the number of terms that a Sector Member may serve

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RPSG Committee Structure

- Simple Majority Voting
 - RPSG decision-making that will be recognized by the Transmission Provider for purposes of Attachment K shall be those authorized by a simple majority vote by then-current Sector Members
 - Voting by written proxy is allowed

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RPSG Formation

✤ 2013 Sector Representatives

✤ 2014 Sector Representatives

Economic Studies

Attachment K:

The operative theory for the Economic Planning Studies is for them to identify meaningful information regarding the requirements for moving large amounts of power beyond that currently feasible, whether such transfers are internal to the Region or from this Region to interconnected regions.

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Economic Studies

- Study Process:
 - SERTP Sponsors identify the transmission requirements needed to move large amounts of power above and beyond existing long-term, firm transmission service commitments
 - Analysis is consistent with NERC standards and companyspecific planning criteria
 - Models used to perform the analysis incorporate the load forecasts and resource decisions as provided by LSEs
 - Power flow models are made available to stakeholders to perform additional screens or analysis
 - Scoping Meeting typically held in April/May



2014 Economic Planning Study Requests

- Previous Economic Planning Studies
- Current Economic Planning Study Requests
- Vote on Economic Planning Studies

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Interactive Training Session

Interactive Training Session

- Explain and discuss the underlying methodology and criteria that will be utilized to develop the transmission expansion plan
- Planning Criteria:
 - On the SERTP Website

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Interactive Training Session

Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria

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Project Identification

Interactive Training Session

- Expansion Plan Development
 - Expansion Plan Timeline
 - Power Flow Analyses
 - Planning Criteria

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Project Identification



Transmission Expansion Plan

Expansion Plan Timeline

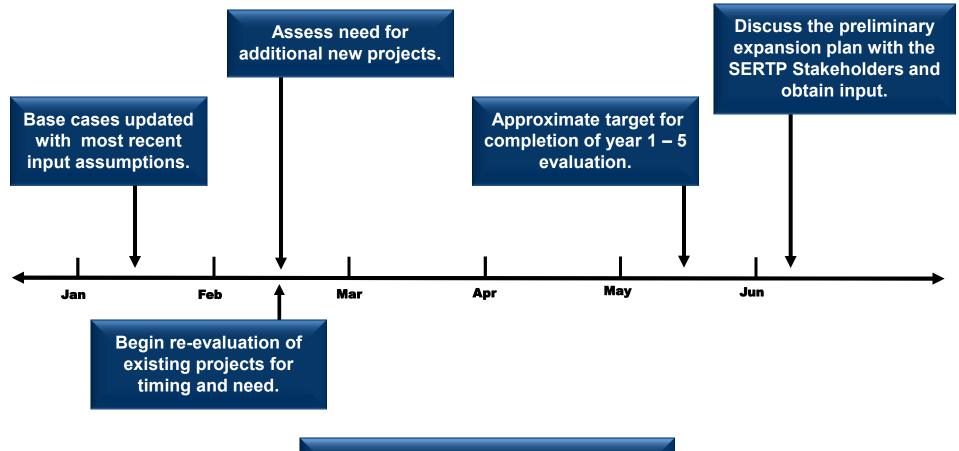
- First Five Year Focus
- Second Five Year Focus

Approximate Planning Time Line (Years 1 – 5)

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Coordination among SERTP Sponsors and neighboring utilities

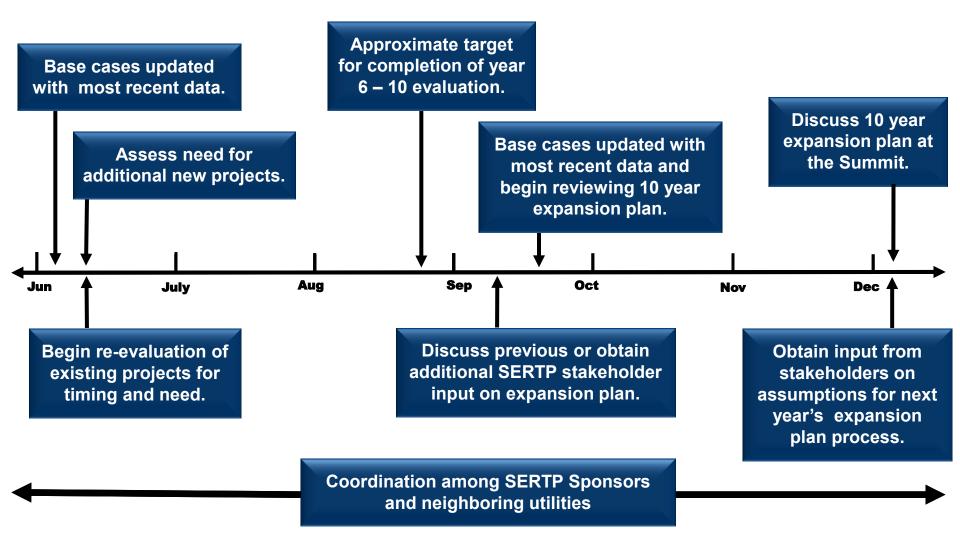
First Five Year Focus

- Focus is on near-term reliability constraints
- Utilize the most recent base case assumptions
- Re-evaluate existing projects for timing and need
- Assess the need for additional projects
- Coordinate with SERTP Sponsors and neighboring utilities
- Input from SERTP Stakeholders
 - Preliminary plan discussed, along with years 6-10 (projected), at the "Preliminary Expansion Plan Meeting" in the 2nd Quarter

Approximate Planning Time Line (Years 6 – 10)

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Second Five Year Focus

- Focus is on outer-year reliability constraints
- Update the base cases
- Re-evaluate existing projects for timing and need
- Assess the need for additional projects
- Coordinate with SERTP Sponsors and neighboring utilities
- Input from SERTP Stakeholders
- Year-end review of 10 year expansion plan
- Update the base cases for next year's evaluation



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Original Project Year from 2012 Expansion Plan:

2016

<u>Constraint:</u>

Douglasville - Post Road 115kV T.L.

Contingency:

The loss of the Post Road end of the Douglasville - Post Road 115 kV line overloads the Douglasville end.

Enhancement:

Replace 6.0 miles of 336 and 397 ACSR 115kV line with 1033 ACSR in 2016.

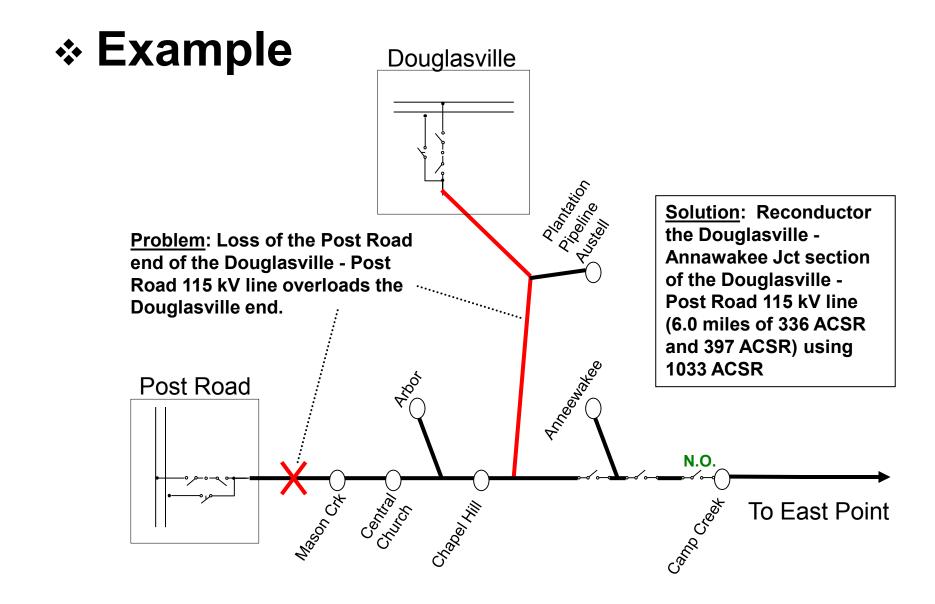
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* Example

- With the 2013 assumptions, which included a downward trend in loading, the thermal constraint was no longer present in 2016.
- The 2013 expansion plan process determined that the line exceeded its thermal rating for the same contingency in 2017.
- Currently, re-evaluating need for project in 2017.

