

Jonathan G. Koomey

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Summary

More than 25 years of interdisciplinary scholarship on energy and environmental issues, incorporating engineering, economics, public policy, and environmental science. Intellectual leadership in analyzing resource impacts of information technology, assessing the economics of greenhouse gas emission reductions, teaching critical thinking skills, and applying engineering-economic tools to solve problems for public and private sector decision makers. Demonstrated abilities in teaching, fund raising, and mentoring.

Education

Ph.D., Energy and Resources (1990), University of California, Berkeley

Thesis supervisor: Anthony Fisher, Professor of Agricultural and Resource Economics (Committee also included Art Rosenfeld, Physics; John Quigley, Public Policy; Robert Edelstein, Business School; and Carl Blumstein, Universitywide Energy Research Group)
Dissertation: Energy Efficiency in New Office Buildings: An Investigation of Market Failures and Corrective Policies.

M.S., Energy and Resources (1986), University of California, Berkeley

Thesis supervisor: Edward Kahn, Staff Scientist and Group Leader, Lawrence Berkeley National Laboratory

Thesis title: A Simplified Spreadsheet Model for Assessing the Load and Energy Impacts of Demand-Side Programs for Selected Residential Appliances.

Coursework: Energy engineering, physics, economics, energy policy, and environmental science

A.B., History and Science (1984), *cum laude*, Harvard University, Cambridge, MA.

Thesis supervisor: Richard Hirsh, Visiting professor at Harvard Business School (Professor of History of Technology and Science & Technology Studies at Virginia Tech)

Thesis title: Energy Policy in Transition: The Rise of Conservation (documenting changing attitudes towards energy efficiency in the 1970s)

Coursework: Physics, engineering, computer science, economics, philosophy, history, and history of science.

Awards and Scholarships

- AT&T Industrial Ecology Fellowship (2005) to study electricity used by the telephone system and the implications for a large-scale conversion of the phone system to Voice Over IP technology <http://www.att.com/ehs/ind_ecology/fellow_guidelines.html>.
- Aldo Leopold Leadership Fellowship (2004), a training fellowship for mid-career academics on effective communications about environmental issues <<http://www.leopoldleadership.org>>.
- LBNL outstanding performance award (2001) for providing the strategic vision for implementing the 2001 California Energy Crisis web site <<http://savepower.lbl.gov/>>.
- LBNL outstanding performance award (1998) for taking a leadership role in the buildings sector and the integrating economic analysis for the 1997 Interlaboratory study on scenarios of U.S. carbon reductions <<http://enduse.lbl.gov/projects/5lab.html>>.
- National Research Council award (1994) for excellence in transportation research for the Transportation Research Record article titled “Improving Fuel Economy: A Case Study of the 1992 Honda Civic Hatchbacks”.
- Harvard College Scholarship for academic excellence (1981-84).
- Harvard University Dean's List (1980-84).
- Sperry & Hutchinson Scholarship (1980-84).

Professional experience

Consulting Professor at Stanford University, Department of Civil and Environmental Engineering (June 2004-present).

Technical Advisor to Wattbot (September 2007 to the present), a startup company based in San Francisco, CA focusing on ways to improve consumer access to energy efficiency and renewable energy technologies.

Project Scientist at Lawrence Berkeley National Laboratory's Energy Analysis Department in Berkeley, CA (September 2003-June 2010).

Visiting Professor, Yale University, School of Forestry and Environmental Studies (September through December 2009), teaching a course titled “Energy Systems Analysis” and a seminar titled “Forecasting energy futures: Pitfalls and prospects”.

Shimizu Visiting Professor, Stanford University, Department of Civil and Environmental Engineering (September through December 2008), teaching a course titled “Quantitative methods for exploring energy futures”.

Leader of an industry consensus process (March through November 2006) to develop a protocol for attaching energy use of servers to standard performance benchmarks.

Judge (2005) and Technical Advisor (2005-2008) to the *California Clean Tech Open*, a business-plan competition promoting clean energy technologies in California.

Senior Fellow, Uptime Institute, Santa Fe, New Mexico (February 2005 – April 2010).

- The Uptime Institute promotes reliability in high density computing facilities and continues to collaborate with me on issues related to power use in these facilities.
- Co-chair and Master of Ceremonies for the Uptime Institute’s 2007 Data Center Design Charrette, October 28-31, 2007.

MAP/Ming visiting professor in Energy and Environment, Stanford University (September 2003-June 2004). Achievements:

- Teaching a class titled “Quantitative methods for exploring energy futures” in Winter 2004, and a class titled “Analyzing combined heat and power technologies from engineering, environmental, and economic perspectives” in Spring 2004.
- Giving invited talks and participating in the Civil and Environmental Engineering department’s discussions of the “green dorm.”
- Supervising student projects analyzing the economic and logistic feasibility of the hydrogen economy, the potential for the Stanford campus to have achieved energy savings if it had built “green” over the past 15 years, and other comparisons of forecasts to historical data.

Senior Fellow, Rocky Mountain Institute (July 2003-present). Key achievement:

- Working with RMI staff on assessing the potential for reducing petroleum use in the US. “Winning the Oil Endgame” report released September 2004.

Staff Scientist and Group Leader at the Lawrence Berkeley National Laboratory’s Energy Analysis Department in Berkeley, CA (August 1991 to August 2003). Achievements:

- Starting and leading the End-Use Forecasting group (<http://enduse.lbl.gov>), which provides technical support for the U.S. Environmental Protection Agency and Department of Energy. Responsible for direct supervision of more than a dozen researchers and other staff, with a budget of \$1.5-\$2M/year.
- Tracking and refuting high-profile claims by a coal-industry funded group that electricity used by the computers and office equipment used huge amount of

electricity. These claims, which permeated the media, were based on flawed assumptions that vastly overstated electricity use. We used the latest data and analysis to demonstrate these flaws, and published our work in peer-reviewed journals <<http://enduse.lbl.gov/Projects/InfoTech.html>>.

- Conducting technical and market analysis for the U.S. Environmental Protection Agency's Atmospheric Pollution prevention division, which is responsible for the EPA's ENERGY STAR programs.
- Leading the team to analyze the Clinton Administration's proposed tax incentives for efficient equipment in the building sector, as part of the President's Climate Change Technology Initiative announced in the State of the Union Address in January 1998.
- Participating as a primary author of two interlaboratory analyses of the cost of reducing carbon emissions in the U.S. in 1997 and 2000. Principal author of the analysis on efficiency in buildings, and responsible for the integrated cost analysis and modeling for both studies.
- Producing (as author or coauthor) more than 150 articles, books, and reports on energy conservation technology, energy economics, energy policy, environmental externalities, global climate change, and cost-benefit comparisons between competing demand- and supply-side resources.
- Invited to testify before Congress in September 2001 about electricity used by high density computing facilities, but those hearings were canceled after September 11th and not rescheduled.

Visiting Scholar at the Department of Applied Physics, University of Sydney (November 2000).

- Collaborating with Christopher Dey and others working on photovoltaic technologies.
- Giving an invited talk at the Australian Greenhouse Office in Canberra.

Senior Lecturer at the Energy and Resources Group, at the University of California, Berkeley (Spring 2000). Achievement:

- Teaching a class titled “Tricks of the Trade” using a draft of *Turning Numbers into Knowledge* as the main text.

Lecturer at the Central European University, in Budapest, Hungary (July 1999). Achievement:

- Teaching a course titled “Energy Policy for Economies in Transition” which presented comparative economics of power generation and efficiency technologies, analytical techniques for evaluating those technologies, and key historical events in energy policy.

Post-Doctoral Research Fellow at the Lawrence Berkeley National Laboratory's Energy Analysis Department in Berkeley, CA (1990-91). Key achievement:

- Producing the most comprehensive assessment of electricity efficiency potential for the US residential sector that had been created up until that point. The data and analysis tools developed in that effort are still in use today, in modified form.

Commissioner, City of Berkeley Energy Commission (1986-1990). Key achievement:

- Developing and working to pass (in collaboration with other commissioners and the city council) a revised version of Berkeley's Residential Energy Conservation Ordinance, which requires homeowners to upgrade the energy efficiency of their homes upon resale (up to some dollar cap).

Research Assistant at the Lawrence Berkeley National Laboratory's Energy Analysis Department in Berkeley, CA (1984-90). Key achievements:

- Presenting invited testimony before energy regulatory bodies in Wisconsin (1988) and California (1990).
- Analyzing the impacts on U.S. electric utilities of proposed appliance efficiency standards (1986-1992).

Professional activities

- **Member, editorial board** of the journal *Contemporary Economic Policy* (1993-Present).
- **Guest Editor** for a special issue of the journal *Resources, Conservation, and Recycling* on information technology and resource use (2001-2002).
- **Frequent reviewer** for the journals *Energy Policy*, *The Energy Journal*, and *Energy—the International Journal*, and an **occasional reviewer** for *Science*, *Contemporary Economic Policy*, *Resources, Conservation and Recycling*, *The Journal of Infrastructure Systems*, and the National Science Foundation.
- **Dissertation committee member** for Nate Hultman (UC Berkeley, 2001), Holmes Hummel (Stanford, 2006), Lily Parshall (Columbia University, 2009), Danny Cullenward (Stanford, current).

