Welcome

SERTP 2014 – 1st Quarter Meeting

"First RPSG Meeting & Interactive Training Session"

2014 SERTP

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**

2014 SERTP
Process Overview

2014 SERTP Process Overview

- **1st 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

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
  2) The RPSG serves as stakeholder representatives for the eight (8) industry sectors in interactions with the SERTP Sponsors

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

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

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

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

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.

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 company-specific 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

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

Interactive Training Session

❖ Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria
- Project Identification

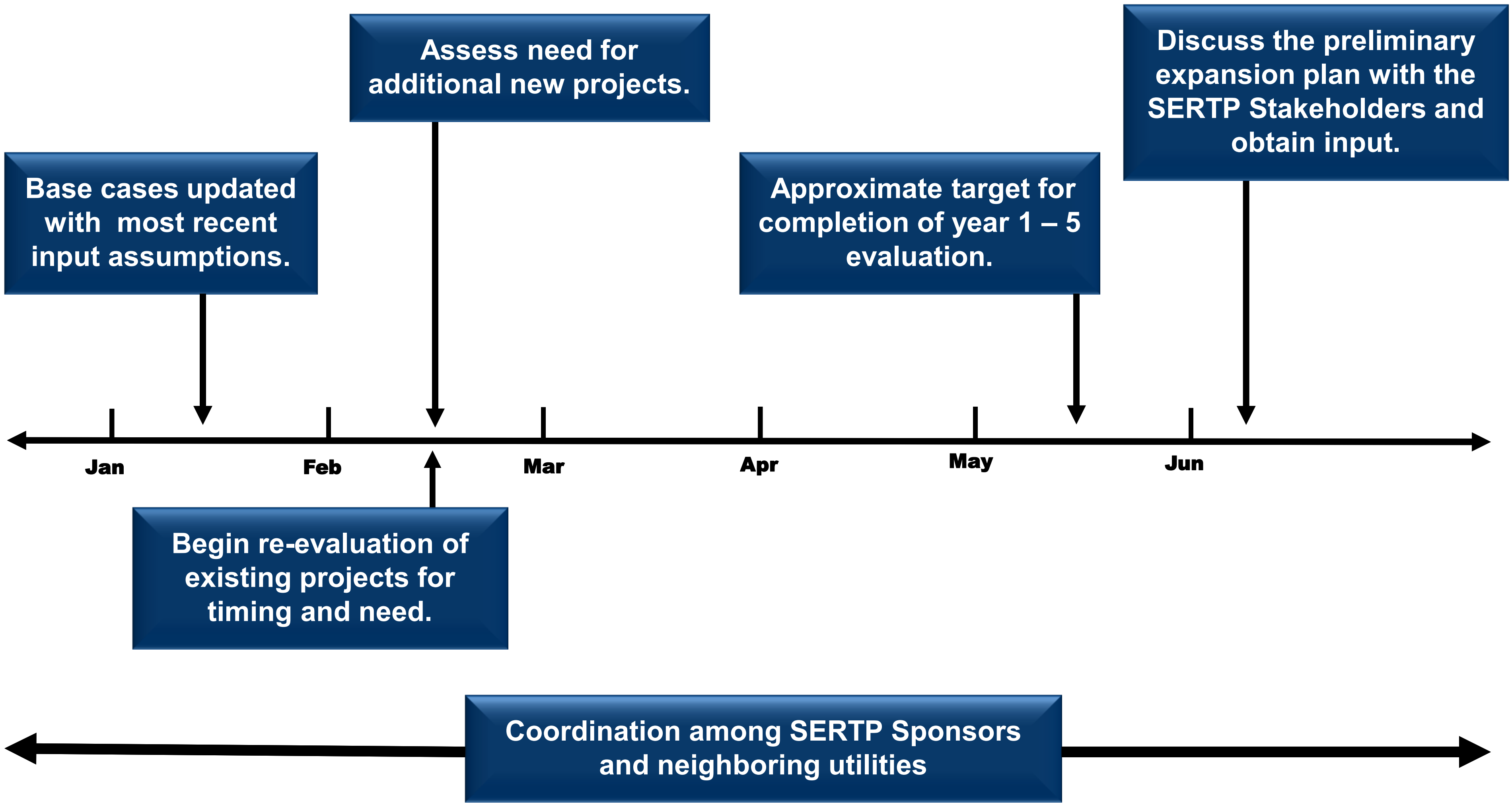
Interactive Training Session

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

Transmission Expansion Plan

- **Expansion Plan Timeline**
  - First Five Year Focus
  - Second Five Year Focus

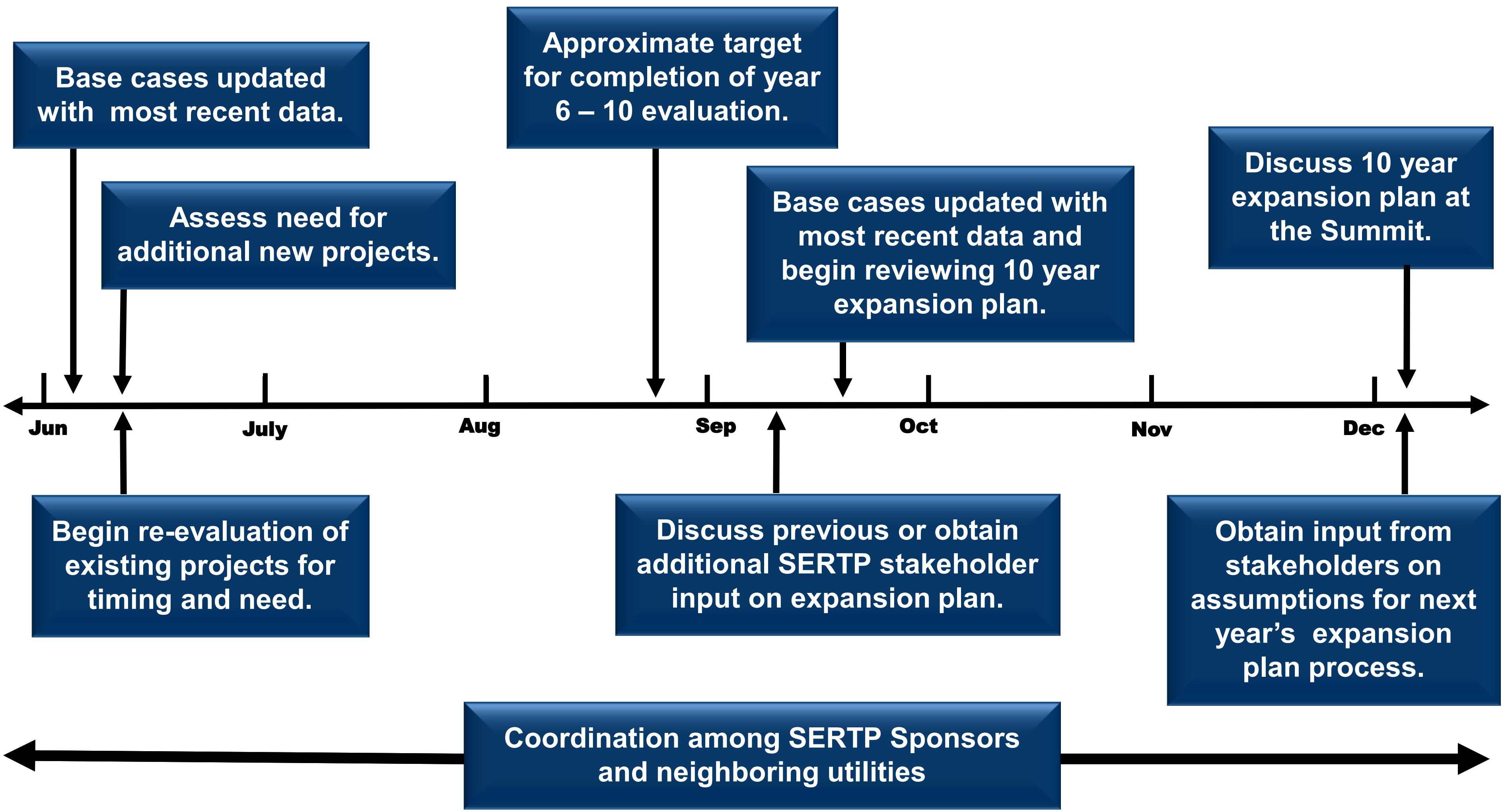
Approximate Planning Time Line (Years 1 – 5)



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)



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

❖ Example

- **Original Project Year from 2012 Expansion Plan:**

  2016

- **Constraint:**

  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.

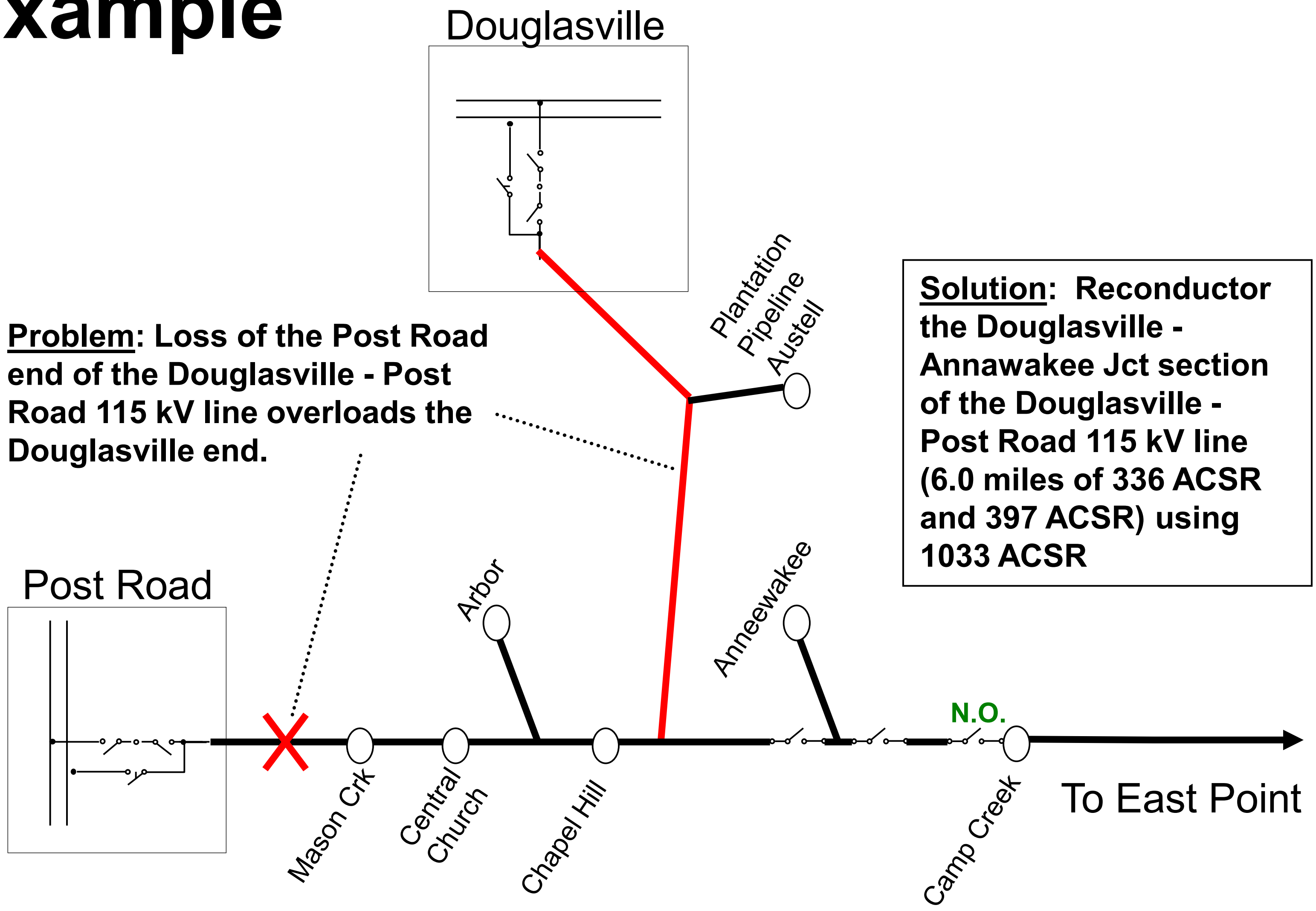
- **Enhancement:**

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

❖ 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.

❖ Example



Problem: Loss of the Post Road end of the Douglasville - Post Road 115 kV line overloads the Douglasville end.

