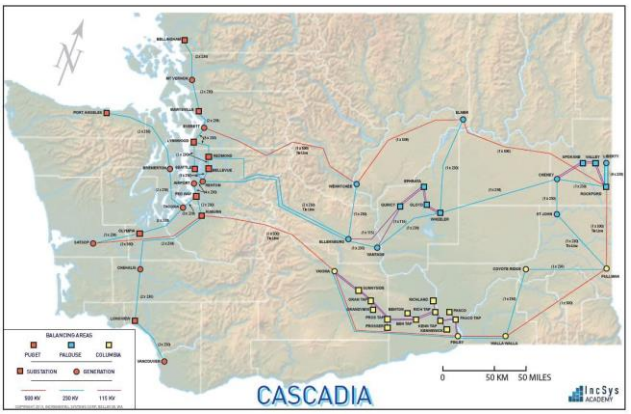
Transmission Lines



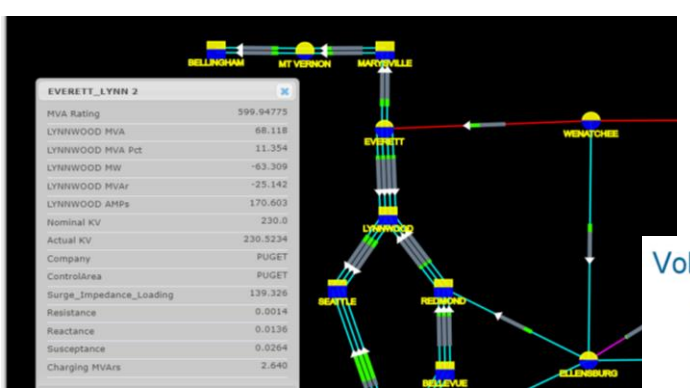
This course is a computer based blended course of video lecture and simulation exercise to instruct students on the features of Transmission Lines in regards to voltage control on networks and surge impedance loading. They will also learn the characteristics of transmission lines in regards to voltage control on a network. The lecture will explain the behavior of transmission lines under various loaded conditions. Students will learn the definition and derivation of Surge Impedance Loading (SIL). Using the concept of SIL as a square function, students learn how severely MVArs are consumed or created based on the line loading and the SIL. Students will then apply what they have learned through a simulation exercise where they operate a hypothetical network and observe transmission lines characteristics at different loading levels. The students learn how MVAr gains and losses affect the voltage profile in order to predict the changes in voltage during the simulation exercise. Students will also learn the derivation of the Ferranti rise calculation, how the condition is caused, and the risks associate. They will also observe and record system conditions on different transmission lines in the network and record the MVAr reserves in the system and what are produced on a set of transmission lines. Students prepare to increase the load on those lines, and calculate the change in voltage and MVArs absorbed by transmission lines. They will also simulate contingencies by removed lines from service, loaded parallel lines 2x and 4x their SIL. During the contingencies, students monitor for IROL violations and record system conditions including voltage and MVAr reserves.

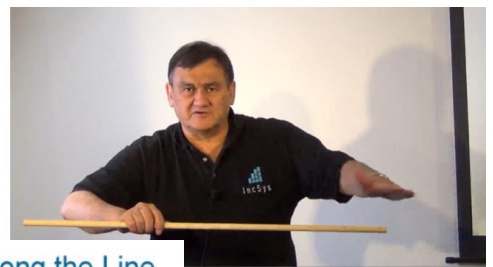
COURSE CE HOURS		
OT	STD	SIM
2.0	1.5	1.5

Cascadia 5060 Course Objectives

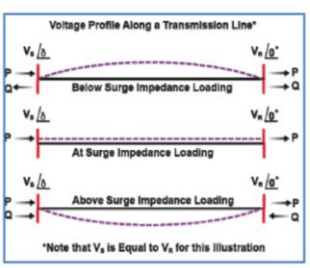
Transmission Lines

- Define Surge Impedance Loading.
- Identify the conditions when transmission lines act as capacitors and reactors.
- Predict when increase and decrease of MVArs based on the MW loading of a transmission line.
- State the risks of overloading transmission lines.
- State the conditions that can cause Ferranti rise and risks associated with Ferranti rise.
- Observe transmission lines loaded to different levels of SIL and record values for voltage, MVAr, and MW flow.
- Predict the voltage and MVAr flow on transmission lines that are loaded 2x and 4x above the SIL.
- During simulation, respond to the loss of parallel transmission lines by monitoring contingency analysis, MVAr reserves, and network voltage.
- Record the change in system conditions and compare to previous calculated conditions.





Voltage Profile Along the Line



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