

Jessika E. Trancik

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EMPLOYMENT

Atlantic Richfield Associate Professor in Energy Studies Institute for Data, Systems, and Society, Massachusetts Institute of Technology	2016-present
Atlantic Richfield Assistant Professor in Energy Studies Institute for Data, Systems, and Society, Massachusetts Institute of Technology	2014-2016
Assistant Professor Engineering Systems Division, Massachusetts Institute of Technology	2010-2014
Omidyar Fellow Santa Fe Institute	2006-2009
Adjunct Associate Research Scholar Earth Institute, Columbia University	2006-2009
Earth Institute Fellow Columbia University	2003-2005
Research Officer WSP International/United Nations Development Programme, Geneva	2002-2003
Research Assistant Chalmers University	1996 (Summer)
Process Engineer, Co-op Semester Intel Corporation	1995

EDUCATION

University of Oxford, D.Phil. Materials science	2002
Cornell University, B.S. Materials science and engineering	1997

AWARDS AND HONORS

Atlantic Richfield Career Development Professorship, MIT	2014-
External Faculty, Santa Fe Institute	2012-
Poptech Science and Public Leadership Fellow	2011
Omidyar Fellowship, Santa Fe Institute	2005-2009
Earth Institute Fellowship, Columbia University	2003-2005
National Science Foundation Graduate Fellowship Award	1999-2002
Rhodes Scholarship	1997
Marshall Scholarship (offered)	1997
TMS Presidential Scholar Award, The Mineral, Metals & Materials Society (TMS)	1997

ASM Outstanding Scholar Award, The Materials Information Society (ASM Int'l)	1996
Barry M. Goldwater National Scholar	1996

TEACHING

MIT Short Programs Professional Course (new offering 2014) <i>Understanding and Predicting Technological Innovation: New Data and Theory</i>	2014 -
ESD.124, MIT graduate course (new offering 2010) <i>Energy Systems and Climate Change Mitigation</i> ; students from 5 schools at MIT	2010 -
ESD.125, MIT graduate course (new offering 2011) <i>Mapping and Evaluating New Energy Technologies</i> ; students drawn from 3 schools at MIT	2011 -
Santa Fe Institute Global Sustainability Summer School Co-founder and co-director; school offered in 2009, 2010, 2016 (co-sponsors: PIK, IASS, NREL)	2009
College of Santa Fe, Short course on technological innovation Guest lecturer	2007
Watamu Primary and Secondary School, Kenya Crossroads Africa, teacher, mathematics (8th grade) and English (2nd grade)	1997 (Summer)

PUBLICATIONS

*corresponding author, principal investigator

^authors contributed equally

Peer-reviewed journal articles:

- Kavlak G, McNerney J, **Trancik JE***, Evaluating the changing causes of photovoltaics cost reduction, in preparation
- McNerney J, **Trancik JE***, Mathematical theory of economies of scale and application to photovoltaics, in preparation
- Pereira G, Silva C, **Trancik JE***, Value of community solar with storage: Insights from Portugal, in final preparation
- Mueller JM, **Trancik JE***, Storage technology cost targets for renewable energy arbitrage, in final preparation
- Ghoddsi H, Roy M, **Trancik JE***, Technology cost riskiness: the case of biofuels, in review
- Klemun MM, **Trancik JE***, Hidden effects of carbon-focused energy policies call for methane mitigation, in review
- Edwards MR, McNerney J, **Trancik JE***, Testing emissions equivalency metrics against climate policy goals, in final preparation
- Needell Z, McNerney J, Chang M, **Trancik JE***, Potential for widespread electrification of personal vehicle travel in the United States, *Nature Energy*, 2016, in press
- Miotti M[^], Supran G[^], Kim E, **Trancik JE***, Personal vehicle technologies evaluated against climate change mitigation targets, *Environmental Science and Technology*, 2016, DOI: 10.1021/acs.est.6b00177
- Braff W, Mueller JM, **Trancik JE***, Value of storage technologies for wind and solar energy, *Nature Climate Change*, 2016, DOI: 10.1038/NCLIMATE3045

