

ARNE JACOBSON

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CURRENT POSITION (since January, 2005)

Assistant Professor, Environmental Resources Engineering
Co-Director, Schatz Energy Research Center
Graduate Coordinator, Energy, Environment, and Society Master's Program
Humboldt State University, Arcata, CA, 95521
Telephone: (707) 826-3184; Electronic Mail: arne@humboldt.edu

EDUCATION

Ph.D. (2004), Energy & Resources Group, University of California, Berkeley
Dissertation title: "Connective Power: Solar Electrification and Social Change in Kenya"

Master of Science (1997) Environmental Systems, Humboldt State University,
Renewable Energy Engineering Emphasis, Phi Kappa Phi Honor Society, GPA 3.95

Bachelor of Arts (1990), Physics, Earlham College, All College Honors, Departmental Honors, Phi Beta Kappa Honor Society, Varsity Soccer (3 years), 9 months study abroad in Bogotá, Colombia, GPA 4.0

RESEARCH INTERESTS

Solar photovoltaic technology; renewable energy technologies and markets; energy policy and climate change mitigation; international development; Africa; Latin America

FELLOWSHIPS & AWARDS

US EPA STAR Fellow, 2001-2004

United State Environmental Protection Agency "Science to Achieve Results" (STAR) Fellowship for Graduate Environmental Study. Three years of full funding for environmental related graduate research.

Rocca Foundation Dissertation Fellow for African Studies, 2002-2003

Supplemental research funding for social science research in Africa.

Foreign Language and Area Studies (FLAS) Fellowship, 2002

Support for 2 months of Swahili language study during the summer of 2002.

Link Foundation Energy Fellow, 2000-2001

One year of funding for graduate studies related to education and innovation in the area of societal production and utilization of energy.

Energy Foundation Fellow, 1998-2000

Two years of funding for graduate studies related to energy and society.

Phi Kappa Phi Honor Society, 1994

for outstanding academic achievement at Humboldt State University

Codoni Scholarship, 1993-94

This scholarship was awarded based on academic achievement and financial need. It provided partial support during the 1993-94 academic year at Humboldt State University.

Major William C. Carr Scholarship, 1993-94

This scholarship was also awarded based on academic achievement and financial need. It provided partial support during the 1993-94 academic year at Humboldt State University.

Phi Beta Kappa Honor Society, 1990

for outstanding academic achievement at Earlham College

"All College Honors", 1990

awarded at graduation for academic achievement at Earlham College

Wendell M Stanley Senior Scholar-Athlete Award, 1990

for academic and athletic achievement at Earlham College

Clifford Crump Phi Beta Kappa Award, 1989

This scholarship award was awarded based on character and scholarship at Earlham College

Swaim Memorial Scholarship, 1989

for academic excellence in physics at Earlham College

Stifel Award, First Prize, 1986

for outstanding academic achievement and the highest score among Ohio County public high school seniors on the Stifel standardized test; the cash prize was \$300

First Prize, Young Writers Editorial Contest, 1986

for an editorial on the 1986 US attack on Libya titled "Real issues hidden behind military attack", Charleston Gazette, May 8, 1986 (Charleston, West Virginia).

Male student athlete of the year, 1986

for academic and varsity soccer achievements at Wheeling Park High School in West Virginia

PUBLICATIONS

Jacobson, Arne (2007) "Connective Power: Solar Electrification and Social Change in Kenya" *World Development*, v35, n1, pp. 144-162.

Jacobson, Arne and Daniel M. Kammen (2007) "Engineering, Institutions, and the Public Interest: Evaluating Product Quality in the Kenyan Solar Photovoltaics Industry", *Energy Policy*, v35, pp. 2960-2968.

Jacobson, Arne (2006) "Product Quality in Solar PV Markets: Results for Amorphous Silicon Solar Module Performance from African and North American Markets", Conference Proceedings, American Solar Energy Society (ASES), Denver, July 8-13, 2006.

Bailis, Rob, Charles Kirubi, and Arne Jacobson (2006) "Searching for Sustainability: Kenya's Energy Past and Future", African Centre for Technology Studies (ACTS), November 2006 edition, Nairobi, Kenya.

Jacobson, Arne and Daniel M. Kammen (2005) "Science and Engineering that Values the Planet", journal article in *The Bridge*, National Academy of Engineering, Winter Issue, 2005.

