

ENERGY AND ENVIRONMENTAL ECONOMICS, INC.

New York, NY

Senior Managing Consultant

Mr. Zhang joined E3 in 2018 with his Master of Environmental Management (MEM) degree from Duke University and dual bachelor's degrees in environmental science and economics from Xiamen University, China. At E3, he specializes in model development, technical analysis, and project management, focusing on optimal dispatch, cost-effectiveness, and adoption of distributed energy resources (DER) and building electrification (BE) incorporating economic and policy drivers to inform policy design and investment decisions.

Mr. Zhang leads RESTORE, E3's dispatch and valuation model for flexible DERs, a tool leveraged across E3's practice areas for diverse analyses, including but not limited to hybrid and standalone storage systems, vehicle grid integration, and microgrids. He also contributed to IDSM, an E3 tool developing cost-effective DER portfolios for distribution/region planning, and BE-Toolkit, which assesses the impacts of building electrification.

Mr. Zhang has also led projects exploring load flexibility value in California and charting paths for distributed generation, efficiency, and building electrification in New York. Furthermore, he has assisted in asset valuation, particularly in evaluating battery energy storage systems in both California and New York markets.

Notable projects at E3 include:

- **FortisBC Kelowna Electrification Case Study (2023):** Reviewed and provided recommendations on FortisBC's analysis of gas-to-electric fuel switching impacts in Kelowna's winter peak electricity demand. Validated their methodology and modeling frameworks, and proposed enhancements for both methodology and scenario design.
- **RAP China Time-of-Use Rate Design Whitepaper (2022):** Co-authored a comprehensive whitepaper in collaboration with RAP China, focusing on the best practices of time-of-use rate design.
- **CEC/LBNL California Load Flexibility and Deployment Hub (CalFlexHub) (2022 – Present):** Contributed as an advisor for model enhancements in E3's RESTORE model that optimally dispatch assorted flexible load technologies. These enhancements supported development of an evaluation and prioritization framework to evaluate the economics and environmental impacts of flexible load technologies in CA's electric grid.
- **NYSERDA/Cadmus NYS Statewide Potential Study (2021 – 2023):** Led a team to conduct a comprehensive statewide efficiency and electrification potential study for all NYS buildings capturing economic and policy drivers.
- **NYSERDA Building Electrification Roadmap (2020 – Present):** Developed new features to expand the capabilities of the NYSERDA Building Efficiency and Electrification Model (BEEM) suite to evaluate the cost-effectiveness and consequent adoption of building electrification and

efficiency measures under different incentive frameworks to support the development of a building electrification roadmap for New York State.

- **USTDA Tata Power-DDL DER Roadmap and Regulatory Support (2018 – 2022):** Explored the cost-effectiveness and the least-cost portfolio of DER technologies within TPDDL's service territory using E3's RESTORE and IDSM models to support Tata Power-DDL in the development of a DER roadmap and valuation framework, and to support regulatory filings promoting DER programs in the near-term including demand response and electric vehicles.
- **NYSERDA Value of DER (VDER) Value Stack Calculator, (2018 – Present):** Led a team to support the NY-Sun team to develop, maintain, and provide annual and as-needed updates the public-facing VDER Calculator to help distributed generation project developers and financiers better estimate and understand the compensation of VDER credits and thereby reduce the barrier of uncertainty associated with the impact of the new Value Stack tariff in New York State.
- **Utah Residential Electrification Cost-effectiveness (2021 – 2022):** Developed the underlying analytical tool for cost-effectiveness evaluations to support E3's efforts on examining the participant economics of all-electric new construction in Utah's three major climate zones for single-family and multi-family homes.
- **DPS/NYSERDA New York Distributed Solar Roadmap (2021):** Technical lead on developing a supply curve model for distributed solar projects in New York. Used this model to evaluate program costs for different incentive program options to support the development of a new roadmap for New York to achieve the installation of at least 10 GW of distributed solar by 2030.
- **Heat Pump OEM National Electrification Analysis (2021):** Technical lead on upgrading an adoption model for assessing the national heat pump market, capturing policy and economic drivers.
- **SMUD Net Energy Metering Successor Tariff (2021):** Technical lead on modeling adoption impacts of different rate designs on behind-the-meter solar and storage within SMUD's service area. The analysis informed SMUD's 2022 rate plan to identify a successor to NEM 1.0.
- **DCAS Department of Energy Management, New York City LL97 Action Plan (2020 – 2021):** Supported the modeling and technical analysis of the cost and carbon impact of various decarbonization pathways for New York City government agencies to achieve deep decarbonization in compliance with Local Law 97.
- **California Energy Commission, Non-residential PV and Storage Cost-Effectiveness (2020 – 2021):** Technical lead on evaluating the participant lifecycle cost-effectiveness of PV and storage systems in high-rise multi-family and non-residential new construction to support final decisions on 2022 California building standards using E3's RESTORE model.
- **Hawaiian Electric Companies (HECO) Integrated Grid Planning (2019 – 2021):** Developed new features to expand the capabilities of E3's capacity planning tool (RESOLVE) to support HECO's Integrated Grid Planning process to incorporate new system need assumptions and evaluate bids on each of HECO's operating islands in the context of Hawaii's long-term energy policies.
- **Silicon Valley Clean Energy (SVCE) DER and Electrification Adoption Study (2019 – 2020):** Technical lead on the DER adoption modeling workstream to support SVCE in estimating the impact of various incentive mechanisms and rate designs on the adoption of building

electrification and DERs including electric vehicles, residential solar PV, and behind-the-meter storage.