- Roy M, Edwards MR, **Trancik JE***, Timelines for mitigating methane emissions from energy technologies, *Environmental Research Letters*, 2015, Vol. 10, 114024 (10 pp)
- Kavlak G, McNerney J, Jaffe RL, **Trancik JE***, Metals production requirements for rapid photovoltaics deployment, *Energy & Environmental Science*, 2015, Vol. 8, pp. 1651-1659
- Edwards MR, **Trancik JE***, Climate impacts of energy technologies depend on emissions timing, *Nature Climate Change*, 2014, Vol. 4, 347-352
- **Trancik JE***, Chang MT[^], Karapataki C[^], Stokes L[^], Effectiveness of a segmental approach to climate policy, *Environmental Science and Technology*, 2014, Vol. 48, 27-35
- Bettencourt LMA[^], **Trancik JE***, and Kaur J Vol. 4, pp. 347-352, Determinants of the pace of global innovation in energy technologies, *PLoS One*, 2013, Vol. 8, e67864
- **Trancik JE***, Cross-Call D, Energy technologies evaluated against climate targets using a cost and carbon trade-off curve, *Environmental Science and Technology*, 2013, Vol. 47, 6673-6680
- Nagy B, Farmer JD, **Trancik JE***, Statistical basis for predicting technological progress, *PLoS One*, 2013, Vol. 8, e52669
- Nagy B, Farmer JD, **Trancik JE**, Gonzales JP, Superexponential long-term trends in information technology, *Technology Forecasting and Social Change*, 2011, Vol. 78, 1356-1364
- McNerney J, Farmer JD, Redner S, **Trancik JE***, Role of design complexity in technology improvement, *Proceedings of the National Academy of Sciences*, 2011, Vol. 108, pp. 9008-9013
- McNerney J, Farmer JD, **Trancik JE***, Historical costs of coal-fired electricity and implications for the future, *Energy Policy*, 2011, Vol. 39, 3042-3054
- **Trancik JE***, Calabrese Barton S, Hone J, Transparent and Catalytic Carbon Nanotube Films, *Nano Letters*, 2008, Vol. 8, pp. 982-987
- **Trancik JE***, Scale and innovation in the energy sector: a focus on photovoltaics and nuclear fission, *Environmental Research Letters*, 2006, Vol. 1, 014009 (7 pp)
- **Trancik JE**, Czernuszka JT, Riekel C, Bell FI, Viney C, Nanostructural features of a spider dragline silk as revealed by electron and X-ray diffraction studies, *Polymer*, 2006, Vol. 47, pp. 5633-5642 (invited paper)
- Halvarsson M, **Trancik JE**, Ruppel S, The microstructure of CVD kappa-Al₂O₃ multilayers separated by thin intermediate TiN or TiC layers, *International Journal of Refractory Metals & Hard Materials*, 2006, Vol. 24, pp. 32-38.
- **Trancik JE**, Czernuszka JT, Cockayne DJH, Viney C, Nanostructural physical and chemical information derived from the unit cell scattering amplitudes of a spider dragline silk, *Polymer*, 2005, Vol. 46, pp. 5225-5231
- **Trancik JE**, Czernuszka JT, Merriman C, Viney C, A simple method for orienting silk and other flexible fibres in transmission electron microscopy specimens, *Journal of Microscopy*, 2001, Vol. 203, pp. 235-238
- Kraus GT, Lu Y-C, **Trancik JE**, Mitro DM, Giannelis EP, Thompson MO, and Sass SL, Synthesis and magnetic properties of Ni- Al₂O₃ thin films, *Journal of Applied Physics*, 1997, Vol. 82, pp. 1189-1195

Other:

- **Trancik JE***, Innovation: Clean energy enters virtuous cycle, *Nature*, 2015, Vol. 528, p. 333