Classes taught

- **Class titled “Energy Systems Analysis”.** Yale University School of Forestry and Environmental Studies, Fall 2009.
- **Seminar titled “Forecasting energy futures: pitfalls and prospects”.** Yale University School of Forestry and Environmental Studies, Fall 2009.
- **Turning numbers into knowledge: getting the numbers you need.** Workshop for the Software Testers Association meeting in Colorado Springs, CO, July 13, 2009.

- **Environmental sustainability – the new imperative** for Microsoft Corporation, in separate events in St. Louis and Minneapolis, MN on November 17 + 18, 2008
- **Class titled “Quantitative methods for forecasting energy futures”** at Stanford University, Fall quarter 2008.
- **Class on critical thinking, analysis, and data presentation skills** for the Global Business Network in Emeryville, CA, using *Turning Numbers into Knowledge* as the text. February 13, 2006.
- **Class titled “Analyzing combined heat and power technologies from engineering, environmental, and economic perspectives”** at Stanford University, Spring quarter 2004.
- **Class on critical thinking, analysis, and data presentation skills** as a lecturer for IBM’s Performance Testing Group in Morgan Hill, CA, using *Turning Numbers into Knowledge* as the text. March 29-31, 2004.
- **Class titled “Quantitative methods for forecasting energy futures”** at Stanford University, Winter quarter 2004.
- **Class summarizing the U.S. energy system and some tricks of the trade** as a lecturer for an internationally known energy company in Portland, OR, from February to November 2001. Conducted five such classes in 2001.
- **Class titled “Tricks of the Trade,”** as a Senior Lecturer at the Energy and Resources Group, at the University of California, Berkeley (Spring 2000).
- **Class titled “Energy Policy for Economies in Transition”** as a lecturer at the Central European University, in Budapest, Hungary (July 1999). Taught comparative economics of power generation and efficiency technologies, analytical techniques for evaluating those technologies, and key historical events in energy policy.

Selected invited lectures: climate

Debate with Bjorn Lomborg at Stanford University, sponsored by Silicon Valley Bank, April 9, 2010

Facing the Climate Challenge: Some Lessons about Technology

Yale- REIL- REEEP Roundtable on Climate Change & Clean Energy Policy
October 23, 2009

Facing the Climate Challenge

Stanford University, February 24, 2009

Stanford University, September 11, 2008

Facing the Climate Challenge: What You and We Can Do.

Presented at the Oakland College Preparatory School, January 14, 2010

Presented at a fundraiser for Ecology Project International, October 21, 2007

Creating the Future: Cost Effective Options for Minimizing Climate Risks and Reducing Oil Dependence

University of WI, Madison, Roy Weston Distinguished Global Sustainability Lecture, October 26, 2006

Notes on Facing the Climate Challenge

NPR Climate Panel, San Francisco, CA, 27 March 2007

Asking the right questions about climate change mitigation costs

Scientific Symposium in Celebration of the 50th Anniversary of ECN - the *Energy Research Centre of the Netherlands*, in Petten, the Netherlands, November 17-18, 2005.

Costs of reducing carbon emissions in the U.S.: Some recent results

Sonoma State University, February 20, 2002

Lewis and Clark College Fourth Annual Symposium on Environmental Affairs, Portland, OR, October 19, 2001

American Association for the Advancement of Science, San Francisco, CA, February 20, 2001

Australian Greenhouse Office, Canberra, Australia, November 29, 2000

University of Sydney, Department of Applied Physics, Sydney, Australia, November 24, 2000

Cutting carbon emissions: Burden or benefit?

Hopkins Marine Station, Stanford University. August 18, 2004.

Designing voluntary pollution prevention programs in the real world: Some stories from the front lines

Donald Bren School of Environmental Science and Management Colloquium, UCSB, Santa Barbara, CA, May 17, 1999

Selected invited lectures: critical thinking skills and quantitative analysis

Sorry, wrong number: Real-life lessons for responsible use of data and analysis in decision making

Yale University, October 14, 2009

Plenary talk for the Software Testers Association meeting in Colorado Springs, CO, July 14, 2009

Plenary talk for the IRS Compliance Services Analyst CPE FY09 in Orlando, FL, October 28, 2008

Responsible use of numbers in decision making

US Air Force Academy, January 25, 2006

Sorry, wrong number: Avoiding pitfalls in quantitative analysis

Plenary talk for The Data Warehousing Institute Conference, Las Vegas, NV, February 22, 2007

University of California, Davis, December 2, 2005.

Plenary talk for one of Dupont's Six Sigma Engineering groups, Newark Delaware, March 15, 2005.

Sorry, wrong number: The use and misuse of numerical facts in analysis of energy issues

Stanford University, November 21, 2003

Yale University, October 29, 2003

Board of Directors, Rocky Mountain Institute, October 4, 2002

Sorry, wrong number: Why getting the numbers right really matters

Aspen Institute, Aspen, CO, December 17, 2002

Selected invited lectures: forecasting

Avoiding Common Pitfalls in the Use of Energy Forecasting Models for Scenario Analysis

Detroit Edison Company, April 17, 2007

Conference on Interrogating the Practice and Politics of Scenarios, Brown University, Providence, RI, March 23-24, 2007

Long-term Energy Forecasts: Is Useful Learning Possible?

International Institute for Applied Systems Analysis at the Conference on Learning and Climate Change, Laxenberg, Austria, April 10-11, 2006

Forecasting the "efficiency gap"

Energy Modeling Forum, Prout's Neck, Maine, October 7, 1993

Dynamic analyses for a dynamic world: the importance of policy context

International Energy Agency/DOE Workshop on Technologies to Reduce Greenhouse Gas Emissions, Hilton Crystal City, Arlington, VA, May 6, 1999

What can history teach us? A retrospective examination of long-term energy forecasts for the US

Stanford University, February 12, 2004

Selected invited lectures: general energy

Energy 101: Key data, concepts, and issues

Yale University, October 31, 2009

Energy efficiency: Key concepts and opportunities

Singularity University, July 22, 2009

Yale University (webinar for Megawatts on Main Street), December 2, 2009

1973 vs 2005: Technology and the Energy Crisis

Panel at the Sun Microsystems Summit on Eco-Responsibility and Design for the Environment, San Francisco, CA, Nov. 14, 2005. Chaired by Michael Krasny of KQED. Also on the panel: Amory Lovins (RMI), Greg Papadopoulos (CTO, Sun Microsystems), Scott McNealy (CEO, Sun Microsystems), Noah Horowitz (NRDC), and Christine Ervin (Former US Assistant Secretary of Energy)

Identifying new energy opportunities

Gave talk and moderated a panel session on new energy opportunities for the MIT Club of Northern California, at Parc, October 4, 2005.

Selected invited lectures: information technology electricity use

Assessing trends in the electrical efficiency computation over time

University of California Berkeley (CITRIS), March 19, 2010

Yale University, October 27, 2009

Energy efficiency improvements in computers: Research summary

Webinar for Climate Savers Computing Initiative, October 20, 2009

Trends in server energy use, performance, and costs: implications for cloud computing and the environment

Yale University, October 13, 2009

The energy and CO2 implications of different music delivery options

Stanford University, March 2, 2010

Yale University, October 6, 2009

What's driving data center electricity use?

Information Week Leadership panel webinar, December 10, 2009

Massachusetts Institute of Technology, EmTech forum, September 23, 2009

Whole system redesign for electricity efficiency: Some lessons from the world of cloud computing

University of California, Berkeley, June 12, 2009

The environmental cost of cloud computing: assessing power use and impacts

Green:Net, March 24, 2009

Powering the cloud: addressing electricity use and efficiency for the next generation data center

International Data Company cloud computing forum in San Francisco, February 18, 2009

The energy issue in data centers

Presented at Spansion Inc. in San Jose, June 24, 2008

Powering the cloud: Electricity use and efficiency of data centers

Computerworld Green IT symposium in Washington, DC, September 18, 2008.

Giga Om Structure 08 conference in San Francisco, June 25, 2008

Electricity use and efficiency of servers and data centers: A review of recent data and developments

IEEE Conference in San Francisco, CA, May 20, 2008

Data Center Operations Conference (plenary) in Athens, Greece, March 13, 2008

Computerworld Premier 100 leaders conference (plenary) in Orlando, FL, March 11, 2008

American Power and Electronics Conference (APEC, plenary) in Austin, TX, February 25, 2008

Computerworld Data Center Directions Virtual Conference (plenary), February 13, 2008

Yahoo! in San Jose, CA, February 7, 2008

Webinar for the Climate Group in the UK, December 11, 2007

Google, Mountain View, CA, December 4, 2007

Intel Fellows Meeting (plenary), San Diego, CA, November 29, 2007

Understanding Data Center Electricity Use

Stanford University, Palo Alto, CA, October 3, 2007

Cisco Systems, San Jose, CA, August 29, 2007

Webcast for SearchDataCenter.com, August 21, 2007

Data Center Electricity Use: What We Know

Intel Developer Forum, San Francisco, CA, September 19, 2007.

VC taskforce meeting in Palo Alto, CA, June 20, 2007

Detroit Edison Company, April 17, 2007

EPA stakeholder workshop at the Santa Clara Convention Center, February 16, 2007

Measuring energy consumption and performance of servers: Progress on energy metrics

Data Center Dynamics Conference, SF, CA, July 27, 2006

Measuring energy consumption and performance of data centers and servers

Data Center Decisions Conference, Chicago, IL, October 25, 2006

Data center power use: a review of the historical data

IBM Austin Conference on Energy-Efficient Design, Austin, TX , March 2, 2004

Latest measured data on data center power use in the U.S.