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Interactive Training Session

Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria

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Project Identification

Transmission Expansion Plan

Power Flow Solutions

- Performed using PSS\E and MUST
- Non-linear, iterative solutions for bus voltages and branch currents

Power Flow Analyses

- Base Case Analysis
 - All modeled transmission facilities in-service
- Contingency Analysis
 - Modeled elements out of service
 - » Generator
 - » Transmission Circuit
 - » Transformer

Interactive Training Session

Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria

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Project Identification



Transmission Expansion Plan * Planning Criteria

• Similar for all SERTP Sponsors » Meet NERC TPL Standards

Transmission Expansion Plan

Voltage

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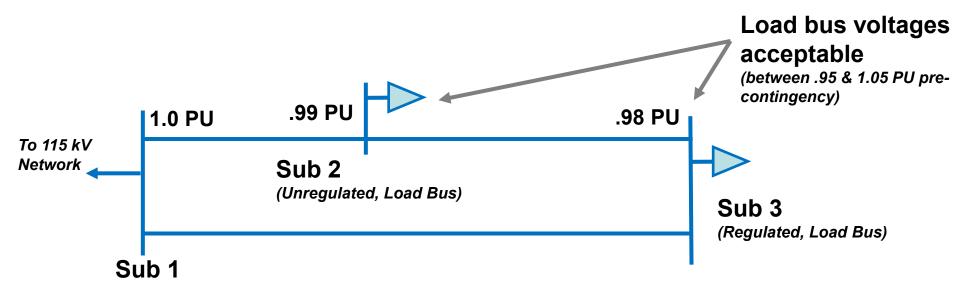
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 <u>Generating Plants</u>: Terminal voltage on high side of GSU should not exceed the maximum or minimum allowable voltage limits for all facilities in service and during planning contingency conditions.



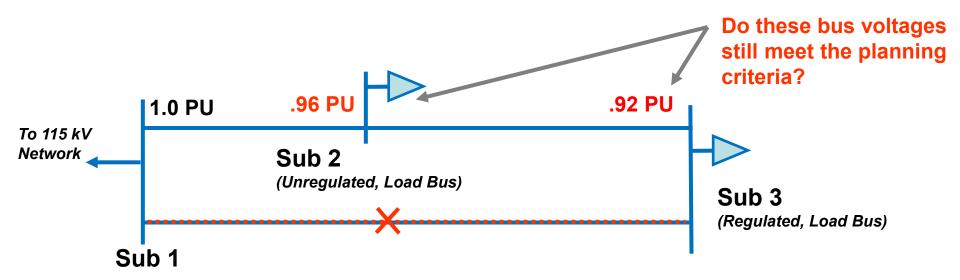
- * Voltage
 - Load Buses:
 - No contingency:
 - » < 500 kV: 95% to 105% of nominal voltage
 - » 500 kV: 98% to 107.5% of nominal voltage



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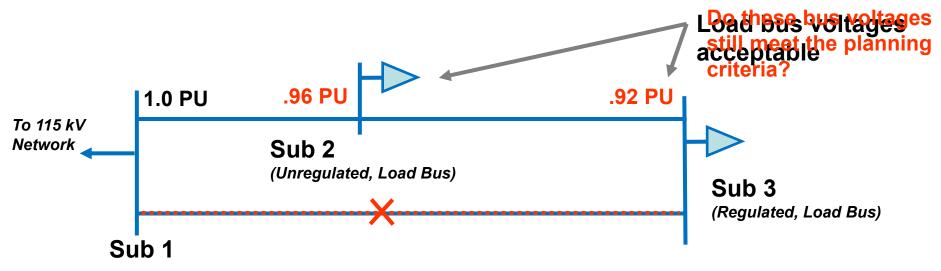


- Load Buses:
 - With contingency:
 - » +/- 5% deviation for non-regulated buses
 - » +/- 8% deviation for regulated buses
 - » Voltage should not drop below 97% for 500 kV buses and below 90% for buses less than 500 kV



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- * Voltage
 - Load Buses:
 - Sub 2: PASS
 - » Deviation = 99% 96% = 3% (<5% for <u>unregulated</u> buses)
 - » Bus Voltage = 96% (> 90% for post-contingency)
 - Sub 3: PASS
 - » Deviation = 98% 92% = 6% (<8% for <u>regulated</u> buses)
 - » Bus Voltage = 92% (> 90% for post-contingency)

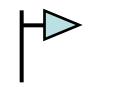


Transmission Expansion Plan

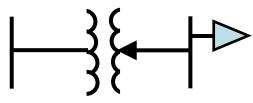
Voltage

- Load Buses:
 - Why can regulated buses deviate more than unregulated buses?
 - Transmission model generally captures distribution load, not bus regulators or transformer load tap changers (LTCs).

Transmission Model



Explicit Representation



Transmission Expansion Plan

Thermal Loading

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- Transmission Lines: Line loadings should not exceed design specifications
- <u>Transformers</u>: Transformer loading should not exceed nameplate rating for normal conditions. Transformer loading should not exceed calculated capability rating for contingency conditions

Transmission Expansion Plan

Planning Contingencies

- Summer Peak
 - Loss of one transmission element and one critical generating unit
- Shoulder Conditions
 - 93% of summer peak load
 - Hydro generation off-line
 - Loss of one transmission element and one critical generating unit

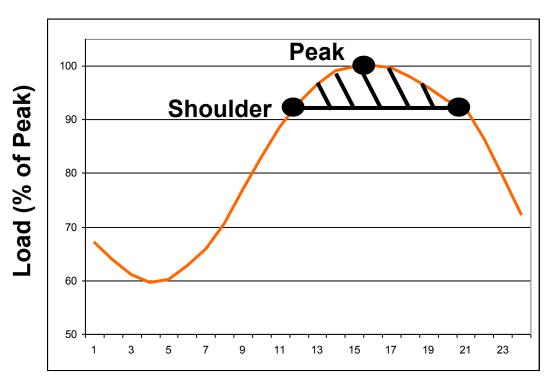
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Transmission Expansion Plan

Daily Load Curve – Summer

- Summer Load Levels Evaluated
 - Peak
 - Shoulder



Time (Daily Hour)

