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Scalable optimization of complex energy systems under uncertainty using high-performance computers.

Complex energy systems, such as the U.S. power grid, are affected by increased uncertainty of its target power sources, due for example to increasing penetration of wind power coupled with the physical impossibility of very precise wind forecast. Optimization of such systems under uncertainty results in extremely large optimization problems that can be solved only by means of high-performance computing (HPC). We present scalable algorithms and implementations for the solution of stochastic linear and nonlinear programming problems with recourse. Our computational approach is based on interior point methods and implements specialized distributed memory linear algebra. We present and discuss numerical simulations of electricity dispatch models for the State of Illinois obtained on leadership HPC platforms of the U.S. Department of Energy. (Received September 22, 2015)