Power Systems Lab using PSS®E and Python

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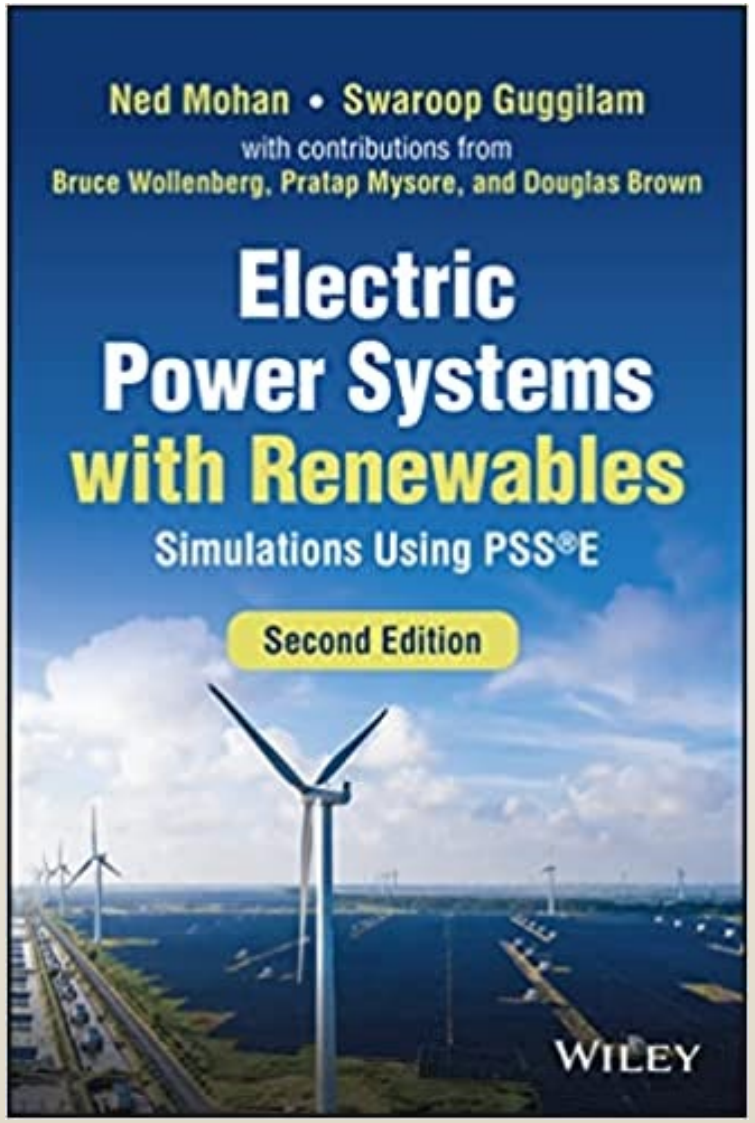
ASSOCIATED TEXTBOOK

Amazon Link



HIGHLIGHTS

This lab will be available on **CUSP (https://cusp.umn.edu/)** website for **FREE**.