- **CEC EPIC Solar + Storage Tool (2018 – 2020):** Contributed to the development of a CEC-funded (GFO 16-309) solar + storage tool to evaluate and optimize the dispatch, operations, and value proposition for integrated solar + storage systems.

DARTMOUTH COLLEGE

EDF Climate Corps Fellow

Hanover, NH

Jun 2018 – Aug 2018

- Collaborated with Dartmouth's Sustainability and Environmental Health & Safety Offices to develop a deployable "Green Labs" program aiming to reduce the energy intensity of campus laboratories as part of the college's commitment to cut 50% carbon emissions by 2025.
- Assessed existing energy-saving efforts, benchmarked best practices from other universities, and conducted interviews with researchers to create a menu of energy-saving options for labs.
- Developed initiatives including the "Shut-the-Sash" program for fume hoods, "Chill-Up Initiative" for ULT freezer temperatures, a rebate program "Cash for Clunkers" for energy-efficient freezer purchases, and a "Lighting Retrofit Program" transitioning to LED bulbs.

CENTERS OF AMERICAN STATES

Market Research and Business Development Intern

Shanghai, China

Jun 2017 – Aug 2017

- Supported Michigan State Governor's trade mission to China by representing one Michigan-based company to interact with 60 high-potential Chinese business partners and successfully invited 16 of them to 1-on-1 business meetings, which resulted in a \$3 million investment in the client's R&D
- Performed market research to identify the list of high-potential partners and made 300+ cold calls to establish relationships with these firms

DUKE UNIVERSITY

Graduate Teaching Assistant

Durham, NC

Sept 2017 – Spring 2018

- Held office hours and lab sessions; graded assignments and exams for Instructors Dr. Dalia Patino-Echeverri and Dr. Timothy Johnson on *Modeling for Energy Systems and Markets for Power Systems*; and for Instructor Dr. Elizabeth Albright on *Applied Data Analysis*

Project Experience

- **Residential Microgrid System Design** Sept 2017 – Dec 2017
Explored optimal designs of residential community microgrids under various scenarios in San Diego, CA, by using HOMER (microgrid optimization model) and considered the regulatory framework, financial incentives, project economics, and case-specific constraints
- **Power System Renewable Integration** Jan 2017 – Apr 2017
Applied optimization and simulation in simplified power system models to analyze the effect of different renewable energy strategies on the system's reliability, costs, and emissions
- **Supply-Chain Sustainability Life-Cycle Assessment (LCA)** Jan 2017 – May 2017

Led a 3-member team to identify a 30% carbon-reduction opportunity for one REI's (top sports gear manufacturer & retailer) product by developing an LCA model to quantify the product's supply-chain sustainability under various scenarios (scope 1, 2, and 3 carbon emissions)

- **Scenario Analysis for Duke Energy Integrated Resource Planning (IRP)** Sept 2016 – Dec 2016
Developed policy-change scenarios to bind the impacts of natural-gas-policy uncertainty with Duke Energy's capacity planning; using a simplified capacity planning spreadsheet model
- **GIS-Based Multi-Criteria Wind Farm Site Selection** Sept 2016 – Dec 2016
Evaluated 10 nominated sites in North Carolina by the criteria of land feasibility, regulations, bird population, wind resource, and economics to filter out the optimal sites by using ArcGIS and spreadsheet modeling

Research Experience

- **Increasing Solar PV Capacity at Duke University** Apr 2017 – May 2018
 - Estimated available installation area, the technical potential (87.1 MWdc), and hourly power output of on-site PV capacity atop rooftop and parking lots by geospatial analysis, PVWatts, and HOMER (energy models)
 - Analyzed the grid impact of PV integration by modeling and simulating the power system operation in CPLEX (system optimization software) under various scenarios
 - Summarized the regulatory framework for large-scale solar projects, implementation barriers, and best practices from other universities
 - Performed financial analysis for various PV project configurations by spreadsheet modeling considering the availability of financial incentives (ITC), and then compared the GHG abatement cost of PV projects with other available carbon-abating strategies, informing a better pathway to achieve climate goal
- **Bottom-Up Model of Residential Electricity Demand China by End-Uses** Sept 2017 – May 2018
 - Analyzed detailed household energy-audit data to categorize residential customers by their energy consumption behaviors using statistical clustering methods in R
 - Approximated hourly load profiles for different behaviors of each household appliance, and then interpolated the hourly generation at the city and province level by available demographic, socioeconomic, geographic, and appliance energy efficiency data, using spreadsheet modeling and R
- **End-Use Model of Residential Electricity Demand in Mexico** Jan 2017 – May 2017
 - Assisted in developing the end-use model of residential electricity demand in Mexico by cleaning input data, updating model parameters, and visualizing results in Tableau

Education

Duke University Durham, NC
Master of Environmental Management May 2018

Xiamen University Xiamen, China
B.S., Environmental Science, Bachelor of Economics 2016