Solution: Reconductor the Douglasville - Annawakee Jct section of the Douglasville - Post Road 115 kV line (6.0 miles of 336 ACSR and 397 ACSR) using 1033 ACSR

Interactive Training Session

❖ Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria
- 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
  - Project Identification

Transmission Expansion Plan

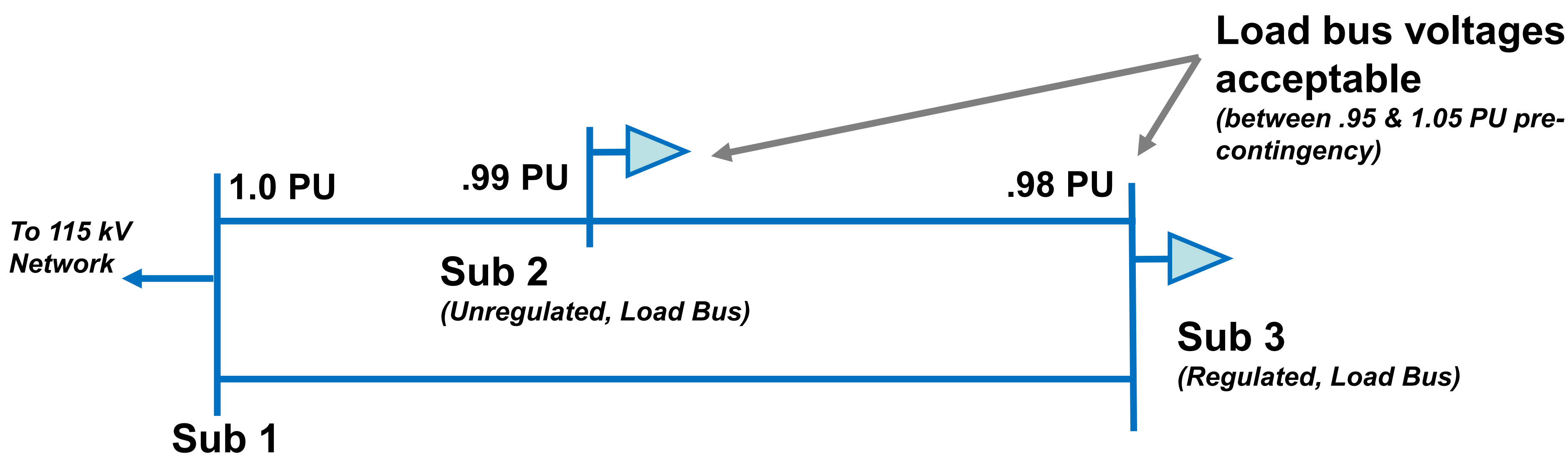
- Planning Criteria
  - Similar for all SERTP Sponsors
    - » Meet NERC TPL Standards

Transmission Expansion Plan

- **Voltage**
  - **<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.

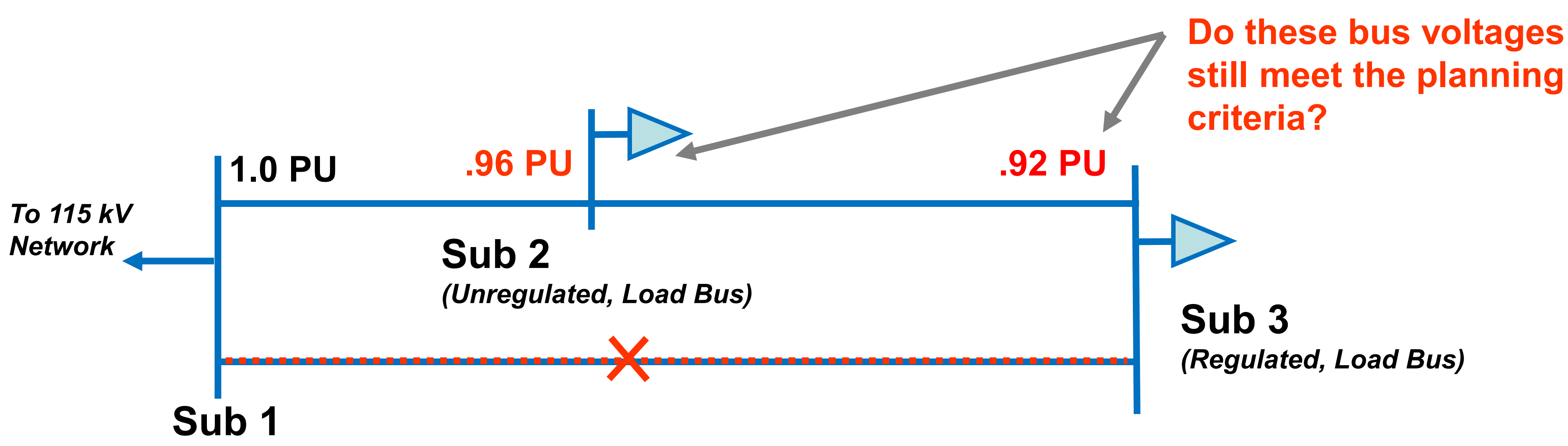
❖ Voltage

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



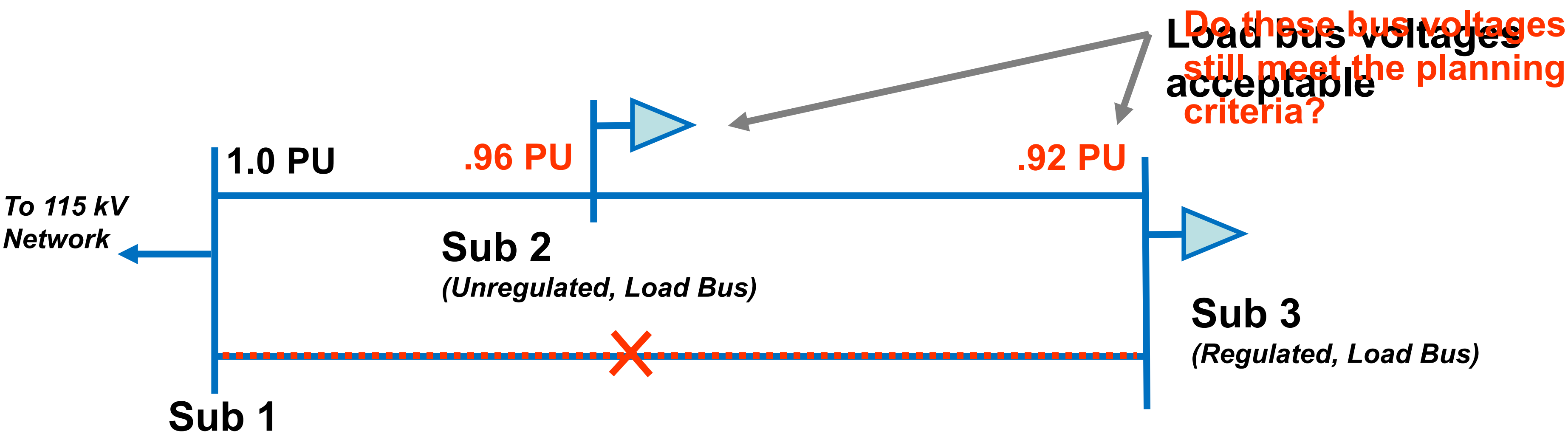
Voltage

- **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



❖ Voltage

- **<u>Load Buses:</u>**
  - **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)***

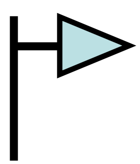


Transmission Expansion Plan

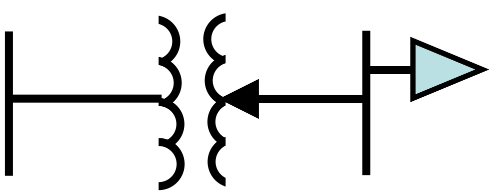
❖ Voltage

- **<u>Load Buses:</u>**
  - 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

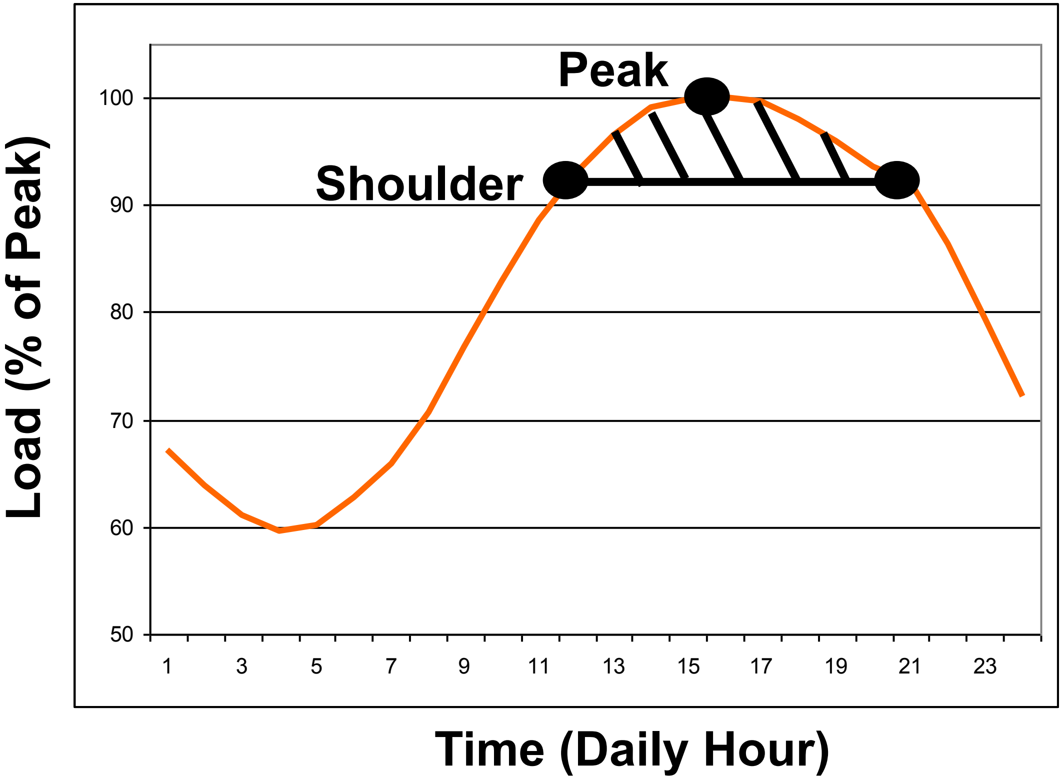
- **Transmission Lines:** Line loadings should not exceed design specifications
- **Transformers:** Transformer loading should not exceed nameplate rating for normal conditions. Transformer loading should not exceed calculated capability rating for contingency conditions

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**

Transmission Expansion Plan

- Daily Load Curve – Summer
  - Summer Load Levels Evaluated
    - Peak
    - Shoulder



Interactive Training Session

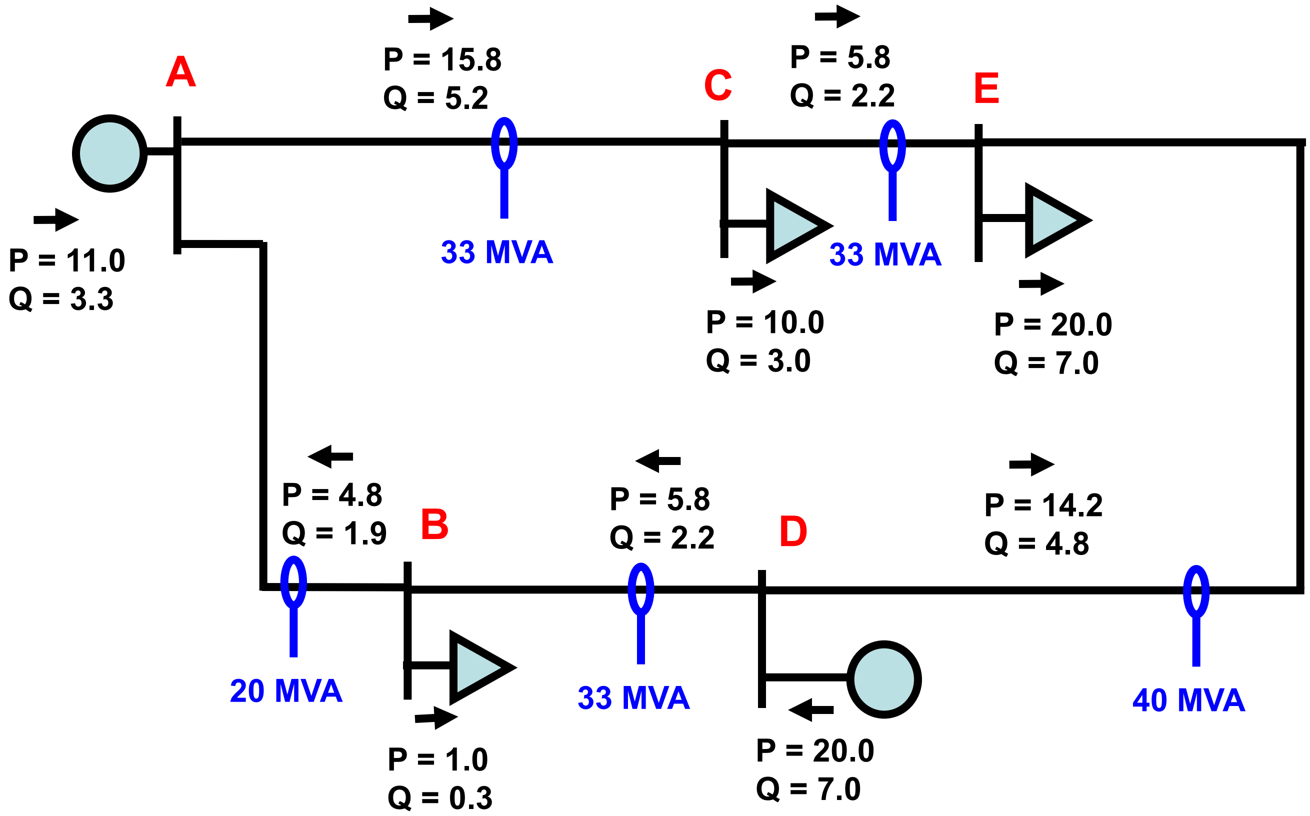
❖ Expansion Plan Development

- Expansion Plan Timeline
- Power Flow Analyses
- Planning Criteria
- Project Identification