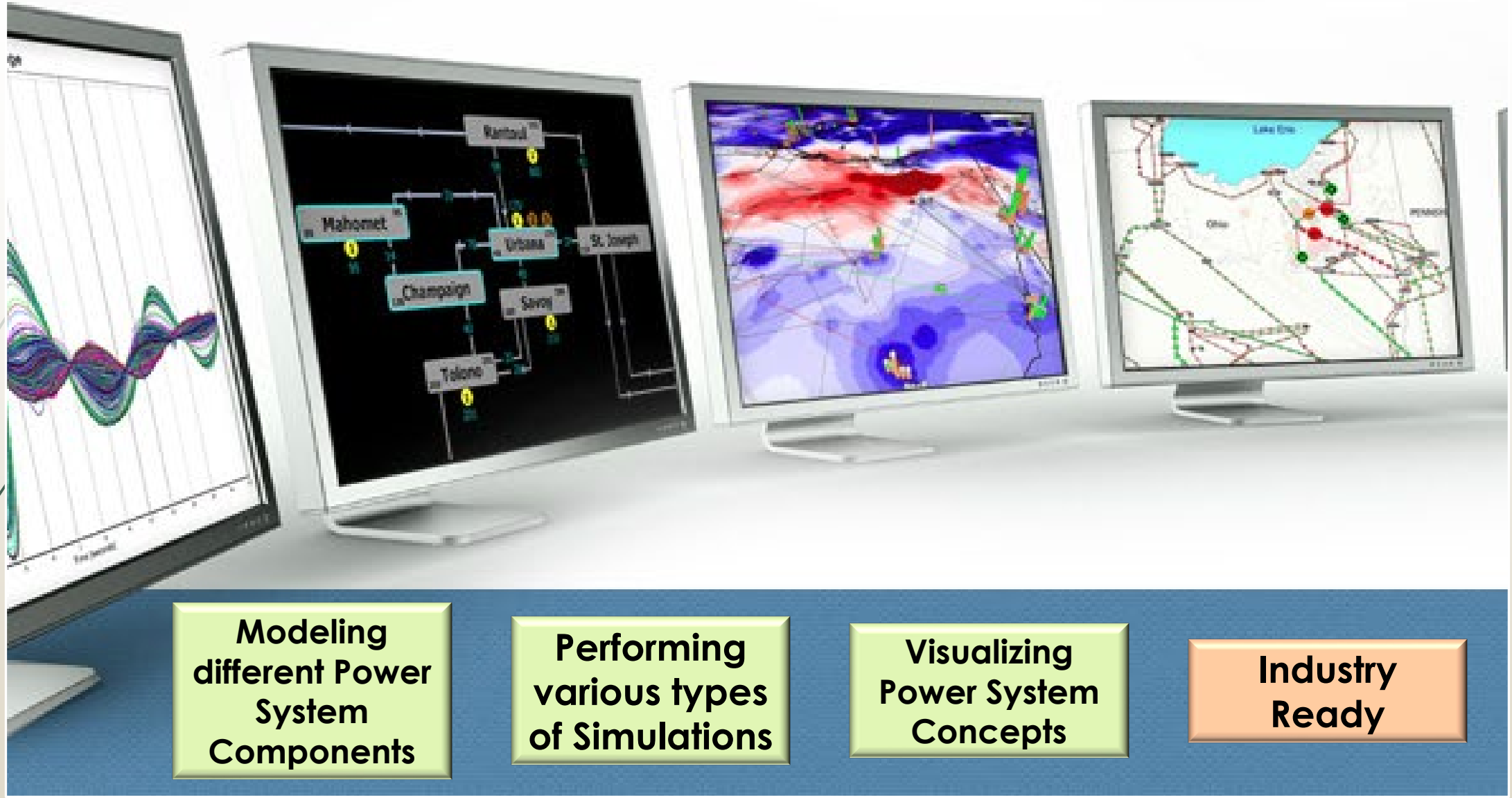
*Expected Jan 2024

Software - PSS®E Xplore Student Version. Available for **FREE**.

Video tutorials available for **FREE**.

Live Webpage

WHY THIS LAB?



Modeling different Power System Components

Performing various types of Simulations

Visualizing Power System Concepts

Industry Ready

PRELIMINARY LIST OF EXPERIMENTS

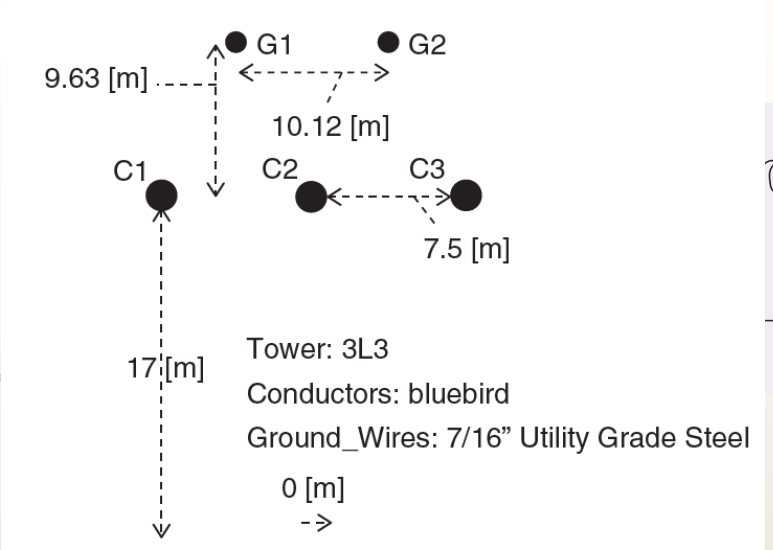
- 1. Visit a local substation or a generating plant.
- 2. Familiarizing yourself with PSSE Software (Installation and the Graphical User Interface Usage).
- 3. Designing the transmission line parameters using PSSE-Lineprop Tool.
- 4. Power Flow analysis using MATLAB and PSSE.
- 5. Modeling and analysis of Transformers.
- 6. HVDC transmission line modeling and performing various control actions on voltage source converters.
- 7. Synchronous generator model and analysis.
- 8. Voltage regulation using generators, shunts, static compensators, capacitor banks, etc.
- 9. Inverter based resources modeling for steady state analysis in PSSE.
- 10. Performing optimal power flow using PSSE.
- 11. Transient Stability using MATLAB.
- 12. Setting up PSSE Python Environment and Basics.
- 13. Performing power flow and analysis using python automated script.

