

Adam R. Brandt

CONTACT INFORMATION

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CURRENT POSITION

Acting Assistant Professor, Department of Energy Resources Engineering, Stanford University

RESEARCH INTERESTS

Greenhouse gas emissions from transportation fuels production, optimization of energy systems, life-cycle assessment of energy systems.

EDUCATION

Ph.D. (2008), Energy and Resources, University of California, Berkeley

- Dissertation title: Greenhouse gas impacts of declining hydrocarbon resource quality: depletion, dynamics, and process emissions
- Advisor: Richard Norgaard (previously Alex Farrell)

M.S. (2005), Energy and Resources, University of California, Berkeley

B.S. (2003), Environmental Studies (emphasis Physics), Highest Honors, University of California, Santa Barbara

ACADEMIC EXPERIENCE

Stanford University

Acting Assistant Professor

June 2009 to present

Acting Assistant Professor in the Department of Energy Resources Engineering. Teaching: Courses include *Optimization of Energy Systems*, *Transitions to sustainable energy systems*, and *Fundamentals of renewable energy processes*.

Current research projects include:

- Oil sands greenhouse gas (GHG) emissions life cycle assessment for regulatory purposes. Funded by the European Commission, DG Climate Action. July 2010 to present.
- Two Elk Clean Energy Park, examining carbon capture and storage for coal-fired power plants in Wyoming. June 2009 to Present. URL: <http://ere.stanford.edu/research/wyccs/>
- CO₂ mineralization research, analyzing a variety of CO₂ mineralization strategies from a life-cycle perspective. Funded by the Joint Institute for Strategic Energy Analysis (JISEA), National Renewable Energy Laboratory. June 2010 to present.
- Conventional oil greenhouse gas (GHG) emissions tool. Develop life cycle assessment tool for use in California Low Carbon Fuel Standard (LCFS). Funded by California Air Resources Board (CARB) February 2010 to present.
- Modeling of transition to unconventional resources and other oil substitutes. Undergraduate research fellowships from Stanford University School of Earth Sciences to Stephanie Webber (2011), Lucas Prokopiak (2010) and Siyu Wang (2010).

University of California, Berkeley

Graduate Student Researcher

August 2003 to December 2008

Research projects included:

- California Air Resources Board: developed recommendations for California low carbon fuel standard. February to June 2007. URL: http://www.energy.ca.gov/low_carbon_fuel_standard/
- Energy Modeling Consortium (collaboration between UCB, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, and Stanford University): researched advanced

robustness-based energy modeling methods. May to August 2006.

- Climate Decision Making Center, Carnegie Mellon University: modeled the energy efficiency and carbon emissions implications of substitutes for conventional petroleum. August 2004 to July 2005. URL: <http://cdmc.epp.cmu.edu/>
- Lawrence Berkeley National Laboratory: analyzed uncertainty in greenhouse gas emissions inventory methodologies. Developed research recommendations for improving accuracy of California greenhouse gas inventories. August 2003 to May 2004. URL: http://www.energy.ca.gov/pier/final_project_reports/CEC-500-2005-097.html

University of California, Santa Barbara

Teaching Assistant

September 2007 to June 2008

Teaching assistant for courses *Energy and the Environment* and *Quantitative Thinking in Environmental Studies*.

University of Southern California

Undergraduate Research Fellow

June 2002 to September 2002

Sustainable Cities Program undergraduate research fellowship in industrial ecology. Modeled the Los Angeles economy using regional economic input-output matrices to optimize materials flows in industry.

PUBLICATIONS

*Indicates peer-reviewed publication

*Kirchofer, A. J. Van der Bruggen, N. Alvarez, W.W. Ng, E. Dicharry, **A.R. Brandt**, J. Wilcox (2011) Assessing the potential of mineral carbonation with industrial alkalinity sources. In review: *Environmental Science & Technology*

***Brandt, A.R.** (2011) Variability and uncertainty in life cycle assessment models for greenhouse gas emissions from Canadian oil sands production. In review: *Environmental Science & Technology*

*Kang, C.A., **A.R. Brandt**, L. Durlinsky (2011) Optimal operation of an integrated energy system including fossil fuel power generation, CO₂ capture and wind. In press: *Energy*

***Brandt, A.R.** (2011). Upstream greenhouse gas (GHG) emissions from Canadian oil sands as a feedstock for European refineries. Report for European Commission. January 18th, 2011, updated May 2011.