Transmission Expansion Plan

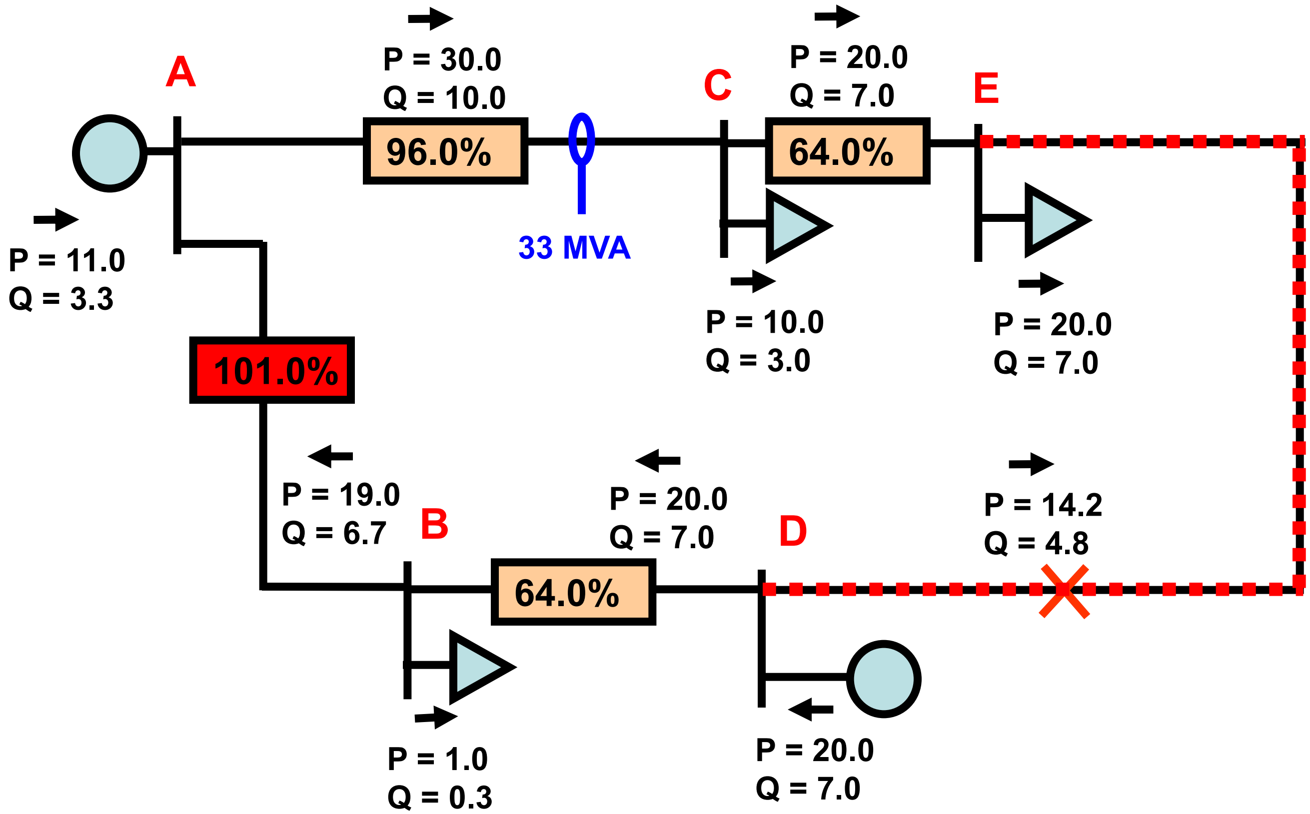
- **Simple Example**
  - Neglects transmission losses
  - N – 1 evaluation only (no unit offline scenarios)
  - Voltage impacts not assessed

Transmission Expansion Plan



No transmission lines overloaded without contingencies

Transmission Expansion Plan



Line A – B overloaded for contingency D – E

Transmission Expansion Plan

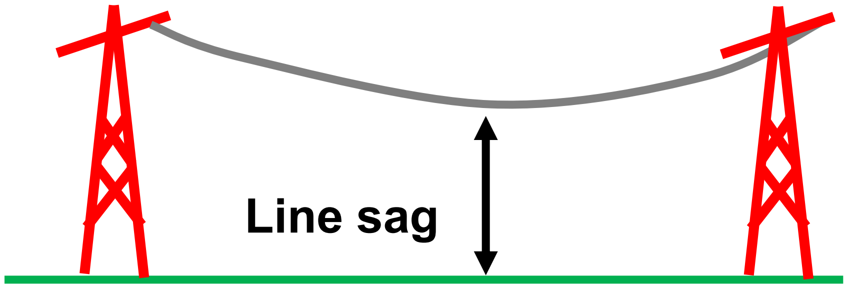
❖ Example Solutions for A – B

- "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

❖ <u>Transmission Line Upgrade</u>

- **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 ºC)



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**

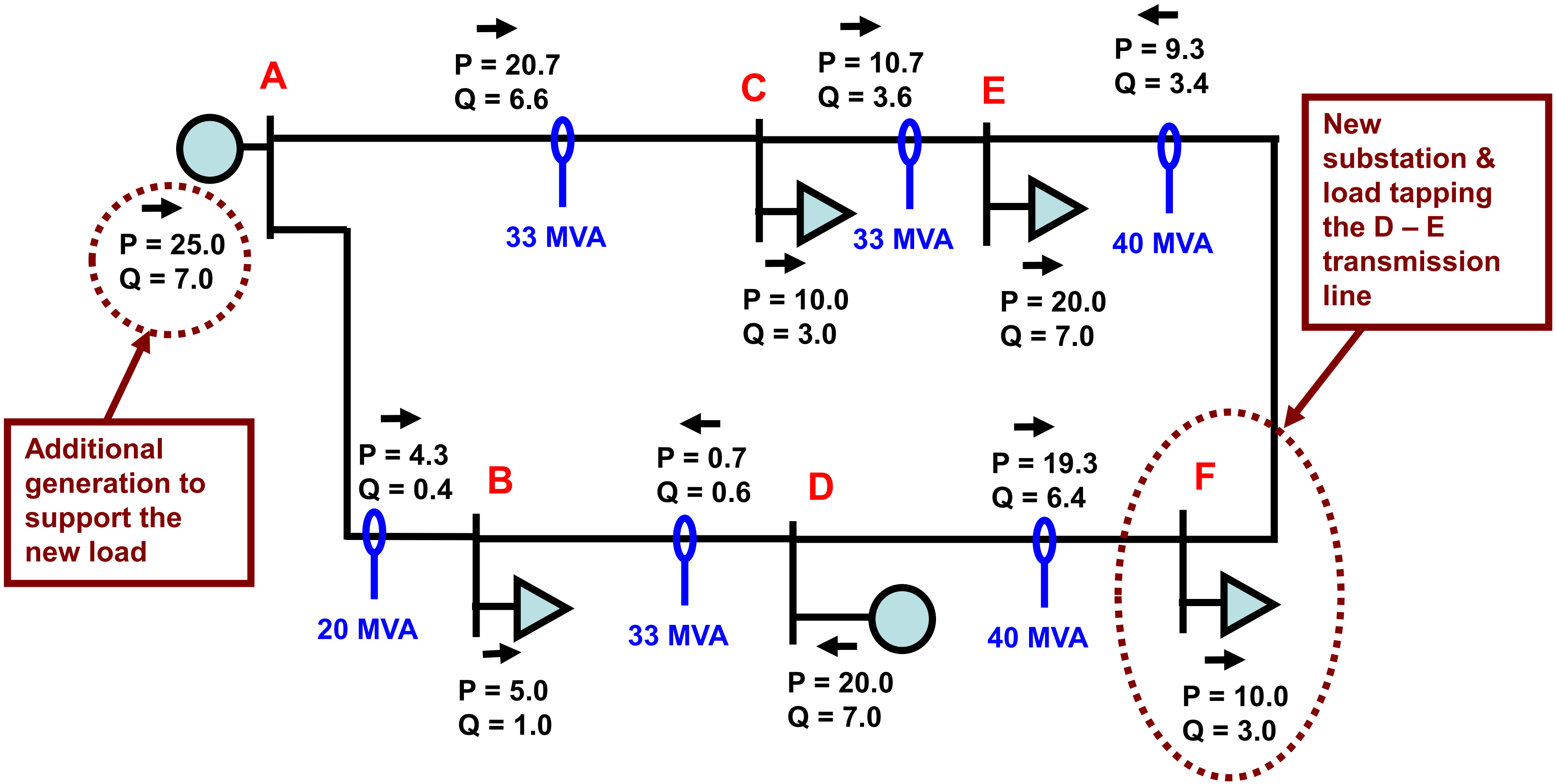
Transmission Expansion Plan

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

Transmission Expansion Plan

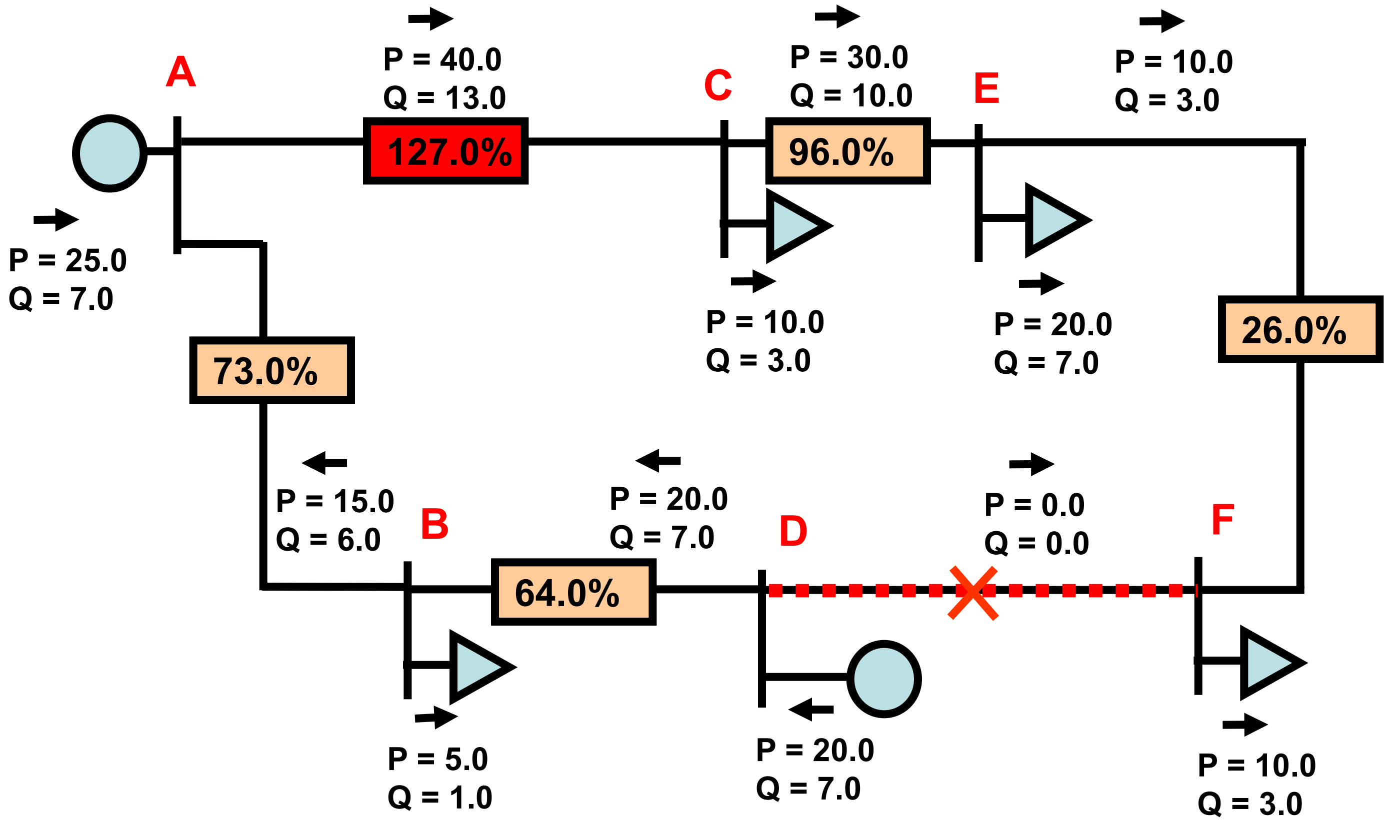
- **In previous example, assume Line “D – E” is tapped with a new load**
  - Real Power = 10.0 MW
  - Reactive Power = 3.0 MVAR
  - Generation at Bus A is designated by the LSE for an additional 10 MW to serve the new load