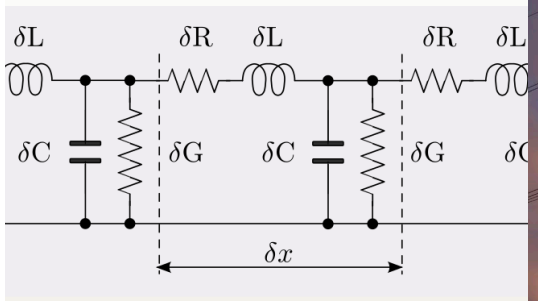
Note:

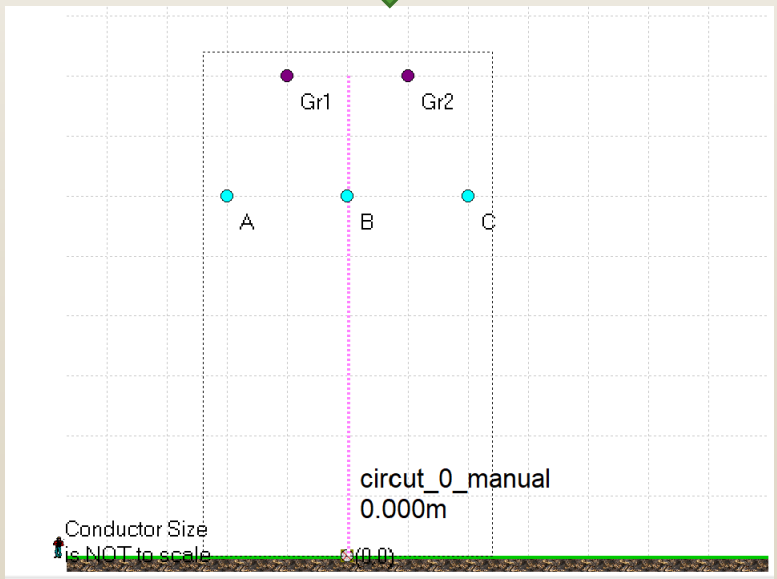
- ❑ The primary focus will be PSS®E but MATLAB and other tools will also be acknowledged and used where applicable.
- ❑ More experiments will be added

