

Sharad Bharadwaj

One Broadway, 14th Floor, Cambridge, MA 02142

sharad@ethree.com

ENERGY AND ENVIRONMENTAL ECONOMICS, INC.

Cambridge, MA

Senior Managing Consultant

Mr. Bharadwaj joined E3 in 2015 after receiving both his M.S. and B.S. degrees in Energy Resources Engineering from Stanford University. His work focuses on analyzing and modeling long-term greenhouse gas reduction strategies in the energy economy, and on combining E3's strengths in electricity planning and markets with a broader economy-wide perspective on how the transportation, buildings, and industrial sectors may evolve over time. He served as the lead modeler on decarbonization studies in Oregon, Washington, New York, New Mexico, Atlantic Canada, and the US overall. Select E3 projects include:

- **New York State, Draft Scoping Plan (2020-Present).** Supporting the New York State Climate Action Council, through working with NYSERDA, Mr. Bharadwaj explored pathways to achieving New York State legislative GHG reduction targets and helped prepare a Draft Scoping Plan articulating the strategies New York will undertake to achieve emissions targets. E3 created scenarios of energy end-use demands over time, ran RESOLVE and RECAP models to develop optimal electricity capacity portfolios and ensured reliability of electric sector resources, and integrated insights from parallel studies on oil and gas, HFC mitigation, and others.
- **Atlantic Clean Power Planning Committee (ACP-PC), Benefits of Regional Coordination in Low-Carbon Future (2020-Present).** Supported ACP-PC, a consortium of federal and provincial governments and agencies and utilities, to consider potential benefits of regional coordination in decarbonizing the Atlantic Canada region. E3 estimated load forecasts under a high-electrification low-carbon future, and used its RESOLVE model to estimate resource builds needed to meet these loads reliably in the region. We ran cases with and without regional coordination to illustrate the benefits, in terms of costs, resource builds, and reliability, that regional coordination can provide.
- **State Energy Agency, 100% Renewable Energy Analysis (2017 – 2019).** Supported a state energy agency in exploring the feasibility, timing, and cost of achieving a 100% renewable energy future. E3 is using the LEAP model to create scenarios of energy end-use demands over time and the RESOLVE model to develop optimal electricity capacity portfolios at high renewable penetrations.
- **Coal asset developer, Cost and benefit of retirement and repowering (2019).** Performed electricity dispatch and capacity analysis, combined with value of carbon and value of avoided emissions, to help a coal owner consider options to fuel switch or repower the site to help local utility achieve reliable, lower-carbon power.
- **NW Natural, Pacific Northwest Pathways to 2050 (2018).** Analyzed deep decarbonization scenarios for the Pacific Northwest with a focus on space heating technologies and trade-offs associated with electrification vs. continuing the direct use of natural gas to identify cost-effective approaches to reducing regional economy-wide emissions 80 percent below 1990 levels by 2050.
- **South Carolina Office of Regulatory Staff (2018-2022).** Supported ORS in analyzing avoided costs and the value of distributed energy resources (DER) under South Carolina Act 236, with a focus on successor approaches to net energy metering. Convened and explained modeling results to a large and diverse stakeholder group and prepared a summary report reflecting ORS, utility, and

stakeholder perspectives. Continued to support ORS in testimony and proceedings regarding the value of DERs, value of solar, avoided cost for PURPA qualifying facilities.

- **Hawaiian Electric Companies (2015 – 2016).** Developed a set of least-cost investment solutions necessary to reach state renewable portfolio standards of 100% by 2045 and tested them under various technological and pricing uncertainties to help guide policy and investment decision-making on the island.
- **Kansas Electric Power Cooperative (2016).** Provided research and strategic advice to Kansas Electric Power Cooperative Board of Directors regarding the Cooperative's planning for optimal generation investment and expansion.
- **Oregon Department of Environmental Quality (2016).** Assisted the Oregon Department of Environmental Quality by performing an economic analysis of a market-based carbon reduction program and modeling potential economic effects on Oregon specifically.

STANFORD UNIVERSITY

Research Assistant

Palo Alto, CA

September 2014 – June 2015

- Estimated greenhouse gas emissions from the Bakken region by applying statistical learning and image processing techniques on NOAA weather satellite data.

ARPA-E: U.S. DEPARTMENT OF ENERGY

Tech2Market Summer Scholar

Washington, DC

Summer 2014

- Characterized “state of the landscape” for grid-scale energy storage modeling software
- Identified appropriate range-finding tools for early-stage grid storage technologies
- Beta tested models to guide refinement of future ARPA-E storage technology performance metrics

STANFORD UNIVERSITY

Oral Communication Tutor

Palo Alto, CA

September 2013 – June 2015

- Helped students improve their oral communications (presentations, interviews, and speeches)

UTILIDATA, INC.

Product Engineer Intern

Providence, RI

Summer 2013

- Under R&D and QA teams, modified specification to define signal structure for new version of AdaptiVolt product and performed systems engineering and testing of development code

LANL SUMMER OF APPLIED GEOPHYSICAL EXPERIENCE

Participant

Los Alamos, NM

Summer 2013

- Characterized Espanola basin with seismic, gravity, and electromagnetic tools
- Identified possible subsurface aquifers using signal processing and inverse modeling techniques

STANFORD UNIVERSITY

Research Assistant

Palo Alto, CA

June 2011 – August 2012

- Characterized European crude oils by greenhouse gas intensity of production and extraction
- Created a production-weighted baseline of current EU crudes' greenhouse gas emissions
- Performed historical life cycle analysis of Albertan oil sands to calculate energy return ratios, and greenhouse gas intensities, of the extraction and production of bitumen over time

Education

Stanford University
M.S., Energy Resources Engineering Palo Alto, CA
2015

Stanford University
B.S., Energy Resources Engineering Palo Alto, CA
2014

Refereed Publications

1. "The energy efficiency of oil sands extraction: Energy return ratios from 1970 to 2010," Brandt, Englander, Bharadwaj. June 2013. *Energy: The International Journal*.
2. "Historical trends in life cycle GHG emissions of the Alberta oil sands from 1970 to 2010," Englander, Bharadwaj, Brandt. November 2013. *Environmental Research Letters*.