Transmission Expansion Plan



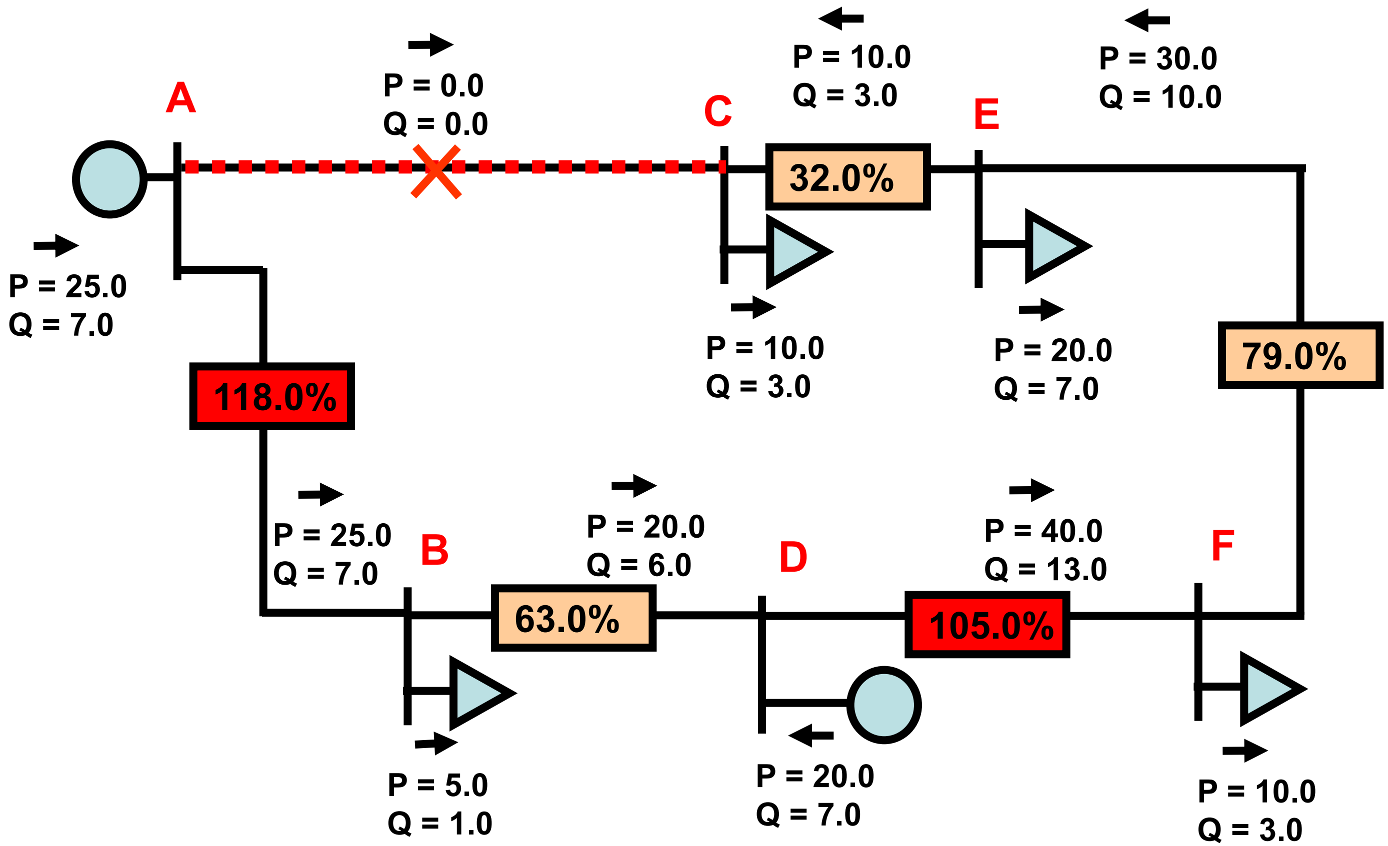
No transmission lines overloaded <u>without</u> contingencies

Transmission Expansion Plan



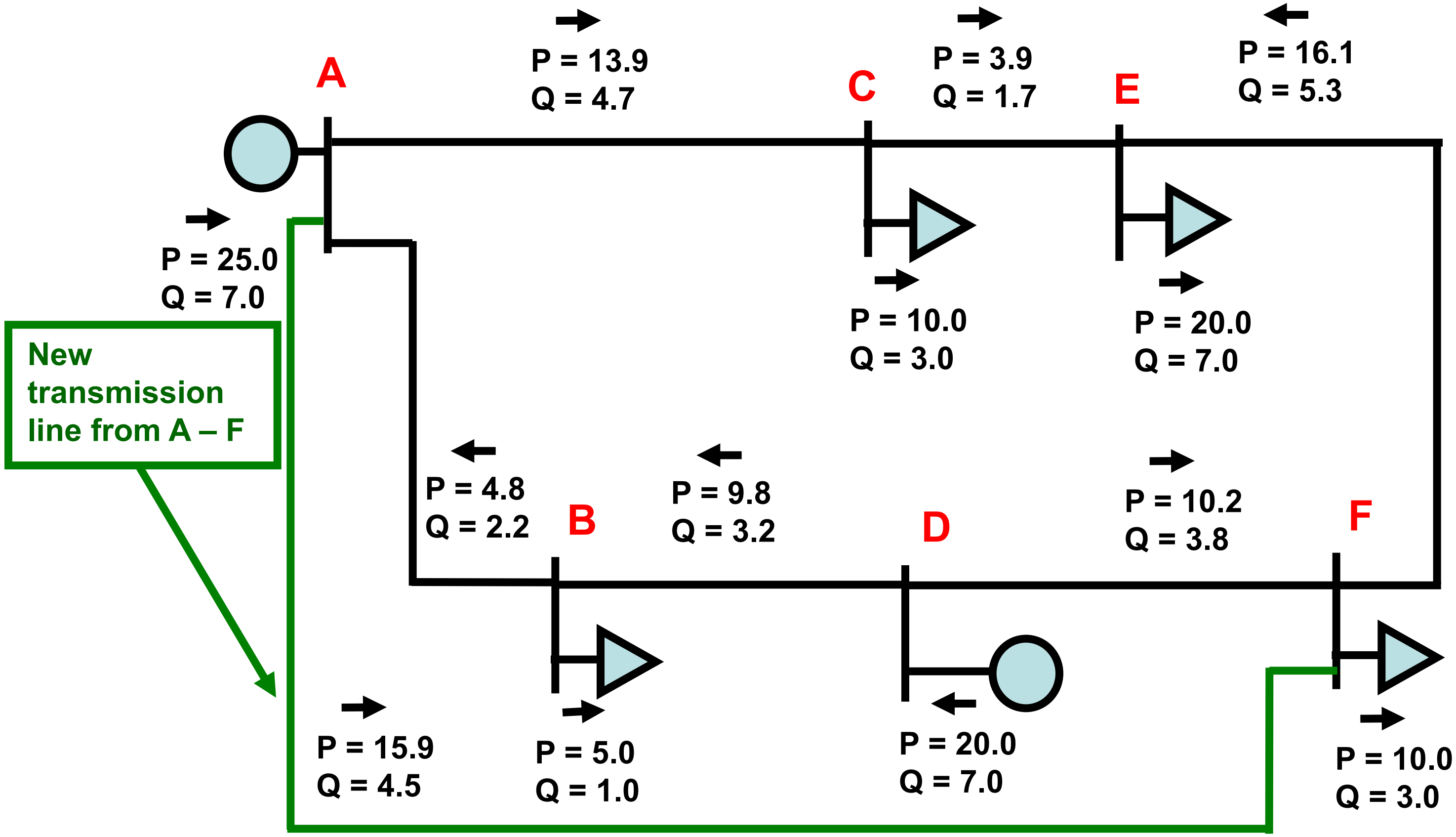
Line A – C overloaded for contingency D – F

Transmission Expansion Plan



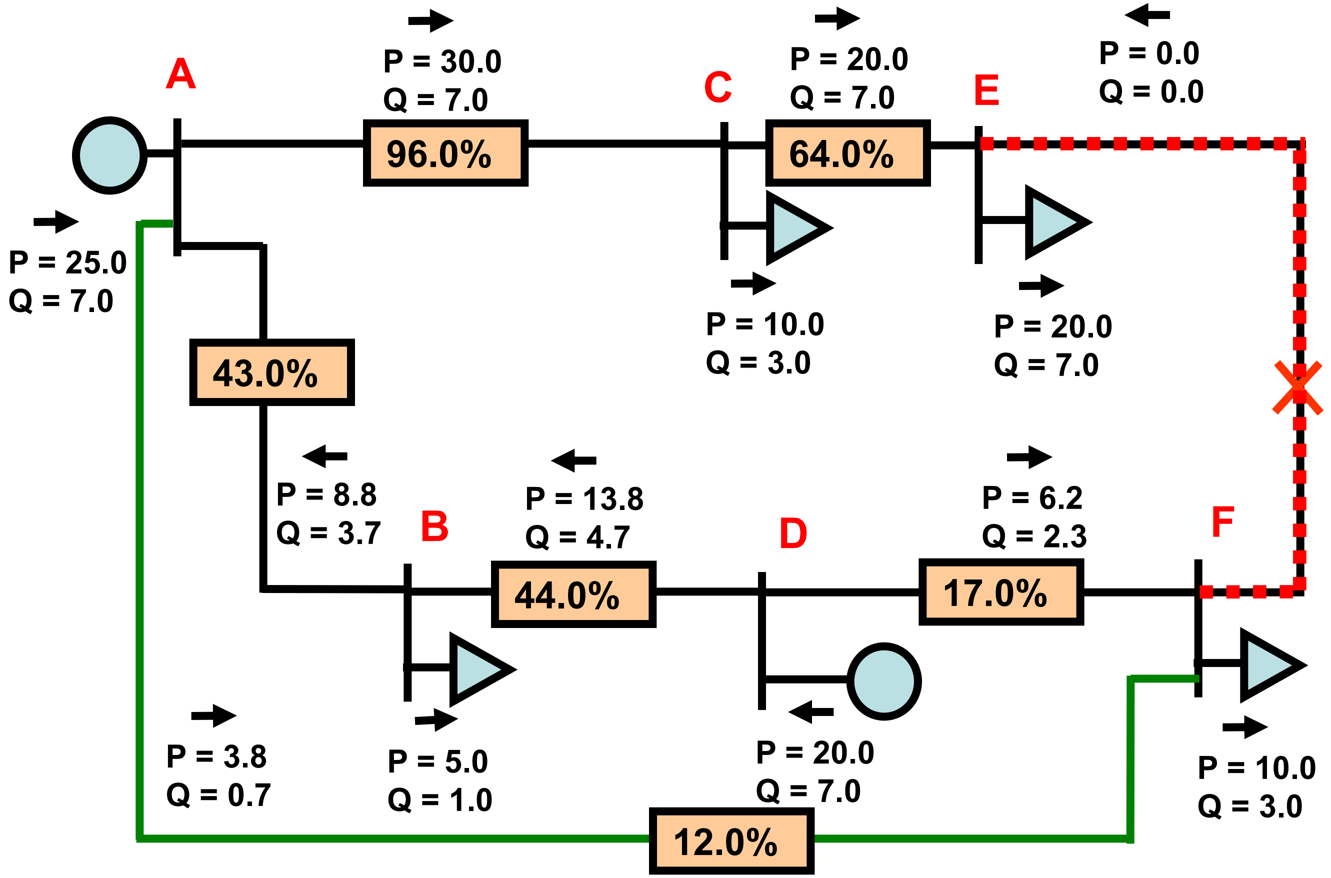
Line A – B overloaded for contingency A – C
Line D – F overloaded for contingency A – C