DESIGNING TRANSMISSION LINE PARAMETERS

TRANSMISSION LINE PARAMETERS

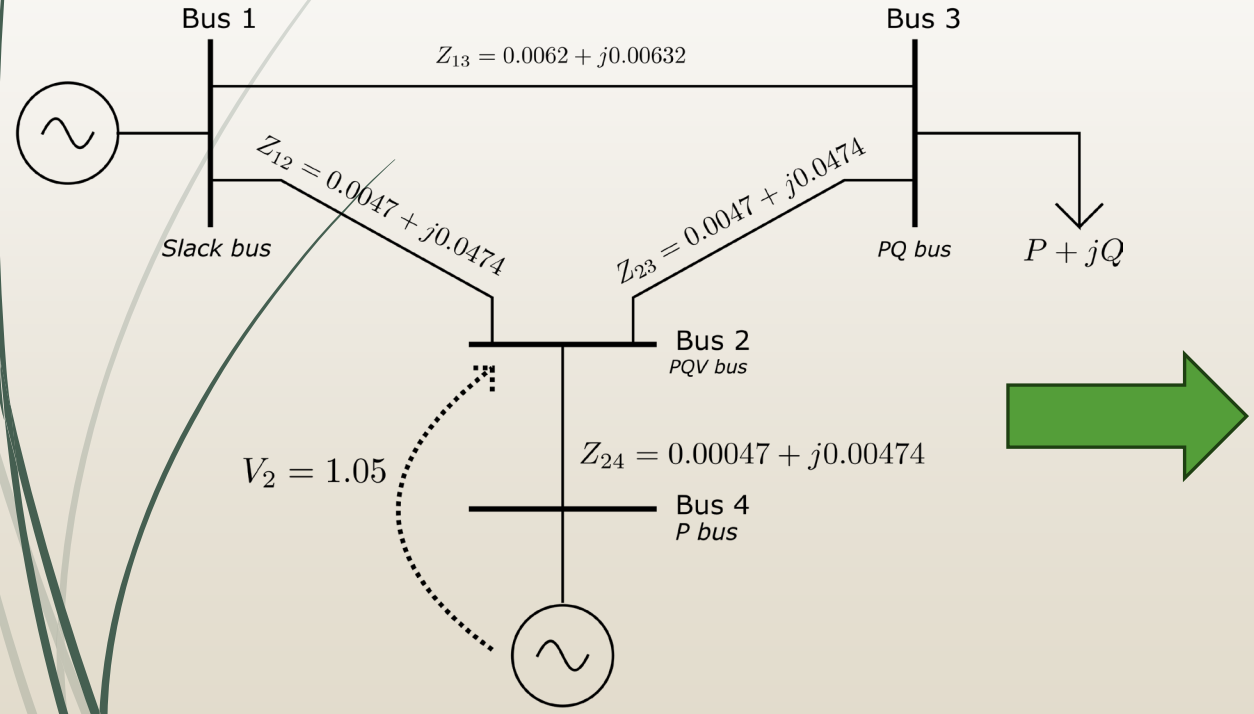


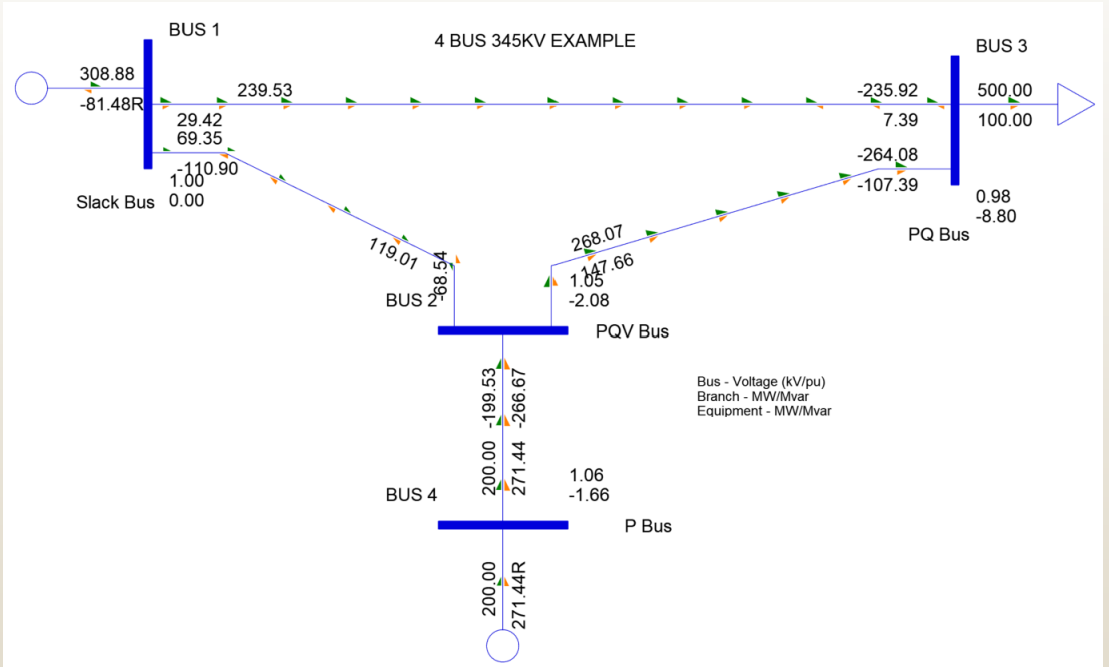




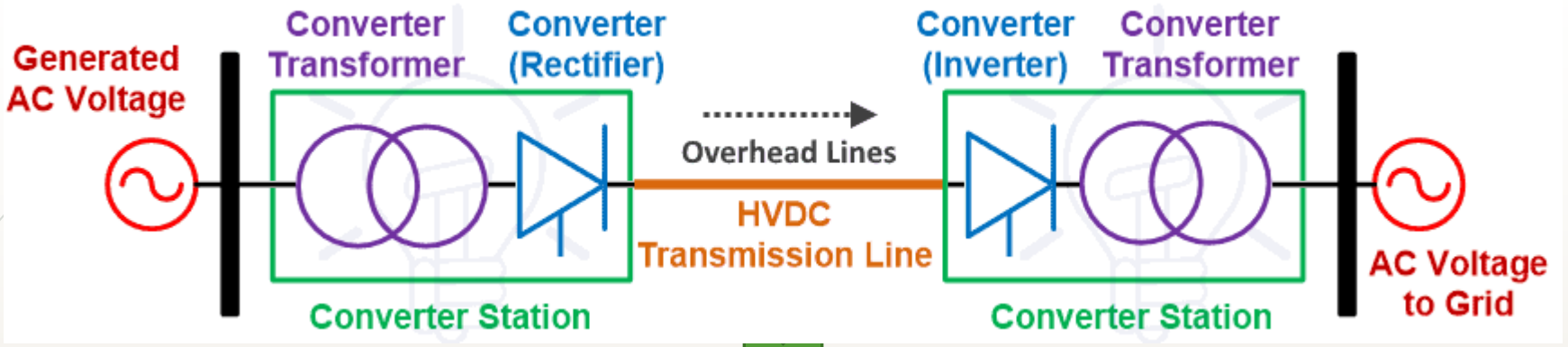
MODELING OF POWER SYSTEM AND ITS COMPONENTS

