



Stanford University

TomKat Center for Sustainable Energy  
Precourt Institute for Energy  
Energy and Environment Affiliates Program  
Civil and Environmental Engineering  
Department of Electrical Engineering

## Stanford SmartGrid Seminar

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# Synchronization-Aware and Algorithm-Efficient Chance Constrained Optimal Power Flow

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1pm Thursday, October 10<sup>th</sup>, McCull 122

**Abstract:** One of the most common control decisions faced by power system operators is the question of how to dispatch generation to meet demand for power. This is a complex optimization problem that includes many nonlinear, non convex constraints as well as inherent uncertainties about future demand for power and available generation. In this talk we discuss convex formulations to appropriately model crucial classes of nonlinearities and stochastic effects. We focus on solving a nonlinear optimal power flow (OPF) problem that includes loss of synchrony constraints and models wind-farm caused fluctuations. In particular, we develop (a) a convex formulation of the deterministic phase-difference nonlinear Optimum Power Flow (OPF) problem; and (b) a probabilistic chance constrained OPF for angular stability, thermal overloads and generation limits that is computationally tractable. [The reported results are based on a joint work with R. Bent (LANL) and D. Bienstock (Columbia).]

**Bio:** Dr. Chertkov's areas of interest include statistical and mathematical physics applied to energy and communication networks, machine learning, control theory, information theory, computer science, fluid mechanics and optics. Dr. Chertkov received his Ph.D. in physics from the Weizmann Institute of Science in 1996, and his M.Sc. in physics from Novosibirsk State University in 1990. After his Ph.D., Dr. Chertkov spent three years at Princeton University as a R.H. Dicke Fellow in the Department of Physics. He joined Los Alamos National Lab in 1999, initially as a J.R. Oppenheimer Fellow in the Theoretical Division. He is now a technical staff member in the same division. Dr. Chertkov has published more than 120 papers in these research areas. He is an editor of the Journal of Statistical Mechanics (JSTAT), associate editor of IEEE Transactions on Control of Network Systems, a fellow of the American Physical Society (APS), and a Founding Faculty Fellow of Skolkovotech - young graduate school built in Moscow (Russia).