1077-90-1204 **Mihai Anitescu*** (anitescu@mcs.anl.gov), Mathematics and Computer Science Division, 9700 S Cass Avenue, Argonne, IL 60439, and **Cosmin Petra**, **Miles Lubin** and **Victor Zavala**.
Scalable Stochastic Programming for Optimization Under Uncertainty of Energy Systems.

Optimal design, planning and management of nationally critical complex energy systems such as the power electric grid require the optimization of large-scale interconnected sub-systems in the presence of multiple sources of uncertainty. For complex energy systems, the source of uncertainty can be incomplete information or reductive modeling of weather conditions, consumer demand, market prices, etc. In this work we investigate scalable approaches for one framework for decision-making under uncertainty: stochastic programming (SP) with recourse. Our methodology relies on approximating the underlying uncertainty of the stochastic problem via sampling, and solving the corresponding sample average approximation (SAA) problem using an interior-point method with a specialized linear algebra layer, based on a Schur complement approach. The approach is demonstrated to scale well for problems of up to a few billion variables on 130 thousand cores of Argonne BG/L supercomputer. We discuss how to eliminate expected scalability bottlenecks on future architectures, by use of stochastic preconditioning and resampling approaches, for which both theoretical and computational demonstrations will be presented. (Received September 17, 2011)