

# CHRIS MARNAY

## Microgrid Design of Mendocino LLC

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## Education

Ph.D.	1986-1993	U.C. Berkeley, Energy and Resources
M.S.	1982-1983	U.C. Berkeley, Agricultural & Resource Econ.
	1981-82	University of Hawaii, East-West Center
B.A.	1981	U.C. Berkeley, Development Studies
	1968-72	London School of Economics, London, U.K.

## Summary Bio

Chris Marnay is a retired Staff Scientist from Berkeley Lab, where he worked for 29 years, and produced over 100 publications. He currently leads an independent consultancy, and remains an Affiliate with Berkeley Lab's China Energy Group within the Environmental Energy Technologies Area. He has worked for 16 years in the microgrid area, and has been one of its most influential researchers. He has published a large body of research on microgrid principles, economics, and applications, and was a member of the Consortium for Electric Reliability Solutions (CERTS) team that proposed the CERTS Microgrid concept. This has been commercialized by Tecogen and is the system that allowed the Brevoort Apartment Coop in Manhattan to function throughout the post-Sandy blackout. The building became one of the Sandy success stories that have had such a major impact in the northeastern U.S. on resiliency thinking. He developed the principles on which the Distributed Energy Resources Customer Adoption Model (DER-CAM) are based, and led its development for until his retirement. DER-CAM was the first microgrid optimization model that conducts integrated optimization of building microgrid systems, covering both heat and electrical systems. He has worked at the University of Texas at Austin, and was a Japan Society for the Promotion of Science Fellow in 2006. He led the Los Angeles Air Force Base V2G project from 2011 until his retirement. He serves as Convenor of the CIGRÉ Working Group 6.22. Chris currently focuses on international microgrid research and demonstrations. He led a \$1M project under the U.S.-China Climate Change Working Group Smart Grid collaboration, and conducts other research on microgrids and smart grid in China. Additional work with U.S. DOE, Shenzhen Building Institute, and Energy Foundation is focused on developing methods for optimizing community scale systems, and a current CERC project explores the benefits of DC distribution in buildings. He is currently a Visiting Scholar in Residence at McGill University for the winter of 2016-17.

## Collaborations

Chris Marnay has collaborated with many individual researchers, students, and groups during his career. He has chaired all ten of the annual International Microgrid Symposiums. He organized the first on the U.C. Berkeley campus in 2005, and the subsequent nine events around the world. He both chaired the events themselves, as well as chaired the Steering Committee that organizes the Symposiums. All Symposiums have been by-invitation-only and offered without any registration fee. Marnay has raised enough funding to cover basic expenses. Details of the Symposiums and presentations are available at <http://microgrid-symposiums.org> Marnay is also Convenor of the CIGRÉ Working Group 6.22: Microgrid Evolution Roadmap. In this role he leads a group of 25 researchers from 11 countries. This diverse group has produced its first major report. As is clear from the bibliography below, virtually all Marnay's research has been conducted in teams, and often involving multiple institutions. He is an affiliate faculty of the Energy and Resources Group, and has supervised dissertation work by of several students, including those of Afzal Siddiqui, Ryan Firestone, Gonçalo Cardoso, David Dallinger, Gonçalo P Mendes, and Kumudhini Ravindra.

### Personal Data

former name: Christopher David Pignone  
married, no children  
born: 3 May 1950 at Stourport-on-Severn, U.K.

### Organizations

Associate Editor, International J. of Distributed Energy Resources  
International Association of Energy Economists  
Institute of Electrical and Electronics Engineers & CIGRÉ

## Ph.D. Details

department: Energy and Resources Program, U.C. Berkeley, 1993  
<http://erg.berkeley.edu>  
title: Intermittent Electrical Dispatch Penalties for Air Quality Improvement  
committee: Prof. Catherine P. Koshland, Public Health, Chair  
Dr. Edward P. Kahn, Lawrence Berkeley National Laboratory  
Prof. Felix F. Wu, Electrical Engineering and Computer Science

### abstract:

The photochemical smog problem of the San Francisco Bay Area occurs as intermittent episodes, while current electric utility emissions regulations rely on mandated fixed stack clean-up equipment. Since electricity generators have some flexibility in the boilers they commit and dispatch during episodes, a policy to encourage use of cleaner boilers could result in reduced emissions of the smog precursor gas NO<sub>x</sub>. Deviating from normal minimum cost operations results in higher fuel bills. The dispatch of more polluting thermal generation within the confines of the Bay Area Air Quality Management District (BAAQMD) was simulated under a variable NO<sub>x</sub> penalty, i.e. a variable pollution tax. The effect was explored through a Lagrangian relaxation unit commitment and dispatch simulation of an historic episode in September 1989, under a Monte Carlo sampling of outage states. Imposition of the tax results in modest NO<sub>x</sub> reductions, but achieved for a small increase in fuel bill. That is, the cost per avoided episode metric ton of NO<sub>x</sub> emitted is low compared to the costs of Selective Catalytic Reduction of NO<sub>x</sub>, the mandated control technology. The taxed dispatch tends to use more units but at lower power. Additionally, the variance of expected emissions across the outage states of the system is reduced, reflecting the fact that the dispatch optimization takes full account of the tax. Since during any one actual episode the system state is random, the lower variance implies that the existence of the tax lowers the risk that NO<sub>x</sub> emissions will deviate from their expected value. Two power sector NO<sub>x</sub> emissions patterns, with and without the tax, were fed into BAAQMD's version of the Urban Airshed Model. Unfortunately, since the power sector emits a small share of total NO<sub>x</sub>, most coming from mobile sources, the change in emissions resulted in an immeasurably small effect on peak ozone estimates for the test episode. This result raises a policy issue concerning inconsistent California pollution regulation. The effectiveness of targeted control strategies is limited because point sources are under local BAAQMD authority but the much larger source, vehicles, are regulated at the state level with constant statewide standards. If politically feasible however, local driving restrictions could provide variable vehicle emission abatement.

