Power Quality Impact Study for Interconnection of Heterogeneous Distributed Energy Resources

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Outline

- Research Objectives
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Research Objectives

- This project aims to study the combined impacts on power quality due to the interconnection of multiple distributed generators on a distribution utility feeder.

- The study involves investigating the following:
  - Harmonic injections
  - Voltage fluctuations
  - Voltage swell/sag
  - Flicker
  - Impact of low frequency anti-islanding signal injection
  - Different switching frequency converters
  - Impact of harmonics on nearby transformers

Research Significance

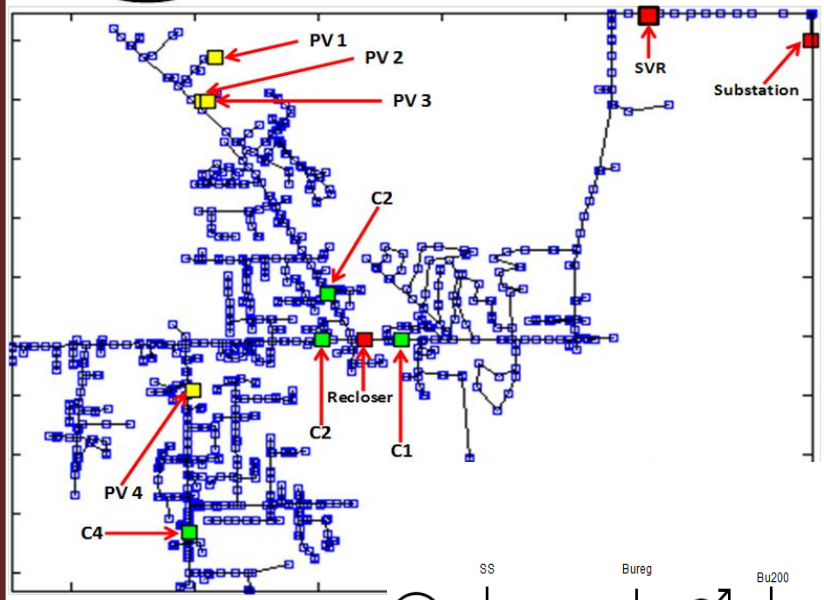
- **Power Quality**:
  - Refers to a wide variety of electromagnetic phenomenon that characterize the voltage and current at a given location on the power system. [IEEE Std. 1159]

- Penetration of renewable energy sources to the grid in the form of local generation sources is increasing.

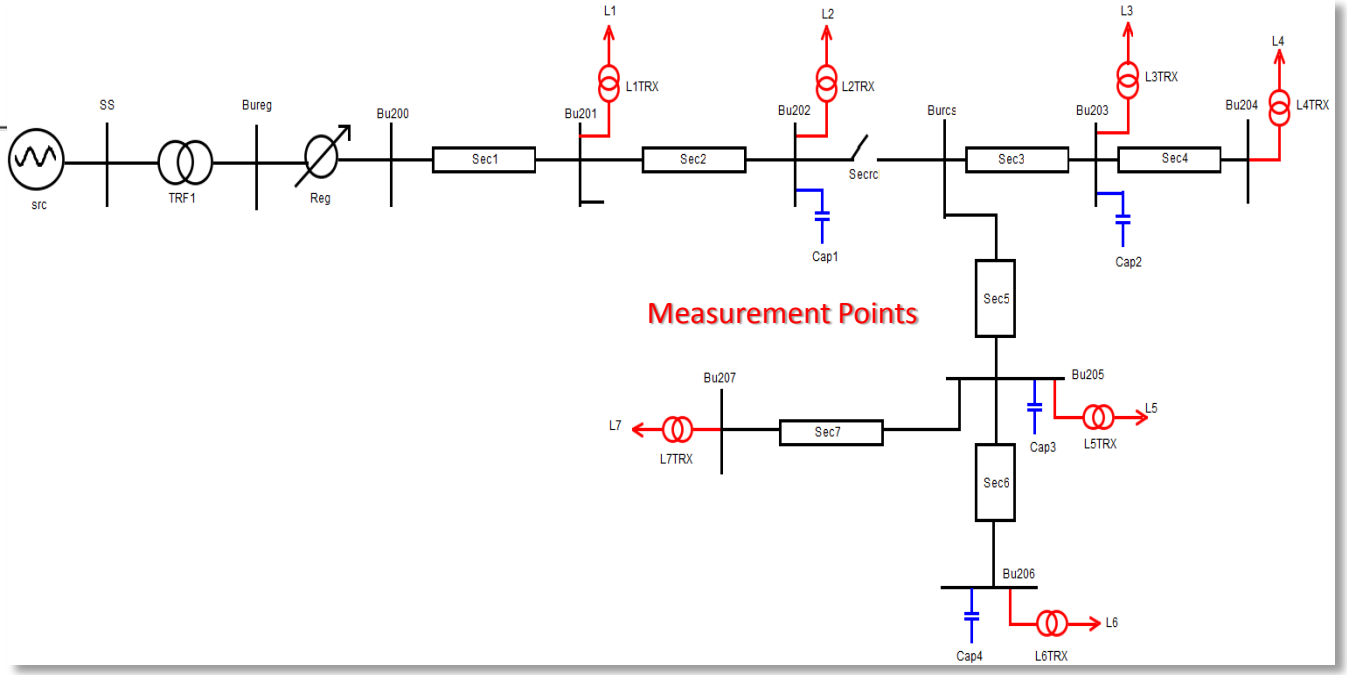
- Grids are moving towards bidirectional power flow where customers can produce power and inject the excess onto the grid as a part of a “Smart Grid” concept involving smart metering , automation, and lots of other new concepts.

- It is better to be prepared to what to expect as the DG penetration increases and start looking for early solutions.

Modeling



- 12.47 kV distribution system.
- Connects to substation at 138 kV level through a 22 MVA, 138 kV /12.47 kV transformer.
- Recloser located at 2.2 miles from substation
- Feeder splits to two laterals after the recloser extending to two miles.
- SVR with $\mp 10\%$ regulation with 32 steps, 2 minute operation time.
- Four switched capacitor banks, total of 3.3 MVAR.
- Average loading of 5 MW, and peak around 6-7 MW.
- 1200 line sections and 800 distribution transformers.



Some Results