***Brandt, A.R.**, M. Dale (2011). A general mathematical framework for systems-scale efficiency of energy extraction and conversion: Energy return on investment (EROI) and other energy return ratios. *Energies* **2011**(4): 1211-1245. DOI:10.3390/en4081211

*Nemet, G., **A.R. Brandt** (2011). Willingness to pay for a climate backstop: Liquid fuel producers and direct CO₂ air capture. *The Energy Journal* **33**(1): 53-81. DOI:10.5547/ISSN0195-6574-EJ-Vol33-No1-3

*Mulchandani, H., **A.R. Brandt** (2011). Oil shale as an energy resource in a CO₂ constrained world: The concept of electricity production with in-situ carbon capture (EPICC). *Energy & Fuels*. **25**(4): 16331641. DOI:10.1021/ef101714x

***Brandt, A.R.** (2011). Oil depletion and the energy efficiency of oil production: The case of California. *Sustainabilities*. **3**(10): 1833-1844. DOI:10.3390/su3101833

*Yeh, S., S.M. Jordaan, **A.R. Brandt**, M. Turetsky, S. Spatari, D. Keith (2010). Land use greenhouse gas emissions from conventional and unconventional oil production. *Environmental Science*

Energy & Technology, **44**(22): 8766-8772. DOI:10.1021/es1013278

***Brandt, A.R.**, S. Unnasch (2010). Energy intensity and greenhouse gas emissions from thermal enhanced oil recovery. *Energy & Fuels*, **24**(8): 4581-4589. DOI:10.1021/ef100410f

*Lemoine, D.M., R.J. Plevin, A.S. Cohn, A.D. Jones, **A.R. Brandt**, S.E. Vergara, D.M. Kammen. (2010). The climate impacts of bioenergy systems depend on market and regulatory contexts. *Environmental Science & Technology*, **44**(19): 7347-7350. DOI: 10.1021/es100418p

***Brandt A.R.** (2010). Review of mathematical models of future oil supply: Historical overview and synthesizing critique. *Energy* **35**(9): 3958-3974. DOI: 10.1016/j.energy.2010.04.045

***Brandt A.R.**, R.J. Plevin and A.E. Farrell (2010). Dynamics of the oil transition: Modeling capacity, depletion, and emissions. *Energy: The International Journal*, **35**(7): 2852-2860. DOI: 10.1016/j.energy.2010.03.014

***Brandt, A.R.**, J. Boak, and A.K. Burnham (2010). Carbon dioxide emissions from oil shale derived liquid fuels, in *Oil shale: A solution to the liquid fuels dilemma*, O. Ogunsola, Editor. ACS Symposium Series 1032. American Chemical Society: Washington, D.C. DOI: 10.1021/bk-2010-1032.ch011

*Sorrell, S., J. Speirs, R. Bentley, **A.R. Brandt**, R. Miller (2009). Global oil depletion: A review of the evidence. *Energy Policy*, **38**(9): 5290-5295. DOI: 10.1016/j.enpol.2010.04.046

***Brandt, A.R.** (2009). Converting oil shale to liquid fuels with the Alberta Taciuk Processor: Energy inputs and greenhouse gas emissions. *Energy & Fuels* **23**(12): 6253-6258. DOI: 10.1021/ef900678d.

Sorrell, S., J. Speirs, R. Bentley, **A.R. Brandt**, R. Miller (2009). *An assessment of the evidence for a near-term peak in global oil production*. UK Energy Research Centre, 2009.

Farrell, A.E., **A.R. Brandt**, S. Arons (2008). The Race for 21st Century Auto Fuels. *Physics of Sustainable Energy: Using Energy Efficiently and Producing it Renewably*. D. Hafemeister, B. Levi, M. Levine and P. Schwartz, American Institute of Physics: 235-250.

Brandt A.R., A.E. Farrell (2008). Dynamics of the oil transition: Modeling capacity, costs, and emissions. UC Energy Institute, Energy Policy and Economics Working Paper 021. http://www.ucei.berkeley.edu/PDF/EPE_021.pdf.

***Brandt, A.R.** (2008). Converting oil shale to liquid fuels: Energy inputs and greenhouse gas emissions of the Shell in situ conversion process. *Environmental Science & Technology*, **42**(19): 7489-7495. DOI: 10.1021/es800531f

Farrell, A.E., D. Sperling, et al. (2007). A low carbon fuel standard for California, Part 1: Technical analysis. California Energy Commission, August 1st. Available from http://www.energy.ca.gov/low_carbon_fuel_standard/.

Farrell, A.E., D. Sperling, et al. (2007). A low carbon fuel standard for California, Part 2: Policy analysis. California Energy Commission, August 1st. Available from http://www.energy.ca.gov/low_carbon_fuel_standard/.