Interactive Training Session

Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria

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Project Identification

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Transmission Expansion Plan

* Simple Example

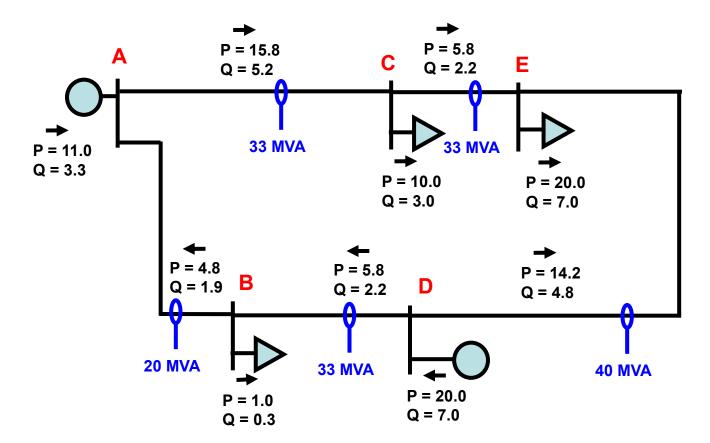
- Neglects transmission losses
- N 1 evaluation only (no unit offline scenarios)
- Voltage impacts not assessed

Transmission Expansion Plan

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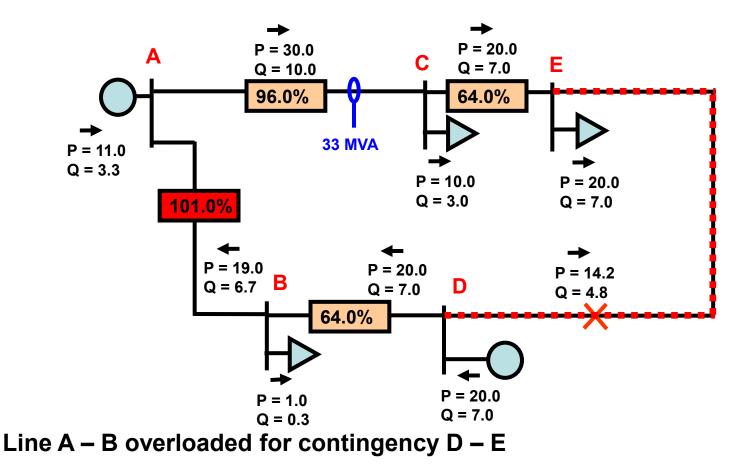


No transmission lines overloaded without contingencies

Transmission Expansion Plan

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Transmission Expansion Plan

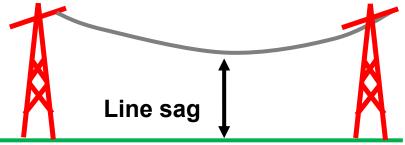
Example Solutions for A – B

- "Upgrade"
 - Increase the conductor operating temperature of A B
- "Reconductor"
 - Replace the existing A B conductor with a higher-rated conductor
- "New Transmission Line"
 - Construct a new transmission line that alleviates the loading on A – B

Transmission Expansion Plan

Transmission Line Upgrade

- Increasing maximum conductor operating temperature
- The more current, the higher the operating temperature
 - Higher <u>maximum</u> temperature = higher line ampacity
 - <u>Maximum temperature</u> based on transmission line sag, ambient conditions, and conductor specifications
- ACSS versus ACSR
 - ACSS aluminum is fully annealed & intended for higher temperatures (>100 °C)



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Transmission Expansion Plan

* <u>Reconductor</u>

- Replacing the existing conductor with a higher rated conductor type
- Differences in conductors
 - Ampacity
 - Weight / Thickness
 - Sag
 - Span Lengths
- Therefore, structure replacement may be necessary

Transmission Expansion Plan

* <u>New Transmission Line</u>

- Potential Applications
 - Multiple overloads in an area
 - Voltage support
 - Overload of a long transmission line
 - Stability Needs

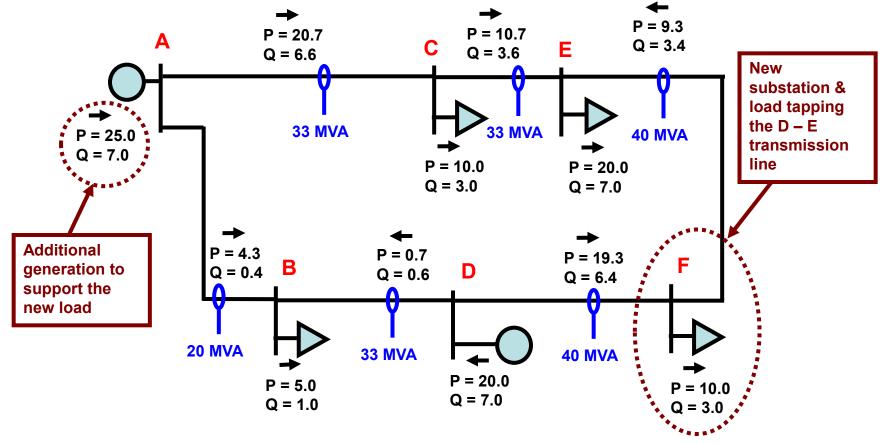
Transmission Expansion Plan

- In previous example, assume Line "D E" is tapped with a new load
 - Real Power = 10.0 MW

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- Reactive Power = 3.0 MVAR
- Generation at Bus A is designated by the LSE for an additional 10 MW to serve the new load

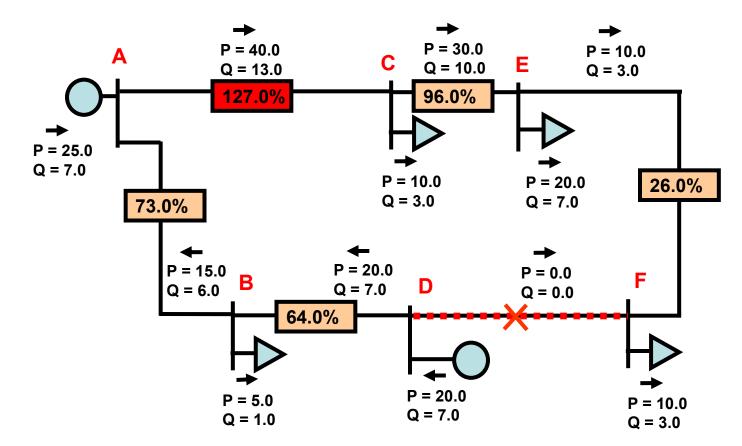
Transmission Expansion Plan



No transmission lines overloaded without contingencies

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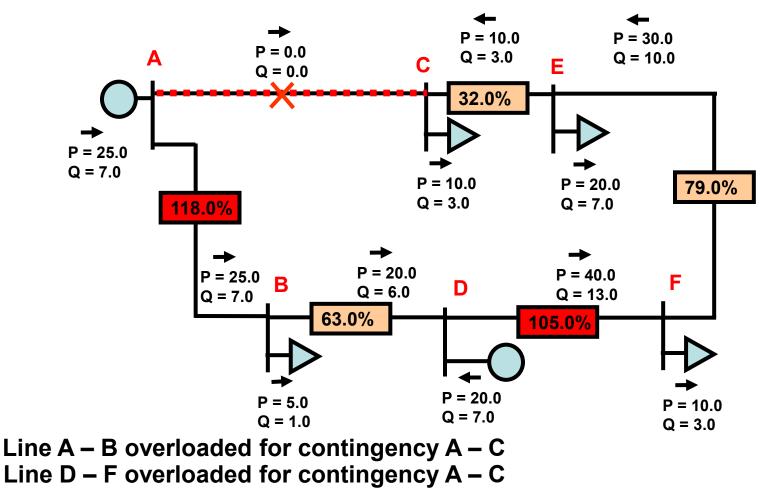
Transmission Expansion Plan



