

**Proposal for the
Penn State Center for Energy and Environmental Economics and Policy**

Submitted to the Earth and Environmental Systems Institute

By

Seth Blumsack and Karen Fisher-Vanden (Co-Directors)

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Education and Training

B.A., Mathematics and Economics, Reed College (1998).
M.S., Economics, Carnegie-Mellon University (2003).
Ph.D., Engineering and Public Policy, Carnegie-Mellon University (2006).
Postdoctoral Research, Carnegie-Mellon University (2006-07).

Research and Professional Experience

Assistant Professor of Energy and Mineral Engineering, The Pennsylvania State University, 2007-present;
Consulting Economist, Economic Insight, Inc., 1998 – 2001.

Recent Publications

- P. Hines, S. Blumsack, E. Cotilla-Sanchez and C. Barrows, 2011. "The Topological and Electrical Structure of Power Networks," in review, *IEEE Transactions on Circuits and Systems*.
- A. Fernandez, S. Blumsack and P. Reed, 2011. "Evaluating Wind-Following and Ecosystem Services for Hydroelectric Dams," Under review, *Journal of Regulatory Economics*.
- M. Sahraei-Ardakani, Mostafa, S. Blumsack and A. Kleit, 2011. "Supply Curve Estimation for Transmission-constrained Electric Power Networks," Under review, *Energy Journal*.
- S. Blumsack, S. Smith and A. Kleit, 2011. "Evaluation of State and Federal Subsidies for Energy Efficiency," Revise and re-submit, *Energy Efficiency*. Original submission November 2010.
- S. Blumsack, 2010. "Ready or Not, Here Comes the Smart Grid," under review, *Energy*. Invited in November 2010 as part of a special issue related to the Advanced Energy Symposium in October 2010, Barcelona, Spain.
- J. Kern, G. Characklis, M. Doyle, S. Blumsack, R. Wishunt, 2010. "The Influence of De-Regulated Electricity Markets on Hydropower Generation and Downstream Flow Regime," under second review, *Journal of Water Resources Planning and Management*. Original submission in May 2010.
- Y. Li, S. Blumsack, J. Xu, 2011 (in press). "The Impact of Renewable Energy Siting Decisions on Electricity-Sector Air Emissions in the Western U.S.," *Energy Policy*.
- L. Iulo, S. Blumsack, J. Brownson, R. A. Kimel, 2011 (in press). "Renewable Energy in the Planned World," *Interdisciplinary Themes Journal*.
- S. Blumsack, 2010. "How Free Markets Rocked the Grid," *IEEE Spectrum* 47:12.
- P. Hines, E Cotilla-Sanchez, S. Blumsack. "Do Topological Models Provide Good Information About Electricity Infrastructure Vulnerability?" *Chaos: An Interdisciplinary Journal of Nonlinear Science* 20:3, doi: 10.1063/1.3489887 (5 pages).
- S. Blumsack, J. R. S. Brownson and L. Witmer, Economic and environmental performance of ground-source heat pumps, *Proc. 43rd Hawaii Int. Conf. Sys. Sci.* (2009).

- R. Walawalkar, S. Blumsack, J. Apt and S. Fernands, Analyzing PJM's Economic Demand Response Program, *Energy Policy*, 36, 3692-3702 (2008). Available online at <http://dx.doi.org/10.1016/j.enpol.2008.06.036>.
- A. Newcomer, S. Blumsack, J. Apt, L. B. Lave and M. G. Morgan, The Short Run Economic and Environmental Effects of a Carbon Tax on U.S. Electric Generation, *Env. Sci. Tech.*, 42, 3139 – 3144 (2008). Available online at <http://dx.doi.org/10.1021/es071749d>.
- S. Blumsack, Lester B. Lave and Marija Ilic, 2008. "The Real Problem with Merchant Transmission," *Electricity Journal* 21:2, pp. 9 – 19.
- S. Blumsack, Measuring the benefits and costs of regional electric grid integration, *Energy Law Journal* 28, 147-184 (2007).
- S. Blumsack, L. B. Lave and M. Ilic, A quantitative analysis of the relationship between congestion and reliability in electric power networks, *Energy Journal*, 28, 73-100 (2007).

Service and Synergistic Activities:

Administrative: Adjunct Research Professor, Carnegie Mellon Electricity Industry Center; Adjunct Researcher, Centre for Energy and Mineral Economics, Curtin University of Technology (Australia); Affiliate, Alfred P. Sloan Foundation Industry Studies Program.

Editorial: Regular referee (at least twice per year) for *Environmental Science and Technology*, *Energy Policy*, *IEEE Transactions on Power Systems*, *Energy Journal* and *Journal of Regulatory Economics*.

