Mengyao Yuan, Ph.D.

44 Montgomery Street, Suite 1500, San Francisco, CA 94104 415.391.5100
mengyao.yuan@ethree.com

ENERGY AND ENVIRONMENTAL ECONOMICS, INC. San Francisco, CA
Managing Consultant

Dr. Mengyao Yuan joined E3 in 2019. Her work at E3 focuses on long-term resource planning and emerging energy technologies for achieving deep decarbonization. She has led power sector modeling to evaluate the benefits of regional transmission expansion, developed tools to assess economy-wide opportunities for hydrogen, and contributed to enhancing E3's modeling capabilities to integrate emerging technologies.

Prior to E3, Mengyao conducted research on near-zero-emission energy systems and membrane-based carbon capture from power generation. Her research has been published in *Applied Energy*, the *International Journal of Greenhouse Gas Control*, and *Environmental Science & Technology*. Mengyao holds a PhD in Energy Resources Engineering and an MS in Environmental Engineering and Science from Stanford University, and a BEng in Chemical Engineering from the Hong Kong University of Science and Technology.

Notable E3 projects include:

- **Integrated Resource Planning, California Public Utilities Commission (CPUC), 2019-ongoing.** Supporting the CPUC in its IRP process by conducting research and analysis on a wide range of topics, including technology assessment, resource costs, procurement tracking, and cost and emissions implications of various policies. Developed tools and inputs to support the development and modeling of CPUC's 2021 Proposed Preferred System Plan. Prepared RESOLVE model packages and PowerPoint presentations for the public release of IRP materials on the CPUC website.
- **EPIC Grant to Assess the Value of Long-Duration Energy Storage, California Energy Commission (CEC), 2020-ongoing.** Working with a team of E3 consultants, industry experts, and research scientists to evaluate the role of long-duration energy storage in meeting California's future clean energy goals. Leading a model benchmarking effort for bulk energy system analysis. Presented E3's research on long-duration storage and other emerging technologies at a public CEC workshop and addressed stakeholder comments.
- **PERFORM Grant to Develop Software for Improved Electric Grid Operations, Advanced Research Projects Agency-Energy (ARPA-E), 2020.** Worked on a team to develop a modeling tool that will be made publicly available and can be used by system operators to dynamically calculate the need for operating reserves to improve the reliability of a high-renewables grid. Developed part of the model in Python to streamline the processing of load and renewable generation data.
- **Least-Cost Carbon Reduction Policies in PJM, Electric Power Supply Association (EPSA), 2020.** Supported a study that examined a variety of policy alternatives to facilitate long-term decarbonization in the PJM region. Developed inputs and scenarios to model least-cost resource portfolios that meet state and regional policy targets using E3's RESOLVE model. Contributed to the PowerPoint representations and report for EPSA.

- **Opportunities for Hydrogen in the Western United States, Mitsubishi Hitachi Power Systems Americas, Inc. (MHPS), 2019-2020.** Led the analysis of opportunities for hydrogen in the electricity sector. Developed a Python model to evaluate the market potential of renewable hydrogen in California and the Pacific Northwest. Developed an Excel tool to estimate costs of battery storage and hydrogen-based long-duration energy storage. Contributed to the E3 report for MHPS and supported marketing efforts for this study.
- **Evaluating the Potential Sale of Santee Cooper, South Carolina Department of Administration, 2019-2020.** Synthesized data and inputs to support modeling and analysis that evaluated the cost-effectiveness of Santee Cooper's proposed resource plan.

CARNEGIE INSTITUTION FOR SCIENCE Stanford, CA
Postdoctoral Research Scientist January 2018 – May 2019

- Modeled and analyzed near-zero-emission energy systems to inform investment and policymaking
- Attended and provided logistical support for the international workshop, "Energy for Development in a Carbon-constrained World (EDC2018)"

STANFORD UNIVERSITY Stanford, CA
Graduate Researcher April 2013 – January 2018

- Performed techno-economic modeling and optimization for carbon dioxide capture from fossil fuel power systems
- Designed, coordinated, and performed experiments to characterize potential materials for carbon capture and hydrogen purification

NATURAL RESOURCES DEFENSE COUNCIL Beijing, CHINA
Schneider Fellow Summer 2015

- Co-authored, edited, and translated (English/Chinese) policy reports on demand-side management, electric vehicles, and renewable energy integration for stakeholders
- Assisted in organizing conferences and workshops for policymakers, industry leaders, and researchers

CARBON RECYCLING INTERNATIONAL Reykjavik, ICELAND
Research & Development Intern Summer 2013

- Developed Excel models to evaluate lifecycle emissions of various renewable methanol production pathways
- Conducted country-level case studies and made recommendations for potential plant locations

STANFORD ENVIRONMENTAL CONSULTING Stanford, CA
Consultant April 2012 – April 2013

- Conducted lifecycle assessment of several recyclable products using SimaPro and Excel

Education

Stanford University — Stanford, CA
Ph.D., Energy Resources Engineering — 2018
M.S., Environmental Engineering and Science — 2013

The Hong Kong University of Science and Technology — Hong Kong
BEng, Chemical Engineering (with First Class Honors) — 2011
Minor in Humanities

Citizenship

China

Peer-Reviewed Publications

1. **Yuan, M.**, F. Tong, L. Duan, J.A. Dowling, S.J. Davis, N.S. Lewis, and K. Caldeira. 2020. "Would firm generators facilitate or deter variable renewable energy in a carbon-free electricity system?" *Applied Energy* 279: 115789.
2. Tong, F., **M. Yuan**, N.S. Lewis, S.J. Davis, and K. Caldeira. 2020. "Effects of deep reductions in energy storage costs on highly reliable wind and solar electricity systems." *iScience* 23(9): 101484.
3. Dowling, J.A., K.Z. Rinaldi, T.H. Ruggles, S.J. Davis, **M. Yuan**, F. Tong, N.S. Lewis, and K. Caldeira. 2020. "Role of long-duration energy storage in variable renewable electricity systems." *Joule* 4(9): 1907–28.
4. McQueen, N., P. Psarras, H. Pilorgé, [et al., including **M. Yuan**], N. Deich, and J. Wilcox. 2020. "Cost analysis of direct air capture and sequestration coupled to low-carbon thermal energy in the United States." *Environmental Science & Technology* 54(12): 7542–51.
5. **Yuan, M.**, H. Teichgraeber, J. Wilcox, and A.R. Brandt. 2019. "Design and operations optimization of membrane-based flexible carbon capture." *International Journal of Greenhouse Gas Control* 84: 154–163.
6. **Yuan, M.**, K. Lee, D.G. Van Campen, S. Liguori, M.F. Toney, and J. Wilcox. 2018. "Hydrogen purification in palladium-based membranes: An operando x-ray diffraction study." *Industrial & Engineering Chemistry Research* 58(2): 926–34.
7. **Yuan, M.**, S. Liguori, K. Lee, D.G. Van Campen, M.F. Toney, and J. Wilcox. 2017. "Vanadium as a potential membrane material for carbon capture: Effects of minor flue gas species." *Environmental Science & Technology* 51(19): 11459–67.
8. Tsai, C., K. Lee, J.S. Yoo, [et al., including **M. Yuan**], J. Wilcox, and J.K. Nørskov. 2016. Direct water decomposition on transition metal surfaces: Structural dependence and catalytic screening." *Catalysis Letters* 146(4): 718–24.
9. Lee, K., **M. Yuan**, and J. Wilcox. 2015. "Understanding deviations in hydrogen solubility predictions in transition metals through first-principles calculations." *Journal of Physical Chemistry C* 119(34): 19642–53.

10. **Yuan, M.**, K. Narakornpijit, R. Haghpanah, and J. Wilcox. 2014. "Consideration of a nitrogen-selective membrane for postcombustion carbon capture through process modeling and optimization." *Journal of Membrane Science* 465: 177–84.