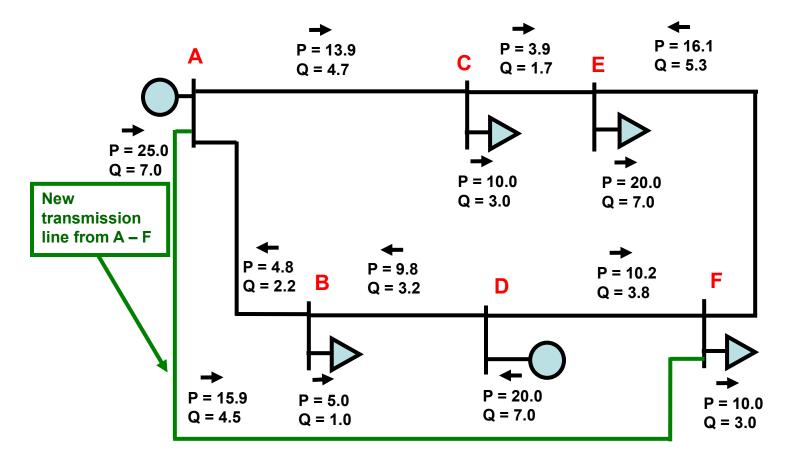
Line A – C overloaded for contingency D – F

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Transmission Expansion Plan



Transmission Expansion Plan



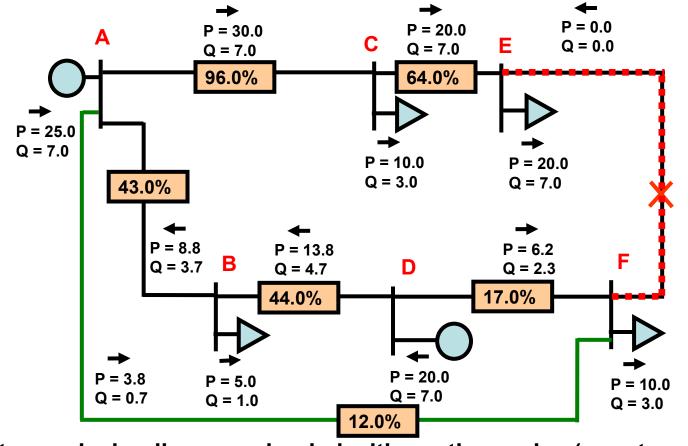
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No transmission lines overloaded without contingencies

Transmission Expansion Plan



No transmission lines overloaded with contingencies (worst case shown)

Interactive Training Session

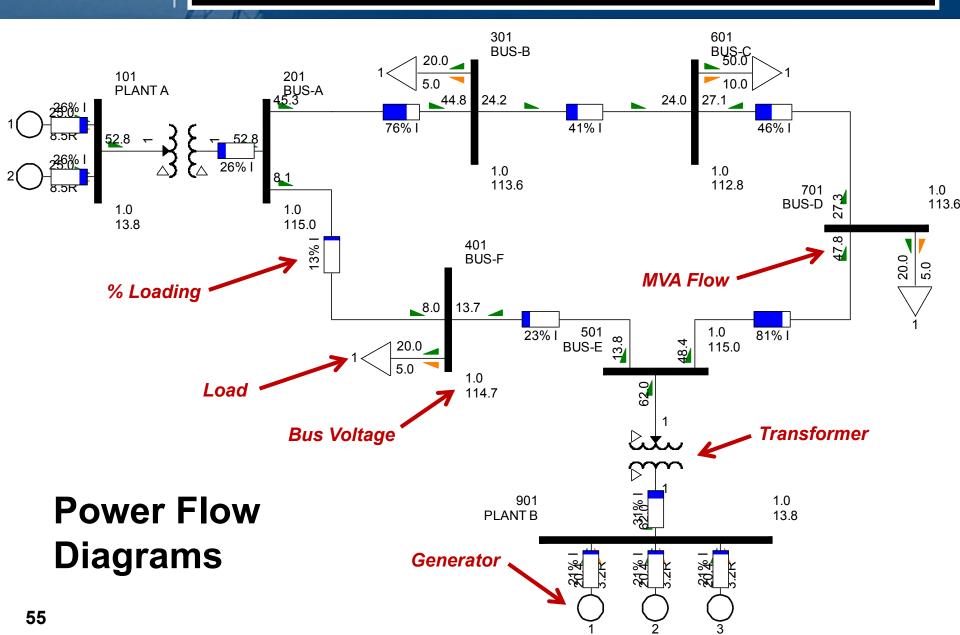
PSS/E BASICS

- Power Flow Diagrams
- Data Tables
- AC Contingency Solution (ACCC) Analysis

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Interactive Training Session

* PSS/E BASICS

- Power Flow Diagrams
- Data Tables
- AC Contingency Solution (ACCC) Analysis

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Interactive Training Session

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letv	vork data	× SERTP Ex	ample.sld			500595			_		Settings	•		•	
	Bus Number	Bus Name	Base kV	Area Num	Area Name	Zone Num	Zone Name	Owne Owner r Name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)	Emergency Vmax (pu)	Emergen Vmin (pu
	101	PLANT A	13.8	1		1		1	2	1.0000	-0.19	1.0500	0.9500	1.1000	0.900
-	201	BUS-A	115.0	1		1		1	1	1.0000	-0.19	1.0500	0.9500	1.1000	0.900
	301	BUS-B	115.0	1		1		1	1	0.9877	-0.81	1.0500	0.9500	1.1000	0.900
	401	BUS-F	115.0	1		1	0	1	1	0.9972	-0.24	1.0500	0.9500	1.1000	0.900
	501	BUS-E	115.0	1		1		1	1	1.0000	-0.00	1.0500	0.9500	1.1000	0.900
-	601	BUS-C	115.0	1		1		1	1	0.9810	-1.15	1.0500	0.9500	1.1000	0.90
	701	BUS-D	115.0	1		1		1	1	0.9877	-0.72	1.0500	0.9500	1.1000	0.90
-	901	PLANT B	13.8	1		1		1	3	1.0000	0.00	1.0500	0.9500	1.1000	0.90
: <u> </u>															
K .	ut Bar	Bus / Plant			a Ta } Fixed				Induction	Machine \ B	iranch 👌 Bre	aker <u>}</u> 2 Wir	nding 👌 3 Wi	nding \ Imp	edance tabl
Jutp	ut Bar	Bus / Plant ,	Machine	Load			λ Swite		Induction	Machine λ B)ranch <mark>} B</mark> re	aker } 2 Wir	nding 👌 3 Wi	nding \ Imp	edance tab

Interactive Training Session

Bus Data

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TRANSMISSION PLANNING

Net	work data	× SERTP_Exa	ample.sld											
	Bus Number	Bus Name	Base kV	Area Num	Area Name	Zone Num	Zone Name		Owner Name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)
	101	PLANT A	13.8	1		1		1		2	1.0000	-0.19	1.0500	0.9500
	201	BUS-A	115.0	1		1		1		1	1.0000	-0.19	1.0500	0.9500
	301	BUS-B	115.0	1		1		1		1	0.9877	-0.81	1.0500	0.9500
▲	401	BUS-F	115.0	1		1		1		1	0.9972332	-0.24	1.0500	0.9500
	501	BUS-E	115.0	1		1		1		1	1.0000	-0.00	1.0500	0.9500
	601	BUS-C	115.0	1		1		1		1	0.9810	-1.15	1.0500	0.9500
	701	BUS-D	115.0	1		1		1		1	0.9877	-0.72	1.0500	0.9500
	901	PLANT B	13.8	1		1		1		3	1.0000	0.00	1.0500	0.9500

Interactive Training Session

Generator Data

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Net	twork dat	a 🗙 SE	RTP_Exa	mpl	e.sld							
	Bus Numbe	Bu Nan	s ne	ld	Area Num	Area Name	Zone Num	Zone Name	Code	VSched (pu)	Remote Bus	In Service
	101	PLANT A	13.8	1	1		1		2	1.0000	201	1
	101	PLANT A	13.8	2	1		1		2	1.0000	201	V
	901	PLANT B	13.8	1	1		1		3	1.0000	501	V
	901	PLANT B	13.8	2	1		1		3	1.0000	501	V
	901	PLANT B	13.8	3	1		1		3	1.0000	501	V
¥.												

