John C. Stevens, Ph.D.

44 Montgomery St, Suite 1500, San Francisco, CA 94104 415-391-5100
john.stevens@ethree.com

ENERGY AND ENVIRONMENTAL ECONOMICS, INC. San Francisco, CA
Senior Managing Consultant September 2017 – Present

Dr. Stevens' focus areas are electricity market planning and analysis and asset valuation. Dr. Stevens focuses on integrating renewable power into the grid, determining the value of energy storage in decarbonized grids and on synthetic fuels such as hydrogen. His recent E3 projects include leading an ARPA-E-funded project to use machine learning to dynamically assess ancillary services and flexible renewable capacities in the CAISO Real Time Energy Markets, as well as investigating the potential market size for grid-tied electrolyzers and hydrogen-powered gas turbines to provide long duration energy storage. Dr. Stevens has significant expertise in Python and was the lead developer of E3's RESERVE tool. Dr. Stevens received a Ph.D. in Mechanical Engineering and a M.S. in Mechanical Engineering from the University of California at Berkeley, and a B.S. in Mechanical Engineering from Tufts University.

Select E3 projects include:

- Project manager, proposal lead and data acquisition lead for an initiative funded by the U.S. DOE's Advanced Research Projects Agency-Energy (ARPA-E) PERFORM program. Project deliverable is a machine learning (ML) model that can dynamically predict probabilistic distributions of net load, ancillary services (AS) needs, as well as flexible wind and solar capacities in the CAISO Real Time Energy Markets (RTM). The potential reliability impacts, cost savings and carbon savings from improving AS and flexible renewables deployment in CAISO RTM will be evaluated with PLEXOS production simulation software. E3 is working directly with CAISO as industry partner on project.
- Technical lead on project for Mitsubishi Power Americas, Inc., which evaluated total market size and per-plant revenue of green hydrogen-powered combustion turbines operating in a deeply decarbonized CAISO and Pacific Northwest grid.
- Project manager and proposal lead for a study performed for a major OEM evaluating the total market size and per-vehicle benefits of vehicle-grid integration (VGI) for battery electric vehicles (BEVs) in CAISO and NYISO. Project assessed VGI revenues from AS, capacity and energy market participation. Project also identified critical advancements in policy required to deploy VGI.
- Evaluated the value of various solar PPAs to hypothetical offtakers based on plant's energy and capacity market revenue in CAISO market.
- Served as modeling lead using PLEXOS to analyze potential value of pumped storage hydro for major balancing area (BA) in Western Interconnection.
- Primary developer of E3's Python-based RESERVE tool, which has been used to predict AS needs for 15 different BAs across the U.S.
- Improved E3's modeling of the expected load carrying capacity of shaped demand response measures through code updates to E3's Python-based RECAP tool.

- Project manager and proposal lead for project using RESERVE and PLEXOS to calculate the integration charges for IPP wind, solar and solar + storage power plants operating in a vertically integrated utility in the Western Interconnection.
- Team member on project evaluating the benefits of flexible solar power plant operation in Tampa Electric service territory.

U.S. DEPARTMENT OF ENERGY Washington, DC
Physical Scientist, *Office of Energy Efficiency and Renewable Energy (EERE)* June 2016 – June 2017
Hydrogen and Fuel Cell Technologies Office (HFTO)

- Served in a project management role for the HFTO's "H2@Scale" initiative. This initiative sought to launch an R&D program to enable low-cost electrolyzers to serve as a flexible load to integrate high penetrations of renewable power in a decarbonized electricity grid.
- Worked on technoeconomic analyses of market segmentation between fuel cell electric vehicles (FCEVs) and BEVs within the light, medium and heavy-duty vehicle sectors.
- Participated in HFTO review of research proposals submitted by industry, national laboratory teams, and academia to work with DOE EERE's Energy Materials Network. Reviewed proposals on advanced hydrogen production via photoelectrochemical and electrolysis pathways.