National Energy Modeling System conference, Washington DC, March 12, 2002

Latest estimates of power densities of data centers in the U.S.

RMI Data Center Charrette, San Jose, CA, February 3, 2003

Estimating electricity use “associated with the internet”: A cautionary tale

Western Region Air Partnership Forum, San Francisco, CA, June 1, 2000

Telecommunications Industry Energy Workshop, AT&T Technology Center, Washington DC, March 20, 2000

Electricity used by the Internet: How an urban legend became conventional wisdom

National Energy Modeling System conference, Washington, DC, March 12, 2002

Site Uptime Network Conference, Atlanta, GA, October 10, 2001

U.S. Telecom Association Conference, Dallas, TX, May 22, 2001

International Symposium on Electronics and the Environment, Denver, CO, May 8, 2001 (Keynote address).

Electronic Industries Association Spring Conference, Environmental Issues Council Meeting, May 7, 2001

Re-estimating the Annual Energy Outlook 2000 forecast using updated assumptions about the Internet economy

Earth Technologies Forum, Washington DC, October 30, 2000

Office equipment electricity use: Of urban legends and key uncertainties

NY Academy of Sciences/Tellus Institute Joint Symposium on E-Commerce and the Environment, New York, New York, October 24 - 25, 2000

Selected invited lectures: nuclear power

A Presentation of Work in Progress: Historical Costs of Nuclear Power in the U.S.—A Reactor-by-Reactor Analysis

Detroit Edison Company, April 17, 2007

University of Calgary, May 11, 2006

University of California, Berkeley, February 8, 2006

Stanford University, December 14, 2005

Selected invited lectures: reducing oil dependence

Winning the Oil Endgame: Innovation for Profits, Jobs, and Security

The Colorado Springs World Affairs Council, January 24, 2006

St Mary's College, Moraga, CA, January 10, 2006

University of California, Davis, December 2, 2005

Media

Appeared on Nova/Frontline, BBC Radio, CNBC, All Things Considered, Marketplace, On the Media, Tech Nation, Uncommon Knowledge, The California Report, Tech TV, CNET radio, and KQED radio.

Quoted in the New York Times, the Wall Street Journal, Barron's, the Washington Post, Christian Science Monitor, Dow Jones Newswires, Science, American Scientist, Science News, USA Today, WorldChanging.com, SF Chronicle, Harvard Magazine, Inside Energy, Environment-Energy Daily, Oakland Tribune, Interactive Week, MacWeek, Business 2.0, Network Magazine, Computing Canada, and Salon.com.

Other interests

Aikido (3rd degree black belt), classical contrabass, astronomy, hiking.

Publications

Refereed Journal Articles

- Blazek, Michele, Huimin Chong, Woonsien Loh, and Jonathan Koomey. 2004. "A data center revisited: Assessment of the energy impacts of retrofits and technology trends in a high-density computing facility." *The ASCE Journal of Infrastructure Systems*. vol. 10, no. 3. September. pp. 98-104.
- Brown, Marilyn A., Mark D. Levine, Joseph P. Romm, Arthur H. Rosenfeld, and Jonathan G. Koomey. 1998. "Engineering-Economic Studies of Energy Technologies to Reduce Greenhouse Gas Emissions: Opportunities and Challenges." In *Annual Review of Energy and the Environment 1998* Palo Alto, CA: Annual Reviews, Inc.
- Brown, Marilyn A., Mark D. Levine, Walter Short, and Jonathan G. Koomey. 2001. "Scenarios for a Clean Energy Future." *Energy Policy* (Also LBNL-48031). vol. 29, no. 14. November. pp. 1179-1196.
- Brown, Richard, Carrie Webber, and Jonathan Koomey. 2002. "Status and Future Directions of the ENERGY STAR Program." *Energy—The International Journal* (also LBNL-45952). vol. 27, no. 5. May. pp. 505-520.
- Brown, Richard E., and Jonathan G. Koomey. 2003. "Electricity Use in California: Past Trends and Present Usage Patterns." *Energy Policy* (also LBNL-47992). vol. 31, no. 9. July. pp. 849-864.
- Craig, Paul, Ashok Gadgil, and Jonathan Koomey. 2002. "What Can History Teach Us?: A Retrospective Analysis of Long-term Energy Forecasts for the U.S." In *Annual Review of Energy and the Environment 2002*,. Edited by R. H. Socolow, D. Anderson and J. Harte. Palo Alto, CA: Annual Reviews, Inc. (also LBNL-50498).
- Davis William B, Alan H. Sanstad, Jonathan G. Koomey. 2003. Contributions of Weather and Fuel Mix to Recent Declines in U.S. Energy and Carbon Intensity. *Energy Economics* (also LBNL-42054). Vol. 25, no. 4. July. pp. 375-396.
- Eto, Joseph, Jonathan Koomey, James McMahon and Edward Kahn. 1988. "Integrated Analysis of Demand-Side Programs." *IEEE Transactions on Power Systems*. vol. 3, no. 4.
- Ghanadan, Rebecca, and Jonathan Koomey. 2005. "Using Energy Scenarios to Explore Alternative Energy Pathways in California." *Energy Policy*. Vol. 33, No. 9. June, pp. 1117-1142.
- Gumerman, Etan, Jonathan G. Koomey, and Marilyn A. Brown. 2001. "A Sensitivity Analysis of the Clean Energy Future Study's Economic and Carbon Savings Results." *Energy Policy* (also LBNL-47357). vol. 29, no. 14. November. pp. 1313-1324.
- Hultman, Nathan E., and Jonathan G. Koomey. 2007. "The risk of surprise in energy technology costs." *Environmental Research Letters*, vol. 2, no. 034002. July. <http://www.iop.org/EJ/abstract/1748-9326/2/3/034002/>.

- Hultman, Nathan E., Jonathan Koomey, and Dan Kammen. 2007. "What history can teach us about the future costs of U.S. nuclear power." *Environmental Science & Technology*. vol. 41, no. 7. April 1. pp. 2088-2093.
- Kawamoto, Kaoru, Jonathan Koomey, Bruce Nordman, Richard E. Brown, Maryann Piette, Michael Ting, and Alan Meier. 2002. "Electricity Used by Office Equipment and Network Equipment in the U.S." *Energy--The International Journal (also LBNL-45917)*. vol. 27, no. 3. March. pp. 255-269.
- Koomey, Jonathan and Arthur H. Rosenfeld. 1990. "Revenue-Neutral Incentives to Promote Efficiency and Environmental Quality." *Contemporary Policy Issues*. vol. VIII, no. 3. p. 142. July 1990.
- Koomey, Jonathan, Arthur H. Rosenfeld and Ashok K. Gadgil. 1990. "Conservation Screening Curves for Comparing Efficiency Investments to Power Plants". *Energy Policy*. Vol. 18, No. 8. October 1990 (also LBL-27286)
- Koomey, Jonathan G., Deborah E. Schechter, and Deborah Gordon. 1993. "Improving Fuel Economy: A Case Study of the 1992 Honda Civic Hatchbacks." *Transportation Research Record*. vol. 1416, no. p. 115.
- Koomey, Jonathan, Timothy Oey, and Eric Bergman. 1993. "The Economics of Cycling Personal Computers." *Energy Policy*. vol. 21, no. 9. p. 937.
- Koomey, Jonathan, and Alan H. Sanstad. 1994. "Technical Evidence for Assessing the Performance of Markets Affecting Energy Efficiency." *Energy Policy*. vol. 22, no. 10.
- Koomey, Jonathan G., Camilla Dunham, and James D. Lutz. 1995. "The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-use Treatment." *Energy-The International Journal*. vol. 20, no. 7. p. 627.
- Koomey, Jonathan, Mary Ann Piette, Mike Cramer, and Joe Eto. 1996. "Efficiency Improvements in U.S. Office Equipment: Expected Policy Impacts and Uncertainties." *Energy Policy*. vol. 24, no. 12. p. 1101.
- Koomey, Jonathan, Alan H. Sanstad, and Leslie J. Shown. 1996. "Energy-Efficient Lighting: Market Data, Market Imperfections, and Policy Success." *Contemporary Economic Policy*. vol. XIV, no. 3. p. 98.
- Koomey, Jonathan G., Susan A. Mahler, Carrie A. Webber, and James E. McMahon. 1999. "Projected Regional Impacts of Appliance Efficiency Standards for the U.S. Residential sector." *Energy: the International Journal*. vol. 24, no. 1. January. pp. 69-84.
- Koomey, Jonathan G., Nathan C. Martin, Marilyn Brown, Lynn K. Price, and Mark D. Levine. 1998. "Costs of reducing carbon emissions: U.S. building sector scenarios." *Energy Policy*. vol. 26, no. 5. April. pp. 433-440 (also LBNL-40829).
- Koomey, Jonathan G., Carrie A. Webber, Celina S. Atkinson, and Andrew Nicholls. 2001. "Addressing Energy-Related Challenges for the U.S. Buildings Sector:

- Results from the Clean Energy Futures Study." *Energy Policy (also LBNL-47356)*. vol. 29, no. 14. November. pp. 1209-1222.
- Koomey, Jonathan. 2002. "Guest Editorial—Information technology and resource use: Editor's introduction to the special issue." *Resources, Conservation, and Recycling (also LBNL-50857)*. vol. 36, no. 3. October. pp. 169-173.
- Koomey, Jonathan, Chris Calwell, Skip Laitner, Jane Thornton, Richard E. Brown, Joe Eto, Carrie Webber, and Cathy Cullicott. 2002. "Sorry, wrong number: The use and misuse of numerical facts in analysis and media reporting of energy issues." In *Annual Review of Energy and the Environment 2002*. Edited by R. H. Socolow, D. Anderson and J. Harte. Palo Alto, CA: Annual Reviews, Inc. (also LBNL-50499). pp. 119-158.
- Koomey, Jonathan G., Paul Craig, Ashok Gadgil, and David Lorenzetti. 2003. "Improving long-range energy modeling: A plea for historical retrospectives." *The Energy Journal (also LBNL-52448)*. vol. 24, no. 4. October. pp. 75-92.
- Koomey, Jonathan, Huimin Chong, Woonsien Loh, Bruce Nordman, and Michele Blazek. 2004. "Network electricity use associated with wireless personal digital assistants." *The ASCE Journal of Infrastructure Systems (also LBNL-54105)*. vol. 10, no. 3. September. pp. 131-137.
- Koomey, Jonathan, Nate Hultman. 2007. "A Reactor-level analysis of busbar costs for U.S. nuclear plants, 1970-2005." *Energy Policy*. vol. 35, no. 11. November. pp. 5630-5642. (<http://dx.doi.org/10.1016/j.enpol.2007.06.005>)
- Koomey, Jonathan. 2008. "Worldwide electricity used in data centers." *Environmental Research Letters*. vol. 3, no. 034008. September 24. <<http://stacks.iop.org/1748-9326/3/034008>>
- Koomey, Jonathan, Hashem Akbari, Carl Blumstein, Marilyn Brown, Richard Brown, Chris Calwell, Sheryl Carter, Ralph Cavanagh, Audrey Chang, David Claridge, Paul Craig, Rick Diamond, Joseph H. Eto, William Fulkerson, Ashok Gadgil, Howard Geller, José Goldemberg, Chuck Goldman, David B. Goldstein, Steve Greenberg, David Hafemeister, Jeff Harris, Hal Harvey, Eric Heitz, Eric Hirst, Holmes Hummel, Dan Kammen, Henry Kelly, Skip Laitner, Mark Levine, Amory Lovins, Gil Masters, James E. McMahon, Alan Meier, Michael Messenger, John Millhone, Evan Mills, Steve Nadel, Bruce Nordman, Lynn Price, Joe Romm, Marc Ross, Michael Rufo, Jayant Sathaye, Lee Schipper, Stephen H. Schneider, James L. Sweeney, Malcolm Verdict, Diana Vorsatz, Devra Wang, Carl Weinberg, Richard Wilk, John Wilson, and Ernst Worrell. 2010. "Defining a standard metric for electricity savings." *Environmental Research Letters*. vol. 5 014017, no. 1 January-March. <<http://iopscience.iop.org/1748-9326/5/1/014017>>
- Koomey, Jonathan G., Stephen Berard, Marla Sanchez, and Henry Wong. 2010. "Implications of Historical Trends in The Electrical Efficiency of Computing." *IEEE Annals of the History of Computing*. In press. March.
- Krause, Florentin, John F. Busch, and Jonathan G. Koomey. 1993. "Carbon Reduction Costs in New England's Power Sector." *Contemporary Policy Issues*. vol. XI, no. 2. p. 100.

- Krause, Florentin and Jonathan Koomey. 1996. "The cost of cutting carbon emissions -- a case study of Western Europe." *Energy Conversion and Management*. 37 (6-8), 973-978.
- Laitner, John A. "Skip", Stephen J. Decanio, Jonathan G. Koomey, and Alan H. Sanstad. 2003. "Room for Improvement: Increasing the Value of Energy Modeling for Policy Analysis." *Utilities Policy (also LBNL-50627)*. Vol. 11, no. 2. pp. 87-94. June.
- Levine, Mark D., Jonathan G. Koomey, James E. McMahon, Alan H. Sanstad, and Eric Hirst. 1995. "Energy Efficiency Policy and Market Failures." In *Annual Review of Energy and the Environment 1995*. Edited by J. M. Hollander. Palo Alto, CA: Annual Reviews, Inc.
- Levine, Mark D., Jonathan Koomey, Lynn Price, Howard Geller, and Steve Nadel. 1995. "Electricity End-Use Efficiency: Experience with Technologies, Markets, and Policies Throughout the World." *Energy -- The International Journal*. vol. 20, no. 1. p. 37.
- Mitchell-Jackson, Jennifer, Jonathan Koomey, Michele Blazek, and Bruce Nordman. 2002. "National and Regional Implications of Internet Data Center Growth." *Resources, Conservation, and Recycling (also LBNL-50534)*. vol. 36, no. 3. pp. 175-185.
- Mitchell-Jackson, Jennifer, Jonathan Koomey, Bruce Nordman, and Michele Blazek. 2003. "Data Center Power Requirements: Measurements From Silicon Valley." *Energy--the International Journal (also LBNL-48554)*. vol. 28, no.8. pp. 837 – 850. June.
- Rosenfeld, Arthur H., Robert J. Mowris and Jonathan G. Koomey. 1989. "Policies to Improve Energy Efficiency and Reduce Global Warming." *Strategic Planning and Energy Management*. vol. 9, no. 2. p. 7. Fall 1989.
- Rosenfeld, Arthur, Celina Atkinson, Jonathan Koomey, Alan Meier, Robert Mowris, and Lynn Price. 1993. "Conserved Energy Supply Curves." *Contemporary Policy Issues*. vol. XI, no. 1. p. 45. This document was one of LBL's contributions to Chapter 3 of the report of the Mitigation Subpanel of the National Academy of Sciences Panel on Policy Implications of Greenhouse Warming.
- Sanchez, Marla C., Jonathan G. Koomey, Mithra M. Moezzi, Alan K. Meier, and Wolfgang Huber. 1998. "Miscellaneous Electricity Use in U.S. Homes: Historical Decomposition and Future Trends." *Energy Policy*. vol. 26, no. 8. July. pp. 585-593 (also LBNL-40295).
- Sanstad, Alan H., Stephen DeCanio, Gale Boyd, and Jonathan G. Koomey. 2001. "Estimating bounds on the economy-wide effects of the CEF policy scenarios." *Energy Policy (also LBNL-48104)*. vol. 29, no. 14. November. pp. 1299-1312.
- Sezgen, A. Osman, and Jonathan G. Koomey. 1998. *Interactions between lighting and space conditioning energy use in U.S. commercial buildings*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-39795. *Energy: the International Journal*. Vol. 25, No. 8. August. pp. 793-805.

- Webber, Carrie A., Richard E. Brown, and Jonathan G. Koomey. 2000. "Savings Estimates for the ENERGY STAR Voluntary Labeling Program." *Energy Policy*. vol. 28, no. 15. December. pp. 1137-1150.
- Weber, Christopher, Jonathan G. Koomey, and Scott Matthews. 2009. *The Energy and Climate Change Impacts of Different Music Delivery Methods*. Analytics Press. August 17. <<http://www.intel.com/pressroom/kits/ecotech>>. In press at *Journal of Industrial Ecology*.

Refereed Articles in Process

- Koomey, Jonathan and Brian Fortenbery 2010. "Energy savings from power factor correction in computer power supplies." To be submitted to *Energy Policy*.
- Koomey, Jonathan, Mike Rufo, and Richard Brown. 2010. "Assessing peak demand impacts from efficiency options in California: a review of analytical methods and recent results." To be submitted to *Energy Policy*.
- Masanet, Eric R., Richard E. Brown, Arman Shehabi, Jonathan G. Koomey, and Bruce Nordman. 2010. "Deep Savings: The Energy Efficiency Potential of U.S. Data Centers." *Submitted to Environmental Science and Technology*.

Books

- Koomey, Jonathan. 2008. *Turning Numbers into Knowledge: Mastering the Art of Problem Solving*. 2d edition. Oakland, CA: Analytics Press. <<http://www.numbersintoknowledge.com>>
- Krause, Florentin, Wilfred Bach and Jon Koomey. 1989. **Energy Policy in the Greenhouse**. Volume 1. *From Warming Fate to Warming Limit: Benchmarks to a Global Climate Convention*. El Cerrito, CA: International Project for Sustainable Energy Paths. Also published by John Wiley and Sons, NY, 1992.
- Krause, Florentin, Eric Haites, Richard Howarth, and Jonathan Koomey. 1993. **Energy Policy in the Greenhouse**. Volume II, Part 1. *Cutting Carbon Emissions-Burden or Benefit?: The Economics of Energy-Tax and Non-Price Policies*. El Cerrito, CA: International Project for Sustainable Energy Paths.
- Krause, Florentin, Jonathan Koomey, Hans Becht, David Olivier, Giuseppe Onufrio, and Pierre Radanne. 1994. **Energy Policy in the Greenhouse**. Volume II, Part 3C. *Fossil Generation: The Cost and Potential of Low-Carbon Resource Options in Western Europe*. El Cerrito, CA: International Project for Sustainable Energy Paths.
- Krause, Florentin, Jonathan Koomey, David Olivier, Pierre Radanne, and Mycle Schneider. 1994. **Energy Policy in the Greenhouse**. Volume II, Part 3E. *Nuclear Power: The Cost and Potential of Low-Carbon Resource Options in Western Europe*. El Cerrito, CA: International Project for Sustainable Energy Paths.
- Krause, Florentin, Jonathan Koomey, and David Olivier. 1995. **Energy Policy in the Greenhouse**. Volume II, Part 3D. *Renewable Power: The Cost and Potential of*

Low-Carbon Resource Options in Western Europe. El Cerrito, CA: International Project for Sustainable Energy Paths.

Krause, Florentin, David Olivier, and Jonathan Koomey. 1995. **Energy Policy in the Greenhouse**. Volume II, Part 3B. *Negawatt Power: The Cost and Potential of Low-Carbon Resource Options in Western Europe*. El Cerrito, CA: International Project for Sustainable Energy Paths.

Lovins, Amory B., E. Kyle Datta, Odd-Even Bustnes, Jonathan G. Koomey, and Nathan J. Glasgow. 2004. *Winning the Oil Endgame: Innovation for Profits, Jobs, and Security*. Old Snowmass, Colorado: Rocky Mountain Institute. September <<http://www.oilendgame.com>>.

Book Sections

Koomey, Jonathan G., and Stephen Meyers. 1995. "Residential and Commercial Sectors." In *Greenhouse Gas Mitigation Assessment: A Guidebook*. Edited by J. Sathaye and S. Meyers. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Koomey, Jonathan G., and Florentin Krause. 1996. "Chapter 5: Introduction to Social Externality Costs." In *CRC Handbook of Energy Efficiency*. Edited by R. West and F. Krieth. Boulder: CRC Press, Inc.

Koomey, Jonathan G., R. Cooper Richey, Skip Laitner, Robert J. Markel, and Chris Marnay. 2000. "Technology and greenhouse gas emissions: An integrated analysis using the LBNL-NEMS model." In *Global Warming Beyond a Doubling of Greenhouse Gases*. D. C. Hall and R. B. Howarth, eds. New York and Amsterdam: Elsevier Science.

McMahon, James E. , Peter Chan, Joseph Eto, Jon Koomey, Mark Levine, Chris Pignone and Henry Ruderman. 1987. "The LBL Residential Energy and Hourly Demand Models." In *Strategic Planning in Energy and Resources*. Edited by B. e. a. Lev. Holland: Elsevier Science Publishers B.V.

Levine, Mark D. , Jon Koomey, Henry Ruderman, Paul Craig, James E. McMahon and Peter Chan. 1985. "Chapter 16: Economics of Efficiency Improvements in Residential Appliances and Space Conditioning Equipment." In *Energy Sources: Conservation and Renewables, Conference Proceedings #135*. Edited by D. Hafemeister. New York, NY: American Institute of Physics (also LBL-26952).

Conference Papers

Blazek, Michele, and Jonathan Koomey. 2006. *Predicting Future Power Requirements for the IT Sector: Making the Case for Including Life-Cycle Implications in Design of Servers*. Proceedings of the IEEE International Symposium on Electronics and the Environment. San Francisco, CA: IEEE. May

Brown, Richard E., Celina S. Atkinson, Jeffrey L. Warner, Judy A. Roberson, Marla C. Sanchez, Sarah E. Bretz, and Jonathan G. Koomey. 1998. *Developing Energy-Efficiency Packages for New Production Homes*. Asilomar, CA: American Council for an Energy Efficient Economy, Washington DC, (also LBNL-41561).

- Brown, Richard, Carrie Webber, and Jonathan Koomey. 2000. *Status and Future Directions of the ENERGY STAR Program*. 2000 ACEEE Summer Study on Energy Efficiency in Buildings. Asilomar, CA. August.
- Eto, Joe, James E. McMahon, Jonathan Koomey, Peter Chan, and Mark D. Levine. 1989. "The Regional Impacts of the National Appliance Energy Conservation Act of 1987". Presented at the DSM Conference in Cincinnati, OH. May.
- Eubank, Huston, Bernard Aebischer, Malcolm Lewis, Jon Koomey, William Tschudi, Peter Rumsey, and Chris Hipp. 2004. *High Performance Data Centers*. Proceedings of the International Conference on Improving Energy Efficiency in Commercial Buildings. Frankfurt, Germany: April 19-20.
- Johnson, Francis X., Jonathan Koomey and James E. McMahon. 1992. "Incorporating Technology Choices Into Residential End-Use Forecasting: Evaluation and Comparison of Three Models with Respect to Space Heating." In *Proceedings of the 1992 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA: American Council for an Energy Efficient Economy.
- Kaarsberg, Tina, Ronald Fiskum, Joseph Romm, Arthur Rosenfeld, Jonathan Koomey, and W. Peter Teagan. 1998. *Combined Heat and Power (CHP or Cogeneration) for Saving Energy and Carbon in Commercial Buildings*. Asilomar, CA: American Council for an Energy Efficient Economy, Washington DC.
- Kawamoto, Kaoru, Jonathan Koomey, Bruce Nordman, Richard E. Brown, Maryann Piette, and Alan Meier. 2000. *Electricity Used by Office Equipment and Network Equipment in the U.S.* 2000 ACEEE Summer Study on Energy Efficiency in Buildings. Asilomar, CA. August (also LBNL-45917).
- Koomey, Jonathan G., Mark D. Levine, Nathan C. Martin, Lynn K. Price, Marilyn Brown, George Courville, Michael MacDonald, J. Tomlinson, J. Van Coevering, and R. Wendt. 1997. "The Potential for Energy-Efficient Technologies to Reduce Carbon Emissions in the United States: Building Sector". Presented at 32nd Intersociety Energy Conversion Engineering Conference in Honolulu, Hawaii. Published by July 27-August 1, 1997.
- Koomey, Jonathan and Arthur Rosenfeld. 1988. "Promoting Efficiency Investments in New Buildings." In *Proceedings of the 1988 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA: American Council for an Energy Efficient Economy.
- Koomey, Jonathan, Arthur H. Rosenfeld and Ashok K. Gadgil. 1990. "Conservation Screening Curves for Comparing Efficiency Investments to Power Plants: Applications to Commercial Sector Conservation Programs" In *Proceedings of the 1990 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA: American Council for an Energy Efficient Economy.
- Koomey, Jonathan G., Camilla Dunham, and James D. Lutz. 1994. "The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-use Treatment". In *Proceedings of the 1994 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA. Published by American Council for an Energy Efficiency Economy (also LBL-35475).

- Koomey, Jonathan G. 1996. "Trends in Carbon Emissions from U.S. Residential and Commercial Buildings: Implications for Policy Priorities". Presented at The EPA/White House Climate Change Analysis Workshop (also LBNL-39421) in Springfield, VA. Published by June 6-7, 1996.
- Koomey, Jonathan G., Mary Ann Piette, Mike Cramer, and Joe Eto. 1996. "Efficiency Improvements in U.S. Office Equipment: Pollution Prevention at a Profit". In *Proceedings of the 1996 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA. Published by American Council for an Energy Efficiency Economy (also LBNL-37383.Rev1).
- Koomey, Jonathan G., Mark D. Levine, Nathan C. Martin, Lynn K. Price, Marilyn Brown, George Courville, Michael MacDonald, J. Tomlinson, J. Van Coevering, and R. Wendt. 1997. *The Potential for Energy-Efficient Technologies to Reduce Carbon Emissions in the United States: Building Sector*. Honolulu, Hawaii: July 27-August 1, 1997.
- Koomey, Jonathan. 2000. *Avoiding "The Big Mistake" in Forecasting Technology Adoption*. ENERGEX 2000 Conference. Las Vegas, NV. July.
- Krause, Florentin and Jonathan Koomey. 1990. "Internalizing Global Warming Risks in Power Sector Planning: An Illustrative Screening Curve Analysis of Carbon Reduction Costs for the New England Region". Presented at *German-American Workshop on Analysis and Internalization of External Environmental Costs of Electric Power Production and Utility Acquisition* in Ladenburg, FRG. October 23-25, 1990
- Krause, Florentin, Jonathan G. Koomey and David Olivier. 1992. "Incorporating Global Warming Externalities Through Environmental Least-Cost Planning: A Case Study of Western Europe". Presented at 2nd International Conference on the External Costs of Electric Power in Racine, Wisconsin, September 8-11, 1992.
- Krause, Florentin, and Jonathan G. Koomey. 1997. "A Comparison of Deregulation, Electrical Efficiency Programs, and Integrated Market Transformation Policies: Impacts on Carbon Emissions and Service Costs in Western Europe's Power Sector." *Proceedings of the ECEEE 1997 Summer Study on the Energy Efficiency Challenge*. Prague: European Council for an Energy Efficiency Economy.
- Krause, Florentin, David Olivier, and Jonathan G. Koomey. 1997. "The costs and benefits of policies for efficient use of electricity: improved estimates of per kWh costs, and potential cumulative cost savings for Western European electricity users." *Proceedings of the ECEEE 1997 Summer Study on the Energy Efficiency Challenge*. Prague: European Council for an Energy Efficiency Economy.
- Laitner, John A. "Skip", Jonathan G. Koomey, Ernst Worrell, and Etan Gumerman. 2000. "Re-estimating the Annual Energy Outlook 2000 Forecast Using Updated Assumptions about the Internet Economy". *Presented at the Eastern Economics Association Conference*. Crystal City, Virginia. March 24.
- Laitner, John A. "Skip", Stephen J. Decanio, Jonathan G. Koomey, and Alan H. Sanstad. 2002. *Room for Improvement: Increasing the Value of Energy Modeling for Policy Analysis*. Proceedings of the 2002 ACEEE Summer Study on Energy

Efficiency in Buildings. Asilomar, CA: Washington, DC: American Council for an Energy Efficient Economy (also LBNL-50627). August.

- McMahon, James E., Douglas Berman, Peter Chan, Terry Chan, Jonathan Koomey, Mark D. Levine and Steve Stoft. 1990. "Impacts of U.S. Appliance Energy Performance Standards on Consumers, Manufacturers, Electric Utilities, and the Environment." In *Proceedings of the 1990 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA: American Council for an Energy Efficient Economy.
- McMahon, James E. , Peter Chan, Joseph Eto, Jon Koomey, Mark Levine, Chris Pignone and Henry Ruderman. 1986. "The LBL Residential Energy and Hourly Demand Models: Electric Utility Applications". Presented at *Second Symposium on Analytic Techniques for Energy, Natural Resources, and Environmental Planning* in Philadelphia, PA.
- Roberson, Judy A., Richard E. Brown, Jonathan G. Koomey, Jeffrey L. Warner, and Steve E. Greenberg. 1998. *Recommended Ventilation Strategies for New Energy-Efficient Production Homes*. Asilomar, CA: American Council for an Energy Efficient Economy, Washington DC, (also LBNL-40378).
- Rosenfeld, Arthur, Evan Mills, Robert Mowris and Jonathan Koomey. 1988. "Energy Efficiency, Competition, and Least-Cost Planning". Presented at *NARUC LCUP Aspen 1988 Conference* in Aspen, CO.
- Rosenfeld, Arthur H., Robert J. Mowris and Jonathan G. Koomey. 1990. "Policies to Improve Energy Efficiency, Budget Greenhouse Gases, and Answer the Threat of Global Climate Change". Presented at *1990 AAAS Annual Meeting: Fueling Our Future: Energy Policy and the Greenhouse Effect* in New Orleans, LA.
- Turiel, Isaac, Douglas Berman, Peter Chan, Terry Chan, Jonathan Koomey, Benoit Lebot, Mark D. Levine, James E. McMahon, Greg Rosenquist and Steve Stoft. 1990. "U.S. Residential Appliance Energy Efficiency: Present Status and Future Directions." In *Proceedings of the 1990 ACEEE Summer Study on Energy Efficiency in Buildings*. Asilomar, CA: American Council for an Energy Efficient Economy.

LBLN And Other Reports

- Atkinson, Barbara, James E. McMahon, Evan Mills, Peter Chan, Terry Chan, Joseph H. Eto, Judith D. Jennings, Jonathan G. Koomey, Kenny W. Lo, Matthew Lecar, Lynn Price, Francis Rubinstein, Osman Sezgen, and Tom Wenzel. 1992. *Analysis of Federal Policy Options for Improving U.S. Lighting Energy Efficiency: Commercial and Residential Buildings*. Lawrence Berkeley Laboratory. LBL-31469. December.
- Eto, Joseph, Jonathan Koomey, Peter Chan and Winifred Yen-Wood. 1988. *Statistical Indicators of Potential for Electric Utility Least-Cost Planning Programs*. Lawrence Berkeley Laboratory. LBL-25473. July 1988.
- Eto, Joe, Jonathan Koomey, James E. McMahon and Peter Chan. 1986. *Financial Impacts on Utilities of Load Shape Changes: The Nevada Power Company*. Lawrence Berkeley Laboratory. LBL-21597. April 1986.

- Eto, Joe, Jonathan Koomey, James E. McMahon and Peter Chan. 1986. *Financial Impacts on Utilities of Load Shape Changes: The Texas Utilities Electric Company*. Lawrence Berkeley Laboratory. LBL-21598. April 1986.
- Eto, Joe, Jonathan Koomey, James E. McMahon and Peter Chan. 1986. *Financial Impacts on Utilities of Load Shape Changes: Thermal Integrity Measures for Residential Buildings; Texas Utilities Electric Company and Nevada Power Company*. Lawrence Berkeley Laboratory. LBL-22627. May 1986.
- Eto, Joseph, James McMahon, Jonathan Koomey, Peter Chan and Mark Levine. 1988. *The Regional Energy and Economic Impacts of the National Appliance Energy Conservation Act*. Lawrence Berkeley Laboratory. LBL-25471. June 1988.
- Eto, Joseph, Jonathan Koomey, Bryan Lehman, Nathan Martin, Evan Mills, Carrie Webber, and Ernst Worrell. 2001. *Scoping study on trends in the economic value of electricity reliability to the U.S. economy*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-47911. May.
- Fortenbery, Brian, and Jonathan Koomey. 2006. *Assessment of the Impacts of Power Factor Correction in Computer Power Supplies on Commercial Building Line Losses*. Oak Ridge, TN: EPRI Solutions, for the California Energy Commission (Contract # 500-04-030). March 31.
- Hanford, James W., Jonathan G. Koomey, Lisa E. Stewart, Matthew E. Lecar, Francis X. Johnson, and Roland J. Hwang. 1994. *Baseline Data for the Residential Sector and Development of a Residential Forecasting Database*. Lawrence Berkeley Laboratory. LBL-33717. May.
- Hwang, Roland J., Francis X. Johnson, James W. Hanford, Jonathan G. Koomey, and Richard E. Brown. 1994. *Appliance data, assumptions and methodology for residential end-use forecasting with EPRI-REEPS 2.1*. Lawrence Berkeley Laboratory. LBL-34046. May.
- Interlaboratory Working Group on Energy-Efficient and Clean-Energy Technologies. 2000. *Scenarios for a Clean Energy Future*. Oak Ridge, TN and Berkeley, CA: Oak Ridge National Laboratory and Lawrence Berkeley National Laboratory. ORNL/CON-476 and LBNL-44029. November.
- Johnson, Francis X., James W. Hanford, Alan H. Sanstad, and Jonathan G. Koomey. 1994. *HVAC data, assumptions and methodology for residential end-use forecasting with EPRI-REEPS 2.1*. Lawrence Berkeley Laboratory. LBL-34045. June.
- Kahn, Edward, Joseph Eto, Jon Koomey, James McMahon, Peter Chan and Mark Levine. 1986. *Valuation of Demand Side Utility Programs*. Lawrence Berkeley Laboratory. LBL-21524.
- Kawamoto, Kaoru, Jonathan Koomey, Mike Ting, Bruce Nordman, Richard E. Brown, Maryann Piette, and Alan Meier. 2001. *Electricity Used by Office Equipment and Network Equipment in the U.S.: Detailed Report and Appendices*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-45917. February.

- Koomey, Jonathan G., Francis X. Johnson, Roland J. Hwang, James W. Hanford, Alan H. Sanstad, and Richard E. Brown. 1994. *Residential Sector End-use Forecasting with EPRI-REEPS 2.1: Summary Input Assumptions and Results*. Lawrence Berkeley Laboratory. LBL-34044. May.
- Koomey, Jonathan G., Francis X. Johnson, Jennifer Schuman, Ellen Franconi, Steve Greenberg, Jim D. Lutz, Brent T. Griffith, Dariush Aresteh, Celina Atkinson, Kristin Heinemeier, Y. Joe Huang, Lynn Price, Greg Rosenquist, Francis M. Rubinstein, Steve Selkowitz, Haider Taha, and Isaac Turiel. 1994. *Buildings Sector Demand-Side Efficiency Technology Summaries*. Lawrence Berkeley Laboratory (Prepared for the Technology Characterization Database of the Intergovernmental Panel on Climate Change). LBL-33887. March.
- Koomey, Jonathan. 1990. *Comparative Analysis of Monetary Estimates of External Environmental Costs Associated with Combustion of Fossil Fuels*. Lawrence Berkeley Laboratory. LBL-28313. July 1990.
- Koomey, Jonathan, Celina Atkinson, Alan Meier, James E. McMahon, Stan Boghosian, Barbara Atkinson, Isaac Turiel, Levine Mark D., Bruce Nordman and Peter Chan. 1991. *The Potential for Electricity Efficiency Improvements in the U.S. Residential Sector*. Lawrence Berkeley Laboratory. LBL-30477. July 1991.
- Koomey, Jonathan, James E. McMahon and Cheryl Wodley. 1991. *Improving the Thermal Integrity of New Single-Family Detached Residential Buildings: A Regional Assessment of Capital Costs and Energy Savings*. Lawrence Berkeley Laboratory. LBL-29416. July 1991.
- Koomey, Jonathan G., Deborah E. Schechter, and Deborah Gordon. 1993. *Cost-Effectiveness of Fuel Economy Improvements in 1992 Honda Civic Hatchbacks*. Energy and Resources Group, University of California, Berkeley. Presented at the 72nd Annual meeting of the National Research Council's Transportation Research Board, January 10-14, 1993, Washington, DC. ERG-93-1, May 1993.
- Koomey, Jonathan, Francis X. Johnson, James E. McMahon, Mary Orland, Mark Levine, Peter Chan, and Florentin Krause. 1993. *An Assessment of Future Energy Use and Carbon Emissions from U.S. Residences*. Lawrence Berkeley Laboratory. LBL-32183. December.
- Koomey, Jonathan G., Camilla Dunham, and James D. Lutz. 1994. *The Effect of Efficiency Standards on Water Use and Water Heating Energy Use in the U.S.: A Detailed End-use Treatment*. Lawrence Berkeley Laboratory. LBL-35475. May.
- Koomey, Jonathan, Alan H. Sanstad, and Leslie J. Shown. 1995. *Magnetic Fluorescent Ballasts: Market Data, Market Imperfections, and Policy Success*. Lawrence Berkeley National Laboratory. LBL-37702. September.
- Koomey, Jonathan G., Mary Ann Piette, Mike Cramer, and Joe Eto. 1995. *Efficiency Improvements in US Office Equipment: Expected Policy Impacts and Uncertainties*. Lawrence Berkeley Laboratory. LBL-37383. December.
- Koomey, Jonathan G., Susan A. Mahler, Carrie A. Webber, and James E. McMahon. 1998. *Projected Regional Impacts of Appliance Efficiency Standards for the U.S.*