Transmission Expansion Plan



No transmission lines overloaded without contingencies

Transmission Expansion Plan

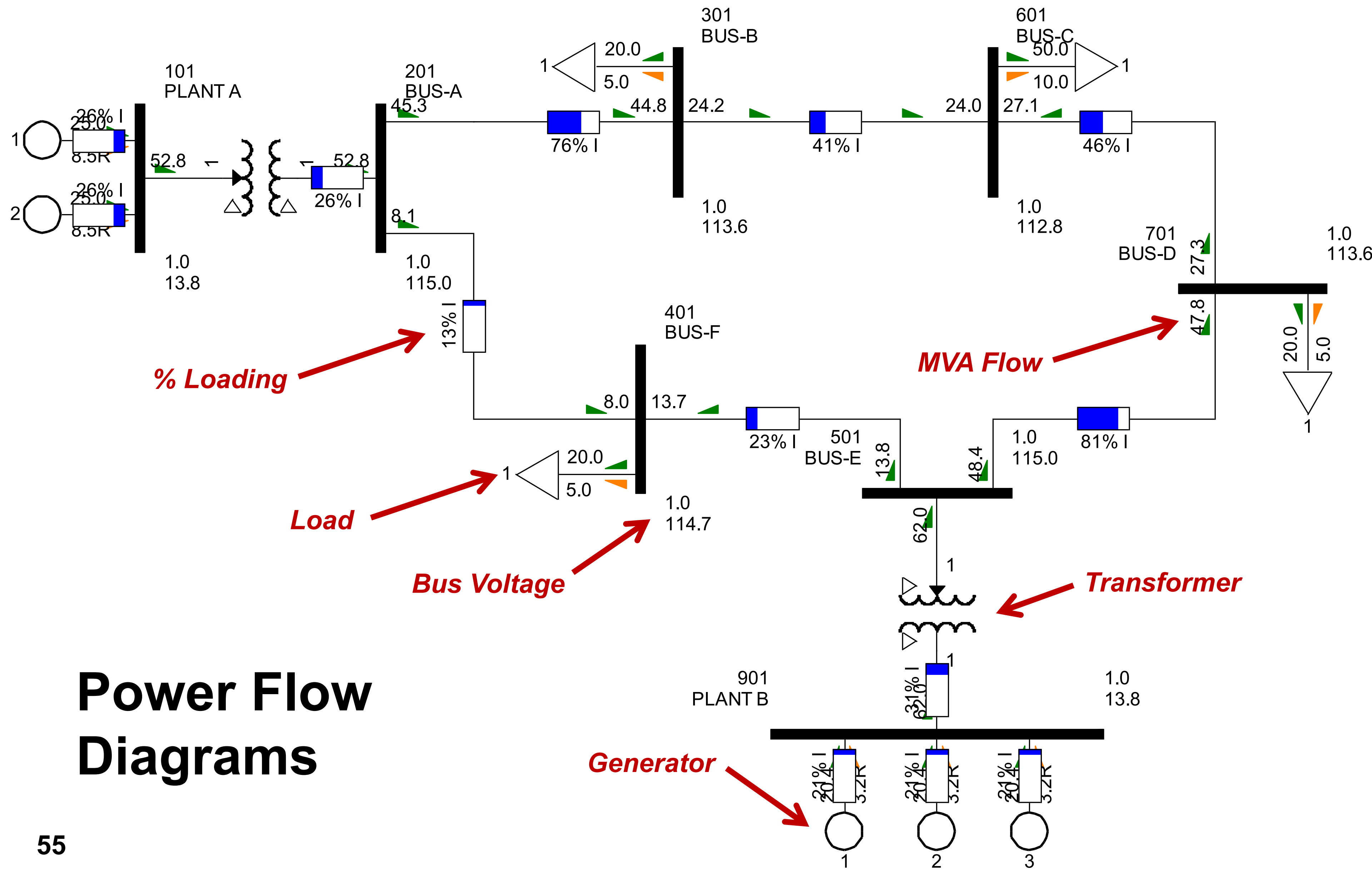


No transmission lines overloaded with contingencies (worst case shown)

Interactive Training Session

- **PSS/E BASICS**
  - **Power Flow Diagrams**
  - **Data Tables**
  - **AC Contingency Solution (ACCC) Analysis**

2014 SERTP

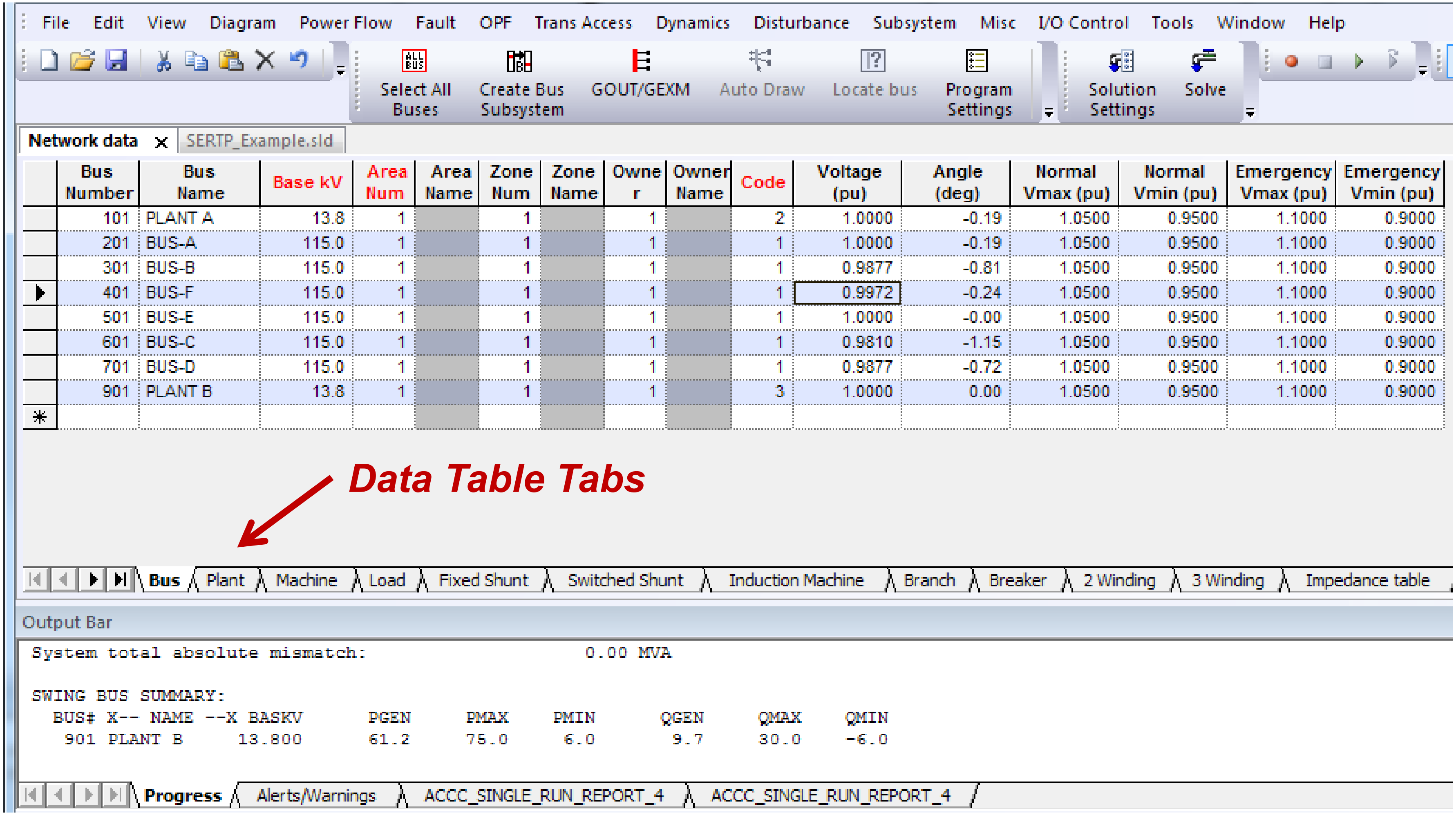


Power Flow Diagrams

Interactive Training Session

- **PSS/E BASICS**
  - Power Flow Diagrams
  - Data Tables
  - AC Contingency Solution (ACCC) Analysis

Interactive Training Session



Bus Number	Bus Name	Base kV	Area Num	Area Name	Zone Num	Zone Name	Owner	Owner Name	Code	Voltage (pu)	Angle (deg)	Normal Vmax (pu)	Normal Vmin (pu)	Emergency Vmax (pu)	Emergency Vmin (pu)
101	PLANT A	13.8	1		1		1		2	1.0000	-0.19	1.0500	0.9500	1.1000	0.9000
201	BUS-A	115.0	1		1		1		1	1.0000	-0.19	1.0500	0.9500	1.1000	0.9000
301	BUS-B	115.0	1		1		1		1	0.9877	-0.81	1.0500	0.9500	1.1000	0.9000
401	BUS-F	115.0	1		1		1		1	0.9972	-0.24	1.0500	0.9500	1.1000	0.9000
501	BUS-E	115.0	1		1		1		1	1.0000	-0.00	1.0500	0.9500	1.1000	0.9000
601	BUS-C	115.0	1		1		1		1	0.9810	-1.15	1.0500	0.9500	1.1000	0.9000
701	BUS-D	115.0	1		1		1		1	0.9877	-0.72	1.0500	0.9500	1.1000	0.9000
901	PLANT B	13.8	1		1		1		3	1.0000	0.00	1.0500	0.9500	1.1000	0.9000

```
System total absolute mismatch:                    0.00 MVA

SWING BUS SUMMARY:
  BUS# X-- NAME --X BASKV      PGEN     PMAX    PMIN      QGEN     QMAX    QMIN
   901 PLANT B      13.800     61.2     75.0     6.0       9.7     30.0    -6.0
```

Interactive Training Session

Bus Data

Network data × | SERTP_Example.sld

Bus Number	Bus Name	Base kV	Area Num	Area Name	Zone Num	Zone Name	Owner	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

Network data | SERTP_Example.sld

Bus Numbe	Bus Name	Id	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	☑
101	PLANT A 13.8	2	1		1		2	1.0000	201	☑
901	PLANT B 13.8	1	1		1		3	1.0000	501	☑
901	PLANT B 13.8	2	1		1		3	1.0000	501	☑
901	PLANT B 13.8	3	1		1		3	1.0000	501	☑

PGen (MW)	PMax (MW)	PMin (MW)	QGen (Mvar)	QMax (Mvar)	QMin (Mvar)	Mbase (MVA)	R Source (pu)	X Source (pu)	RTran (pu)	XTran (pu)	Gentap (pu)	Owner
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

Interactive Training Session

Branch (Line) Data

etwork data × | SERTP_Example.sld

From Bus Number	From Bus Name	To Bus Number	To Bus Name	Id	Line R (pu)	Line X (pu)	Charging B (pu)	In Service	Metered
201	BUS-A 115.0	301	BUS-B 115.0	1	0.020000	0.030000	0.000010	☑	☑ From
201	BUS-A 115.0	401	BUS-F 115.0	1	0.020000	0.030000	0.000010	☑	☑ From
301	BUS-B 115.0	601	BUS-C 115.0	1	0.020000	0.030000	0.000010	☑	☑ From
401	BUS-F 115.0	501	BUS-E 115.0	1	0.020000	0.030000	0.000010	☑	☑ From
501	BUS-E 115.0	701	BUS-D 115.0	1	0.020000	0.030000	0.000010	☑	☑ From
601	BUS-C 115.0	701	BUS-D 115.0	1	0.020000	0.030000	0.000010	☑	☑ From

Rate A	Rate B	Rate C	Line G From (pu)	Line B From (pu)	Line G To (pu)	Line B To (pu)	Length	Owner	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

Interactive Training Session

Transformer Data

Network data × | SERTP_Example.sld

	From Bus Number	From Bus Name	To Bus Number	To Bus Name	Id	Name	In Service	Metered	Winding 1 Side	Controlled Bus	Controlled Side	Tap Positions	Control Mode
	101	PLANT A 13.8	201	BUS-A 115.0	1		☑	☑ From	☑ From	0	☐ Tapped	33	None
	501	BUS-E 115.0	901	PLANT B 13.8	1		☑	☑ From	☑ From	0	☐ Tapped	33	None
*							☑	☑ 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

Interactive Training Session

Area Interchange Data

Network data × | SERTP_Example.sld

	Area Num	Area swing bus	Desired Interchang	Tolerance (MW)	Area Name
	1	901	0.00	10.00	
*					

Sum of all transfers in and out of Area 1.