## Research Experience

Dec 2016 – May. 2017	Visiting Scholar	McGill University, Montreal, Canada
Aug 2013 – present	Principal	Microgrid Design of Mendocino LLC, Comptche, CA
Jul 2013 – present	Staff Scientist (Affiliate)	China Energy Group ( <a href="http://china.lbl.gov/">http://china.lbl.gov/</a> ), Energy Analysis & Environ. Impacts Dept. Grid Integration Group, Energy Storage & Dist. Res. Dept. Energy & Resources Group, U.C. Berkeley Technology Evaluation, Modeling & Assessment Group
Jan 2012 – Jun 2013	Staff Scientist	
Jan 2008 – present	Affiliate Faculty	
May 2007 – Apr 2010	Group Leader	
Feb. 2006 – Apr. 2006	Guest Professor	The University of Kitakyushu, Japan
Jan. 1995 – Jun. 2013	Staff Scientist	Energy Analysis Program, Berkeley Lab
Jan. 1994 – Dec 1999	President	Meled Inc., Berkeley, CA
Feb. 1994 – Dec. 1994	Post-Doc. Fellow	Energy Analysis Program, Berkeley Lab
Mar. 1993 – Oct. 1993	Research Fellow	Center for Energy Studies, Univ. of Texas at Austin
Feb. 1984 – Feb. 1993	Research Associate	Energy Analysis Program, Berkeley Lab
Jul. 1988 – Jun. 1993	Consultant	CA Public Utilities Commission, San Francisco, CA
May 1991 – Aug. 1991	Research Fellow	Center for Energy Studies, Univ. of Texas at Austin
Jan. 1989 – Jun. 1989	Research Assistant	Energy and Resources Group, Univ. of California, Berkeley
Feb. 1985 – Jun. 1985	Consultant	CESEN-Ansaldo, Genova, Italy
Jul. 1981 – Aug. 1982	Participant	Resource Systems Institute, East-West Center, Univ. of HI

## Refereed Journal Publications

Jin, Ming, Wei Feng, Ping Liu, Chris Marnay, and Costas Spanos. MOD-DR: Microgrid Optimal Dispatch with Demand Response, forthcoming in *Applied Energy*.

Lee, Eleanor S, Christoph Gehbauer, Brian E Coffey, Andrew McNeil, Michael Stadler, and Chris Marnay, "Integrated control of dynamic facades and distributed energy resources for energy cost minimization in commercial buildings," *Solar Energy*, 2015, vol. 122, pp. 1384-1397.

Jones, C Birk, Matthew Robinson, Hans Barsun, Spencer Dutton, Wei Feng, Chris Marnay, and Andrea Mammoli, "The price of perfection: tradeoffs between complexity and reliability in distributed energy systems scheduling using software-as-a-service, under review at *Applied Energy*, 2015.

Steen, David, Michael Stadler, Gonçalo Cardoso, Markus Groissböck, Nicholas DeForest, and Chris Marnay, "Modeling of thermal storage systems in MILP distributed energy resource models," *Applied Energy*, Jan 2015, vol. 137, pp. 782-792.

Stadler M, M Groissböck, A Siddiqui, E.L. Cano, and C Marnay. "Optimizing Distributed Energy Resources: Innovative Operational and Strategic Decision Models," *Applied Energy*, Oct 2014, vol. 81, pp. 416-423.

Mendes, Gonçalo, Wei Feng, Michael Stadler, Jan Steinbach, Judy Lai, Nan Zhou, Chris Marnay, Yan Ding, Jing Zhao, Shilei Lv, Zhe Tian, Neng Zhu, Chengshan Wang. "Regional Analysis of Building Distributed Energy Costs and CO<sub>2</sub> Abatement: A U.S. - China Comparison," *Energy and Buildings*, Jul 2014, vol. 77, pp. 112-129 [LBNL-6465E]. <http://authors.elsevier.com/sd/article/S0378778814002679>

Romankiewicz, John, Chris Marnay, Nan Zhou, and Min Qu. "Lessons from international experience for China's microgrid demonstration program" *Energy Policy*, Apr 2014, vol. 67, pp. 198-208, <http://www.sciencedirect.com/science/article/pii/S0301421513011890> also available as "International Microgrid Assessment: Governance, Incentives, and Experience (IMAGINE), [LBNL-6159E].

Cardoso, Gonçalo, Michael Stadler, Mohammad Bozchalui, Ratnesh Sharma, Chris Marnay, Ana Barbosa-Póvoa, and Paulo Ferrão. "Optimal Investment and Scheduling of Distributed Energy Resources with Uncertainty in Electric Vehicle Driving Schedules," *Energy*, vol. 64, Jan 2014, pp. 17-30 [LBNL-6471E].

Cardoso, Gonçalo, Michael Stadler, Afzal Siddiqui, Chris Marnay, Nicholas DeForest, Ana Barbosa-Póvoa and Paulo Ferrão. "Microgrid Reliability Modeling and Battery Scheduling Using Stochastic Linear Programming," *Journal of Electric Power Systems Research*, vol. 103, Oct 2013, pp. 61-69 [LBNL-6309E].

Stadler, M., M. Kloess, M. Groissböck, G. Cardoso, R. Sharma, M.C. Bozchalui, and C. Marnay. "Electric storage in California's commercial buildings," *Applied Energy*, vol. 104, Apr 2013 [LBNL-6071E].

Mammoli, Andrea, Hans Barsun, Richard Burnett, Nicholas DeForest, Michael Stadler, and Chris Marnay. "Optimal Operation of a Building Scale Thermal System via Software-as-a-Service Experience of a Practical Implementation (in review), also presented as a paper at *Microgen'III: Third International Conference of Microgeneration and Related Technologies*, Naples, Italy, 15-17 Apr 2013 [LBNL-4764E].

Marnay, Chris, Michael Stadler, Afzal Siddiqui, Nicholas DeForest, Jon Donadee, Prajesh Bhattacharya, and Judy Lai. "Applications of Optimal Building Energy System Selection and Operation," *Journal of Power and Energy*, vol. 227(1), Feb 2013, an earlier version was presented as a paper at *Microgen'II: Second International Conference of Microgeneration and Related Technologies*, University of Strathclyde, Glasgow, Scotland, 4-6 Apr 2011 [LBNL-4764E].

Marnay, Chris, and Judy Lai. "Serving Electricity and Heat Requirements Efficiently and with Appropriate Energy Quality via Microgrids," *Electricity Journal* vol. 25(8), Oct 2012.

Stadler, M., C. Marnay, M. Kloess, G. Cardoso, G. Mendes, A. Siddiqui, R. Sharma, O. Mégel, J. Lai. "Optimal Planning and Operation of Smart Grids with Electric Vehicle Interconnection," *Journal of Energy Engineering Special Issue: Challenges and opportunities in the 21st century energy infrastructure*, vol. 138(2), Jun 2012, ISSN 0733-9402 / e-ISSN - 1943-7897, [LBNL-5251E].

