

## Transportation Engineering Seminar Series

# Real-Time Energy Management for Fuel Cell Electric Vehicles

### Presentation Abstract

Electric vehicles generally include battery electric vehicles, plug-in hybrid electric vehicles, and fuel cell electric vehicles. Compared with battery technology, fuel cell technology is a promising solution to accelerating electrification and achieving zero-emission in medium-duty vehicles, heavy-duty vehicles, and other segments of vehicles. Each fuel cell electric vehicle relies on an energy management strategy to allocate its demand power within its hybrid energy system efficiently and safely. This seminar will review the existing energy management strategies for fuel cell electric vehicles. Then, this seminar will present a novel adaptive model predictive control-based real-time optimal energy management strategy for fuel cell electric vehicles developed by Dr. Wei Qiao's group. The optimal energy management strategy employs a linear, parameter-varying prediction model developed for the hybrid energy systems of fuel cell electric vehicles. Compared with the prediction models used in the existing energy management strategies, the linear, parameter-varying prediction model provides higher accuracy by considering the variations of system parameters while offering better real-time implementation capability. Compared with the state-of-the-art energy management strategies, the proposed optimal energy management strategy can improve fuel efficiency and mitigate the degradation of the on-board hybrid energy systems for fuel cell electric vehicles.

### About the Speaker



**Dr. Wei Qiao** has been with UNL Electrical and Computer Engineering Department since August 2008. Currently, he is the Clyde Hyde Professor of Electrical and Computer Engineering, Director of the Power and Energy Systems Laboratory, and Chair of the Electrical Engineering Graduate Program. His research interests include modeling, control, condition monitoring, and optimization of renewable energy systems, power electronic systems, electric motor drives, energy storage systems, electric vehicles, and electric power grids; decision making and risk management in the electricity markets with high penetrations of renewable energy; electrical energy conversion devices; and transportation electrification. He is the author or coauthor of more than 280 papers in refereed journals and conference proceedings and holds 13 granted U.S. patents. Dr. Qiao is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE), a Fellow of the Asia-Pacific Artificial Intelligence Association (AAIA), and a Senior Member of the National Academy of Inventors (NAI). He was a recipient of the 2010 U.S. National Science Foundation CAREER Award and the recipient of the 2021 IEEE Power Electronics Society Sustainable Energy Systems Technical Achievement Award and the 2010 IEEE Industry Applications Society Andrew W. Smith Outstanding Young Member Award. Dr. Qiao received a Ph.D. degree from Georgia Institute of Technology, Atlanta, GA, USA, in 2008 and a master's and bachelor's degrees from Zhejiang University, Hangzhou, China, in 1997 and 2002, respectively, all in electrical engineering. He also received a master's degree in High Performance Computation for Engineered Systems from Singapore-MIT Alliance (SMA) in 2003.

### Join us in person:

**Friday, December 1, 2023**

**11:00 - 11:50 AM Central Time**

Nebraska Hall (NH) Room 404 (in person), Lincoln

Peter Kiewit Institute (PKI) Room 160 (remote), Omaha

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