CREATING POWER SYSTEM MODEL IN PSS®E

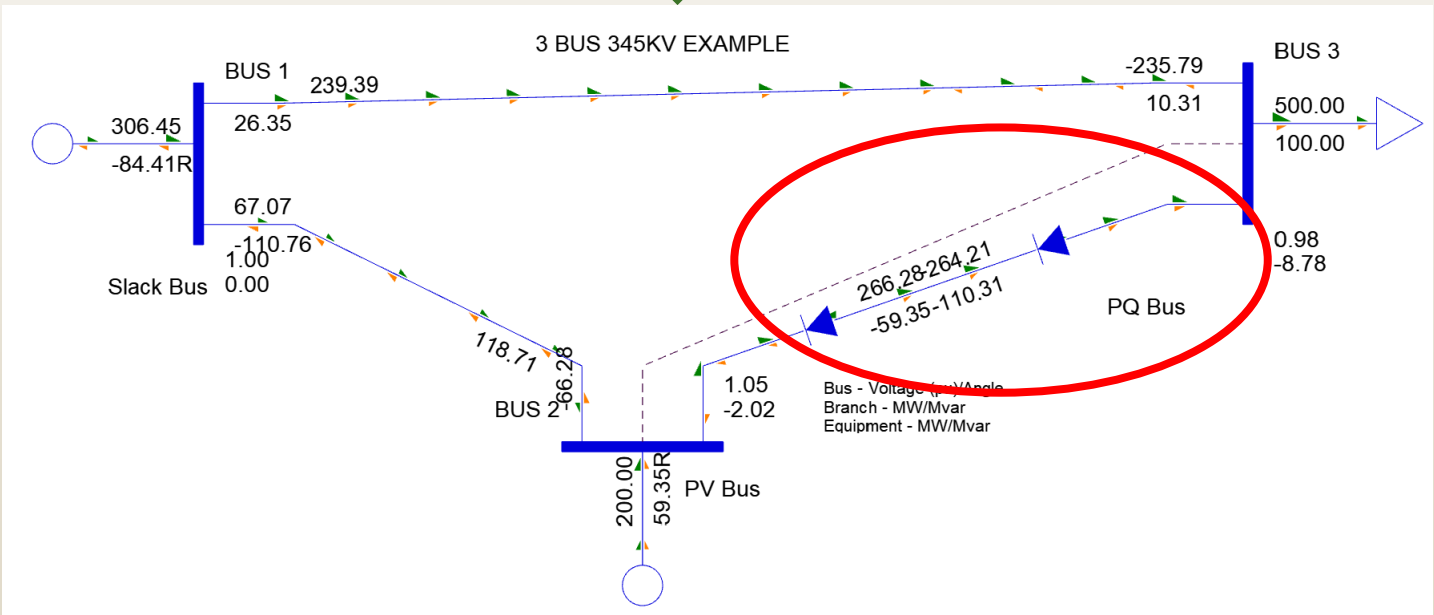




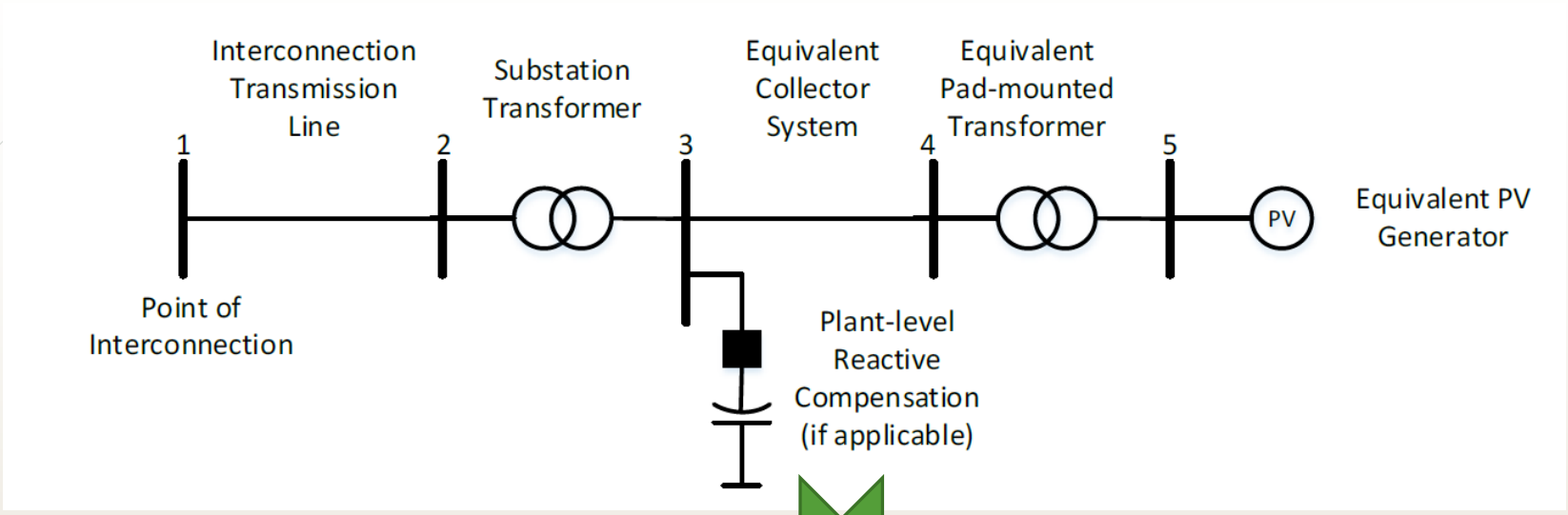