***Brandt, A.R.** and A.E. Farrell (2007). Scraping the bottom of the barrel: CO₂ emission consequences of a transition to low-quality and synthetic petroleum resources. *Climatic Change*, **84**(3-4): 241-263. DOI: 10.1007/s10584-007-9275-y

***Brandt, A.R.** (2007). Testing Hubbert. *Energy Policy*, **35**(5): 3074-3088.
DOI: 10.1016/j.enpol.2006.11.004

*Farrell, A.E. and **A.R. Brandt** (2006). Risks of the oil transition. *Environmental Research Letters*, **1**(1). DOI: 10.1088/1748-9326/1/1/014004

Farrell, A.E., A. Kerr, **A.R. Brandt**, M. Torn (2005). Research roadmap for greenhouse gas inventory methods. California Energy Commission Report #CEC-500-2005-097.

GOOGLE
SCHOLAR
STATISTICS

Citation statistics updated November 2011 (duplicates removed)

Indexed publications: 22

h-index: 7

Total citations: 262

INVITED
LECTURES

Coordinating Research Council (CRC) *Workshop on Life Cycle Analysis of Biofuels*. October 17th-19th, 2011. Argonne National Laboratory (ANL), Argonne, IL.

Pollution Probe *The Workshop on Low Carbon Fuel Standards: Taking Stock of the Implications and Assessing the Future of LCFS in British Columbia*. Victoria, British Columbia, October 12th-13th, 2011.

European Commission, Directorate General (DG) Climate Action. Presentation to EC regarding oil sands greenhouse gas emissions. Brussels, Belgium. May 27, 2011

Center for European Policy Studies (CEPS) *Comparing Approaches to Life Cycle Analysis of Crude Oil*. Brussels, Belgium. March 21, 2011.

SLAC National Accelerator Laboratory Colloquium Series. Invited lecture on transitions to oil substitutes, February 1st, 2010.

Stanford University, Stanford Energy Seminar. Invited lecture on modeling the transition to oil substitutes. September 23rd, 2009.

Humboldt State University, Energy, Environment, & Society Speaker Series. Invited lecture on oil shale GHG emissions, April 16th, 2009.

Lawrence Livermore National Laboratory, Carbon Management Seminar. Invited lecture on avoiding high GHG emissions from oil shale production, February 11th 2009.

Stanford University, Energy Resources Engineering departmental seminar. Invited lecture on oil shale production energy balance and GHG emissions, December 4th, 2007.

CONFERENCE
PRESENTATIONS

Brandt, A.R. (2011). A bottom-up mathematical framework for energy return on investment (EROI) and other energy return ratios. Biophysical Economics Conference (3rd), April 15th-16th 2011.

Brandt, A.R. (2010). Time-varying LCA of liquid fuels: Energy efficiency and GHG emissions consequences of oil depletion. LCA-X Conference, American Center for Life Cycle Assessment. Portland, OR, November 2010.

Mulchandani, H., A.R. Brandt (2010). Oil shale as an energy resource in a CO₂ constrained world: The concept of electricity production with in-situ carbon capture (EPICC). 30th Oil Shale Symposium, Colorado School of Mines, October 2010.

Brandt, A.R. J. Boak, A.K. Burnham (2009) Determinants of CO₂ emissions from oil shale: The case of liquid fuel production. 29th Oil Shale Symposium, Colorado School of Mines, October 21st, 2009.

Brandt, A.R. (2007). "Converting Green River oil shale to liquid fuels with ATP and ICP technologies: Life-cycle comparison of energy efficiency and GHG emissions." 27th Oil Shale Symposium, Colorado School of Mines, October 17th, 2007.

Brandt A.R. (2006). "Testing Hubbert." Best Student Paper Award Competition at 26th North American Conference of the International Association for Energy Economics, Ann Arbor, Michigan, September 25th, 2006.

Farrell A.E. and A.R. Brandt (2006). "Greenhouse gas emissions from a transition to oil substitutes." Modeling the Oil Transition: A DOE/EPA Workshop on the Economic and Environmental Implications of Global Energy Transitions, April 20th to 21st, 2006. Resources for the Future, Washington DC. Available from <http://cta.ornl.gov/oilTransitions/>

Brandt, A.R. and A.E. Farrell (2005). "Scraping the bottom of the barrel: CO₂ emission consequences of a transition to low-quality and synthetic petroleum resources." 25th Annual North American Conference of the International Association for Energy Economics, Denver, Colorado, September 19th, 2005.

