PSERC Power Systems Engineering Research Center

PSERC WEBINAR

Electricity Network Design and Operation in an Era of Solar and Storage

Duncan Callaway
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As prices for solar photovoltaics and battery energy storage plummet, grids around the globe are undergoing tremendous changes. How should we design and operate grids in the future in the presence of these technologies? This talk will cover some of my group's recent efforts to answer this question. First, I will focus on a new approach to decentralized network optimization – a variant of the primal-dual subgradient method – that can be used to enable grid-integration of distributed energy resources such as solar photovoltaics, batteries and electric vehicles. I will then discuss how grids should be built in the future when distributed energy resource costs are so low. Using a simple concept called an iso-reliability curve, I will explain a method to identify cost-optimal fully decentralized systems – i.e. standalone solar home systems. After applying this method to a large solar resource dataset, I will present results indicating that in many unelectrified parts of the world, future decentralized systems will be able to deliver electricity at costs and reliabilities better than existing centralized grids.

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Duncan Callaway is an Associate Professor of Energy and Resources at the University of California, Berkeley. He is also a faculty affiliate in Electrical Engineering and Computer Science, and a faculty scientist at Lawrence Berkeley Laboratory. He received his PhD from Cornell University. He has held engineering positions at Davis Energy Group and PowerLight Corporation, and academic positions at UC Davis, the University of Michigan and UC Berkeley. Duncan teaches courses on electric power systems and at the intersection of statistical learning and energy. His research focuses on grid integration of renewable electricity and models and control strategies for demand response, electric vehicles and electricity storage.