Beer, Sebastian, Tomás Gómez, David Dallinger, Ilan Momber, Chris Marnay, Michael Stadler, and Judy Lai. "An Economic Analysis of Used Electric Vehicle Batteries Integrated into Commercial Building Microgrids," *IEEE Transactions on Smart Grid special Issue on Transportation Electrification and Vehicle-to-Grid Applications*, 10.1109/TSG.2011.2163091, vol. 3(1), Mar 2012 [LBNL-6159E].

Stadler, Michael, Afzal Siddiqui, Chris Marnay, Hirohisa Aki, and Judy Lai. "Control of Greenhouse Gas Emissions by Optimal Technology Investment and Operation in Zero-Net-Energy Buildings," *European Transactions on Electric Power*, Jan 2010 [LBNL-2692E, Aug 2009].

Komiyama, Ryoichi, Chris Marnay, Michael Stadler, Inês Lima Azevedo, Sam Borgeson, Brian Coffey, and Judy Lai. "Japan's Energy Outlook for 2050 with Stochastic Sectoral Energy Modelling," *Institute of Energy Economics of Japan Journal*, vol.4(2), Jun 2009(LBNL-3849E).

Norwood, Zack, Timothy Lipman, Michael Stadler, and Chris Marnay. "Assessment of Combined Heat and Power System 'Premium Power' Applications in California," *International Journal of Distributed Energy Resources*, vol 6(2), 1 Apr-Jun 2009 (LBNL-3563E).

Siddiqui, Afzal, and Chris Marnay. "Distributed Generation Investment by a Microgrid Under Uncertainty," *Energy: The International Journal*, Dec 2008, vol 33(12), also a paper presented at the 19th Mini-EURO Conference Operation Research Models and Methods in the Energy Sector (ORMMES 2006). Coimbra, Portugal, 6-8 Sep. 2006, [www.inescc.pt/ormmes06](http://www.inescc.pt/ormmes06) (LBNL- 60592, Jun 2006).

Stadler, Michael, Chris Marnay. "Dezentrale Energieversorgung mit Speichertechnologien," *Energy Journal of the Austrian Energy Agency*, Number 2 & 3 /2008 Jul, ISBN 1026-339X (LBNL-618E available in German only).

Marnay, Chris, Giri Venkataramanan, Michael Stadler, Afzal Siddiqui, Ryan Firestone, and Bala Chandran. "Optimal Technology Selection and Operation of Microgrids in Commercial Buildings," *IEEE Transactions on Power Systems*, 10.1109/TPWRS.2008.922654, vol. 23(3), Aug 2008. Previously published in the Proceedings of the IEEE Power Engineering Society General Meeting 2007, Tampa Convention Center, 24-28 Jun 2007, Tampa FL, 10.1109/PES.2007.385847 (LBNL-62315).

Marnay, Chris. "Microgrids and Heterogeneous Power Quality and Reliability: Matching the Quality of Delivered Electricity to End-Use Requirements," *International Journal of Distributed Energy Resources*, vol 4(4), 1 Oct-Dec 2008 (LBNL-63524).

Marnay, Chris, and Nan Zhou.

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研究活動 - "Status of Overseas Microgrid Programs: 1) Microgrid Research in the U.S.," *Energy and Resources*, vol. 29(1), Jan 2008. (LBNL-56E & LBNL-56E available in Japanese only). Siddiqui, Afzal, and Chris Marnay. "Operation of Distributed Generation Under Stochastic Prices," *Pacific Journal of Optimization*, vol. 3(3), Sep 2007, also appeared in the Proceedings of the 29th International Conference of the International Association of Energy Economists, Potsdam, Germany, 7-10 June 2006, paper presented in an earlier version at the INFORMS Annual Meeting, San Francisco, CA, 13-16 Nov 2005 (LBNL-59446, Apr 2006).

Maribu, Karl, Ryan Firestone, Chris Marnay, and Afzal Siddiqui. "Distributed Energy Resources Market Diffusion Model," *Energy Policy*, vol. 35(9), Sep 2007. Also presented at Energex 2006, the 11<sup>th</sup> International Energy Conference and Exhibition, Stavanger, Norway , 12-15 June, 2006, (LBNL-60590).

Firestone, Ryan, and Chris Marnay. "Distributed Generation Dispatch Optimization under Various Electricity Tariffs," E-Business Applications in the Energy Sector special issue of the *International Journal of Electronic Business Management*, vol. 5(3), Sep 2007 (LBNL-62869).

Illindala, Mahesh, Afzal Siddiqui, Giri Venkataramanan, and Chris Marnay. "Localized Aggregation of Diverse Energy Sources for Rural Electrification using Microgrids," *Journal of Energy Engineering* special issue on Distributed Generation, vol. 133(3), Sep 2007 (LBNL-60399).

Siddiqui, Afzal, Chris Marnay, Ryan Firestone, and Nan Zhou. "Distributed Generation with Heat Recovery and Storage," *Journal of Energy Engineering* special issue on Distributed Generation, vol. 133(3), Sep 2007, previously presented at the 7th European Conference of the International Association for Energy Economics, Bergen, Norway, 28-30 Aug 2005 (LBNL-58630).

Zhou, Nan,, Masaru Nishida, Weijun Gao, and Chris Marnay. Assessment of Distributed Energy Adoption in Commercial Buildings, Part 1 An Analysis of Policy, Building Loads, Tariff Design, and Technology Development, *Bulletin of The Faculty of Engineering Kyushu Sangyo University*, No.42, Dec.20,2005 (LBNL-



60494).

Zhou, Nan, Chris Marnay, Ryan Firestone, Weijun Gao, and Masaru Nishida. "An Analysis of the DER Adoption Climate in Japan Using Optimization Results for Prototype Buildings with U.S. Comparisons," *Energy and Buildings*, vol. 38(12), pp. 1423-1433, Dec 2006. (LBNL-60594).

Siddiqui, Afzal S., Emily S. Bartholomew, and Chris Marnay. "Empirical Analysis of the Spot Market Implications of Price-Elastic Demand." *Energy Studies Review*, Fall 2005, vol. 14(1). (LBNL-58747).