Jacobson, Arne and Daniel M. Kammen (2005) "The Value of Vigilance: Evaluating Product Quality in the Kenyan Solar Photovoltaics Industry", Report delivered to solar industry stakeholders in East Africa, July 2, 2005.

Jacobson, Arne (2005) "The Market for Micro-Power: Social Uses of Solar Electricity in Rural Kenya," Working Paper #9, Tegemeo Institute of Agricultural Policy and Development, Nairobi, Kenya.

Jacobson, A.; Milman, A.; and Kammen, D. (2005) "Letting the (Energy) Gini Out of the Bottle: Lorentz Curves of Cumulative Electricity Consumption and Gini Coefficients as Metrics of Energy Distribution and Equity", *Energy Policy*, v33, n14, pp. 1825-1832.

Jacobson, Arne (2004) "Connective Power: Solar Electrification and Social Change in Kenya", Ph.D. Dissertation, Energy and Resources Group, University of California, Berkeley.

Duke, R.; Jacobson, A.; and Kammen D. (2002) "Product Quality in the Kenyan Solar Home Systems Market", *Energy Policy*, v30, pp. 477-499.

Jacobson, A., Duke, R., Kammen, D.M., & Hankins, M. (2000) "Field Performance Measurements of Amorphous Silicon Photovoltaic Modules in Kenya," Conference Proceedings, American Solar Energy Society (ASES), Madison, Wisconsin, USA, June 16-21, 2000.

Duke, Graham, Hankins, Jacobson, Kammen, Osawa, Pulver, and Walther, (2000) "Field Performance Evaluations of Amorphous Silicon (a-Si) Photovoltaic Systems in Kenya:

Methods and Measurements in Support of a Sustainable Commercial Solar Energy Industry”, ESMAP Technical Paper 005, World Bank, Washington, DC.

Jacobson, Arne (2000) "Solar energy measurements for Ladakh, India" National Renewable Energy Conference (NREC), Indian Institute of Technology, Mumbai, India, November 30 - December 2, 2000.

Starrs, Thomas and Jacobson, Arne (1999) "The Yurok Tribe's Wireless Utility", Conference Proceedings, American Solar Energy Society (ASES), Portland, ME, June 12-16, 1999.

Jacobson, Arne (1999). "Case Study: Rural Electrification in Ladakh, India" in Chapter 17, *Special Report on Methodological and Technological Issues in Technology Transfer*, Inter-governmental Panel on Climate Change (IPCC) Working Group II.

Solarnet Magazine Articles (www.solarnet-ea.org)

Jacobson, Arne (2005), "AJ's Technical Tips: Protecting the Battery from Problems Caused by Deep Discharge", *Solarnet*, December 2005, Nairobi, Kenya.

Jacobson, Arne (2005), "AJ's Technical Tips: Performance Results for Amorphous Silicon Solar Modules Sold in Kenya," *Solarnet*, September 2005, Nairobi, Kenya.

Jacobson, Arne (2005), "AJ's Technical Tips: Lead Acid Batteries and the Problem of Over-Charging," *Solarnet*, vol. 7, no.1, Nairobi, Kenya.

Jacobson, Arne (2004), "AJ's Technical Tips: Inverters in Small Solar PV Systems," *Solarnet*, vol. 6, no. 1, Nairobi, Kenya.

Jacobson, Arne (2004), "AJ's Technical Tips: Charge Controllers and Small Solar PV Systems," *Solarnet*, vol. 5, no. 2, Nairobi, Kenya.

Jacobson, Arne (2003), "AJ's Technical Tips: Designing a Small Solar PV System Part IV: Selecting Wires for the System," *Solarnet*, vol. 5, no. 1, Nairobi, Kenya.

Jacobson, Arne (2002) "Designing a Small Solar PV System Part III - Choosing a Battery for the System", v4,n2.

Jacobson, Arne (2002) "Designing a Small Solar PV System Part II: Sizing the Solar Panel", v4, n1

Jacobson, Arne (2002) "Designing a Small Solar PV System Part I: Calculating the Amount of Energy Used by the Electrical Loads", v3, n3

Jacobson, Arne (2001) "Small solar PV systems should have small batteries", v3, n2.