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

Interactive Training Session

Load Data

Network data | SERTP_Example.sld

	Bus Number	Bus Name	Id	Code	Area Num	Area	Zone Num	Zone Nam	Owner	Owner Name	In Service
	301	BUS-B 115.0	1	1	1		1		1		☑
	401	BUS-F 115.0	1	1	1		1		1		☑
	601	BUS-C 115.0	1	1	1		1		1		☑
	701	BUS-D 115.0	1	1	1		1		1		☑
*											☑

Pload (MW)	Qload (Mvar)	IPload (MW)	IQload (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**

Interactive Training Session

- **ACCC requires the following data files:**
  - Subsystem
  - Monitor
  - Contingency

Interactive Training Session

❖ 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.

```
SUBSYSTEM [label]
(subsystem specification data record)
.
.
(subsystem specification data record)
END
```

```
AREA #
AREAS # #
ZONE #
ZONES # #
KV #
KVRANGE # #
BUS #
BUSES # #
```

Interactive Training Session

❖ 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
```

Interactive Training Session

❖ 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|
```

Interactive Training Session

❖ 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


END
```

Interactive Training Session

❖ 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.

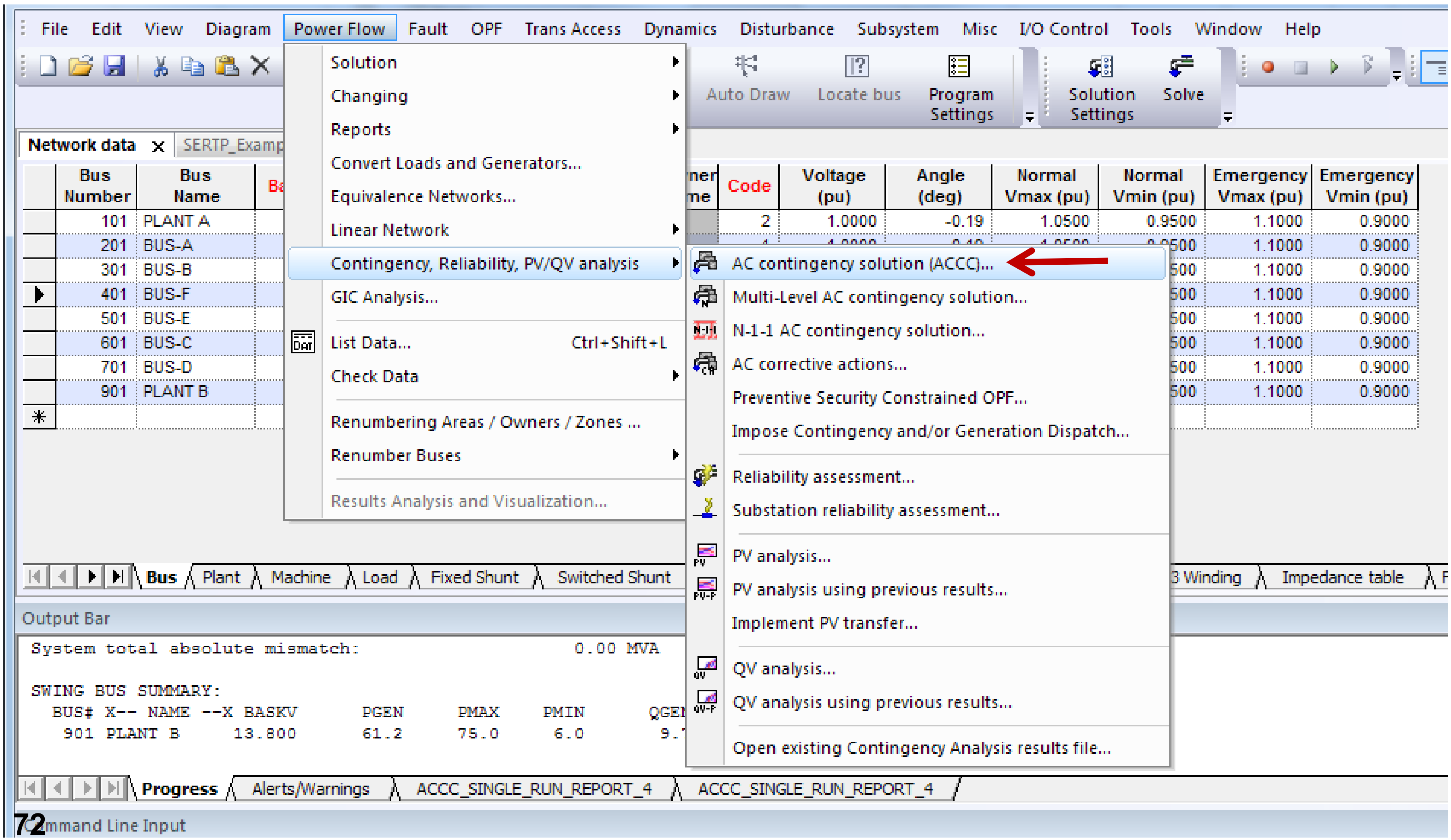
```
CONTINGENCY label [r r]
(contingency event specification record;
below)
.
.
(contingency event specification record;
below)
END
```

Interactive Training Session

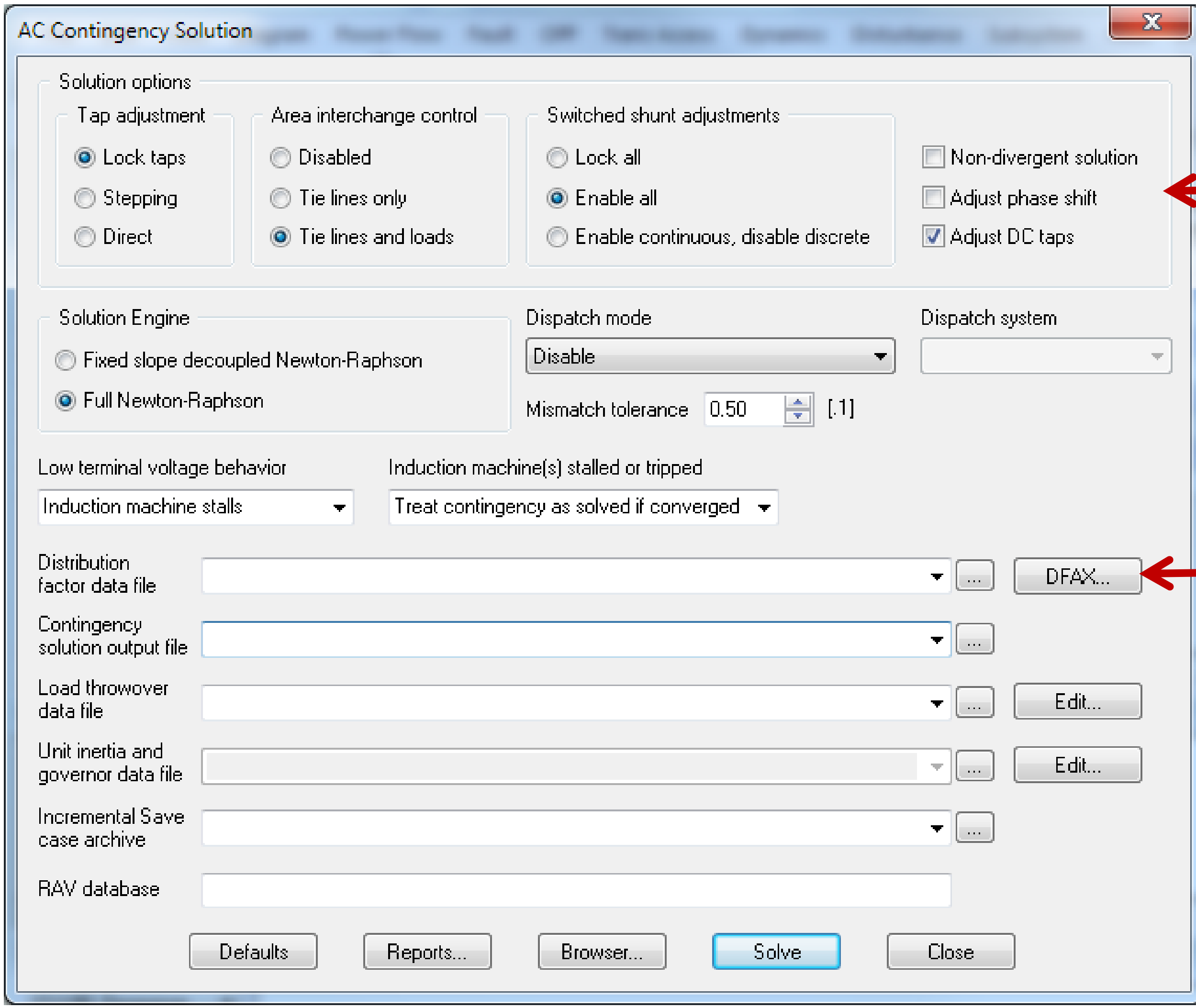
- **Example CONTINGENCY FILE**
  - This file takes contingencies on each branch (line) in the subsystem ‘SERTP’ one element at a time.

```
SINGLE BRANCH IN SUBSYSTEM 'SERTP'
END
```

ACCC Analysis



Interactive Training Session

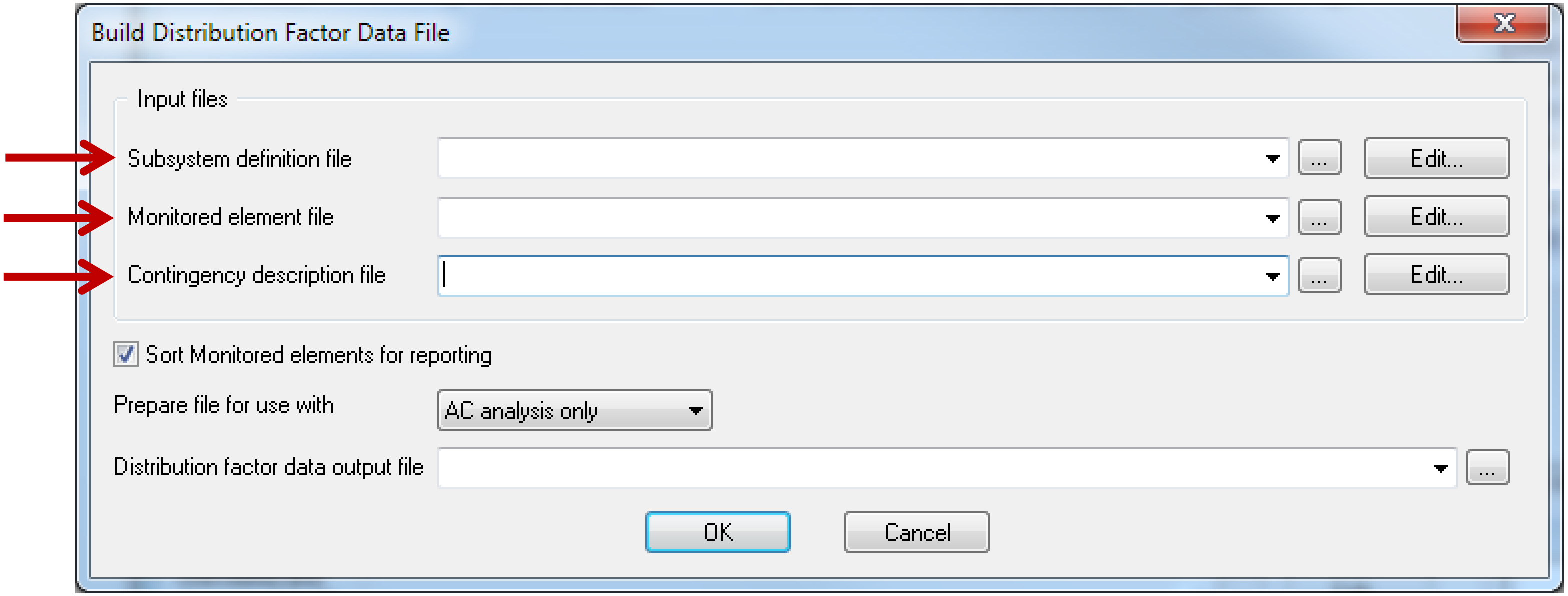


Typical Solve Parameters

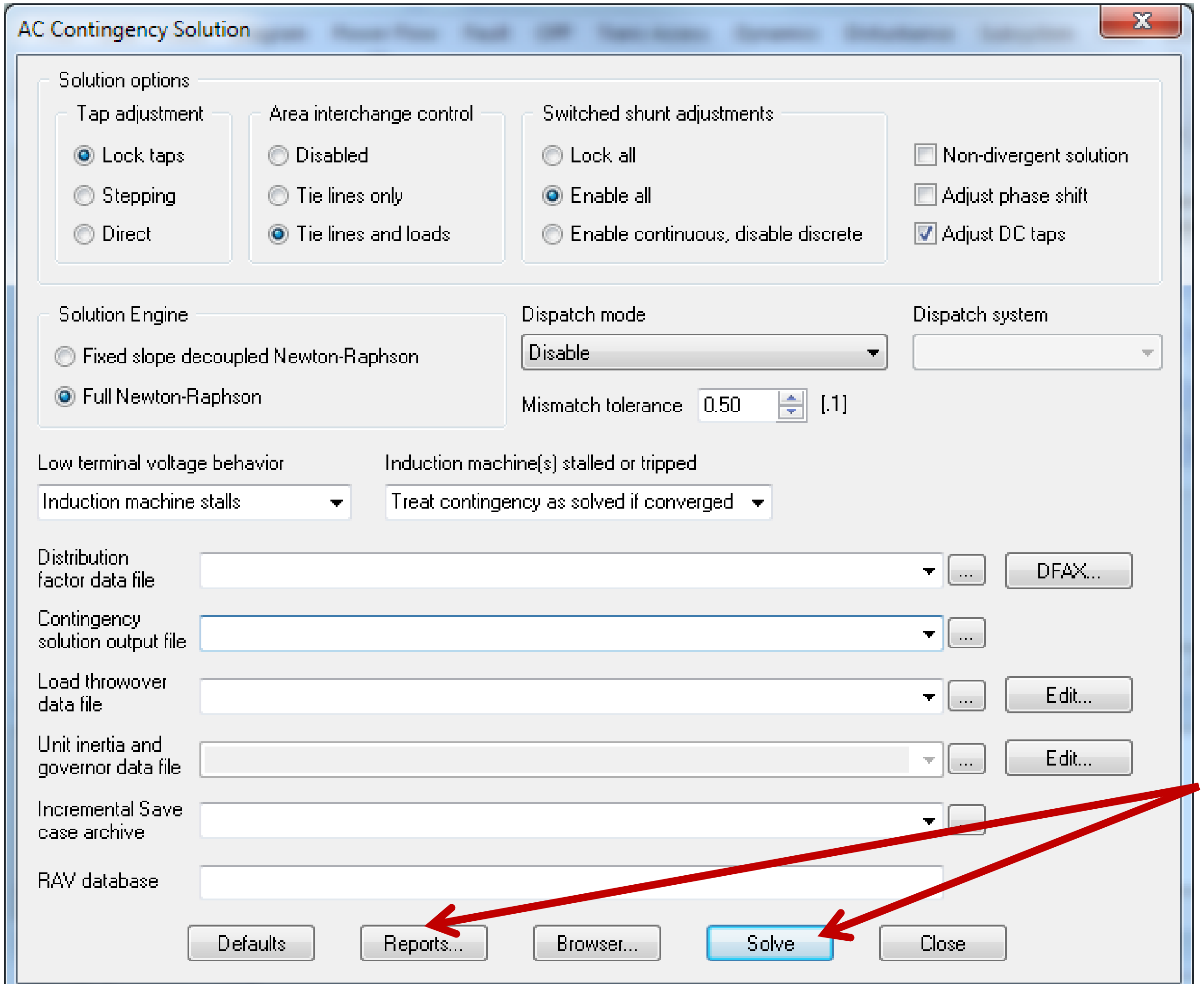
Create a DFAX file consisting of SUB/MON/CON

Interactive Training Session

Create a DFAX file consisting of SUB/MON/CON

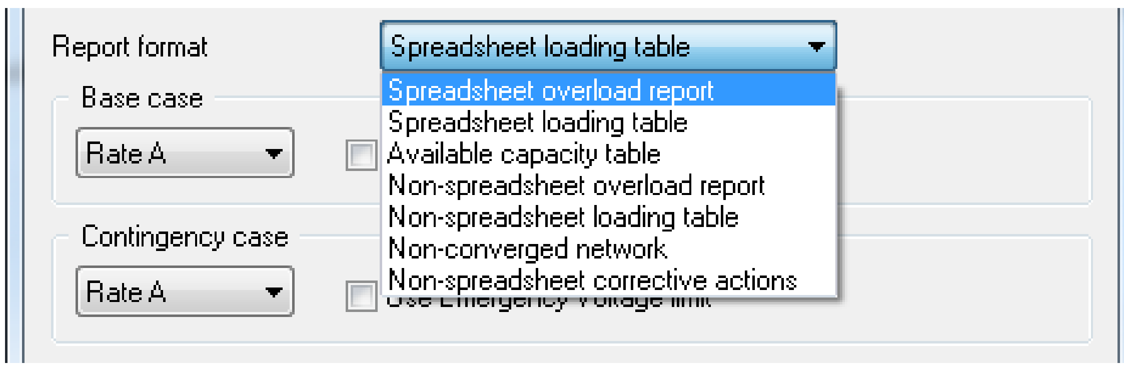


Interactive Training Session



Solve and Create Report

Interactive Training Session



❖ Example ACCC Results