Siddiqui, Afzal S., Emily S. Bartholomew, Chris Marnay, and Shmuel S. Oren. "Efficiency of the New York Independent System Operator Market for Transmission Congestion Contracts," *Managerial Finance*, June 2005, 31(6): pp. 1-45(LBNL-52386). Also a paper presented at and published in the proceedings of the University of California Energy Institute's Center for the Study of Energy Markets, Eighth Annual POWER Research Conference on Electricity Industry Restructuring, March 14, 2003, Clark Kerr Campus, University of California, Berkeley. A reduced version has been published by the Electricity Journal as "The New York Transmission Congestion Contract Market: Is It Truly Working Efficiently, Nov 2003, vol 16(9) (LBNL-53220).

Siddiqui, A. S., C. Marnay, O. Bailey, R.M. Firestone, K. Hamachi LaCommare. Optimal Selection of On-site Power Generation with Combined Heat and Power Applications." *International Journal of Distributed Energy Resources*, Jan-Mar 2005, vol. 1(1), (LBNL-56774).

Siddiqui, Afzal S., Marnay, Chris, Jennifer L. Edwards, Ryan M. Firestone, Srijay Ghosh, and Michael Stadler. "Effects of a Carbon Tax on Microgrid Combined Heat and Power Adoption." *Journal of Energy Engineering* special issue on quantitative models for energy policy, planning and management, Apr 2005, vol. 131(1), (LBNL-51771).

Siddiqui, Afzal S., Chris Marnay, and Ryan H Wiser. *Real Options Valuation of US Federal Renewable Energy Research, Development, Demonstration, and Deployment*, Jan 2007, *Energy Policy*, vol. 35(1), p.265-279. Also presented at the Program on Workable E Mar 2005, Mar 2005 (LBNL-58000).

Siddiqui, Afzal, Chris Marnay, and Mark Khavkin. Excessive Price Volatility in the California Ancillary Services Markets: Causes, Effects, and Solutions. *Electricity Journal*, Jul. 2000, vol. 13(6), (LBNL-46083).

Rosekrans, S., D. Kirshner, and C. Marnay. "Issues in Electricity Planning with Computer Models: Illustrations with Elfin and WASP." *Utilities Policy*, April 1999, vol. 7(4) (LBNL-43745).

Marnay, Chris and Steven J. Pickle. "Power Supply and the Nuclear Option in Poland." *Contemporary Economic Policy*, Jan 1998.

Pickle, Steven J., Chris Marnay, and Frank Olken. "Information Requirements for a Deregulated Electric Power Industry: Assessment and Perspectives from the 1996 Informatics Workshop." *Utilities Policy*, June 1997, vol. 6(2).

Kahn, Ed, Chris Marnay, and Doug Berman. "Evaluating Dispatchability Features in Competitive Bidding." *IEEE Transactions on Power Systems*, PWRS, vol. 7(3), Aug. 1992.

Marnay, Chris, and Todd Strauss. "Effectiveness of Antithetic Sampling and Stratified Sampling in Monte Carlo Chronological Production Cost Modeling." *IEEE Transactions on Power Systems*, vol 6(2), May 1991.

Comnes, G.A., E. Kahn, C. Pignone, and M. Warren. "An Integrated Economic Analysis of Commercial Thermal Energy Storage." *IEEE Transactions on Power Systems*, PWRS vol. 3(4), Nov. 1988.

Kahn, E., C. Pignone, J. Eto, J. McMahon, and M. Levine. "The Effect of Conservation Programs on Electric Utility Earnings: Results of Two Case Studies." *Energy Policy*, vol. 15(3), Jun. 1987 (LBNL-21098, Aug. 1984).

Fassinger, Paul, Chris Pignone, and Jim Weiss. "Coal: Clouds Ahead." *Tellus*, Spring 1981.

## Refereed Conference Proceedings and Poster Publications

Liu, Ping, Wei Feng, Chris Marnay, Spencer Dutton, Ming Jin, Lingwei Zheng, and Nan Zhou. "Towards the Optimal Development of Low-Carbon Community Energy Systems," paper presented at the 2016 ACEE Summer Study on Energy Efficiency in Buildings, Asilomar Conference Center, Pacific Grove, CA, 21-27 Aug 2016. <http://aceee.org/files/proceedings/2016/data/index.htm>

Karali, Nihan, Gianluca Flego, Jiancheng Yu (于建成), Silvia Vitiello, Dong Zhang (张东), and Chris Marnay. "Uncertainty in Benefit-Cost Analysis of Smart Grid Demonstration Projects in the U.S. and China, paper presented at the 39<sup>th</sup> IAAE International Conference, Bergen, Norway, 19-22 Jun 2016.

Karali, Nihan, Dong Zhang (张东), GuoQi Ren (任国岐), Brendan Shaffer, Kevin Clampitt, Jiancheng Yu (于建成), Robert Yinger, and Chris Marnay. "Benefits Analysis of Smart Grid Demonstration Projects," paper presented at the 2016 China International Conference on Electricity Distribution (CICED 2016), Xi'an, China, 10-13 Aug 2016.

Ding, Yan, Spencer Dutton, Wei Feng, and Chris Marnay. "Forecast based optimization of distributed energy system control for campus buildings," The 14th International Conference on Sustainable Energy Technologies, 23-27 Aug 2015, Nottingham, U.K.

Jones, C. Birk, Matthew Robinson, Hans Barsun, Leila Ghanbari, Salman Mashayekh, Wei Feng, Andrea Mammoli and Chris Marnay. "Software-as-a-Service Optimal Scheduling of New Mexico Buildings," *ECEEE 2015 Summer Study on Energy Efficiency*, 1–6 June 2015, Club Belambra Les Criques, Presqu'île de Giens, Toulon/Hyères, France.

G Cardoso, M Stadler, M Chehreghani Bozchalui, R Sharma, C Marnay, A Barbosa-Póvoa, and P. Ferrão. "Stochastic Programming of Vehicle to Building Interactions with Uncertainty in PEVs Driving for a Medium Office Building," paper presented at *IECON 2013, the 39th Annual Conference of the IEEE Industrial Electronics Society*, 10–13 November 2013, Vienna, Austria (LBNL-6416E).

DeForest, Nicholas, Gonçalo Mendes, Michael Stadler, Wei Feng, Judy Lai, and Chris Marnay. "Thermal Energy Storage for Electricity Peak-Demand Mitigation: A Solution in Developing and Developed World Alike," poster and short paper presented at *European Council on an Energy Efficient Economy 2013 Summer Study*, 3–8 Jun 2013, Club Belambra Les Criques, Presqu'île de Giens, Toulon/Hyères, France (LBNL-6308E).

