

Achieving Energy Security: Opportunities at the intersections of Computer Science,
Information Theory, and Decision and Control

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Abstract: Energy security refers to the ability of the energy delivery system to continue to provide quality electrical services to all customers even during periods of high stress on the system, e.g. during extreme weather events. The majority of the disturbances that ultimately lead to major disruptions in electrical service as a result of the cascading nonlinear dynamics of the power system originate in the distribution system. Hence, the greatest opportunity to enhance energy security is through the development of a highly distributed communication and control system that supports that integration real-time data from sensor networks to improve situational awareness, can easily accommodate and manage the integration of a heterogeneous mix of distributed energy resources (generation and storage), supports new market structures that enable wide spread consumer participation in the real-time energy market, and can adaptively manage the distribution system network to improve efficiency, operational reliability, and stability and security of the entire system.

Biosketch: Kenneth A. Loparo is the Nord Professor of Engineering and Chair of the Department of Electrical Engineering and Computer Science at Case Western Reserve University and holds academic appointments in the departments of biomedical engineering and mechanical and aerospace engineering in the Case School of Engineering. He has received numerous awards including the Sigma Xi Research Award for contributions to stochastic control, the John S. Dieckoff Award for Distinguished Graduate Teaching, the Tau Beta Pi Outstanding Engineering and Science Professor Award, the Undergraduate Teaching Excellence Award, the Carl F. Wittke Award for Distinguished Undergraduate Teaching and the Srinivasa P. Gutti Memorial Engineering Teaching Award. He was associate dean of engineering from 1994 -1997 and chair of the Department of Systems Engineering from 1990 -1994.