PGen (MW)	PMax (MW)	PMin (MW)	QGen (Mvar)	QMax (Mvar)	QMin (Mvar)	Mbase (MVA)	R Source			XTran (pu)	Gentap	Owne
								(pu)	(pu)	(pu)	(pu)	
25.0000	25.0000	2.0000	8.5459	10.0000	-2.0000	100.00	0.000000	1.000000	0.00000	0.00000	1.02500	1
25.0000	25.0000	2.0000	8.5459	10.0000	-2.0000	100.00	0.000000	1.000000	0.00000	0.00000	1.02500	1
20.4010	25.0000	2.0000	3.2378	10.0000	-2.0000	100.00	0.000000	1.000000	0.00000	0.00000	1.02500	1
20.4010	25.0000	2.0000	3.2378	10.0000	-2.0000	100.00	0.000000	1.000000	0.00000	0.00000	1.00000	1
20.4010	25.0000	2.0000	3.2378	10.0000	-2.0000	100.00	0.000000	1.000000	0.00000	0.00000	1.00000	1
						0						

Interactive Training Session

Branch (Line) Data

From Bus Number	From Nan		To Bus Number	To E Nar		ld	Line R (pu)	Line X (pu)	Charging B (pu)	In Service	Metere d
201	BUS-A	115.0	301	BUS-B	115.0	1	0.020000	0.030000	0.000010	1	From
201	BUS-A	115.0	401	BUS-F	115.0	1	0.020000	0.030000	0.000010	V	From
301	BUS-B	115.0	601	BUS-C	115.0	1	0.020000	0.030000	0.000010	V	From
401	BUS-F	115.0	501	BUS-E	115.0	1	0.020000	0.030000	0.000010	V	From
501	BUS-E	115.0	701	BUS-D	115.0	1	0.020000	0.030000	0.000010	V	From
601	BUS-C	115.0	701	BUS-D	115.0	1	0.020000	0.030000	0.000010	V	From

Rate A	Rate B	Rate C	Line G From (pu)	Line B From (pu)	Line G To (pu)	Line B To (pu)	Length	Owne r	Fraction 1
60.0	60.0	60.0	0.00000	0.00000	0.00000	0.00000	5.000	1	1.000
60.0	60.0	60.0	0.00000	0.00000	0.00000	0.00000	5.000	1	1.000
60.0	60.0	60.0	0.00000	0.00000	0.00000	0.00000	5.000	1	1.000
60.0	60.0	60.0	0.00000	0.00000	0.00000	0.00000	5.000	1	1.000
60.0	60.0	60.0	0.00000	0.00000	0.00000	0.00000	5.000	1	1.000
60.0	60.0	60.0	0.00000	0.00000	0.00000	0.00000	5.000	1	1.000

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Interactive Training Session

Transformer Data

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RANSMISSION PLANNING

Net	work data	K SERTP_	Exampl	e.sld											
	From Bus Number	From E Nam		To Bus Number	To Br Nam		ld	Name	In Service		Winding 1 Side	Controlled Bus	Controlled Side	Tap Positions	Control Mode
	101	PLANT A	13.8	201	BUS-A	115.0	1		1	From	V From	0	Tapped	33	None
	501	BUS-E	115.0	901	PLANT B	13.8	1		V	🔽 From	🔽 From	0	Tapped	33	None
*									V	🔽 From	📝 From		Tapped		

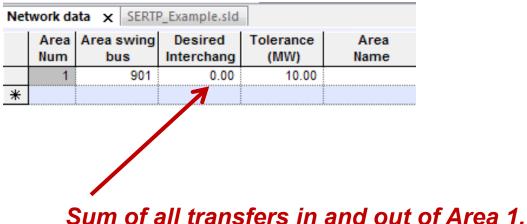
Winding I/O Code	Impedance I/O Code	Admittance I/O Code	Specified R (pu or watts)	Specified X (pu)	Rate A	Rate B	Rate C	Magnetizing G (pu or watts)	Magnetizing B (pu)
Turns ratio (pu on bus base kV)	Zpu (system base)	Y pu (system base)	0.000000	0.000100	200.0	200.0	200.0	0.00000	0.00000
Turns ratio (pu on bus base kV)	Zpu (system base)	Y pu (system base)	0.000000	0.000100	200.0	200.0	200.0	0.00000	0.00000

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Interactive Training Session

Area Interchange Data



Sum of an transfers in and out of Area 1.

For example: 100 MW Import + 75 MW Export = - 25 MW interchange

Interactive Training Session

Load Data

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Net	work data	× SERT	P_Exampl	e.sl	d							
	Bus Number	Bu Nai	is me	ld	Code	Area Num	Are a	Zone Num	Zone Nam	Owne r	Owner Name	In Service
	301	BUS-B	115.0	1	1	1		1		1		1
	401	BUS-F	115.0		1	1		1		1		V
	601	BUS-C	115.0	1	1	1		1		1		V
	701	BUS-D	115.0	1	1	1		1		1		V
*												V

Pload (MW)	Qload (Mvar)	IPload (MW)	lQload (Mvar)	YPload (MW)	YQload (Mvar)	Grounding flag	PNeg (MW)	QNeg (Mvar)	PZero (MW)	QZero (Mvar)
20.0000	5.0000	0.0000	0.0000	0.0000	0.0000	Grounded	0.00000	0.00000	0.00000	0.00000
20.0000	5.0000	0.0000	0.0000	0.0000	0.0000	Grounded	0.00000	0.00000	0.00000	0.00000
50.0000	10.0000	0.0000	0.0000	0.0000	0.0000	Grounded	0.00000	0.00000	0.00000	0.00000
20.0000	5.0000	0.0000	0.0000	0.0000	0.0000	Grounded	0.00000	0.00000	0.00000	0.00000
						Grounded				

Interactive Training Session

PSS/E BASICS

- Power Flow Diagrams
- Data Tables
- AC Contingency Solution (ACCC) Analysis

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ACCC requires the following data files:

- Subsystem
- Monitor
- Contingency

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✤ SUBSYSTEM (SUB) FILE

- Data file that defines a portion of the working case as a subsystem.
- Will be used to define what part of the system to include in the analysis.
- Can be defined by areas, zones, owners, KV, buses, etc.

```
AREA #
SUBSYSTEM [label]
(subsystem specification data record)
CONE #
CONES # #
KV #
(subsystem specification data record)
KVRANGE # #
BUS #
BUS #
BUS #
BUSES # #
```

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Example SUBSYSTEM FILE

 This file defines a subsystem named 'SERTP' that consists of all the elements that are in AREA 1 and between 115 kV and 500 kV

```
SUBSYSTEM 'SERTP'
JOIN
AREA 1
KVRANGE 115 500
END
END
```

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✤ MONITOR (MON) FILE

- Data file that defines the elements in the working case to be monitored for flow or voltage violations.
- Can be defined by subsystems, areas, zones, owners, KV, specific lines, etc.

```
[MONITOR] |BRANCHES| IN |AREA i |
|ZONE i |
|OWNER i |
|KV r |
|SYSTEM label |
|SUBSYSTEM label|
```

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Example MONITOR FILE

- This file monitors all branches (lines) in the subsystem 'SERTP' for flow violations.
- Also monitors elements with voltages outside 0.95 1.05 PU voltage range or with a contingency deviation > 5%.

