PSERC Power Systems Engineering Research Center

2021 PSERC Summer Tutorial

Harnessing the Flexibility of Electric Vehicle Charging: Lessons Learned from the OptimizEV Project

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The internal combustion engine's firm grip on the transportation sector is loosening and for the first time a vision of an all-electric vehicle future is coming into clear focus. It's a vision that may become reality in a matter of decades, and one driven by declining battery costs, progressive policy, consumer demand, and the world's largest automakers. But even with this great momentum, the wide-scale electrification of the transportation sector won't be possible without careful planning and coordination with the power grid and the companies that manage its operation. If left unmanaged, the uncoordinated charging of EVs will amplify existing peak loads, potentially outstripping the grid's current capacity to meet demand. In this tutorial, we discuss these challenges and how to overcome them through managed EV charging. In particular, we focus on recent results from the OptimizEV Project – a real-world pilot study in Upstate New York exploring a novel approach to coordinated residential EV charging where EV owners can use their smartphones to specify how long they intend to leave their vehicles plugged in by selecting from a "menu of deadlines" that offers lower electricity prices the longer they're willing to delay the time required to charge their cars. A smart charging system actively manages the power being drawn by their EVs in real time to minimize overall strain on the grid, while ensuring that every customer's car is fully charged by its deadline. We describe important lessons learned from the OptimizEV Project related to customer behavior, EV charging characteristics, and EV transportation patterns. The OptimizEV Project is joint work with New York State Electric and Gas (NYSEG).

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LINK TO REGISTRATION

(12:00-1:30 P.M. PDT)

Eilyan Bitar is an Associate Professor in the School of Electrical and Computer Engineering at Cornell University. His current research is focused on the optimization, control, and economics of electric power and transportation systems. He received his BS (2006) and PhD (2011) from UC Berkeley. Prior to joining Cornell, he spent one year as a Postdoctoral Fellow at the California Institute of Technology and UC Berkeley.

Polina Alexeenko is a PhD student in the School of Electrical and Computer Engineering at Cornell University. Her research deals with control and optimization in the context of electrical power systems, with a particular focus on electrified transportation. She received a BA degree in Mathematics and Economics from the University of California, Berkeley in 2017.