- Residential Sector*. Ernest Orlando Lawrence Berkeley National Laboratory. LBNL-39511. February.
- Koomey, Jonathan G., R. Cooper Richey, Skip Laitner, Robert J. Markel, and Chris Marnay. 1998. *Technology and greenhouse gas emissions: An integrated analysis using the LBNL-NEMS model*. Berkeley, CA: Ernest Orlando Lawrence Berkeley National Laboratory. LBNL-42054. September.
- Koomey, Jonathan. 2000. *Report to Flexplay Technologies: Preliminary analysis of environmental impacts of video rentals in the U.S.* Oakland, CA. June 12. <http://enduse.lbl.gov/Projects/InfoTech.html>
- Koomey, Jonathan G. 2000. *Rebuttal to Testimony on 'Kyoto and the Internet: The Energy Implications of the Digital Economy'*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-46509. August.
- Koomey, Jonathan, Christian Belady, Henry Wong, Rob Snevely, Bruce Nordman, Ed Hunter, Klaus-Dieter Lange, Roger Tiple, Greg Darnell, Matthew Accapadi, Peter Rumsey, Brent Kelley, Bill Tschudi, David Moss, Richard Greco, and Kenneth Brill. 2006. *Server Energy Measurement Protocol*. Oakland, CA: Analytics Press. November 3. (http://www.energystar.gov/index.cfm?c=products.pr_servers_benchmark).
- Koomey, Jonathan. 2007. *Estimating total power consumption by servers in the U.S. and the world*. Oakland, CA: Analytics Press. February 15. (<http://enterprise.amd.com/us-en/AMD-Business/Technology-Home/Power-Management.aspx>)
- Koomey, Jonathan. 2007. *Estimating regional power consumption by servers: A technical note*. Oakland, CA: Analytics Press. December 5. <<http://www.amd.com/koomey>>
- Koomey, Jonathan G., Stephen Berard, Marla Sanchez, and Henry Wong. 2009. *Assessing trends in the electrical efficiency of computation over time*. Oakland, CA: Analytics Press. August 17. <<http://www.intel.com/pressroom/kits/ecotech>>
- Koomey, Jonathan G., Christian Belady, Michael Patterson, Anthony Santos, and Klaus-Dieter Lange. 2009. *Assessing trends over time in performance, costs, and energy use for servers*. Oakland, CA: Analytics Press. August 17. <<http://www.intel.com/pressroom/kits/ecotech>>
- Krause, Florentin and Jon Koomey. 1989. "Unit Costs of Carbon Savings From Urban Trees, Rural Trees, and Electricity Demand-Side Resources". Presented at Conference on Urban Heat Islands, February 23-24, 1989 in Berkeley, California. LBL-27311. July.
- Krause, Florentin, John F. Busch, and Jonathan G. Koomey. 1992. *Incorporating Global Warming Risks in Power Sector Planning: A Case Study of the New England Region*. Lawrence Berkeley Laboratory. LBL-30797 (vols I and II). November.
- Krause, Florentin, and Jonathan Koomey. 1998. *Low Carbon Comfort: The Costs and Potentials of Energy Efficiency in EU Buildings (Final Report)*. El Cerrito, CA: International Project for Sustainable Energy Paths. January.

- Krause, Florentin, Jonathan Koomey, and David Olivier. 1999. *Cutting Carbon Emissions While Making Money: Climate Saving Energy Strategies for the European Union (Executive Summary for Volume II, Part 2 of Energy Policy in the Greenhouse)*. El Cerrito, CA: International Project for Sustainable Energy Paths. October.
- Levine, Mark D., Jonathan Koomey, James E. McMahon and Henry Ruderman. 1985. *A Multiyear Plan for the Appliance Standards Re-Evaluation*. Lawrence Berkeley Laboratory. LBL-19852. June 1985.
- Levine, Mark D., Peter Chan, James E. McMahon, Henry Ruderman, Isaac Turiel, Phil Cunliffe, Joseph Eto, Ali Heydari, Jon Koomey and Tim Springer. 1987. *Analysis of Federal Appliance Efficiency Standards: the National Appliance Energy Conservation Act of 1987*. Lawrence Berkeley Laboratory. February 27, 1987.
- Levine, Mark D., Howard Geller, Jonathan Koomey, Steve Nadel and Lynn Price. 1992. *Electricity End-Use Efficiency: Experience with Technologies, Markets, and Policies Throughout the World*. Lawrence Berkeley Laboratory. LBL-31885.
- Levine, Mark D., Eric Hirst, Jonathan G. Koomey, James E. McMahon, and Alan H. Sanstad. 1994. *Energy Efficiency, Market Failures, and Government Policy*. Lawrence Berkeley Laboratory. LBL-35376. March.
- Osborn, Julie, Frances Wood, Cooper Richey, Sandy Sanders, Walter Short, and Jonathan G. Koomey. 2001. *A Sensitivity Analysis of the Treatment of Wind Energy in the AEO99 Version of NEMS*. Berkeley, CA: Ernest Orlando Lawrence Berkeley National Laboratory and the National Renewable Energy Laboratory. LBNL-44070. January.
- Piette, Mary Ann, Mike Cramer, Joe Eto, and Jonathan Koomey. 1995. *Office Technology Energy Use and Savings Potential in New York*. Completed for the New York State Energy Research and Development Authority and Consolidated Edison by Lawrence Berkeley Laboratory. Contract #1955-EEED-BES-93, also LBL-36752. January.
- Sanchez, Marla C., Jonathan G. Koomey, Mithra M. Moezzi, Alan K. Meier, and Wolfgang Huber. 1998. *Miscellaneous Electricity Use in the U.S. Residential Sector*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-40295. April.
- Sanstad, Alan H., Jonathan G. Koomey, and Mark D. Levine. 1993. *On the Economic Analysis of Problems in Energy Efficiency: Market Barriers, Market Failures, and Policy Implications*. Lawrence Berkeley Laboratory. LBL-32652. January.
- Sezgen, A. Osman, Ellen M. Franconi, Jonathan G. Koomey, Steve E. Greenberg, and Asim Afzal. 1995. *Technology data characterizing space conditioning in commercial buildings: Application to end-use forecasting with COMMEND 4.0*. Lawrence Berkeley Laboratory. LBL-37065. December.
- Sezgen, A. Osman, Ellen M. Franconi, Steve E. Greenberg, Jonathan G. Koomey, and Hashem Akbari. 1994. *Technology data characterizing space conditioning in*

- office buildings: Application to end-use forecasting with COMMEND 4.0.* Lawrence Berkeley Laboratory. LBL-34123. June.
- Sezgen, A. Osman, Y. Joe Huang, Barbara A. Atkinson, and Jonathan G. Koomey. 1994. *Technology data characterizing lighting in commercial buildings: Application to end-use forecasting with COMMEND 4.0.* Lawrence Berkeley Laboratory. LBL-34243. June.
- Sezgen, A. Osman, and Jonathan G. Koomey. 1995. *Technology data characterizing water heating in commercial buildings: Application to end-use forecasting with COMMEND 4.0.* Lawrence Berkeley Laboratory. LBL-37398. December.
- Sezgen, A. Osman, and Jonathan G. Koomey. 1995. *Technology data characterizing refrigeration in commercial buildings: Application to end-use forecasting with COMMEND 4.0.* Lawrence Berkeley Laboratory. LBL-37397. December.
- Sezgen, A. Osman, and Jonathan G. Koomey. 1998. *Interactions between lighting and space conditioning energy use in U.S. commercial buildings.* Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-39795. April.
- Stanley, John R., Kenneth G. Brill, and Jonathan Koomey. 2007. *Four Metrics Define Data Center "Greenness" Enabling Users to Quantify "Energy Efficiency for Profit" Initiatives.* Santa Fe, NM: The Uptime Institute. <<http://www.uptimeinstitute.org>>
- Stanley, John, and Jonathan Koomey. 2009. *The Science of Measurement: Improving Data Center Performance with Continuous Monitoring and Measurement of Site Infrastructure.* Oakland, CA: Analytics Press. October 23. <<http://www.analyticspress.com/scienceofmeasurement.html>>
- Taylor, Cody, and Jonathan Koomey. 2008. *Estimating energy use and greenhouse gas emissions of Internet advertising.* Working paper for IMC². February 14. <<http://imc2.com/Documents/CarbonEmissions.pdf>>.
- Ting, Michael K., Jonathan G. Koomey, and Mel Pomerantz. 2001. *Preliminary economic and policy evaluation of reflective pavements.* Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-45864. November.
- Vorsatz, Diana, Leslie Shown, Jonathan G. Koomey, Andrea Denver, and Mithra Moezzi. 1997. *Lighting Market Sourcebook.* Ernest Orlando Lawrence Berkeley National Laboratory. LBNL-39102. December.
- Webber, Carrie A., Judy A. Roberson, Richard E. Brown, Christopher T. Payne, Bruce Nordman, and Jonathan G. Koomey. 2001. *Field Surveys of Office Equipment Operating Patterns.* Berkeley, CA: Ernest Orlando Lawrence Berkeley National Laboratory. LBNL-46930. September.
- Webber, Carrie A., Richard E. Brown, Akshay Mahajan, and Jonathan G. Koomey. 2002. *Savings Estimates for the ENERGY STAR Voluntary Labeling Program: 2001 Status Report.* Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-48496. February.