- **Trancik JE***, Klemun MM, Edwards MR, Timing matters: Why methane mitigation needs to be more ambitious than regulators anticipate, *Public comment on the EPA's Clean Power Plan*, December 2014
- Kavlak G, McNerney J, Jaffe RL, **Trancik JE***, Growth in metals production for rapid photovoltaics deployment, *Proceedings of the 40th IEEE Photovoltaics Specialists Conference*, 2014, pp. 1442-1447
- **Trancik JE***, Renewable energy: Back the renewables boom, *Nature*, 2014, Vol. 507, pp. 300-302
- Ghoddsi H, Cross-Call D, **Trancik JE***, The Supply Risks and Resilience of Biofuels, 3rd International Engineering Systems Symposium, *CESUN*, 2012
- Andersson KP, Carpenter SR, Cavender-Bares J, Foley J, Guckenheimer J, Jain S, Kates RW, Ramanathan V, **Trancik JE**, Measuring and Monitoring Progress Toward Sustainability, Chapter in: *Toward a Science of Sustainability*, Eds. William Clark and Simon Levin, Report from: Toward a Science of Sustainability Conference, November 2009, and CID Working Paper, Harvard University, May 2010
- Farmer JD[^] and **Trancik JE[^]**, Dynamics of technological development in the energy sector, *London Accord Final Publication*, J-P Onstwedder and M Mainelli eds. (2007); and Santa Fe Institute Working Paper #07-12-046
- **Trancik JE***, Zweibel K, Technology choice and the cost reduction potential of photovoltaics, *Proceedings of the World Conference on Photovoltaic Energy Conversion*, IEEE WCPEC – 4, 2006, Vol. 2, pp. 2490-2493
- **Trancik JE***, Photovoltaics - a niche-market distraction or a global energy solution? *Georgetown Public Policy Review*, 2006, Vol. 11, pp. 69-81
- **Trancik JE**, Czernuszka JT, Bell F, Viney C, Nanoscale Origins of Spider Dragline Mechanical Properties, *Materials Research Society Symposium Proceedings*, 2005, Vol. 844, Y4.7.1-Y4.7.6
- **Trancik JE**, Gilmore A, Reichardt J, Tiazoldi C, Efficient and Resilient Electric Power Networks: A Chinese Case Study, Complex Systems Summer School, Beijing, Santa Fe Institute (2005)
- **Trancik JE**, and Modi, V., Energy infrastructure design in São Tomé e Príncipe, in Development Plan of Action, Earth Institute Advisory Project (2004)
- **Trancik JE**, Silk microstructures, University of Oxford (2002), D.Phil. Thesis
- Üstündag E, Stocker ML, Shapiro Y, **Trancik JE**, Sass SL, *In situ* processing of metal-ceramic composites using partial reduction reactions: effect of dopants, porosity and volume change, in *Processing and Fabrication of Advanced Materials IV*, T.S. Srivatsan and J.J. Moore (eds.), TMS, Pennsylvania (1996)

PATENTS

Trancik JE and Hone J, 'Ozone-treated Carbon Electrodes', US20090038681A1, US Patent Application, No. 12/221,462, filed 8/1/2008

Saffre F and **Trancik JE**, 'Scheduling Usage or Provision of Resources', US20110029348A1, EP2107518A1, EP2272033A1, WO2009122173A1, Patent Application, EP 08251232.8, filed 3/31/2008

SELECTED PRESS

December 15, 2014: "[Assessing climate impacts of energy technologies](#)" **Energy Futures**

June 13, 2014: "[Living On Earth: EPA Rules Ignore Methane](#)" **NPR**

April 25, 2014: "[Climate change mitigation: Depositing global warming potentials](#)" Nature Climate Change News and Views

November 27, 2013: "[Solar and wind innovations are reflected in booming patents](#)" USA Today

June 6, 2013: "[Researchers develop tool to set cost and emissions targets for energy sources](#)" ClimateWire

April 25, 2013: "[Moore's law is not just for computers](#)" Nature

March 25, 2013: "[Moore's law vs. Wright's law](#)" Forbes

January 19, 2012: "[Seminar challenges with systems approach to climate change](#)" MITEI News

September 1, 2011: "[How a PopTech fellow is accelerating clean energy development](#)" SmartPlanet.com

May 17, 2011: "[Which technologies get better faster?](#)" MIT News

August 27, 2009: "[Here Comes the Sun \(and Wind\)](#)" Seed Magazine

RECENT GRANTS

ARPA-E, US Department of Energy, PI (2016-2018); **Lockheed**, PI (2015-2016), **Ford**, PI (2015-2016); **SMART Singapore-MIT Alliance**, PI (2014-2015); **MITEI Seed Fund Award**, PI (2014); **Sunshot, US Department of Energy**, PI (2013- 2016); **Charles E. Reed Faculty Initiatives Fund**, PI (2012, 2014); **New England University Transportation Center (DOT)**, PI (2014-2015); **BP**, PI (2012-2013); **Lockheed Martin**, PI (2012-2013); **New England University Transportation Center, DOT**, PI (2012-2013); **Solomon Buchsbaum Research Fund**, PI (2010-2011); **National Science Foundation**, co-PI (2007-2011)