LAWRENCE BERKELEY NATIONAL LABORATORY Berkeley, CA
Graduate Student Researcher January 2011 – December 2015

- Developed large-scale multiphysics simulation programs to design optically concentrating, photoelectrochemical systems with greater than 11% annual solar to hydrogen production efficiency.
- Modeled annual profiles of hourly transient component temperature in field-deployed photoelectrochemical devices. Identified different temperature regulation methods to prevent device failure.
- Calculated the energy payback time of gigawatt-scale, wireless photovoltaic-based, water-splitting photoelectrochemical plants. Identified and assessed means of improving energy payback time in a follow up study.

EMCOR ENERGY SERVICES San Francisco, CA
Energy Engineer August 2007 – July 2009

- Identified energy and peak demand savings through retrofits to and new construction of thermal energy storage systems, chillers, package units, boilers, heat pumps, variable speed drives, fume hoods, and building envelope improvements in municipal, commercial, industrial and institutional facilities in Northern California.

Education

University of California Berkeley, CA
Ph.D., Mechanical Engineering 2015

University of California Berkeley, CA

M.S., Mechanical Engineering 2012

Tufts University Medford, MA
B.S., Mechanical Engineering 2007

Selected Presentations and Non-Peer Reviewed Publications

1. Nelson, J., Kasina, S., Stevens, J., Moore, J., "Investigating the Economic Value of Flexible Solar Power Plant Operation" 10/1/2018. https://www.ethree.com/wp-content/uploads/2018/10/Investigating-the-Economic-Value-of-Flexible-Solar-Power-Plant-Operation.pdf

2. Stevens, J. C., "Grid Modernization and H2@Scale" *Johns Hopkins University*. 9/15/2016.

3. Stevens, J. C., "A Theoretical Comparison of Optically Concentrating, Solar Water-Splitting Devices" *The Electrochemical Society 227th Meeting, Chicago.* 5/24/2015.

Peer-Reviewed Publications

1. Morrison, G.; Stevens, J. C.; Joseck, F. "Relative Economic Competitiveness of Light-Duty Battery Electric and Fuel Cell Electric Vehicles" *Transportation Research Part C.* 2018, 87, 183-196.

2. Stevens, J. C.; Weber, A. Z. "A computational study of optically concentrating, solar-fuels generators from annual thermal- and fuel-production efficiency perspectives" *J. Electrochem. Soc.* 2016, 163, H475-H484.

3. Xiang, C. X.; Weber, A. Z.; Ardo, S.; Berger, A.; Cordian, R.; Fountain, K.; Haussener, S.; Hu, S.; Liu, R.; Lewis, N. S.; Modestino, M.; Shaner, M.; Singh, M. R.; Stevens, J. C.; Sun, K.; Walczak, K. "Modeling, Simulation and Implementation of Solar-Driven Water-Splitting Devices" *Angewandte Chemie* 2016, 55, 12974-12988.

4. Sathre, R; Greenblatt, J. B.; Walczak, K. A.; Sharp, I. D.; Stevens, J. C.; Ager, J. W. III; Houle, F. A. "Opportunities to Improve the Net Energy Performance of Photoelectrochemical Water-Splitting Technology" *Energy Environ. Sci.* 2016, 9, 803-819.

5. Sathre, R.; Scown, C. D.; Morrow, W. R.; Stevens, J. C.; Sharp, I. D.; Ager, J. W. III; Walczak, K. A.; Houle, F. A.; Greenblatt, J. B. "Life-cycle Net Energy Assessment of Large-Scale Hydrogen Production Via Photo-Electrochemical Water Splitting" *Energy Environ. Sci.* 2014**,** 7, 3264-3278**.**

6. Singh, M. R.; Stevens, J. C.; Weber, A. Z. "Design of Membrane-Encapsulated Wireless Photoelectrochemical Cells for Hydrogen Production" *J. Electrochem. Soc.* 2014, 161*,* E3283-E3296.

Citizenship

United States