Educational: Within the department of Energy and Mineral Engineering, I have developed undergraduate and graduate-level coursework in the areas of environmental policy analysis, decision-making and the electricity industry.

Recent Grants and Awards

"Greater Philadelphia Innovation Center" (Green Buildings Energy HUB)

Funding Agency: U.S. Department of Energy

Amount: \$129,000,000

PI: Henry Foley (Blumsack Investigator)

Period: 10/1/10 – 12/31/15

One project will implement electricity demand-response experiments among commercial customers at the Philadelphia Navy Yard. The other project will track the emergence of a "regional innovation cluster" in the Philadelphia area related to energy-efficient buildings.

"Risk-Informed Site Selection for the Long-Term Geologic Sequestration of Carbon Dioxide"

Funding Agency: NETL

Amount: \$73,000

PI: Seth Blumsack

Period: 11/1/10 – 10/31/15

"ARRA: The eEnergy Vermont Consumer Feedback Behavior Study"

Funding Agency: Central Vermont Public Service (U.S. Department of Energy prime)

Amount: \$250,000

PI: Seth Blumsack

Period: 5/31/10 – 8/31/13

Karen Fisher-Vanden

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EDUCATION

Harvard University, Public Policy (Major Field: Environmental and Resource Economics and Policy),
Ph.D., 1999

University of California, Los Angeles—Anderson Graduate School of Management, Decision Sciences,
M.S., 1990

University of California, Davis, Mathematics/Computer Science and Economics,
B.S. and B.A., 1985

RECENT PROFESSIONAL EXPERIENCE

2008- Associate Professor of Environmental and Resource Economics, Dept of Ag. Econ and
Rural Soc., Pennsylvania State University

2007-2008 Associate Professor (with tenure) of Environmental Studies, Dartmouth College

1999-2007 Assistant Professor of Environmental Studies, Dartmouth College

2003-2005 Research Scholar, Rockefeller Center for the Social Sciences, Dartmouth
College

1997-2001 Research Fellow, Center for Business and Government, John F. Kennedy School of
Government, Harvard University.

1996-1997 Research Fellow, Belfer Center for Science and International Affairs, John F. Kennedy
School of Government, Harvard University.

1997 Visiting Researcher, International Institute for Applied Systems Analysis (IIASA)—
Laxenburg, Austria.

RECENT JOURNAL ARTICLES

In press Fisher-Vanden, K. and K. Thorburn, 2009, “Voluntary Corporate Environmental
Initiatives and Shareholder Wealth,” Forthcoming, *Journal of Environmental Economics
and Management*.

In print Fisher-Vanden, K. and M.S. Ho, 2010, “Technology, Development, and the
Environment.” *Journal of Environmental Economics and Management*, 59: 94-108.

Fisher-Vanden, K. 2009. “Energy in China: Past Trends and Future Directions.”
International Review of Environmental and Resource Economics, 3(3): 217-244.

Calvin, K., P. Patel, A. Fawcett, L. Clarke, K. Fisher-Vanden, J. Edmonds, S. Kim, R.

Sands, and M. Wise. 2009. "The Distribution and Magnitude of Emissions Mitigation Costs in Climate Stabilization Under Less Than Perfect International Cooperation: SGM Results." *Energy Economics*, 31:S187-S197.

Fisher-Vanden, K., and R. Terry, 2009, "Is Technology Acquisition Enough to Improve China's Product Quality? Evidence from Firm-Level Panel Data." *Economics of Innovation and New Technology*, 18(1): 21-38.

Fisher-Vanden, K., and G. Jefferson, 2008, "Technology Diversity and Development: Evidence from China's Industrial Enterprises." *Journal of Comparative Economics*, 36(4):658-672.

Fisher-Vanden, K., and I. Sue Wing, 2008, "Accounting for Quality: Issues with Modeling the Impact of R&D on Economic Growth, and Carbon Emissions in Developing Economies." *Energy Economics*, 30(6)

Breetz, H. and K. Fisher-Vanden. 2007. "Does Cost-Share Replicate Water Quality Trading Projects? Implications for a Partnership Between Cost-share and Water Quality Trading." *Review of Agricultural Economics*, 29(2), 201-215.

Fisher-Vanden, K., and M.S. Ho. 2007. "How Do Market Reforms Affect China's Responsiveness to Environmental Policy?" *Journal of Development Economics*, 82, 200-233.

Fisher-Vanden, K., Jefferson, G., Ma, J., Xu, J., 2006. "Technology Development and Energy Productivity in China." *Energy Economics*, 28(5/6), 690-705.

Breetz, H., Fisher-Vanden, K., Jacobs, H. and C. Schary, 2005, "Trust and Communication: Mechanisms for Increasing Farmers' Participation in Water Quality Trading." *Land Economics*, 81(2), 170-190.

