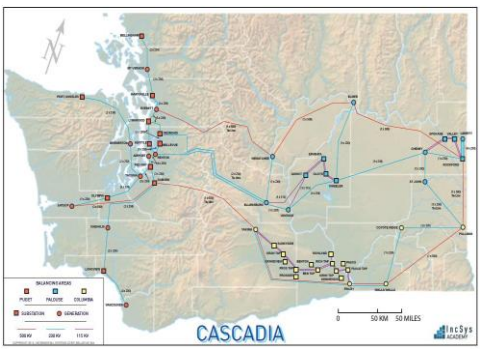
Line Outage Distribution Factors

This is a computer-based training module which consists of a video lecture and two simulation exercises. Students watch a video lecture explaining the concept of generation redispatch as a tool for transmission operators to reduced overloaded transmission line conditions and the applicable requirements from TOP-001. The instructor describes the conditions where generation redispatch is effective, including reducing MW flow, providing MVAR resources, and decreased bus angle differences and also provides guidelines for applying generation dispatch using diagrams. They also define generation shift factor (GSF) and how it affects a network and how network topology changes GSFs. The instructor provides several examples from a hypothetical power system on how to calculate GSF and students will apply the concepts of Line Outage Distribution Factors to a hypothetical power system while reacting to a brush fire event that leads to transmission line outages. An Electrical Distance Diagram is used by students to calculate the LODF on designated transmission lines and they will use the LODF and simulator data to predict the flow on parallel lines when other lines are removed from service. Students then remove the line and compare the simulator results to their calculations. This process is repeated for different configurations with multiple, non-identical, parallel paths. Students will perform a more complicated simulation exercise where they calculate Line Outage Distribution Factors and apply them to multiple paths as they prepare for the outage of a major transmission corridor. Students use the equivalent 230 kV line lengths to accurately estimate the amount of MW flow that will move to another two parallel paths as each transmission line is removed from service.

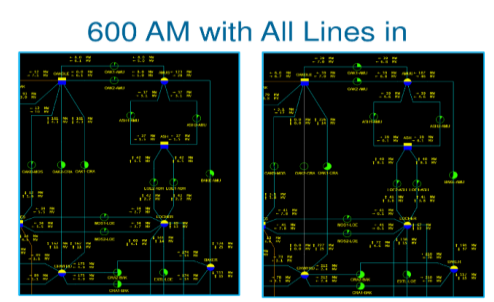


Cascadia 4050 Course Objectives

Line Outage Distribution Factors

COURSE CE HOURS		
OT	STD	SIM
2	.5	1.5

- Identify the correct definitions for Line Outage Distribution Factor (LODF) and Generation Shift Factor (GSF).
- Choose the maximum line loading that should be placed on lines in parallel to avoid an overloading contingency.
- Calculate the LODF based on hypothetical conditions.
- Use an LODF to calculate the change in loading on a transmission line.
- Identify the conditions that affect LODFs and GSFs.
- Recall the conditions and time requirements for NERC TOP-001 standard and how LODFs and GSFs can be used to comply with those standards.
- Determine the LODFs for parallel transmissions lines when there are no other parallel loops.
- Determine the LODFs from an Electrical Distance Diagrams for parallel transmissions lines when there is a one other significant parallel loop.
- Apply the LODFs to calculate post-contingent MW flows when there are single and multiple contingencies.
- Compare the flows calculated using LODFs with the values measured from PowerSimulator.
- Respond to multiple contingencies that create SOL violations.
- Identify a Generation Shed and Load Shed plan when a Line Load Dump limit is exceeded.
- Determine the PTDFs for Generation and Load Shed plan from the Cascadia Electrical Distance Diagram.
- Use the PTDFs to determine the magnitude of the Generation and Load Shed to eliminate the SOL violation.
- Use the PTDF to estimate the MW flows on the element with the SOL violation after Generation and Load Shed is implemented.
- Implement the Generation and Load Shed Plan.
- Measure flows after the Generation and Load Shed plan.
- Compare the measured flows with the estimates based on the PTDFs.
- Compare the PTDFs calculated from the before and after PowerSimulator measurements with the PTDFs calculated from the Electrical Distance Diagram.



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