MONITOR BRANCHES IN SUBSYSTEM 'SERTP'

MONITOR VOLTAGE RANGE SUBSYSTEM 'SERTP' 0.95 1.05 MONITOR VOLTAGE DEVIATION SUBSYSTEM 'SERTP' 0.05

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✤ CONTINGENCY (CON) FILE

- Data file that defines elements to be included in contingency events for analysis.
- Can be defined by subsystems, areas, zones, owners, KV, specific lines, etc.

```
CONTINGENCY label [r r]
(contingency event specification record;
below)
.
.
(contingency event specification record;
below)
END
```

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Example CONTINGENCY FILE

• This file takes contingencies on each branch (line) in the subsystem 'SERTP' one element at a time.

SINGLE BRANCH IN SUBSYSTEM 'SERTP' END

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ACCC Analysis

E Fil	e Edit	View	Diagran	n F	Pow	er Flow Fault OPF Trans Access D	ynan	nics	Disturb	ance Sub	system Miso	I/O Contro	I Tools V	Vindow Hel	p
1	iii 📔	∦ ⊑	b 🖪 🗡	<		Solution Changing	•		부덕 to Draw	[?] Locate bu	us Program Settings		🗄 🚅 Ition Solve ings		► F
Net	vork data Bus		ERTP_Exa			Reports Convert Loads and Generators		ner		Voltage	Angle	Normal	Normal	Emergency	Emergency
	Number	Na	ime	Bε		Equivalence Networks		ne	Code	(pu)	(deg)	Vmax (pu)	Vmin (pu)	Vmax (pu)	Vmin (pu)
	101	PLANT	ΓA			Linear Network			2	1.0000	-0.19	1.0500	0.9500	1.1000	0.9000
	201	BUS-A	\					123		4 0000		4 05 00	0.0500	1.1000	0.9000
	301	BUS-B			_	Contingency, Reliability, PV/QV analysis	_	A.	AC cont	ingency solu	ition (ACCC)		500	1.1000	0.9000
▶		BUS-F				GIC Analysis		P	Multi-Le	vel AC conti	ngency soluti	on	500	1.1000	0.9000
		BUS-E					_	N	N-1-1 A	contingen	cy solution		500	1.1000	0.9000
		BUS-C		6	Der	List Data Ctrl+Shift+		a		ctive action	-		500	1.1000	0.9000
	701	BUS-D				Check Data	•						500 500	1.1000 1.1000	0.9000
*						Renumbering Areas / Owners / Zones Renumber Buses Results Analysis and Visualization	•	ا چې	Impose Reliabili	Contingency ty assessmen	Constrained O / and/or Gene nt y assessment	ration Dispate			
K ·		Bus /	(Plant_)∖	Mac	chine	e λ Load λ Fixed Shunt λ Switched Shu	nt	·~	PV analy PV analy		evious results		3 Wi	nding ∖ Imp	edance table
Outp	ut Bar							1	Impleme	nt PV transf	er				
SWI	tem tot NG BUS US# X 901 PLA	SUMMA NAME	RY: X BA			PGEN PMAX PMIN Q		0V-P	-	ysis using p	revious result:				
		Due		lante	AM-					-	ngency Analy	sis results file.			
		Progr	ess A A	ierts/	/wa	rnings ACCC_SINGLE_RUN_REPORT_4	Λ_	ACCO	C_SINGL	E_RUN_REPO	JKI_4 /				
2 <mark>0</mark> m	mand Line	Input													

Interactive Training Session

Solution options				
Tap adjustment —	Area interchange control	Switched shunt adjustments		
Lock taps	Disabled	🔘 Lock all	Non-divergent solution	
Stepping	🔘 Tie lines only	Enable all	📃 Adjust phase shift 🛛 🤸	Typical Solve
O Direct	Tie lines and loads	Enable continuous, disable discrete	Adjust DC taps	Parameters
Solution Engine		Dispatch mode	Dispatch system	
💿 Fixed slope decou	pled Newton-Raphson	Disable 💌		
Full Newton-Raph	son	Mismatch tolerance 0.50 🚔 [.1]		
.ow terminal voltage be	havior Induction m	achine(s) stalled or tripped		Create a DFAX
ow terminal voltage be Induction machine stal		achine(s) stalled or tripped ngency as solved if converged 👻		Create a DFAX file consisting of
			• DFAX	
Induction machine stal			▼ DFAX ←	file consisting of
Induction machine stal Distribution actor data file Contingency				file consisting of
Induction machine stal Distribution actor data file Contingency colution output file				file consisting of
Induction machine stal Distribution actor data file Contingency colution output file Load throwover data file Jnit inertia and			 Edit 	file consisting of

Interactive Training Session

Create a DFAX file consisting of SUB/MON/CON

Build Distribution Factor Data F	2		x
Input files			
Subsystem definition file		▼ Edit	
Monitored element file		▼ Edit.	
Contingency description file		▼ Edit	
Sort Monitored elements for re	orting		
Prepare file for use with	AC analysis only 🔹		
Distribution factor data output file			
	OK Cancel		

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Interactive Training Session

Tap adjustment	Area interchange control —			
	r les interentinge control	Switched shunt adjustments		
Ock taps	🔘 Disabled	🔘 Lock all	Non-divergent solution	
Stepping	🔘 Tie lines only	Enable all	🔲 Adjust phase shift	
O Direct	Tie lines and loads	Enable continuous, disable discrete	🔽 Adjust DC taps	
Solution Engine		Dispatch mode	Dispatch system	
Fixed slope decoup	led Newton-Raphson	Disable 💌		
Full Newton-Raphs	on	Mismatch tolerance 0.50 🚔 [.1]		
Low terminal voltage beh	avior Induction mad	chine(s) stalled or tripped		
Induction machine stalls		gency as solved if converged 👻		
Distribution factor data file			▼ DFAX	
Contingency solution output file			▼	
Load throwover data file			▼ E dit	
Unit inertia and governor data file			E dit	Solve and
Incremental Save case archive			•	Create Repor
RAV database				

Interactive Training Session

Report format	Spreadsheet loading table
Base case Rate A 🔹	Spreadsheet overload report Spreadsheet loading table Available capacity table Non-spreadsheet overload report
Contingency case Rate A 🔹	Non-spreadsheet loading table Non-converged network Non-spreadsheet corrective actions

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TRANSMISSION PLANNING

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Example ACCC Results

<	MONIT	ORED BRANCH -	>	<- CONTINGENCY LABEL	>	RATING	FLOW 8	ר
501*BUS-E	115.00	701 BUS-D	115.00 1	SINGLE 201-301(1)	60.0	96.3	160.5	
601 BUS-C	115.00	701*BUS-D	115.00 1	SINGLE 201-301(1)	60.0	73.2	125.2	
501*BUS-E	115.00	701 BUS-D	115.00 1	SINGLE 301-601(1)	60.0	73.7	122.9	Thermal
501*BUS-E	115.00	701 BUS-D	115.00 1	SINGLE 401-501(1)	60.0	61.8	103.1	Loading
201*BUS-A	115.00	301 BUS-B	115.00 1	SINGLE 501-701(1)	60.0	96.5	165.3	Violations
301*BUS-B	115.00	601 BUS-C	115.00 1	SINGLE 501-701(1)	60.0	73.3	129.0	
401 BUS-F	115.00	501*BUS-E	115.00 1	SINGLE 501-701(1)	60.0	65.6	109.3	
201*BUS-A	115.00	301 BUS-B	115.00 1	SINGLE 601-701(1)	60.0	73.8	124.5	J