Weber, Christopher, Jonathan G. Koomey, and Scott Matthews. 2009. *The Energy and Climate Change Impacts of Different Music Delivery Methods*. Analytics Press. August 17. <<http://www.intel.com/pressroom/kits/ecotech>>

Wenzel, Tom P., Jonathan G. Koomey, Gregory J. Rosenquist, Marla C. Sanchez, and James W. Hanford. 1997. *Energy Data Sourcebook for the U.S. Residential Sector*. Lawrence Berkeley National Laboratory. LBNL-40297. September.

Invited Testimony

Koomey, Jonathan. 1990. *The Environmental Value of Reducing Greenhouse Gas Emissions*. Testimony Before the California Energy Commission, Hearings on the 1990 Electricity Report. Docket 88-ER-8. January 25, 1990.

Levenson, Leo, Deborah Gordon, Jon Koomey and Arthur Rosenfeld. 1989. *Drive+: A Proposed Consumer Fee-Rebate Program to Stimulate the Market for Cleaner, More Fuel-Efficient Vehicles*. Testimony Before the Mandates and Incentives Workshop, Advisory Board on Air Quality and Fuels. March 23, 1989.

Rosenfeld, Arthur and Jonathan Koomey. 1988. *Promoting Efficiency Investments in New Buildings: A New Policy to Improve Building Efficiency, Reduce Pollution, and Avoid Power Plant Construction*. Testimony Before the Public Service Commission of Wisconsin. August 4, 1988.

Rosenfeld, Arthur, Robert Mowris and Jonathan Koomey. 1988. "Energy Efficiency and Least-Cost Planning". Presented at Testimony Before the California Energy Commission, Conservation Programs Committee, Public Hearing on the Committee Draft 1988 Conservation Report in Sacramento, California.

2008. Testimony of Jonathan Koomey, Ph.D. for a hearing on "Efficiency: The Hidden Secret to Solving Our Energy Crisis". Joint Economic Committee of the U.S. Congress. U.S. Congress. Washington, DC: U.S. Congress. July 30.

Theses

Koomey, Jonathan. 1986. *A Simplified Spreadsheet Model for Assessing the Load and Energy Impacts of Demand-Side Programs for Selected Residential Appliances*. Master's Project Thesis, Energy and Resources Group, University of California, Berkeley.

Koomey, Jonathan. 1990. *Energy Efficiency Choices in New Office Buildings: An Investigation of Market Failures and Corrective Policies*. PhD Thesis, Energy and Resources Group, University of California, Berkeley.

Magazine Articles/Opinion Articles in Journals

Koomey, Jonathan. 1985. "But How Much Does It Really Cost?". *Energy Auditor and Retrofitter*. May/June 1985. p. 23.

Koomey, Jonathan and Alan Meier. 1985. "Beyond Simple Payback Time". *Energy Auditor and Retrofitter*. July/August 1985. p. 27.

- Koomey, Jonathan. 1985. "Saving Energy Dollars With Masonry Backing Rod". *Energy Auditor and Retrofitter*. September/October 1985. p. 37.
- Koomey, Jonathan. 1985. "Strong Medicine". *Energy Auditor and Retrofitter*. January/February 1985. p. 4.
- Koomey, Jonathan. 1988. "Book Review: The ACEEE Agenda". *Home Energy*. September/October 1988. p. 35.
- Koomey, Jonathan. 1988. "Getting More Out of Your Shower: the Shower-Bath Economizer". *Home Energy*. January/February 1988. p. 25.
- Koomey, Jonathan. 1990. "Book Review: Promoting Energy Conservation: An Analysis of Behavioral Research". *Home Energy*. January/February 1990. p. 43.
- Koomey, Jonathan. 2002. "Debunking an Urban Legend." In *The World & I*. September. pp. 144-151.
- Koomey, Jonathan G. 2005. "Book review of Stephen J. DeCanio's book "Economic models of climate change: A critique"." *Ecological Economics*. vol. 55, no. 1. October 5. pp. 131-132.
- Koomey, Jonathan, Marshall van Alstyne, and Erik Brynjolfsson. 2007. "You've got spam" [Op-ed on solving the spam email problem]." *The Wall Street Journal*. New York, NY. September 6. p. A16.
- Koomey, Jonathan, and Florentin Krause. 2009. *Why 2 degrees really matters*. <<http://climateprogress.org/2009/12/06/copenhagen-two-degrees-warming-target/>>
- Krause, Florentin and Jonathan Koomey. 1992. "The Greenhouse Dividend." *The Electricity Journal*. vol. 5, no. 7. p. 44.
- Koomey, Jonathan. 2002. "From My Perspective: Avoiding "The Big Mistake" in Forecasting Technology Adoption." Opinion piece appearing in *Technological Forecasting and Social Change*. vol. 69, no. 5. June. pp. 511-518.
- Koomey, Jonathan. 2002. "Debunking an Urban Legend." In *The World & I*. September. pp. 144-151.
- Koomey, Jonathan. 2003. "Sorry, Wrong Number: Separating Fact from Fiction in the Information Age." In *IEEE Spectrum*. June.
- O'Neill, Brian C., Paul Crutzen, Arnulf Grübler, Minh Ha Duong, Klaus Keller, Charles Kolstad, Jonathan Koomey, Andreas Lange, Michael Obersteiner, Michael Oppenheimer, William Pepper, Warren Sanderson, Michael Schlesinger, Nicolas Treich, Alistair Ulph, Mort Webster, and Chris Wilson. 2006. "Commentary: Learning and Climate Change." *Climate Policy*. vol. 6, no. 5. pp. 585-589.
- Koomey, Jonathan, Marshall van Alstyne, and Erik Brynjolfsson. 2007. "Seeking a spam solution." In *eWeek*. October 8. pp. 60+70.
- Koomey, Jonathan, Marshall van Alstyne, and Erik Brynjolfsson. 2007. "You've got spam [Op-ed on solving the spam email problem]." *The Wall Street Journal*. New York, NY. September 6. p. A16.

Scher, Irene, and Jonathan G. Koomey. 2010. "Is Accurate Forecasting of Economic Systems Possible?" *Climatic Change (forthcoming)*.

Media/Other

Gorrell, Mark, Jonathan Koomey, Jose Garcia and Tom Spuhler. 1988. *Energy Efficient Buildings for Berkeley*. Berkeley Energy Commission, Legislative Committee. December 1988.

Koomey, Jonathan. 1990. Letter to Editor, *New York Times*: "Automobile fuel efficiency is within our grasp". October 1990.

Koomey, Jonathan. 1991. Appeared on KQED's *Forum* radio program concerning the National Energy Strategy. 26 February 1991.

Koomey, Jonathan. 1992. Appeared on CNBC (TV) discussing the ENERGY STAR computers program.

Koomey, Jonathan. 1996. *Letter to Editor about Energy Star office equipment program: Energy Savings Add Up*. MacWeek, 15 April 96, p.31. Vol. 10, No. 15.

Koomey, Jonathan. 2000. Appeared in the Nova/Frontline special "What's up with the weather?" that aired April 18th, 2000, for Earth Day 2000.

Koomey, Jonathan. 2001. Appeared on Marketplace, All Things Considered, The California Report, Tech Nation,

Koomey, Jonathan. 2002. Appeared on BBC Radio, CNET radio,

Koomey, Jonathan. 2003. Appeared on the NPR show "On the Media".

Koomey, Jonathan. 2003. Appeared in Tech TV to discuss how to save energy with personal computers. The show, hosted by Leo Laporte, aired live on April 21st, 2003, for Earth Week 2003.

Koomey, Jonathan. February 2005. Debate with Peter Huber for the PBS TV show "Uncommon Knowledge", aired in April 2005.

Koomey, Jonathan. November 14, 2005. Appeared on stage in a discussion with Michael Krasny (KQED radio), Amory Lovins (RMI), Christine Ervin (Formerly of DOE), Noah Horowitz (NRDC), Scott McNealy (CEO, Sun), and Greg Papadopoulos (CTO, Sun) at a Summit on 21st Century Eco-Responsibility.
