Chance-constrained AC Optimal Power Flow - Modelling and solution approaches

Line Roald, UW Madison

Renewable electricity generation increase uncertainty in power system operation and necessitates new methods for planning and operation. We adopt a chance-constrained AC optimal power flow formulation, which guarantees constraint satisfaction with a pre-defined probability. Obtaining solutions for this problem is challenging due to the AC power flow equations, a set of non-linear, non-convex equality constraints that must be satisfied with high probability. We discuss two different solution approaches based on partial linearization and polynomial chaos expansion, discuss their respective drawbacks and advantages, and show numerical results for different IEEE test cases.