

Mengyao Yuan, Ph.D.

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ENERGY AND ENVIRONMENTAL ECONOMICS, INC. *Senior Consultant*

San Francisco, CA

Dr. Yuan joined E3 in 2019 after conducting postdoctoral research through the Carnegie Institution for Science that modeled and analyzed near-zero-emission energy systems. Her work at E3 focuses on long-term resource planning and emerging energy technologies for achieving deep decarbonization. She has led power sector modeling and analysis to study the benefits of transmission expansion for an inter-governmental and industry planning organization. She has also developed tools to assess economy-wide opportunities for hydrogen and to integrate emerging technologies into resource planning projects. In her ongoing work, she supports the California Public Utilities Commission in its integrated resource planning process, and contributes to a study partnered with industry and academia that aims to understand the role of long-duration storage in achieving California's climate goals.

She completed her Ph.D. in Energy Resources Engineering from Stanford University in 2018. Her doctoral research, published in the *International Journal of Greenhouse Gas Control*, investigated membrane-based carbon capture from a natural gas power plant with flexible electricity output. Dr. Yuan brings with her both an extensive research background in energy systems modeling and analysis, and a fluency with technical tools including Python, MATLAB, and R. She primarily works in E3's planning group, where she helps utilities, system operators, and state agencies prepare for a high renewables future. Dr. Yuan, a native speaker of Mandarin Chinese, also earned a BEng from the Hong Kong University of Science and Technology and an M.S. in Environmental Engineering and Science from Stanford University.

CARNEGIE INSTITUTION FOR SCIENCE *Postdoctoral Research Scientist*

Stanford, CA

January 2018 – May 2019

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

STANFORD UNIVERSITY *Graduate Researcher*

Stanford, CA

April 2013 – January 2018

- Investigated techno-economic modeling and optimization of membrane separation processes for CO₂ capture from coal and natural gas power systems
- Performed ex-situ and operando characterization (XPS, SEM, XRD) of metallic membrane materials for carbon capture and hydrogen purification

NATURAL RESOURCES DEFENSE COUNCIL *Schneider Fellow*

Beijing, CHINA
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

Research & Development Intern

Reykjavik, ICELAND

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

Consultant

Stanford, CA

April 2012 – April 2013

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

INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE (ITRI)

Research Intern

Hsinchu, TAIWAN

Summer 2012

- Conducted a literature review on metal-organic frameworks (MOFs) and received laboratory training in MOF synthesis and characterization
- Performed process modeling and identified membrane materials suitable for oxygen enrichment

Education

Stanford University

Ph.D., Energy Resources Engineering

M.S., Environmental Engineering and Science

Stanford, CA

2018

2013

The Hong Kong University of Science and Technology

BEng, Chemical Engineering (with First Class Honors)

Hong Kong

2011

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.

Reports

1. "Least Cost Carbon Reduction Policies in PJM." E3 report prepared for the Electric Power Supply Association (EPSA). October 2020.
2. "Hydrogen Opportunities in a Low-Carbon Future: An Assessment of Long-Term Market Potential in the Western United States." E3 report prepared for Mitsubishi Hitachi Power Systems Americas, Inc. June 2020.