Marnay, Chris, Terry Chan, Nicholas DeForest, Judy Lai, Jason MacDonald, Michael Stadler, Tobias Erdmann, Andreas Hoheisel, Markus Müller, Scott Sabre, Ed Koch, Paul Lipkin, Robert W. Anderson, Spence Gerber, and Elizabeth Reid. "Los Angeles Air Force Base Vehicle to Grid Pilot Project," paper presented at the European Council on an Energy Efficient Economy 2013 Summer Study, 3–8 June 2013, Club Belambra Les Criques, Presqu'île de Giens, Toulon/Hyères, France [LBNL-6154E].  
<http://microgrid.lbl.gov/publications/los-angeles-air-force-base-vehicle-grid-pilot-project>

Kumar, K. Nandha, B Sivaneasan, P L So, HB Gooi, Nilesh Jadhav, Reshma Singh and Chris Marnay. "A Sustainable Campus with PEV and Microgrid," paper presented at 2012 ACEEE Summer Study on Energy Efficiency in Buildings, 12-17 Aug, 2012, Asilomar Conference Center, Pacific Grove, CA [LBNL-----].

Mendes, Gonçalo, Chris Marnay, Michael Stadler, Paulo Ferrão and Christos Loakimidis. "Modeling of Plug-in Electric Vehicles' Interactions with a Sustainable Community Grid in the Azores," paper presented at 2012 ACEEE Summer Study on Energy Efficiency in Buildings, 12-17 Aug, 2012, Asilomar Conference Center, Pacific Grove, CA [LBNL-81767].



Feng, Wei, Nan Zhou, Chris Marnay, Michael Stadler, and Judy Lai. "Building Distributed Energy Optimization for China – a Regional Analysis of Building Energy Costs and CO<sub>2</sub> Emissions," paper presented at 2012 ACEEE Summer Study on Energy Efficiency in Buildings, 12-17 Aug, 2012, Asilomar Conference Center, Pacific Grove, CA [LBNL-81770].

Marnay, Chris, Steven Lanzisera, Michael Stadler, and Judy Lai. "Building Scale DC Microgrids," paper presented at IEEE EnergyTech 2012, Technology Frontiers in Sustainable Power and Energy, 29-31 May, 2012, Case Western University, Cleveland OH [LBNL-----].

Marnay, Chris, Nicholas DeForest, and Judy Lai. "A Green Prison: The Santa Rita Jail Campus Microgrid," panel paper to be presented at the presentation in Campus Microgrids Panel, 2012 IEEE PES General Meeting in San Diego, CA USA, 24-25 Jul 2012 [LBNL-5345E].

Marnay, Chris, Bruce Nordman, and Judy Lai. "Future Roles of Milli-, Micro-, and Nano-Grids," paper presented at the CIGRÉ International Symposium, *The electric power system of the future - Integrating supergrids and microgrids*, Bologna, Italy, 13-15 Sep 2011 [LBNL-4927E].

Stadler, Michael, Chris Marnay, Ratnesh Sharma, Gonçalo Mendes, Maximilian Kloess, Gonçalo Cardoso, Olivier Mégel, and Afzal Siddiqui. "Modeling Electric Vehicle Benefits Connected to Smart Grids," 7th IEEE Vehicle Power and Propulsion Conference, Chicago, IL, 6-9 Sept 2011 [LBNL-4929E].

Morris, G Young, C Abbey, Geza Joos, and Chris Marnay. "A Framework for the Evaluation of the Cost and Benefit of Microgrids," paper presented at the CIGRÉ International Symposium, *The electric power system of the future - Integrating supergrids and microgrids*, Bologna, Italy, 13-15 Sep 2011. Also published in Portuguese as "Metodologia para avaliação de custos e benefícios das microrredes," *Eletricidade Moderna Magazine's*, Apr 2012, pp. 138-150. [LBNL-5025E].

Stadler Michael, Jonathan Donadee, Chris Marnay, Gonçalo Mendes, Jan von Appen, Olivier Mégel, Prajesh Bhattacharya, Judy Lai. "Application of the Software as a Service Model to the Control of Complex Building Systems," ECEEE 2011 Summer Study, 6–11 June 2011, Belambra Presqu'île de Giens, France, (LBNL-4561E).

Marnay, Chris, Nicholas DeForest, Michael Stadler, Judy Lai, Carlos Dierckxsens, Jonathan Donadee, Gonçalo Ferreira Cardoso. "A Green Prison, Santa Rita Jail Creeps Towards Zero Net Energy (ZNE)," ECEEE 2011 Summer Study, 6–11 June 2011, Belambra Presqu'île de Giens, France (LBNL-4497E).

Lai Judy, Nicholas DeForest, Sila Kiliccote, Michael Stadler, Chris Marnay, and Jon Donadee: "Evaluation of evolving residential electricity tariffs," poster and associated summary, ECEEE 2011 Summer Study, 6–11 June 2011, Belambra Presqu'île de Giens, France (LBNL-4496E-poster).

Lai Judy, Chris Marnay, Sila Kiliccote, Michael Stadler, Nicholas DeForest, and Jon Donadee: "The Effects of Universal Smart Meter Deployment on Tariffs and Residential Consumer Behavior," paper presented at the ECEEE 2011 Summer Study, 6–11 June 2011, Belambra Presqu'île de Giens, France (LBNL-????).

von Appen, Jan, Chris Marnay, Michael Stadler, David Klapp, Alexander von Scheven, and Judy Lai. "Assessment of the Economic Potential of Microgrids for Providing Reactive Power," The 8th International Conference on Power Electronic, Wind, and ECCE Asia May 30 - June 3, 2011, The Shilla Hotel, Jeju, Korea, (LBNL number pending).

DeForest, Nicholas, Judy Lai, Michael Stadler, Gonçalo Mendes, Chris Marnay & Jon Donadee: "Integration & Operation of a Microgrid at Santa Rita Jail," ICPE2011-ECCE Asia, Jeju Island, Korea, 29 May-2 June 2011, refereed poster (LBNL-4850E).

Stadler, Michael, Ilan Momber, Tomás Gómez, Chris Marnay, Giri Venkataramanan, Sebastian Beer, Judy Lai, and Vincent Battaglia. "The Added Economic and Environmental Value of Plug-in Electric

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Marnay, Chris and Prakash Parameswaran. *Suitability of Existing Models for Simulating a Competitive Environment*. Confidential report to the Pacific Gas & Electric Company on production costing practice in a restructured California electricity market. February 1996.

Kahn, Edward P., Chris Marnay, and Doug Berman. *Contracts for Dispatchable Power: Economic Implications for the Competitive Bidding Market*. LBNL report #29447, Oct. 1990.

Marnay, Chris, and G. Alan Comnes. *Ratemaking for Conservation: The California ERAM Experience*. LBNL report #28019, Feb. 1990.

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Pignone, Chris. *New Metering Technologies and Time-of-Use Pricing*. LBNL report #22341, Jan. 1987.

Eto, Joseph H., Ed Kahn, and Chris Pignone. *Thermal Integrity Measures for Residential Buildings: Texas Utilities Electric Company and Nevada Power Company*. Technical Report of The Financial Impacts on Utilities of Load Shape Changes Project. LBNL report #22627, May 1986.

Pignone, Chris. *The Load Management Strategy Testing Model as a Tool for Least-Cost Utility Planning*. LBNL ID#1150, Apr. 1986.

Kahn, E., C. Pignone, J. Eto, J. McMahon, and M. Levine. "The Effect of Conservation Programs on Electric Utility Earnings: Results of Two Case Studies." LBNL report #21098, Aug. 1984.

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## Significant Seminars and Briefings

"Economic and Environmental Optimization of Microgrids." Invited lecture at Beijing University of Construction and Architecture, 6 Nov 2013.

"The Los Angeles Air Force Base Vehicle-to-Grid Demonstration." Presentation at the 4<sup>th</sup> Annual Silicon Valley Energy Storage Symposium, Microsoft Auditorium, Mountain View, 11 Apr 2013.

"Adopting DC Power for Buildings." Panel presentation at the IEEE Energy Tech 2012, Cleveland OH, 31 May 2012.

"Distributed Energy Resources Customer Adoption Model." Presentation to Stephen Kiser, PACOM at Berkeley Lab, 23 Apr 2012.

"D/E2: Energy Technology Systems and Distributed Energy Supply System Integration." Presentation at CERC IAB at Berkeley Lab, 20 Mar 2012.

"The LAAFB ESTCP Project." Presentation at the Los Angeles Air Force Base, 2 Mar 2012.

"A **Smart** but not **Super** Grid." Session sum up at American Association for the Advancement of Science, Vancouver, BC, Canada, 18 Feb. 2012

"Worldwide Microgrid Development: The Evolving Power Supply Paradigm." Presentation at the *Applied Power Electronics Conference and Exposition*, Orlando FL, 9 Feb 2012.

"Microgrids in the Evolving Paradigm of Electricity Generation and Delivery." Lecture at Hangzhou Dianzi University, Hangzhou, China, 14 Dec 2011.

"Microgrids: Optimization Using DER-CAM." Lecture at the Chinese Academy of Science, Beijing, China, 6 Dec 2011.

"Evolving Paradigm of Electricity Generation and Delivery." Presentation at the *Micro Grid Focus 2011: 1st Micro Grid and Distributed Generation Industry Outlook* conference, Sanya, China, 29 Nov 2011.

"Optimal Building-Scale Microgrid Equipment Selection and Operation." Invited lecture at the University of New Mexico, Albuquerque, 17 Oct 2011.

"Direct DC Power Systems for Efficiency and Renewable Energy Integration." LBNL/DOE Webinar, 3 Nov 2011, with Karina Garbesi, Vagelis Vossos, and Paul Savage, posted at:  
[http://efficiency.lbl.gov/news/lbnl\\_doe\\_webinar\\_direct\\_dc\\_power\\_systems\\_for\\_efficiency\\_and\\_renewable\\_energy\\_integration\\_0](http://efficiency.lbl.gov/news/lbnl_doe_webinar_direct_dc_power_systems_for_efficiency_and_renewable_energy_integration_0)

"Microgrids: Renewable Energy Technology for Buildings." 11 Presentation to the CERC Industry Advisory Board, Berkeley Lab, 16 Aug 2011.

"Microgrids: Optimization Using DER-CAM." Lecture at Tongji University, Tianjin, China, 26 Jul 2011. A longer version also presented at Tongji on 3 Dec 2011.

"Microgrids: Optimization Using DER-CAM." Lecture at Tianjin University, Tianjin, China, 25 Jul 2011. A longer version also presented at Tongji on 5 Dec 2011.

"Microgrids: A Survey of International Research Experience." Presentation at the Electrical Engineering Institute of the Chinese Academy of Sciences, Beijing, 21 Jul 2011.

"Introduction to EV Ancillary Services." Presentation at the EV Ancillary Services Workshop, Washington, DC, 17 Jun 2011.

"Smart buildings with electric vehicle interconnection as buffer for local renewables?" Researching the Intelligent City: Key Challenges of Integrating Urban Energy and Mobility Systems Research Symposium, Berlin, 30 May 2011, presented by Michael Stadler.

"Microgrids: An Emerging Component of Smart Distribution Networks," seminar in the EES-UETP class in the *Smart Electricity Distribution Grids: Economics and Regulation*, Universidad Pontificia Comillas, Madrid, Spain, 14 Apr 2011 (also presented to a Comillas graduate class, and as a seminar at the Instituto de Investigación Tecnológica, both on 15 Apr 2011).

"The U.S. Microgrid Research Program," conference keynote address at *Microgen'II: Second International Conference of Microgeneration and Related Technologies*, University of Strathclyde, Glasgow, Scotland, 4-6 Apr 2011.

"Microgrid Optimization Using DER-CAM," seminar at the Sacramento Municipal Utility District, Sacramento CA, 11 Mar 2011.

"The Joy of Stochastic Forecasting: An Overview of the Stochastic Buildings Energy and Adoption Model," seminar presented at Berkeley Lab, Berkeley CA, 14 Feb 2011.

"Microgrid Architectures: Old and New Friends and the Paradigm Shifts They May Cause," presentation at Berkeley Lab to visiting delegation from Samsung Corp., Berkeley Lab, Berkeley CA, 14 Feb 2011.

"Santa Rita Jail Project: Battery Selection and Scheduling," presentation at Chevron Energy Services, San Francisco CA, 24 Jan 2011.

"Optimum Equipment Selection and Scheduling for Microgrids," presentation to OSIsoft at Berkeley Lab, Berkeley CA, 7 Jan 2011, also presented to visiting delegation from NEDO, 15 Dec 2010, and L-3 on 20 Dec 2010.

"Microgrid Architectures: Old and New Friends and the Paradigm Shifts They May Cause," presentation at 4th International Conference on Integration of Renewable and Distributed Energy Resources, Albuquerque, NM, 6-10 Dec 2010.

"Optimum Equipment Selection and Scheduling for Microgrids," presentation at International Minigrids Workshop, CSIRO, Newcastle NSW, Australia, 8 Nov 2010, also presented at the University of Wollongong, 12 Nov 2010.

"Microgrids: Roles in the Changing Power Sector Paradigm Worldwide," presentation at the National Center for Genetic Resources Preservation, 1 Nov 2010.

"Microgrids: Roles in the Changing Power Sector Paradigm Worldwide," invited seminar at U Center for Genetic Resource Preservation, Fort Collins CO, 1 Nov 2010.

"Microgrids: Roles in the Changing Power Sector Paradigm Worldwide," presentation at United Technologies Research Center, Hartford CT, 29 Oct 2010.

"Microgrids: Roles in the Changing Power Sector Paradigm Worldwide," seminar at UTRC, East Hartford CT, 29 Oct 2010.

"Controlling Power Supply Locally," presentation to Visiting Guangdong Study Tour, Berkeley Lab, 12 Oct 2010.

"Smart Grids and Microgrids," presentation to Visiting Mayors from China, Berkeley Lab, 15 Sep 2010.

"Microgrids: Deployment as Elements of the Smart Grid," lecture at the *Renewable Energy 2010* conference, Yokohama, Japan, 1 Jul 2010.

"Introduction to Microgrids: Concepts, Results, and the Status of U.S. Research," lecture presented at the Aichi Institute of Technology and Osaka University, 29 & 30 Jun 2010.

"Introduction to Microgrids," ConnectivityWeek, Santa Clara Convention Center, 27 May 2010.

"Microgrids: Systemic Economic-Environmental Analysis at Building Scale," seminar at the U.S. Environmental Protection Agency, Washington DC, 1 Feb 2010.

"Microgrids: U.S. Activities," keynote at the European Commission Community Research workshop, *Microgrids: Novel Architectures for Future Power Systems*, Paris, 29 Jan 2010.

"Energy Efficiency Perspectives in California and Internationally," seminar at MVV Energie, Mannheim, Germany, 26 Jan 2010.

"Building Scale Microgrid Evaluation Using DER-CAM," seminar at the Karlsruhe Institute of Technology, Karlsruhe Germany, 25 Jan 2010.

"Microgrids: Commercial Building Examples and Analysis, seminar at Fraunhofer ISI, Karlsruhe Germany, 25 Jan 2010.

"Berkeley Lab Involvement in the Santa Rita Jail CERTS Microgrid Project," presentation at Chevron Energy Services, San Francisco CA, 19 Jan 2010.

"Energy Efficiency Standards: Environmental and Utility Analysis Using NEMS," presentation at Berkeley Lab to delegation from OMB and others, 16 Dec 2009.

"Microgrids: Principles and Economic Optimization," guest lecture in *ER 291 – Electric Energy Systems*, U.C. Berkeley, 5 Nov 2009.

"Microgrids: Principles and Economic Optimization," presentation at Berkeley Lab to delegation from Lockheed Martin Corp., 8 Oct 2009.

"Microgrids and Heterogeneous Power Quality," CITRIS Sponsors Meeting: the Computer History Museum, Mountain View CA, 28 Sep 2009.

"The Microgrid Symposium Tradition." Introduction to the San Diego 2009 Symposium on Microgrids, La Jolla CA, 17 Sep 2009.

"Optimal Building Technology Selection and Operation: A Systemic Approach", California Energy Commission, Sacramento CA, 9 Sep 2009.

"CA GHG Abatement from CHP: The Contribution of Medium-Sized Commercial Buildings," seminar at the California Energy Commission, 22 Apr 2009.

"Microgrids: Providing Energy Services Locally," Google Tech Talk, 25 March 2009, posted on YouTube at <http://www.youtube.com/watch?v=3XuCJBvq6Sk>

"Microgrids: Local Energy Services with Appropriate Power Quality & Reliability," invited seminar at the Department of Electrical Engineering, Montana State University, Bozeman MT, 6 Mar 2008.

Panel member in "Decentralize the Grid," session at U.C. Berkeley Energy Symposium: Bold Ideas for a New Energy Landscape, MLK Student Union, 23 February 2009.

"The Role of Storage in Microgrids," keynote address at the Montreux Energy California Clean Energy Round Table, U.C. San Diego, 2 Dec 2008.

"Microgrids: Supplying Building Energy Services Locally with Appropriate Power Quality" Seminar at the Electrical and Electronic Department, University of Hong Kong, 8 Nov 2008, Tsinghua University, 11 Nov 2009, the JCCCCCE China Energy Forum, Beijing, 12 Nov 2009, and the University of Tianjin, 15 Nov 2009.

"Microgrids: Theory and Practice." Presentation in the 2<sup>nd</sup> A\*STAR-UK Energy Partnership Workshop, SINERGY, Fusionopolis, Singapore, 5 Nov 2008. (also led a break-out session on economics of microgrids at the same conference)

"The Microgrid Symposium Tradition." Introduction to the Kythnos 2008 Symposium on Microgrids, Kythnos Is., Greece, 2 Jun 2008.

"Microgrids for Commercial Building CHP and Heterogeneous Power Quality and Reliability." Presentation to visiting Singaporean delegation, Berkeley Lab, 21 May 2008.

"Microgrids for Commercial Building CHP and Heterogeneous Power Quality and Reliability." Guest lecture in the ER-254 Class, U.C. Berkeley, 21 Feb 2008.

"Microgrids vs. Supergrids." Presentation at the CADER 2008 Conference: Turning on Distributed Energy Resources Locally, Nationally, and Globally, Hyatt Regency La Jolla, 31 Jan 2008.

"On-Site Power and Microgrids for Commercial Building Combined Cooling Heating and Power and Heterogeneous Power Quality and Reliability." Presentation to planning meeting for the High Performance Buildings Research & Implementation Center (HiPer BRIC), Berkeley Lab, 21 Dec 2007.

"Microgrids for Commercial Building CHP and Heterogeneous Power Quality and Reliability." Presentation to visiting Korean delegation, Berkeley Lab, 13 Dec 2007.