Jacobson, Duke, and Kammen (2001) "Update on the Performance of 14 Watt Phoenix Gold solar panels", v3, n2.

Jacobson, Duke, and Kammen (2000) "Amorphous Silicon PV Panels: Are they a good value for the money?", v2, n2.

Selected Technical Reports

"Rural Electrification in Ladakh, India: Recommendations for an Implementation Policy Based on Economic Life Cycle Cost Analysis and Field Observations" (1998), Ladakh Ecological Development Group (LEDeG), Leh, Ladakh, India.

"A thermal analysis of an Altus 20 electrolyzer in a solar driven application" (1997), Master's Thesis for degree in Environmental Systems, Schatz Energy Research Center (SERC), Humboldt State University.

"Solar and Wind Energy Data Collection in Ladakh, India" (three annual reports from 1996 to 1998), Ladakh Ecological Development Group (LEDeG), Leh, Ladakh, India.

"Research Issues in Photovoltaic Electrolysis", (five detailed reports from 1993 to 1995), co-authored with Dr. Charles Chamberlin, Dr. Peter Lehman, Gian Pualetto, and Mark Rocheleau, Schatz Energy Research Center (SERC), Humboldt State University

"Informe del uso de energia electrica en la clinica Villa Venezuela y recomendaciones sobre un sistema secundaria de energia electrica" (1994), delivered to Dr. Guillermo Martinez Gaitan, director of the Villa Venezuela medical clinic, Managua, Nicaragua.

"Propuesta para la adquisicion de datos cientificos de recursos naturales para analisis de factibilidad de proyectos de desarrollo en la Mixteca Baja" (1994), co-authored with Don Macleay of AT-Work, Earth Island Institute, San Francisco, California. Delivered to the Frente Indigena de Oaxaca Binacional (FIOB, Indigenous Bi-National Front of Oaxaca), Juchitahuaca, Oaxaca, México.

CONFERENCES and SEMINARS ORGANIZED

"Small Solar Electric Systems: Market Opportunities in East Africa" January 18, 2000 in Nairobi, Kenya

As a representative of the Energy and Resources Group (ERG) of UC Berkeley I co-organized and co-chaired a seminar on solar system quality and performance in Kenya; our project partner was Energy Alternatives Africa (EAA) of Nairobi, Kenya. The seminar was attended by over 40 representatives from businesses, government agencies, and non-government organizations active in the Kenya solar market. We organized the seminar primarily to present research results from the paper titled "Field Performance Measurements of Amorphous Silicon Photovoltaic Modules in Kenya" by Jacobson, et al., 2000 to Kenyan solar market stakeholders.

"Solar Market Development and Capacity Building in Kenya: The Role of Technicians and Upcountry Vendors in the Kenyan Solar Industry"

August 21, 2002 in Nairobi, Kenya

As a representative of ERG I co-organized and co-hosted a seminar on solar technicians and capacity building in the Kenya solar market; our project partner was Energy Alternatives Africa (EAA) of Nairobi, Kenya. The seminar was attended by 46 people, including representatives from Kenya's leading solar businesses, Kenyan and Tanzanian government agencies, and non-government organizations. The research results presented at the seminar are available in the workshop proceedings (available at <http://socrates.berkeley.edu/~rael/papers.html>)

RESEARCH EXPERIENCE

Dissertation Field Research in Kenya, 12 months cumulative from 2000 to 2003
Conducted interviews and field surveys, directed team of two field assistants, utilized engineering technical measurements, archival research, and ethnographic observation methods.

Field Project Leader in Kenya (team of 4 graduate students), 6 months in USA, 2 months in Kenya, 1999; Developed technical solar module field testing procedure, trained graduate students, directed field technical measurements, co-directed survey component of research.

Project Consultant in Ladakh, India, 10 months cumulative from 1995 to 1997;
Developed and directed regional renewable energy evaluation project for the Ladakh Ecological Development Group (LEDeG), a locally based NGO.

Research Engineer, Schatz Energy Research Group (SERC), Humboldt State University, USA, 1993 to 1998 (with leave of absence for work in India). Engineering research on solar and fuel cell hydrogen energy systems. Directed solar hydrogen research laboratory (2 years); designed systems for fuel cell powered electric vehicles; specialized in high pressure gas system design; mathematical modeling of solar hydrogen production system; participated in design of hydrogen vehicle refueling station.

