

Laboratory Experiment 10A

Making a Power System Reliable

Objectives:

1. To understand the planning/design process that goes into making a power system reliable.
2. To understand the editing tools in PowerWorld

Laboratory Tasks and Report:

1. To test the reliability of a system we will apply the following rule:

No single line or generator outage will leave the system with lines overloaded or bus voltages violating limits.

2. Given the PowerWorld case **PowerReliabilityCase.pwb** with the drawing file **PowerReliabilityCase.pwd**
 - a. Read the case into PowerWorld and start it running
 - b. Open each line (open a line by clicking on one breaker at the line's end) one at a time and observe the loading on all other lines. If another line is operating at or above 95% of its limits that outage is considered to have caused the system to fail. Similarly, if an open line causes any bus voltages to go outside the range 0.95 pu to 1.05 pu that case will also be considered to have caused the system to fail.
 - c. Drop each generator one at a time (again just open the generator's breaker). PowerWorld will reallocate the lost generation to other generators. Again, any lines that are overloaded beyond 85% or buses which have a voltage outside the 0.95-1.05 limits will be considered to have caused the system to fail.
3. As a power system engineer you are going to make this system reliable. To do this you can add new equipment such as new transmission lines, new generators, capacitors on buses, etc. You will need to stop the simulator and put it into edit mode and then use the drawing tools and the information tools that can set the parameters for each new component added. If you add a transmission line that is in parallel with an existing line give the new line the same parameters as the existing line. If you add a generator, limit its capacity to 200 MW.
4. Add as many lines, generators, capacitors, etc as necessary so that at the end of the process you can run the tests above in 2b and 2c and no system failures are seen. Try to achieve this with as few new components added as necessary.

This is the five bus PowerReliabilityCase:

