Using the Contingency Analysis in Power World

Background
A contingency is a failure of any one piece of equipment (line or transformer). Power system engineers want their power system to be secure; in other words, they want the system to be able to withstand the failure of any one piece of equipment and still function normally.

A contingency analysis checks for the security of the system. When you run a contingency analysis in Power World, the program will take out of service each piece of equipment, one-by-one, resolve the power flow, and then check that no lines have exceeded their rated capacity.

We assume that all equipment is protected by working protection equipment. Thus, when a piece of equipment fails (becomes shorted or open circuit), it is simply removed from the system.

Running a Contingency Analysis
1. Be sure you are in Run Mode.
2. Click at the top or press then to solve the current system so that we can obtain an initial solution for the contingency analysis.
3. Click Options/Tools → Contingency Analysis…
4. If the system prompts you, always select the top option so that the current solution is used as a starting point.
5. Set the contingency analysis so that it uses a full power flow solution method. The alternative, the DC power flow solution, is computationally much faster, but it will not catch all of the contingency violations due to the approximation. Note that since our system is small, both methods take almost no time to compute.
6. Let’s see how the contingency analysis works. Go to the ‘Contingency’ tab and click ‘Start/Run’

![Contingency Analysis Window]

7. You will notice a list of violations pop up.

![Contingency Analysis Window]

My base case has 7 violations total.
8. What are the violations? Click one underneath ‘Label’ for a full description.

This line, Tim69 to Hana69 was tested by opening.

When Tim69 to Hana69 is opened, two other lines overload:
- Robin69 to Hana69 at 130% rating
- Lauf69 to Robin69 at 151% rating

When Tim69 to Hana69 is opened, several other busses also experience low voltage.

9. As you can see, the opening of Tim69 to Hana69 causes 5 violations: 2 power flows that exceed line capacity (Robin69 to Hana69 and Lauf69 to Robin69 are overloaded), and three busses experience low voltage.

10. Click on the other contingencies under ‘Label’ to see other violations.

Changing Your System and Rerunning a Contingency Analysis
This is VERY IMPORTANT!!! If you add a line to your system, Power World will NOT automatically include it in the contingency analysis. In other words, it will not try opening that line you added to test for other contingency violations. Luckily for you, the base case system was initially without violations, so any line you add and then remove won’t cause an overload.

However, you should know how to include the newly-added line in the contingency analysis.
1. After adding one or several new lines to your system, you need to create a new contingency test list. Click **Auto Insert** button.

![Contingency Analysis Window](image1.png)

2. Make sure you are testing the removal of a single line AND transformer.

![Auto Insertion of Contingencies](image2.png)

Click **Do Insert Contingencies.**

3. Depending on how many lines you have added, a notice box will pop up saying that you are replacing the current contingency list with a list that includes a few more contingency definitions. Click **OK.**

4. That’s it! Now you can rerun the contingency analysis and see all new violations.