TEACHING EXPERIENCE

Assistant Professor, Humboldt State University; Spring semester 2005 – present; primary responsibilities include teaching graduate courses in international development as well as senior level renewable energy engineering design courses.

Teaching Assistant, University of California, Berkeley; Spring semester, 2004, Development Studies, teaching assistant to Gillian Hart for DS100, "Development in Theory and History". I taught 3 sections in this course, including 2 undergraduate sections (29 students in total) and 1 graduate section (14 students). The course had a total of over 120 students.

Teaching Assistant, University of California, Berkeley; Spring semester, 2000, Energy and Resources Group; teaching assistant to Daniel Kammen for ER120 "Renewable Energy Systems". I assisted Dan Kammen to develop and teach this course to 24 students. The course combined aspects of renewable energy policy, renewable energy system design, and hands on laboratory work. During the course I developed three major assignments, gave eight lectures (out of a total of 28), and created five hands on renewable energy laboratory assignments.

Lecturer, Humboldt State University, Fall semester, 1994; Environmental Resources Engineering Department; I taught ERE 331 "Introduction to Thermodynamics and Energy Systems" to 13 students while the regular professor (Dr. Peter Lehman) was on sabbatical. In the process of teaching this regular course offering, I developed four new laboratory assignments that continue to be used by the department when teaching this class.

Teaching Assistant, Humboldt State University, Spring semester 1994; Spring semester 1995, and Fall semester 1996. I assisted Peter Lehman as a laboratory instructor for ERE 331 "Introduction to Thermodynamics and Energy Systems" during three different semesters.

ADDITIONAL EXPERIENCE

Staff Writer: Solarnet Magazine, Nairobi, Kenya, July 2000 - present;
I write "AJ's Technical Tips", an advice column for solar technicians in East Africa in the quarterly "Solarnet Magazine"

Energy Consultant to Yurok Tribe (Northern California), 1998-99;
I advised the Yurok Tribal Council on rural electrification policy and the development of a Tribal utility company; designed solar and small hydroelectric power systems for remote Tribal households; and trained Yurok Tribe employees to carry out maintenance on renewable energy electric power systems.

Solar Electrician and Plumber, Seventh Sun Solar, Berkeley, California, USA, 1991-92
Electrical and plumbing trades work for residential and commercial solar energy systems.

Solar Electrician and Plumber (apprentice), Eclectic Electric, Albuquerque, New Mexico, USA, 1990-91; Electrical and plumbing trades work for residential and commercial solar energy systems.

Volunteer Consulting Engineer, Appropriate Technology Working Group (AT-Work) of the Earth Island Institute, 1991-95. This work included consulting and project evaluation on several trips to Central America:

June 1994, Nicaragua: Engineering consulting with the "Proyecto Playa de Panaloya" (solar water pumping project) and with "La Clinica Villa de Venezuela" (design of an emergency backup power system for a health clinic).

June-July 1992, El Salvador: Evaluation of 6 development projects for the funding agency "New El Salvador Today" (NEST).

November 1991, Nicaragua: Translation and guide services at the "Conference on the Autonomy and Development of the Atlantic Coast of Nicaragua"

Group Co-Coordinator, Earlham College Coffee Picking Brigade to Nicaragua, 1989 & 1990. Co-founded and co-organized a 20 student group to pick coffee for one month (December) on a cooperative farm in Nicaragua (2 consecutive years).

LANGUAGES

Spanish, near fluent

Swahili, advanced speaking and writing ability

OTHER ACTIVITIES

Soccer, ultimate frisbee, hiking

REFERENCES

Dr. Daniel M. Kammen, Associate Professor of Energy and Society in the Energy and Resources Group & Professor of Public Policy in the Goldman School of Public Policy
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Berkeley, CA 94720-3050
email: kammen@berkeley.edu

Dr. Gillian Hart, Professor of Geography & Chair of the Center for African Studies,
507 McCone Hall
Berkeley, CA 94720-4740
email: hart@socrates.berkeley.edu

Dr. Michael J. Watts, Chancellor's Professor of Geography
507 McCone Hall
Berkeley, CA 94720-4740
Email: mwatts@socrates.berkeley.edu