NPS Defense Energy Program Presents:

Defense Energy Seminar

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Achieving Resilient Power Systems Through Resilient Operations, Not Robust Designs

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With Dr. Daniel Eisenberg

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Abstract

The increasing impacts of natural and man-made disasters on energy infrastructure is driving a national need for resilient electric power systems that can adapt to unpredictable and extreme events. Associated engineering efforts focus on designing hardened, smart, distributed, redundant, automated, or otherwise robust power grids that better withstand and recover from failure. However, even these advanced systems are fragile to large-scale blackouts because the consequences of extreme events depend on robust infrastructure and the adaptive capacity of system operators to respond to surprise. This seminar flips the perspective of power grid resilience from infrastructure system design to identifying new ways for operators to adapt to surprising failures. Specifically, this seminar presents an operational perspective on power grid resilience that blends engineering and social science together to identify decision-making bottlenecks that can undermine blackout response. This seminar also presents case studies on the South Korean transmission system and the US Virgin Islands distribution system that reveal decision-making pressures in context and recommendations to increase adaptive capacity. The overall message is that narrow perspectives on resilience that focus on grid robustness rather than operational pressures will remain ineffective at ensuring power grids remain resilient to future surprises.

Biography

Daniel Eisenberg is a Research Assistant Professor in Critical Energy Infrastructure Systems in the Department of Operations Research at the Naval Postgraduate School (NPS). He works with the Dr. David Alderson, the Director of the NPS Center for Infrastructure Defense, and Dr. Daniel Nussbaum, the Principal Member of the NPS Energy Academic Group, to coordinate and lead NPS education and research efforts in critical energy infrastructure resilience. Dan's research focuses on the design, operation, and adaptation of resilient energy systems with emphasis on applying resilience engineering theory to improve infrastructure operations. His work uses tools from network science, operations research, engineering, and public administration to link energy and social systems together to identify fragilities in infrastructure command and control policies. Moreover, his work spans broad energy contexts, from the Oroville Dam crisis in 2017 when the largest hydroelectric dam in the US nearly breached to blackout management for the South Korean national power transmission system.

Dan received his Ph.D. in Civil, Environmental, and Sustainable Engineering from Arizona State University (ASU) and a B.S. in Chemical Engineering from University of California, Davis. Prior to joining NPS, he was a student contractor with the US Army Engineer Research and Development Center's Risk and Decision Science Team. He also received several prestigious fellowships, including a National Science Foundation (NSF) Graduate Research Fellowship, a NSF Integrative Graduate Education and Research Traineeship in Solar Energy Utilization (IGERT-SUN), a NSF East Asia and Pacific Summer Institutes (EAPSI) Fellowship, and a Fulbright Fellowship to Brazil.