HVDC MODELING

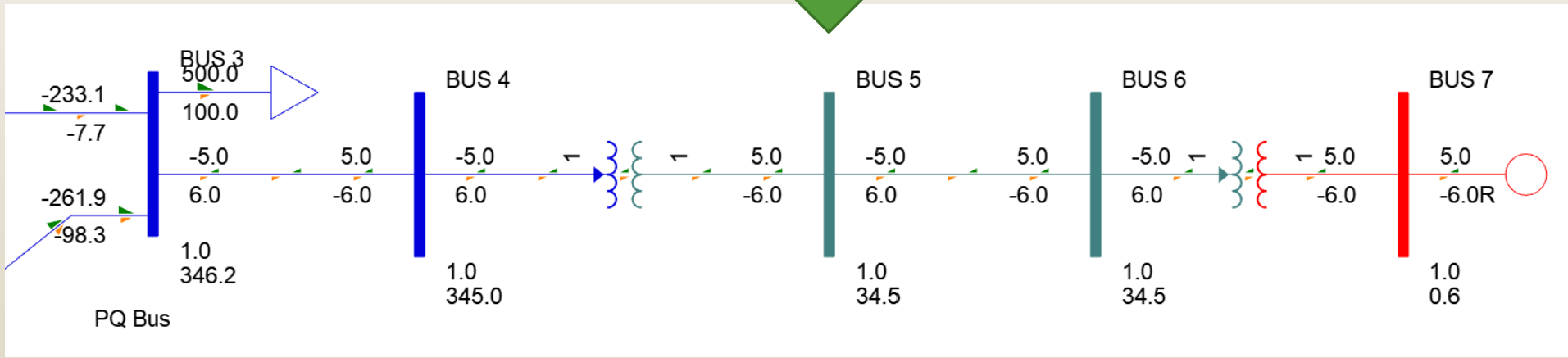


Source



INVERTER BASED RESOURCES (IBR)

