

Calculating the flows in the lines and transformers

1. Obtain the solution to the power flow problem. This gives you the voltage magnitude and angle at each bus:

$$V_i \angle \theta_i$$

2. With the voltage magnitude and angle at both ends of each line, you can calculate the current in each line:

$$\overline{I}_{ij} = y_{ij} (V_i \angle \theta_i - V_j \angle \theta_j)$$

Where y_{ij} is the admittance of the line between nodes i and j and \overline{I}_{ij} is the current flowing from i to j .

3. Once you have the current in each line, you can calculate the complex power flowing in each line. The power flowing from i to j at the i end of the line is given by:

$$S_{ij} = P_{ij} + jQ_{ij} = \overline{V}_i \cdot \overline{I}_{ij}^*$$

While the power flowing into j from i at the j end of the line is given by:

$$S_{ji} = P_{ji} + jQ_{ji} = \overline{V}_j \cdot \overline{I}_{ij}^*$$

4. Note that, unlike the current, the active and reactive flows at the two ends of the line are not identical. The difference is due to the losses (active and reactive).