RECENT GRANTS AND AWARDS

- 2010-2013 Co-Principal Investigator, U.S. Department of Energy, Office of Science, Research in Integrated Assessment Inter-Model Comparison Development, Testing, and Diagnostics, (PI: John Weyant, Stanford University), \$6 million.
- 2010-2013 Co-Principal Investigator, National Science Foundation, "Collaborative Research: WSC-Category 3: Crops, climate, canals, and the cryosphere in Asia – changing water resources around the Earth's third pole," \$1.4 million (with Steve Frolking, University of New Hampshire; Mark Friedl, Boston University; and Regine Hock, University of Alaska, Fairbanks).
- 2010-2011 Principal Investigator, Pacific Northwest National Laboratory (PNNL), "Support for the Second Generation Model (SGM) Development," \$200,000.
- 2009-2013 Principal Investigator, U.S. Department of Energy, Integrated Assessment of Global Climate Change Research Grant, "Factors influencing energy use and carbon emissions in China." \$180,000.

List of Participating Faculty

- Seth Blumsack, Leone Family Department of Energy and Mineral Engineering
- Karen Fisher-Vanden, Agricultural Economics and Rural Sociology
- Andrew Kleit, Leone Family Department of Energy and Mineral Engineering
- James Shortle, Agricultural Economics and Rural Sociology
- Richard Ready, Agricultural Economics and Rural Sociology
- Anthony Kwasnika, Smeal College of Business
- Marc McDill, School of Forest Resources
- R.J. Briggs, Leone Family Department of Energy and Mineral Engineering
- Zhen Lei, Leone Family Department of Energy and Mineral Engineering
- Anastasia Shcherbakova, Leone Family Department of Energy and Mineral Engineering
- Susan Stewart, Departments of Aerospace Engineering and Architectural Engineering

Rationale for the Proposed Center

We propose the creation of a Center for Energy and Environmental Economics and Policy at Penn State, to catalyze a research community at the University that has world-class talent, but to this point has remained unfortunately fragmented. Penn State has had remarkable success in establishing interdisciplinary activities related to the study of energy and environmental economics and policy. These activities have both been cross-cutting, involving constituencies from many different Colleges, and have promoted disciplinary excellence by many of the faculty involved. Penn State scholars in the field of energy and environmental economics are primarily located in the Department of Energy and Mineral Engineering in the EMS College and in the Department of Agricultural Economics and Rural Sociology, in the College of Agricultural Sciences. Faculty from the Smeal College of Business and the School of Forestry also represent deep expertise in environmental economics. In large part because of Penn State's commitment to interdisciplinary research, this group of scholars has been able to establish active and successful research collaborations with colleagues in more than ten different Colleges and Schools within Penn State (not including within-College collaborations), covering multiple campus locations.¹ Faculty in Agricultural Economics and Rural Sociology have a long history of interdisciplinary research, while interdisciplinary collaboration has been one of the most significant factors in the success of the EME energy economics group in building a high level of research output in a period of only a few years.

Energy and environmental economics scholars have provided service to multiple College-level and University-level Institutes by serving as associates or affiliates and engaging in strategic planning processes. Participating faculty are particularly active within PSIEE, the Environmental and Natural Resources Institute (ENRI; James Shortle is the director), EESI (Seth Blumsack sits on the EESI advisory board), the EMS Energy Institute and the Institute for Cyber-Science (Seth Blumsack is serving on the University-wide Cyber-Science Task Force). The proposed Center would unify these collaborations to create a robust University-wide and interdisciplinary research community in energy economics and policy. The proposed Center would serve to support interdisciplinary collaborations involving energy and environmental economists working with faculty in other fields, and would promote excellence within these disciplines by supporting community-building and career-building activities. A few examples of current research areas include:

- Investigations into the economic impacts and risks associated with global climate change, in the Colleges of Agricultural Sciences and Earth and Mineral Sciences. Economists are

¹ Inter-College research collaborations include the Colleges of: Engineering; Agricultural Sciences; Liberal Arts; Arts and Architecture; Information Sciences and Technology; Health and Human Development; Eberly College of Science; Smeal College of Business; and the School of International Affairs, as well as Penn State Outreach and Extension.

working together with meteorologists, geoscientists and environmental scientists on these efforts.

- Analysis of the competitive impacts of restructured electricity markets, centered in the College of Earth and Mineral Sciences. This research involves economists working together with energy engineers and meteorologists.
- Analysis of the impacts of climate-induced variability in hydrologic cycles on human welfare and economic activity. This involves environmental economics working with ethicists and environmental engineers.
- Research into markets and policies encouraging renewable energy sources, and research addressing the challenges of systems integration of renewable energy and distributed energy resources. These efforts involve researchers in Earth and Mineral Sciences as well as multiple departments within the College of Engineering.
- Technical and policy-oriented research related to managing cyber-security risks in “smart” electricity transmission and neighborhood distribution grids. This effort has involved researchers from Earth and Mineral Sciences and the College of Engineering.
- Analysis of efforts to design and implement energy-efficient building systems. This effort is part of the recent Greater Philadelphia Innovation Cluster HUB grant from DOE, and involves colleagues from Earth and Mineral Sciences; the School of Architecture and Landscape Architecture; Health and Human Development; and the College of Engineering.
- Economic, environmental and public policy issues associated with the development of the Marcellus Shale natural gas resource. Researchers in Earth and Mineral Sciences have been working with colleagues in Agricultural Sciences and Outreach/Extension.

The University now has sufficient critical mass in the joint area of energy and environmental economics that an organized integrative effort is appropriate in order to solidify this research community. Here we suggest that a concentrated and organized effort is appropriate to not only encourage additional interdisciplinary research in energy and environmental economics, but also to create a national and global awareness of this Penn State research community in order to be more competitive for large-scale interdisciplinary funding, and to attract high-quality graduate student, researcher and faculty talent.

In addition to requested support from EESI, PSIEE has indicated that they would be interested in providing additional funding for this effort. Further funding will be sought from the Social Science Research Institute (SSRI) and the Institute for CyberScience (ICS). Issues pertaining to energy and the environment have figured prominently in the ICS strategic planning process.

Potential Funding Opportunities

Penn State faculty who would be affiliated with the Center have been highly successful in competing for large grants in which energy and environmental economics and policy play a central role. Many of these opportunities do not arise in the form of regular solicitations, but are issued by a variety of funding agencies in response to emerging energy or environmental issues. Examples of this success are:

- The Penn State Electricity Markets Initiative was founded with approximately \$250,000 over two years from Pennsylvania electric utility companies.
- The Mid-Atlantic Clean Energy Applications Center is a DOE-funded effort (approximately \$500,000) supporting research in combined heat and power technologies.
- The GridSTAR smart grid center (\$5,000,000 over three years from DOE) performs research and develops educational content related to distributed energy production and the smart grid.
- The Greater Philadelphia Innovation Cluster for Energy-Efficient Buildings is one of three ultra-scale (more than \$100,000,000) “energy innovation HUB” awards issued by DOE.
- \$1.4 million in funding from the National Science Foundation’s program on Water, Sustainability and Climate (WSC) for research focused on water resource issues in Asia. The WSC program is likely to continue at NSF for the next several years.

A few examples of programs likely to be targeted by affiliates of this Center include:

- The Regional Integrated Science and Assessments (RISA) program sponsored by NOAA. Several affiliates of the Center were part of a strong but unsuccessful proposal in 2009.
- The Regional Climate Science Center program established by the Department of the Interior. Discussions within Penn State have already begun to strategically position Penn State to compete for a planned Mid-Atlantic Climate Science Center.
- National Science Foundation programs in Decision, Risk and Management Sciences, as well as Cyber-Enabled Discovery and Innovation, have funded interdisciplinary research on energy and environmental issues.

Center Needs

The purpose of the Center is to catalyze and organize research efforts across the university to propel Penn State into a position of national and international leadership in energy and environmental economics and policy. We primarily seek funds to support community-building activities such as strengthening the environmental economics seminar series initiated by James Shortle and expanding that series of seminars to include internal and external speakers on energy economics issues; and a small seed-grant program to encourage collaborative research by Center affiliates; a public web site where information about the Center and working papers can be published; and administrative support for assistance in preparing and administering research grants. The Center would also hold two annual conferences, one focused on policy issues related to energy and the environment, and one academic conference highlighting cutting-edge research. We request \$8,000 per year to support these activities, with the recognition that other organizations on campus such as PSIEE are likely to offer additional funding.

Management Structure

We propose that the Center be headed by two faculty directors from two different Colleges, Karen Fisher-Vanden and Seth Blumsack. The directors will be in charge of approving expenditures and overseeing Center activities. To involve some faculty more deeply in the Center, we envision creating a small number of focus areas with one faculty member serving as a “research director” for each area. Examples of representative focus areas might include oil and natural gas supply; electricity supply; ecosystem services, and so forth. The responsibilities of the research directors would be to act as a resource within their focus area for students, faculty and (when appropriate) external parties such as the media. The co-directors will meet on at least a monthly basis to discuss Center progress. The co-directors will also set and maintain expectations that affiliate faculty will need to be active participants in Center activities (such as seminars or other meetings) in order to be viewed as competitive for grad-student funding, seed-grant opportunities or administrative support with proposal management.