```
<---------------- MONITORED BRANCH ---------> <- CONTINGENCY LABEL ------>   RATING   FLOW %
    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
    501*BUS-E   115.00    701 BUS-D   115.00 1 SINGLE 401-501(1)      60.0    61.8    103.1
    201*BUS-A   115.00    301 BUS-B   115.00 1 SINGLE 501-701(1)      60.0    96.5    165.3
    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
```

Thermal Loading Violations

```
MONITORED VOLTAGE REPORT:
SYSTEM               <- CONTINGENCY LABEL -> <----- B 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
'SERTP'        RANGE SINGLE 501-701(1)        601 BUS-C  115.00  0.92643  0.98104  1.05000  0.95000
'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
```

Voltage Violations

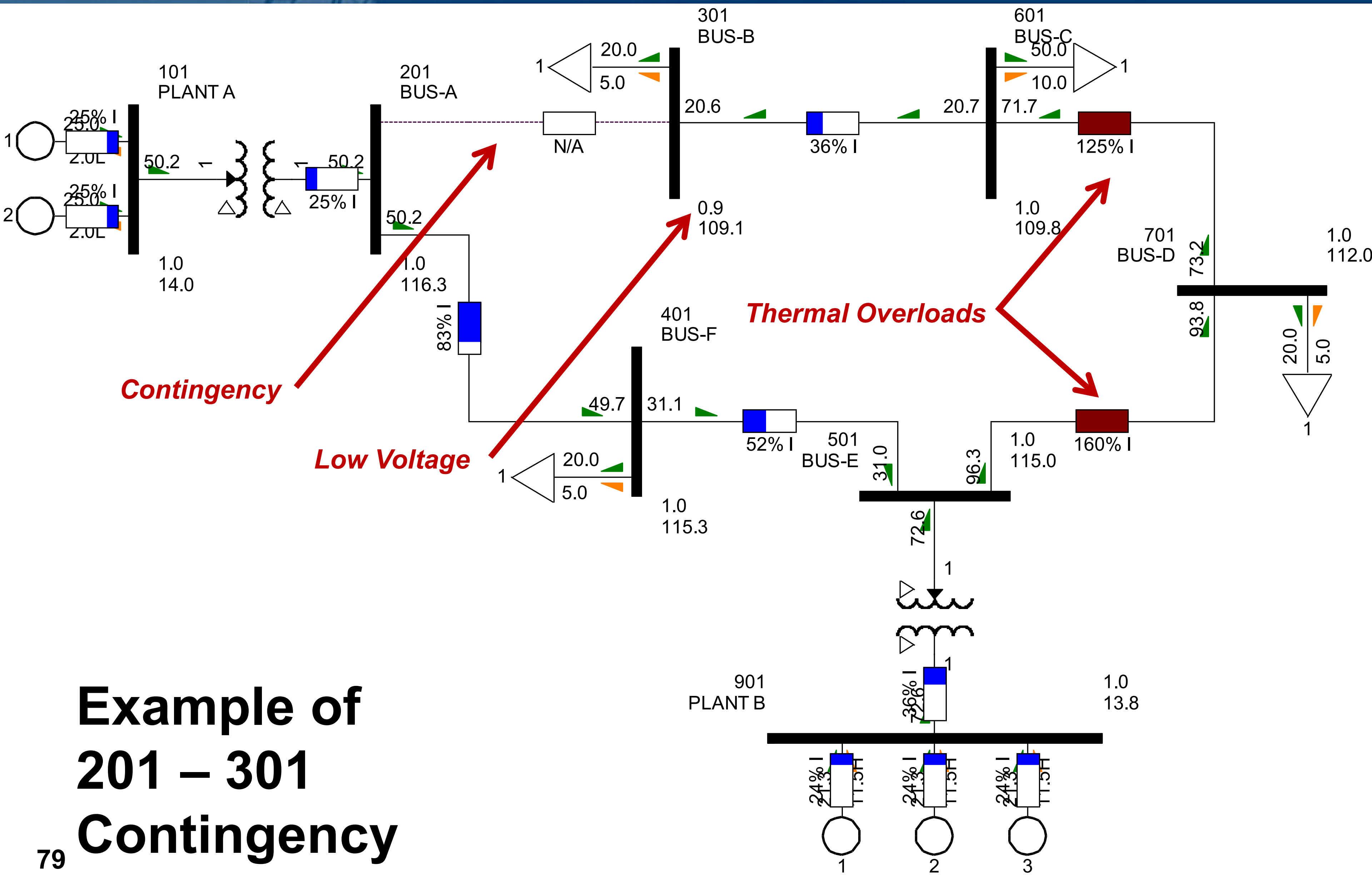
❖ ACCC Results - Summary of Violations Per Contingency