MONITORED	VOLTAGE RE	EPORT :									_	
SYSTEM		<- CONT	FINGENCY	LABEL ->	<	в U	s>	V-CONT	V-INIT	V-MAX	V-MIN	
'SERTP'	RANGE	SINGLE	201-301	(1)	301	BUS-B	115.00	0.94881	0.98770	1.05000	0.95000	
'SERTP'	RANGE	SINGLE	501-701	(1)	301	BUS-B	115.00	0.94667	0.98770	1.05000	0.95000	Voltage
'SERTP'	RANGE	SINGLE	501-701	(1)	601	BUS-C	115.00	0.92643	0.98104	1.05000	0.95000	- Violations
'SERTP'	RANGE	SINGLE	501-701	(1)	701	BUS-D	115.00	0.92044	0.98768	1.05000	0.95000	
'SERTP'	DEVIATION	SINGLE	501-701	(1)	601	BUS-C	115.00	0.92643	0.98104		0.05000	
'SERTP'	DEVIATION	SINGLE	501-701	(1)	701	BUS-D	115.00	0.92044	0.98768		0.05000	

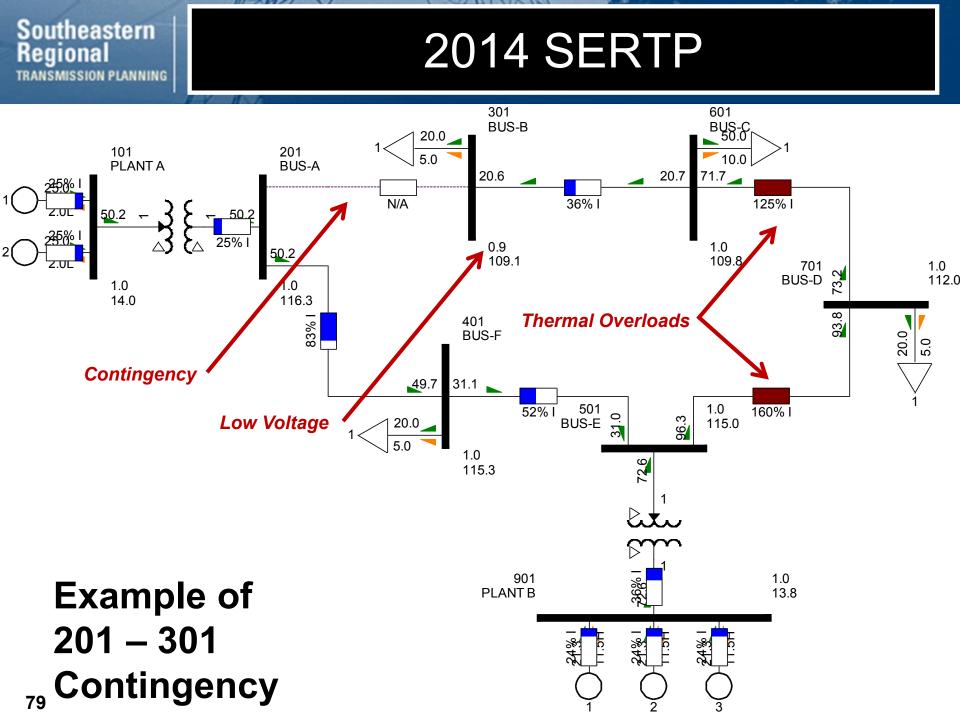
ACCC Results - Summary of Violations Per Contingency

< CONTINGENCY LABEL	POST-CONT	INGEN	ICY SO	LUTION	>
	<termination st<="" td=""><td>'ATE></td><td>FLOW#</td><td>VOLT#</td><td>LOAD</td></termination>	'ATE>	FLOW#	VOLT#	LOAD
BASE CASE	Met convergence	e to	0	0	0.0
SINGLE 201-301(1)	Met convergence	e to	2	1	0.0
SINGLE 201-401(1)	Met convergence	e to	0	0	0.0
SINGLE 301-601(1)	Met convergence	e to	1	0	0.0
SINGLE 401-501(1)	Met convergence	e to	1	0	0.0
SINGLE 501-701(1)	Met convergence	e to	3	5	0.0
SINGLE 601-701(1)	Met convergence	e to	1	0	0.0

of Violations

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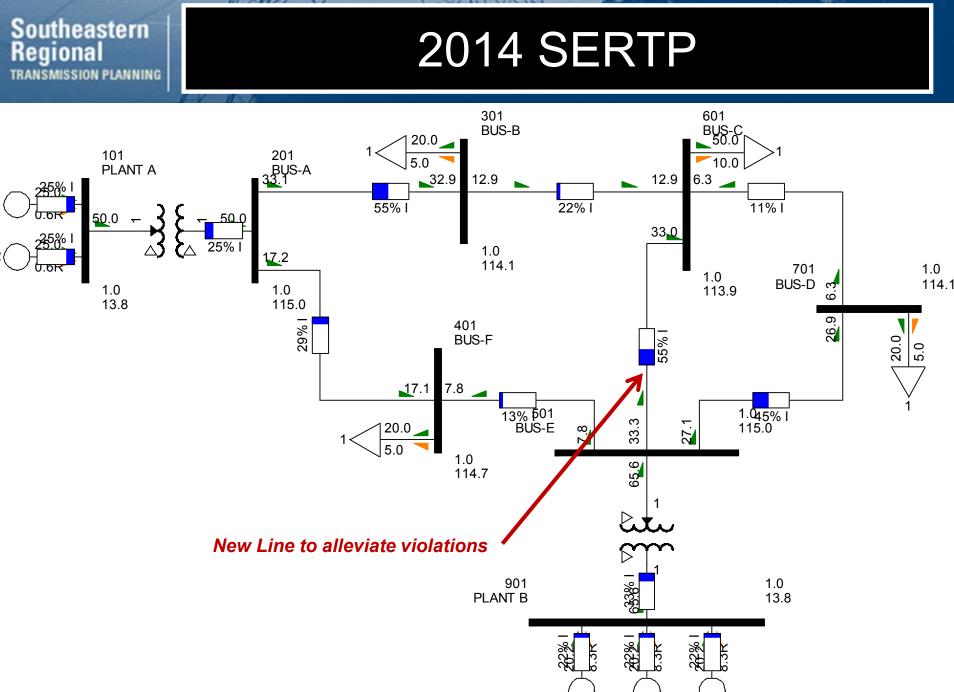
TRANSMISSION PLANNING