SELECTED CONFERENCE PRESENTATIONS

Barcelona Global Energy Challenges, Keynote Speaker (2015); **International Society for Industrial Ecology**, 6 group members presenting (2015); **Materials Research Society Fall Meeting**, (2014) with G Kavlak, J McNerney, and RL Jaffe; **MIT-NSF Workshop: Smarter Service Systems**, (2014); **MIT R&D Conference**, (2014); **Innovation Workshop, Santa Fe Institute**, (2014); **37th IAEE International Conference**, Invited Speaker (2014); **40th IEEE Photovoltaics Specialist Conference** (2014) with G Kavlak, J McNerney, and RL Jaffe; **Gordon Conference on Industrial Ecology** (2014) with M. R. Edwards; **DOE Sunshot Grand Challenge Summit** (2014) with J McNerney and G Kavlak; **BP MIT Meeting** (2014); **StatOil MITEI Meeting** (2014); **INFORMS**, Invited Speaker (2013); **European Conference on Complex Systems Satellite**, Invited Speaker (2013); **DOE Solar Technology Evolution and Diffusion Meeting**, Invited Speaker (2013); **Links Conference, MIT Media Lab**, Keynote Speaker (2013); **International Society for Industrial Ecology** (2013) with M. R. Edwards; **International Symposium on Sustainable Systems and Technology** (2013) with M. R. Edwards; **AMPERE-Advance PIAMDDI Technology Workshop**, Invited Speaker (2013); **Berkeley Bioeconomy Conference** (2013) with H. Ghoddusi, **Materials Research Society**, (2012); **US Association for Energy Economics/ International Association for Energy Economics** (2012) with H. Ghoddusi; **Council on Engineering Systems Universities 3rd International Engineering Systems Symposium** (2012); **Instituto de Sistema Complejos de Valparaíso, Chile** (2012); **CODELCO, Chile** (2012); **Green Economy Workshop at Arizona State University** (2011); **PopTech Conference**, Invited Speaker (2011); **Metal Scarcity Workshop at Yale University School of Forestry and Environmental Studies** (2011); **Thought Leaders Forum**, Legg Mason Capital Management (2010); **Workshop on Measuring, Mapping, and Modeling Technological Change, Italy** (2010), **Materials Processing Center Advisory Committee Meeting, MIT** (2010); **Micro Nano Breakthrough Conference**, Keynote Speaker (2009); **Toward Sustainable Social Systems, Japan**, Invited Speaker (2009); **Santa Fe Institute Science Board Meeting**, Invited Speaker (2009); **Global New Energy Summit** (2009); **Office of Science and Technology Policy, Executive Office of the President, Science of**

Science Policy Workshop for federal research roadmap (2008); **National Academies Keck Futures Initiative Conference on complex systems** (2008); **MIT/Cambridge University workshop on engineering change**, Invited Speaker (2008); **Legg Mason Capital Management Energy Summit**, Invited Speaker (2008); **London Accord launch meeting**, Invited Speaker (2007); **Materials Research Society Meeting**, Spring (2006); **World Conference on Photovoltaic Energy Conversion** (2006); **Materials Research Society Meeting**, (2004).

SELECTED INVITED SEMINARS AND GUEST LECTURES

Stanford University, Energy Resources Engineering (2015); **Carnegie Mellon University**, Electricity Industry Center Seminar Series (2015); **Santa Fe Institute Business Network Meeting on Complex Engineering Systems** (2015); **University of Wisconsin Madison**, Weston Roundtable Seminar Series (2015); **University of California Berkeley**, Energy and Resources Group (2015); **Carnegie Institution for Science**, Department of Global Ecology, Stanford University Campus (2015); **University of California Davis**, Energy Institute (2015); **University of California Santa Barbara**, Bren School of Environmental Science and Management (2015); **University of Massachusetts**, Department of Mechanical and Industrial Engineering (2014); **National Association of Clean Air Agencies**, Global Warming Committee (2014); **Rutgers University**, Energy Policy Seminar Series, (2014); **McGill University and Polytechnique Montreal**, Trottier Energy Institute (2014); **Harvard-MIT Working Group on Sustainability Science** (2014); **MIT**, Sloan School of Management (2014); **MIT**, Department of Materials Science and Engineering, 3.003 (2014); **MIT**, Climate CoLab (2014); **University of Hawai'i at Manoa** (2014); **Harvard**, GSAS (2014); **Chalmers University**, Gothenburg, Sweden (2013); **Chalmers University**, Gothenburg, Sweden (2012); **University of Michigan**, Sustainable Systems Forum (2012); **MIT ILP Research & Development Conference** (2012); **MIT System Design and Management Conference** (2012); **MIT Building Technology Lecture Series** (2012); Arizona State University, **Challenges of Complexity Speaker Series** (2011); **MIT Leaders for Global Operations Operating Committee** (2011); **International Institute for Applied Systems Analysis**, Austria (2011); **Yale University**, School of the Environment (2011); **Carnegie Mellon University**, Department of Engineering and Public Policy (2011); **University of California Santa Barbara**, Bren School of Environmental Science and Management (2009); **Dartmouth College**, Jones Seminar Series (2009); **ETH Zürich**, Department of Mechanical and Process Engineering (2009); **Stanford University**, Earth Sciences (2008); **Los Alamos National Laboratory**, Energy and Climate Series (2007); **Duke University**, Nicholas School for the Environment (2007); **University of California, Berkeley**, Materials Science and Eng. Dept. (2006); **Univ. of Connecticut**, Materials Science and Engineering Dept. (2005); **Santa Fe Institute** (2005); **Stanford University**, Civil and Environmental Engineering Dept. (2005); **Columbia University**, Department of Earth and Environmental Engineering (2005); **Columbia University**, Chemistry Dept. (2004); **Columbia University**, Earth Institute (2004); **Cornell University** (2004).