```
<----- CONTINGENCY LABEL ------><----- POST-CONTINGENCY SOLUTION ----->
                                <TERMINATION  STATE> FLOW# VOLT#  LOAD
BASE CASE                        Met convergence to     0     0    0.0
SINGLE 201-301(1)                Met convergence to     2     1    0.0
SINGLE 201-401(1)                Met convergence to     0     0    0.0
SINGLE 301-601(1)                Met convergence to     1     0    0.0
SINGLE 401-501(1)                Met convergence to     1     0    0.0
SINGLE 501-701(1)                Met convergence to     3     5    0.0
SINGLE 601-701(1)                Met convergence to     1     0    0.0
```

# of Violations

Southeastern Regional TRANSMISSION PLANNING

2014 SERTP

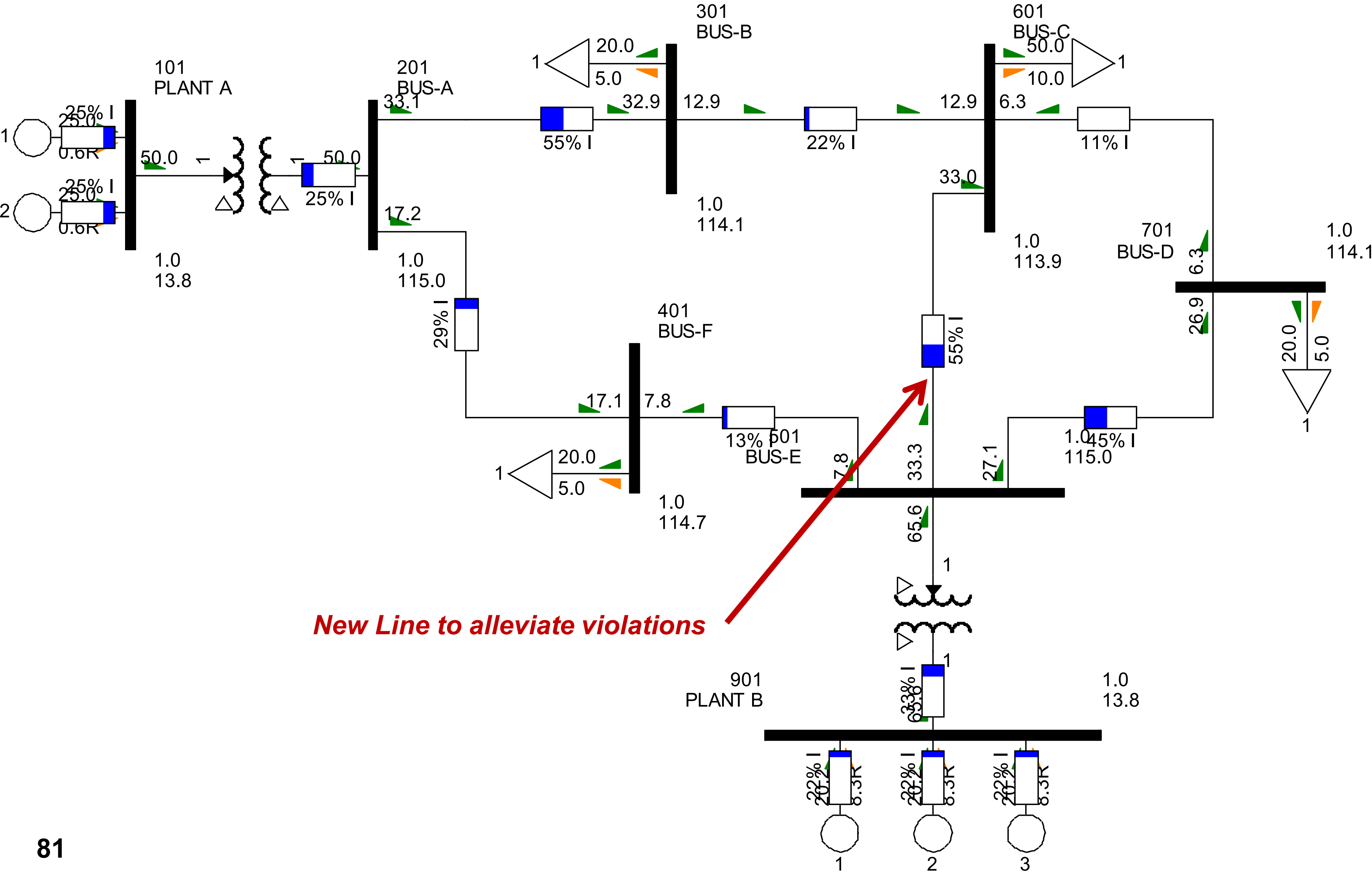


Example of 201 – 301 Contingency

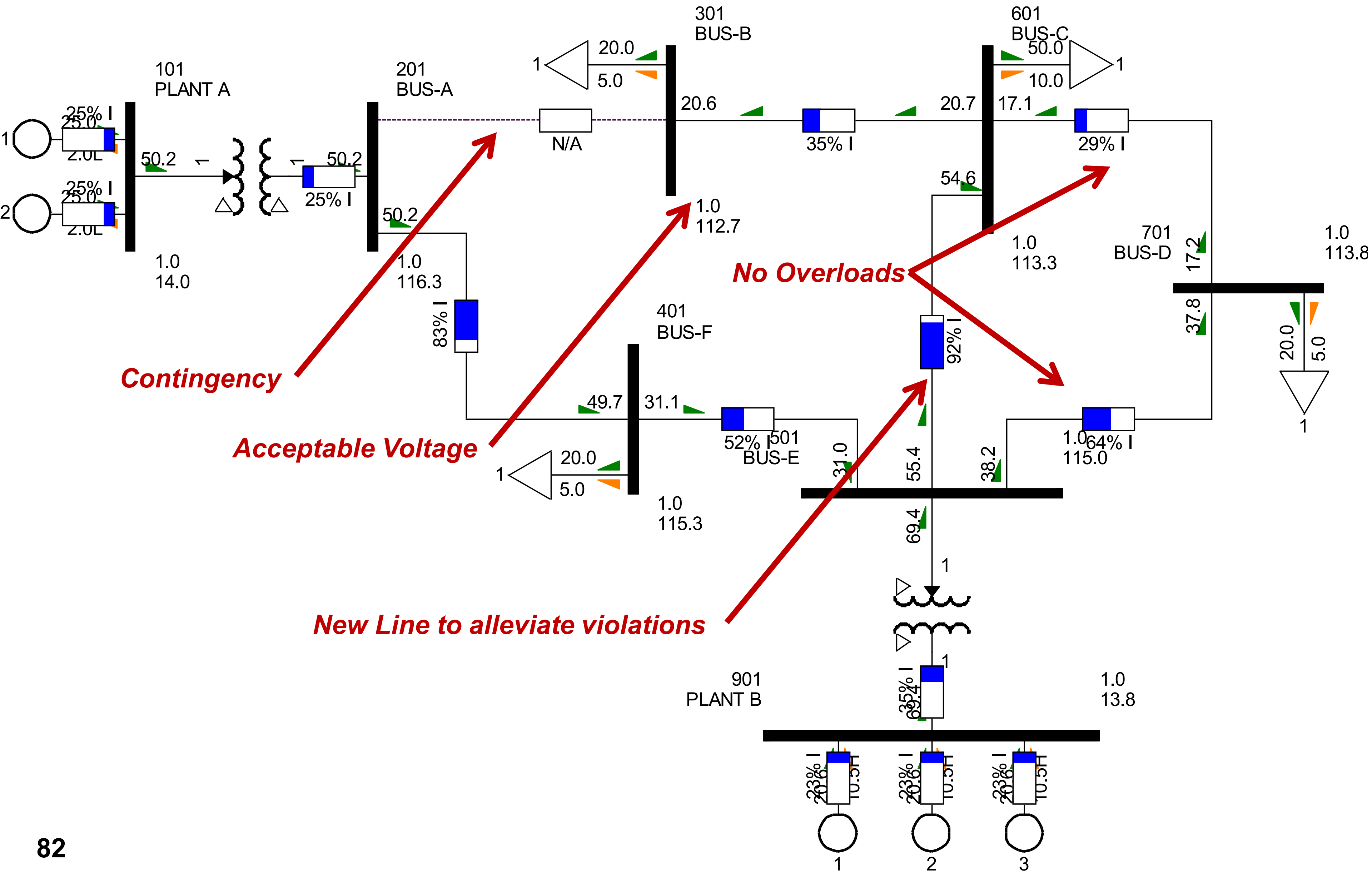
Interactive Training Session

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

2014 SERTP


101
PLANT A
1.0
13.8
201
BUS-A
1.0
115.0
301
BUS-B
1.0
114.1
601
BUS-C
1.0
113.9
701
BUS-D
1.0
114.1
401
BUS-F
1.0
114.7
501
BUS-E
1.0
115.0
901
PLANT B
1.0
13.8
55% I
22% I
11% I
25% I
29% I
13% I
45% I
New Line to alleviate violations

2014 SERTP

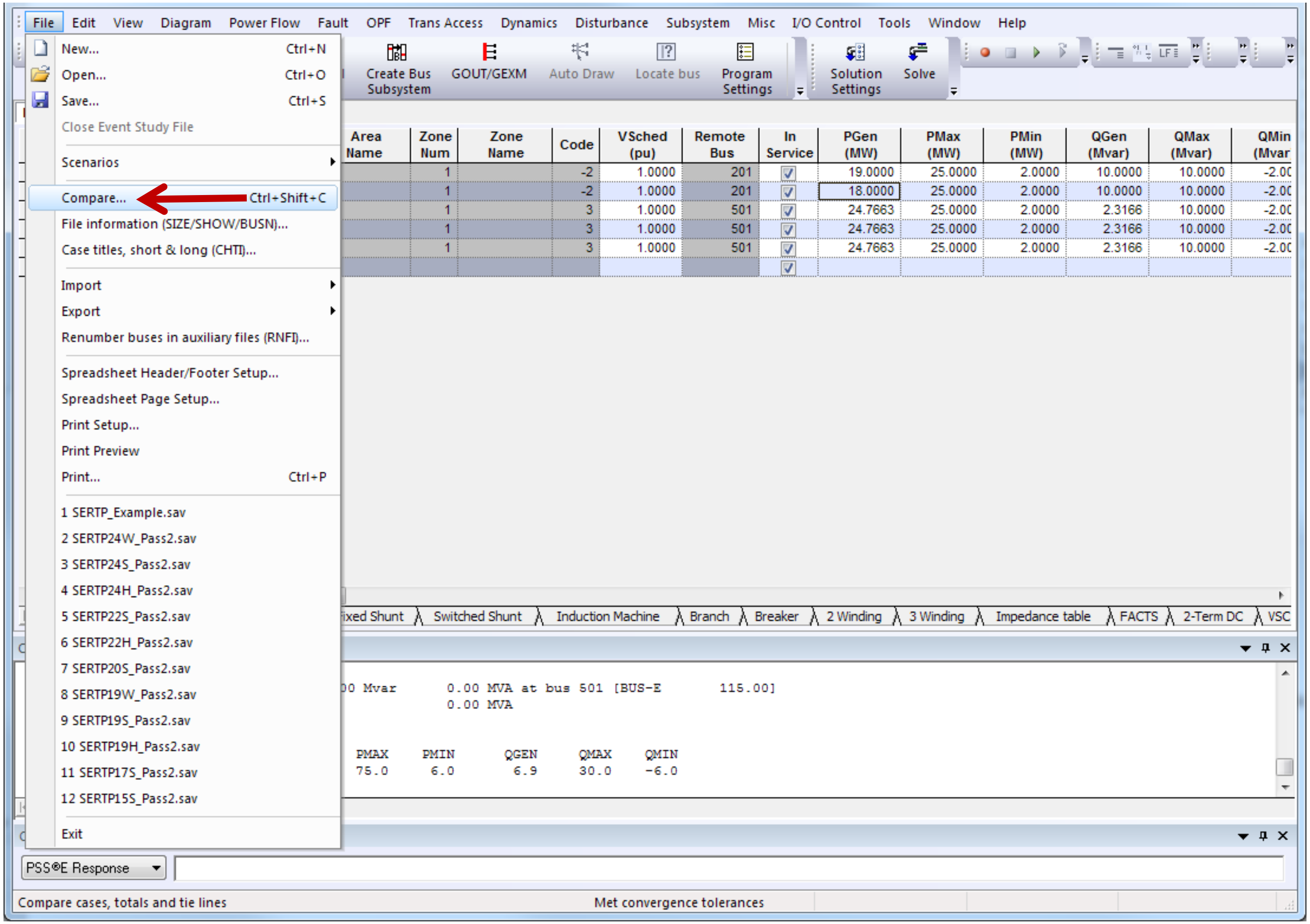

101
PLANT A
1.0
14.0
201
BUS-A
1.0
116.3
301
BUS-B
1.0
112.7
601
BUS-C
1.0
113.3
701
BUS-D
1.0
113.8
401
BUS-F
1.0
115.3
501
BUS-E
1.0
115.0
901
PLANT B
1.0
13.8
N/A
35% I
29% I
83% I
92% I
52% I
64% I
25% I
20.0
5.0
50.0
10.0
20.6
20.7
17.1
54.6
50.2
49.7
31.1
31.0
55.4
38.2
69.4
17.2
37.8
Contingency
Acceptable Voltage
No Overloads
New Line to alleviate violations

- **ACCC Results - Summary of Violations Per Contingency with project applied**

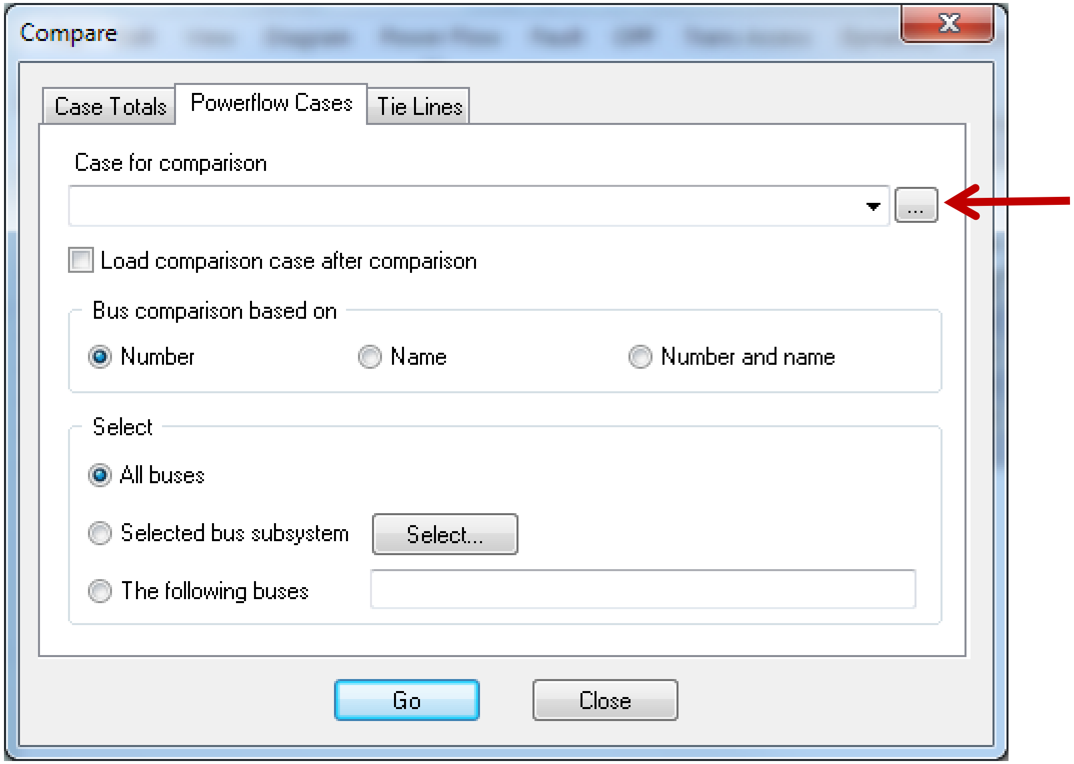
```
<----- CONTINGENCY LABEL ------><----- POST-CONTINGENCY SOLUTION ----->
                                <TERMINATION  STATE> FLOW# VOLT#  LOAD
BASE CASE                        Met convergence to      0     0   0.0
SINGLE 201-301(1)                Met convergence to      0     0   0.0
SINGLE 201-401(1)                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

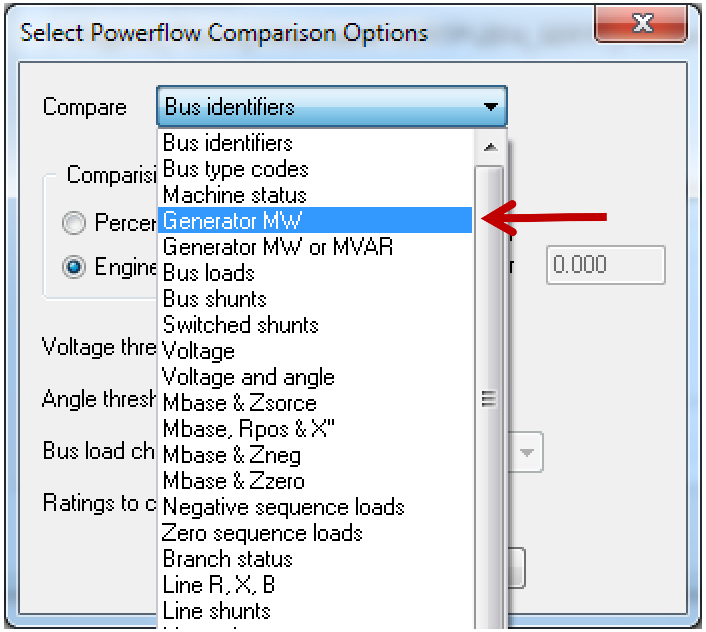
Compare Cases



Compare Cases



Compare Cases



Compare Cases

```
PTI INTERACTIVE POWER SYSTEM SIMULATOR--PSS(R)E     MON, MAR 24 2014   8:17
COMPARISON OF THE WORKING CASE AND THE SAVED CASE SERTP_Example.sav

BUSES WITH MW GENERATION DIFFERING BY MORE THAN   0.0 MW:
                            IN WORKING CASE   IN SERTP_Example.sav
X---------- BUS ----------X     MW       MVAR        MW       MVAR    DELTA MW    %       MVAR     %
   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
```

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
    - Obtain stakeholder input and feedback regarding the plan

Wrap Up