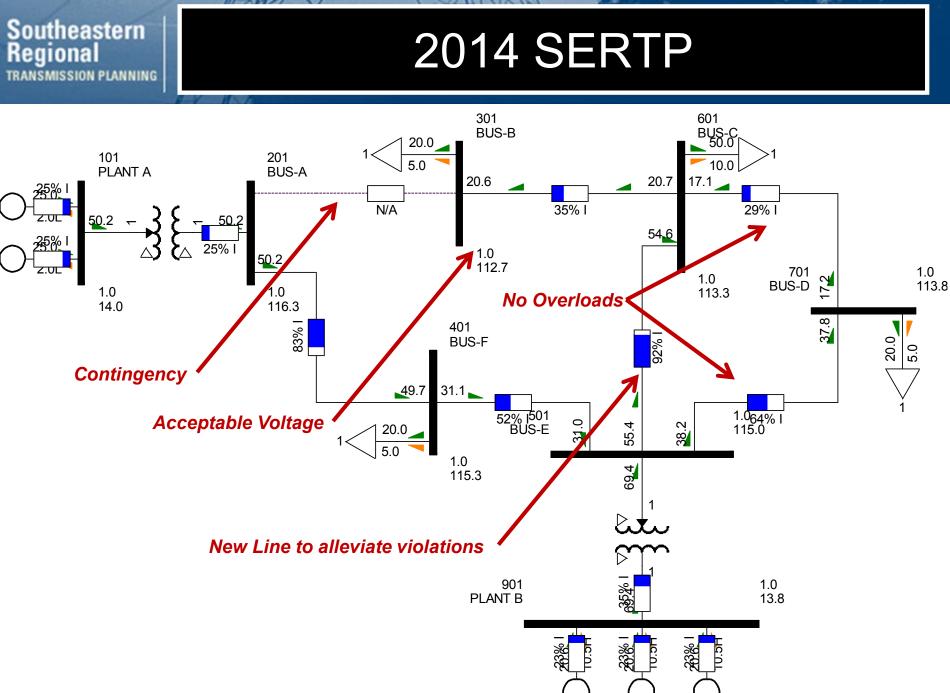


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Interactive Training Session

Example project (new line) added to case to alleviate thermal loading and voltage violations.





ACCC Results - Summary of Violations Per Contingency with project applied

< CONTINGENCY LABEL	POST-CONT	INGENC	Y SOI	LUTION	>
	<termination< b=""> ST</termination<>	ATE> FI	LOW#	VOLT#	LOAD
BASE CASE	Met convergence	to	0	0	0.0
SINGLE 201-301(1)	Met convergence	to	0	0	0.0
SINGLE 201-401(1)	Met convergence	to	0	0	0.0
SINGLE 301-601(1)	Met convergence	to	0	0	0.0
SINGLE 401-501(1)	Met convergence	to	0	0	0.0
SINGLE 501-701(1)	Met convergence	to	0	0	0.0
SINGLE 601-701(1)	Met convergence	to	0	0	0.0

of Violations

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TRANSMISSION PLANNING

Compare Cases

: Fil	e Edit View Diagram Power Flow Fa	ult OPF	Trans Ac	cess Dynami	cs Distu	rbance Su	bsystem N	lisc I/O (Control Too		-	_		
				E	*	?	<u>*</u> =		S :	ç= 🕴 () 🗆 🕨 🎙	_ i = %.	LFI 📮	
		I Create Subsys		OUT/GEXM	Auto Drav	v Locate I	bus Progra Settin		Solution Settings	Solve =				
┢╎╘┛	Save Ctrl+S	Subsy	stem				Settin	ys 👻	settings	•				
H.	Close Event Study File	Area	Zone	Zone	Code	VSched	Remote	In	PGen	PMax	PMin	QGen	QMax	QMin
-	Scenarios	Name	Num 1	Name	-2	(pu) 1.0000	Bus 201	Service	(MW) 19.0000	(MW) 25.0000	(MW) 2.0000	(Mvar) 10.0000	(Mvar) 10.0000	(Mvar -2.00
	Compare Ctrl+Shift+C		1		-2	1.0000	201	✓ ✓	18.0000	25.0000	2.0000	10.0000	10.0000	-2.00
		J	1		3	1.0000	501	V	24.7663	25.0000	2.0000	2.3166	10.0000	-2.00
-	File information (SIZE/SHOW/BUSN)		1		3	1.0000	501 501	V	24.7663 24.7663	25.0000 25.0000	2.0000	2.3166 2.3166	10.0000	-2.00 -2.00
-	Case titles, short & long (CHTI)				<u>,</u>	1.0000	501	V	24.7003	25.0000	2.0000	2.3100	10.0000	-2.00
1	Import	•	.żż											
	Export	•												
	Renumber buses in auxiliary files (RNFI)													
	Spreadsheet Header/Footer Setup													
	Spreadsheet Page Setup													
	Print Setup													
	Print Preview													
	Print Ctrl+P													
	1 SERTP_Example.sav													
	2 SERTP24W_Pass2.sav													
	3 SERTP24S_Pass2.sav													
	4 SERTP24H_Pass2.sav													
-	5 SERTP22S_Pass2.sav	ixed Shunt) Switz	ched Shunt λ	Induction	Machine	Branch)	Breaker)	2 Winding	3 Winding	Impedance t	able à EACT	Sλ 2-Term D	<u>c}vsc</u>
4	6 SERTP22H Pass2.sav	ixed bridine	A 3444	ance on and A	Induction	reactine f			2 Milliong p	ρ τηματής γ	Impedance			
q	7 SERTP20S_Pass2.sav													₹₽×
	-	00 Mvar	0.	.00 MVA at 1	bus 501	IBUS-E	115.0	01						*
	8 SERTP19W_Pass2.sav	[.00 MVA										
	9 SERTP19S_Pass2.sav													
	10 SERTP19H_Pass2.sav	PMAX	PMIN	QGEN	QMAX									_
	11 SERTP17S_Pass2.sav	75.0	6.0	6.9	30.0	-6.0								-
T.	12 SERTP15S_Pass2.sav													
C	Exit													▼ ‡ ×
PSS	®E Response 🔻													
Com	pare cases, totals and tie lines				Me	et converger	nce tolerance	s						
	,													1

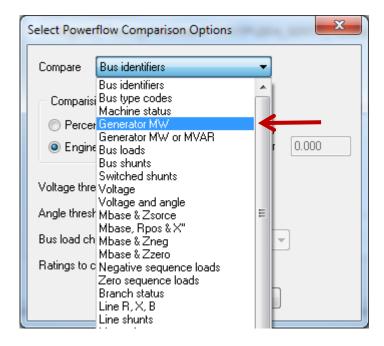
Compare Cases

mpare X
Case Totals Powerflow Cases Tie Lines
Case for comparison
▼ ◄
Load comparison case after comparison
Bus comparison based on
Number Name Number and name
Select
All buses
Selected bus subsystem Select
The following buses
Go Close

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Compare Cases



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Compare Cases

PTI INTERACTIVE PO COMPARISON OF THE			•	•	, MAR 24 Example		:17		
BUSES WITH MW GENI					_		/		
				IN SERTP		.sav 🎽			
X BUS	Х	MW	MVAR	MW	MVAR	DELTA MW	୫	MVAR	8
101 [PLANT A	13.800]	40.0	20.0	50.0	17.1	10.0	25.0	-2.9	14.5
901 [PLANT B	13.800]	71.3	6.9	61.2	9.7	-10.1	14.1	2.8	40.6

Southeastern Regional TRANSMISSION PLANNING

2013 SERTP

Next Meeting Activities

Next Meeting Activities

✤ 2014 SERTP 2nd Quarter Meeting

- Location: TBD
- Date: June 2014
- Purpose:
 - Overview of Order No.1000 Implementation & SERTP Expansion
 - Discuss preliminary 10 year expansion plan
 - $_{\odot}\,$ Obtain stakeholder input and feedback regarding the plan

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2013 SERTP

Wrap Up