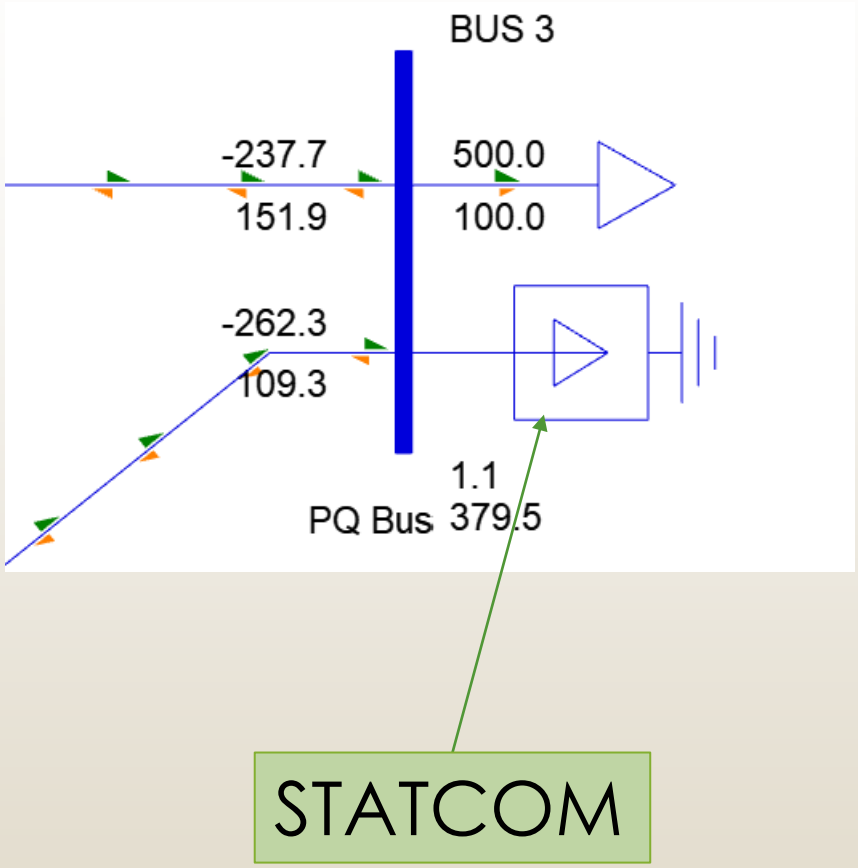




*https://www.wecc.org/Reliability/Solar%20PV%20Plant%20Modeling%20and%20Validation%20Guidline.pdf

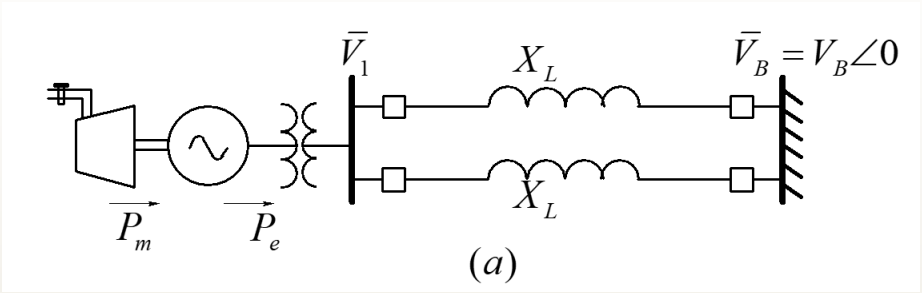
STATCOM

- Provides Voltage Regulation
- Inject or Absorb Reactive Power
- Applicable for Dynamic Simulation or Steady State Power Flow
- Linear V-I curve