TEACHING
EXPERIENCE

Stanford University

Acting Assistant Professor

January 2010 to present

Courses taught:

- ENERGY 191/291 *Optimization of energy systems* - Introductory optimization course with applications to energy technologies, including energy storage, emissions reduction, energy trade and shipment, optimal capital investment in energy systems.
- ENERGY 104 *Transitions to sustainable energy systems* (with Sally Benson) - Systems-scale analysis of energy futures and the transition to a sustainable energy system. Includes topics such as GHG emissions analysis, modeling energy supply and demand, technological learning, fossil-fuel impacts mitigation.
- ENERGY 293 A *Fundamentals of renewable energy processes* (With Anthony Kavscek and Roland Horne) - Introductory graduate course on renewable energy. Taught course section on bio-fuels, including fundamentals of biomass energy capture, gasification and liquefaction of biomass feedstocks.

University of California, Santa Barbara

Teaching Assistant

2003, 2008

Environmental Studies 25, *Quantitative Thinking in Environmental Studies*; Environmental Studies 115, *Energy and the Environment*; Environmental Studies 118, *Industrial Ecology*.

CONSULTING
EXPERIENCE

Directorate General Climate Action European Commission, Brussels, Belgium

Technical consultant

June 2010 to January 2011

Reviewed existing oil sands life cycle assessment studies in order to determine most accurate methods for assessing GHG emissions from oil sands operations. Made recommendations for default GHG emissions values for regulatory process. Investigated differences between LCA methods in different oil sands studies.

UK Energy Research Centre, Imperial College London, United Kingdom

Consulting author

July 2008 to October 2008

Consulting author on project to comprehensively assess the current knowledge about oil depletion. Lead author on Task 4: Mathematical Methods of Forecasting Oil Supply. Project reviews methods of forecasting oil future oil supply, including curve-fitting methods, simulation models, and economic and econometric models. Contact: Steve Sorrell, s.r.sorrell@sussex.ac.uk.

Life Cycle Associates LLC, Portola Valley, CA

Consultant

December 2007 to June 2009

Consultant on a variety of projects, funded by American Petroleum Institute, New Fuels Alliance, etc. Analyzed models of transportation greenhouse gas emissions for federal regulatory processes. Modeling of greenhouse gas impacts of low-quality fuels such as tar sands. Contact: Stefan Unnasch, unnasch@lifecycleassociates.com.

Natural Resources Defense Council, San Francisco, California

Consultant

May to August 2006

Studied the energy inputs and outputs and resulting climate impacts of oil shale development in Colorado and Utah. Prepared report outlining energy balances and emissions from oil shale development. Contact: Johanna Wald, NRDC, (415) 875-6100.

OTHER
EXPERIENCE

Baobab Valley Resource Reserve, Morogoro region, Tanzania, East Africa

Assistant and fund-raiser

June to September 2001

Worked with a non-profit organization working toward sustainable development in rural Tanzania. Assisted with water supply projects in small rural village. Received over \$15,000 in grants and scholarships in conjunction with another student. Was personally awarded the UC President's Undergraduate Fellowship and Kirby-Jones scholarship.

MEDIA
APPEARANCES

Brandt, A. What choice do we have? *New York Times: Room for Debate*. October 3rd, 2011.

Gerritsen, M. Can we effectively and cleanly produce heavy oil resources? (video interview) *Smart Energy*, April 2nd, 2008. <http://smartenergyshow.com/>.

Parks, N. Shale-oil development on the fast track. *Environmental Science & Technology*, Policy News, February 6th, 2008. <http://pubs.acs.org/subscribe/journals/esthag-w/2008/feb/policy/np-oilshale.html>.

Kolbert, E. Unconventional crude: Canada's synthetic fuel boom. *The New Yorker*, November 12th, 2007. http://www.newyorker.com/reporting/2007/11/12/071112fa_fact_kolbert.

HONORS AND
AWARDS

- September 2006: Received Student Paper Award for paper "Testing Hubbert," 26th Annual Conference of the United States Association of Energy Economists.
- June 2003: Outstanding Senior of 2003, Environmental Studies program, UC Santa Barbara.
- June 2003: Highest Honors upon graduation (top 2.5% of graduating students), UC Santa Barbara.
- 1998-2003: Dean's Honors, UC Santa Barbara, 15 consecutive quarters.
- June 2001: Awarded UC President's Undergraduate Scholarship and Kirby-Jones Scholarship.
- 1999-2000: Highest GPA in Sophomore class of the Educational Opportunity Program, a program for under-represented students and students whose parents did not attend college.

COMPUTER SKILLS

- Mathematical Packages: MATLAB, JMP (statistical package), Mathematica
- Languages: AMPL (mathematical programming), MATLAB, Ploticus (script-based plotting)

- Other applications: L^AT_EX