Julia Lindberg* (jrlindberg@wisc.edu), Alisha Zachariah, Nigel Boston and Bernie Lesieutre. Algebraic methods in power engineering.

The operating points of an $n$-node power network are real solutions of the power flow equations, a system of $2n - 2$ quadratic polynomials in $2n - 2$ variables. Our work aims to find the distribution of the number of real solutions, which is important in determining the stability of the network. We use techniques from computational algebraic geometry to find families of graphs for which the number of nontrivial operating points equals the number of real solutions of a single polynomial. We use this polynomial to dramatically speed up computations of distributions. This allows us to visualize regions with a fixed number of real solutions, finding that some cluster around hyperplanes. (Received July 15, 2019)