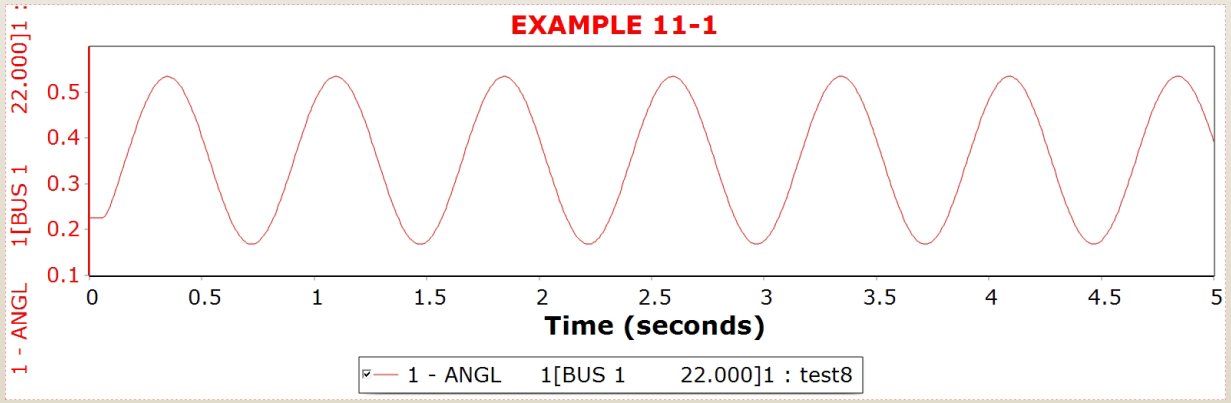


ANALYSIS OF THE POWER SYSTEM

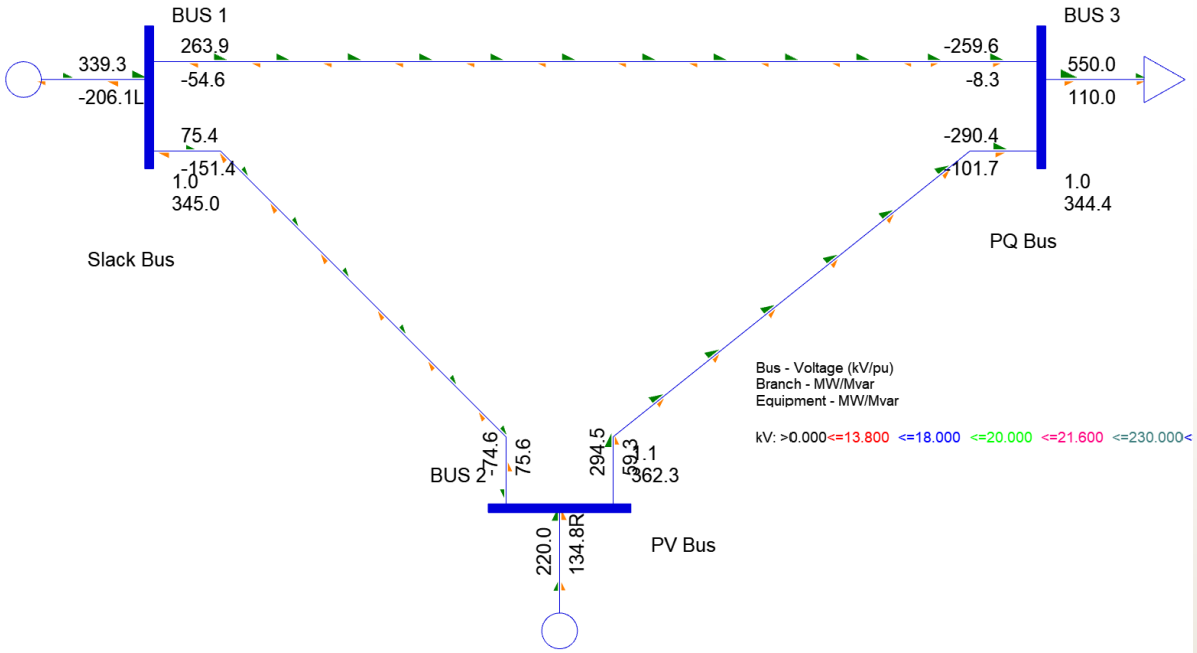
TRANSIENT STABILITY ANALYSIS



Rotor-Angle Curve due to Fault on one of the transmission lines



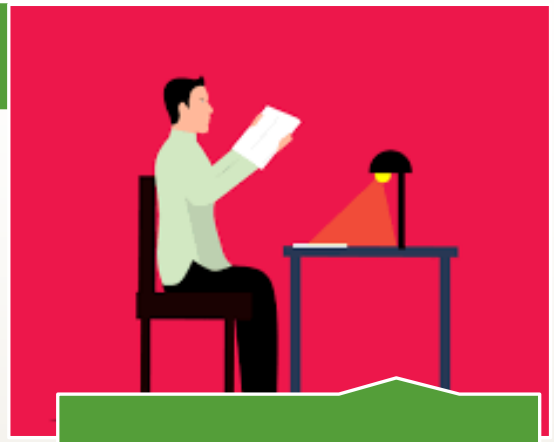
OPTIMAL POWER FLOW




```
Optimal Solution Found.

Minimum fuel cost objective: 2190.99

Elapsed time: 0 minutes, .109863E-01 seconds.

GENERATOR FUEL COST SUMMARY:
----------------------------

   ID TYPE FUEL $     MW OUTPUT     MW MINIMUM MW MAXIMUM    BUS#-SCT X-- NAME --X BASKV ID    PGEN      PFRAC
 ---- ---- ---------- ----------    ---------- ----------  ------------------------------ --   --------  -----
    1 POLY    1402.48     361.20         50.00     450.00       1     BUS 1        345.00  1    361.200  1.000
    2 POLY     788.51     197.90         50.00     300.00       2     BUS 2        345.00  1    197.902  1.000
           ========== ==========    ========== ==========
   TOTALS:    2190.99     559.10        100.00     750.00
```

PSS®E Python

Python



Easy to Learn

Accessible

Support

Libraries

PSS®E Python

Automation

Plots

Bulk Analysis

Time Saving

Questions?

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