WORKSHOPS, MEETINGS, SEMINAR SERIES

Leading Technology Policy Seminar Series , MIT Co-organizer	2013-2014
Modeling Social, Technical, and Natural Systems for Policy Workshop , MIT Co-organizer	2013 (Fall)
Council on Engineering Systems Universities 3rd International Engineering Systems Symposium Co-chair of three sessions (with Noelle Selin and Richard de Neufville)	2012
Modeling Technological Development , Santa Fe Institute Co-organizer	2008 (Summer)
Principles of Repurposing , Santa Fe Institute Co-organizer	2008 (Summer)

Catalyzing Change in the Global Energy System , National Renewable Energy Laboratory and Santa Fe Institute, Co-organizer	2007
Energy, Climate and Sustainable Development , National Renewable Energy Laboratory and Santa Fe Institute, Co-organizer	2006

PROFESSIONAL SERVICE AND ACTIVITIES

Expert reviewer of DOE Quarterly Technology Review	2015
DOE review panel, Sunshot National Laboratory Multiyear Partnership	2015
Reviewer for ES&T, PNAS, Science, ERL, ACS Nano, Elementa, JACS, ASME, Carbon, Nature Climate Change, Energy Policy, PLoS ONE,	2010-
Carbon mitigation domain editor for WIRES Climate Change	2014-
Policy Committee, MIT	2014-
Distinguished Fellowships Committee, MIT	2010-
Science Steering Committee, Santa Fe Institute	2014-2017
Council on Interdisciplinary Education, MIT School of Engineering	2011-2013
NSF review panel and ad hoc reviewer, Environmental Sustainability, Directorate for Engineering	2012-2013
National Academies Science and Technology for Sustainability, Forum on the Energy-Water-Waste Nexus	2013
DOE Sunshot Program, and ARPA-E, Panelist and participant, planning workshops	2012
NSF ad hoc reviewer, Decision, Risk, and Management Sciences, Division of Social and Economic Sciences, Directorate for Social, Behavioral and Economic Sciences	2012
Engineering Systems Division Admissions Committee and Engineering System Division Undergraduate Committee	2010-2012
Reviewer of the National Renewable Energy Laboratory's 'Renewable Electricity Futures Study'; published in 2012	2011
Hosted at MIT a member of the Iraqi Science Fellowship Program run by the US State Department and CDRF	2011
Rhodes Scholarship District Selection Committee	2004-2008
Academic advisor to London Accord project and presenter at launch meeting, convening global investment firms, academics and UK govt. officials to draft investment and public policy recommendations for the low carbon energy sector	2007
Lecturer for middle school science program, Santa Fe Institute 'Growing up thinking scientifically'	2007
Santa Fe Institute public lecture series discussant, 'New Mexico's Renewable Energy Future', Ben Luce	2007
Earth Institute Advisory Project São Tomé e Príncipe – pro bono consultant to the government of São Tomé e Príncipe (West Africa) on energy infrastructure design for sustainable development	2004- 2005

ADVISING

M.S. students: Heshuang Zheng, Masters in Urban Studies and Planning, co-advisor (2011); Shylesh Mularidharan, Masters in Systems Design and Management (2012); Morgan R. Edwards, Masters in Technology and Policy (2013), Michael Chang, Masters in Technology and Policy (2014); Joshua M. Mueller, Masters in Technology and Policy; Zach Needell, Masters in Transportation; Fabian Riether, Masters in Mechanical Engineering

Ph.D. students: James McNerney, co-advisor, Department of Physics, BU (2012); Morgan Edwards, Engineering Systems Division; Marco Miotti, Engineering Systems Division; Magdalena Klemun, Engineering Systems Division; Joshua Mueller, Engineering Systems Division; Goksin Kavlak, Engineering Systems Division; Zach Needell, Civil and Environmental Engineering.

Postdoctoral associates and research staff: Bela Nagy (2008-2010); Hamed Ghodduzi, now faculty at Stevens Institute of Technology (2011-2013); Victor Ocana (2014-); Mandira Roy, Research Associate (2013-); James McNerney (2012-).