"Microgrids for Commercial Building CHP and Heterogeneous Power Quality and Reliability." Keynote address at the *IEEC 2007 Conference on Active Networks and Sustainable Energy Consumption*, Bilbao, Spain, 14-15 Nov 2007

"Overview of Distributed Energy Research at Berkeley Lab." Presentation to visiting Australian delegation, Berkeley Lab, 18 Jul 2007.

"The Future of the Distribution Grid." Invited panel by Astia 2007 Clean Tech Breakfast Series, San Francisco, 12 June 2007.

"Microgrids." Invited lecture at the Katholieke Universiteit Leuven, Belgium, 7 June 2007.

"Microgrid Demonstrations in Japan." Presentation at the California Energy Commission, 25 April 2007.

"Overview of Microgrid R&D in the U.S." Presentation at the *Nagoya 2007 Symposium on Microgrids*, 6 Apr 2007.

"Overview of Microgrid R&D in the U.S." Presentation at the *Nagoya 2007 Symposium on Microgrids*, 6 Apr 2007.

"Peak Load Reduction Technology Penetration Forecast." Presentation to the Office of Electricity Delivery and Energy Reliability Advisory Committee, 26 Feb 2007.

"Introduction to Microgrids." Presentation to visiting attendees to the *California-Denmark Workshop on Clean Technologies*, 1 February 2007.

"Carbon Reduction Potential of Combined Heat and Power in California's Commercial Sector." presentation to California Energy Commission's Energy Systems Integration Advisory Committee, 30 January 2007.

"Annual Symposiums on Microgrids." Presentation at the *2<sup>nd</sup> International Conference on Integration of Renewable and Distributed Energy Resources*, 8 Dec 2006.

"Annual Symposiums on Microgrids." Class lecture in the *Energy and Resources 220, Modeling Energy and Resource Systems*, 28 Nov 2006.

"Microgrids: Relevant Aspects for Europe from a U.S. Viewpoint." *1st International Symposium on Distributed Generation and Smart Grids*, TECHbase Vienna, Austria, 18-19 October 2006.

"Building DER Selection." Presentation at the Energy Program, County of Alameda, 22 Sep 2006.

"DER-CAM to DESS." Presentation at the California Energy Commission, 18 July 2006.

"The Role of Microgrids in a Decentralized Power System." presentation at the *International Symposium on "Urban Energy Infrastructure Development for Mitigating Environmental Impact*, Awaji Yumebutai International Convention Center, Awaji Island, Japan, 29 March 2006.

"A New Era for Distributed Energy Resources: The CERTS Microgrid Concept." Lecture at The University of Kitakyushu, Japan, 15 March 2006.

"DER-CAM to DESS." Presentation at Shimizu Institute of Technology, Tokyo, Japan, 22 March 2006, and a similar presentation made to the Osaka Gas Co, Osaka, Japan, 27 March 2006.

"Microgrids: A California Perspective." *Lecture at Tohoku University, Sendai, Japan, 3 March 2006*

"ComSeM: A NEMS Compatible Model of Commercial Sector Technology Diffusion." Presentation at the Planning, Analysis, and Evaluation Analysis Meeting, Washington, DC, 26 January 2006.

"Government Performance and Results Act Analysis: Modeling the Benefits of the Distributed Energy Program Using the National Energy Modeling System." Presentation at the Distributed Energy Program External Review, Washington, DC, 13 December 2005.

"Microgrids: A Rare Paradigm Shift in Electricity Generation and Delivery." Lecture at the International Forum on an Environmental and Energy Industries," by invitation of Governor Imura of Amori Prefecture, Hachinohe, Japan, 17 Nov 2005.

"Estimating Benefits of Energy Efficiency and Renewable Energy Combined Heat and Power Research and Development." Presentation before the National Research Council Panel on the U.S. Department of Energy's Energy Efficiency and Fossil Energy Research and Development Programs (Phase Two), the Keck Center of the National Academies, Washington DC, 24 Oct 2005.

"Towards Integrated Economic Analysis of Building Microgrids." Invited lecture to the IEEE Greece Power Chapter at the National Technical University of Athens, School of Computer Engineering and Electric Power, 11 Oct 2005.

"Microgrids: A Rare Paradigm Shift in Electricity Generation and Delivery." Invited lecture at IRON Dissemination Workshop, Vienna Technical University, 4 Oct 2005.

"Microgrids and DER-CAM." Presentation at the Westin Santa Clara, 9-10 Sep 2005.

"Microgrid Research in the U.S.." Fully funded invited lecture presented at the Toward Holonic EnergySystems Symposium at the University of Tokyo, 11 Jul 2005.

Marnay, Chris, and Kristina Hamachi LaCommare. *National Energy Modeling System*, presentation in the ER-220 class at U.C. Berkeley, 19 Apr 2005.

"Introduction to Microgrids." Talk presented at the CERTS Berkeley 2005 Symposium on Microgrids

"Power Quality." Seminar presented to visiting Japanese team conducting the Comprehensive Investigation into New Power Technology. Berkeley Lab, 18 Apr 2005.

"The CERTS Microgrid and the Future of the Macrogrid." Seminar at Ecofys, Utrecht, Netherlands, 7 Dec 2004.

"Introduction to NEMS." Presentation at U.C. Energy Institute, Berkeley, 22 Nov 2004.

"The GPRA-05 and 06 Inputs for DE." Briefing at DOE, 17 Nov 2004.

"Berkeley Lab Microgrid Research." Presentation at BART, Oakland, 1 Oct 2004.

"Distributed Generation." Presentation to the Western Underground Committee, at Stanford University, 23 Sep 2004.



"Smart Electricity." Briefing presented at the U.S. Dept. of Energy, 16 Sep 2004.

"Evaluation Framework and Tools for Distributed Energy Resources." Presentation at the first workshop of the CEC-CPUC joint Distributed Generation OII-OIR, California Energy Commission, 5 May 2004.

"The CERTS Microgrid." Seminar presented at U.C. Berkeley, 4 May 2004.

"The CERTS Microgrid." Seminar presented with Nan Zhou at the California Public Utilities Commission to delegation from NEDO, Japan, 14 Nov 2003.

"Global Warming: Who Cares about a Few Degrees?" Lecture at U.C. Extension English Language Program, 26 Nov 2003.

"The CERTS Microgrid." Seminar presented at the University of Wisconsin, Madison, 31 Jul 2003.

"The CERTS Microgrid." Seminar presented to visiting Chinese delegation, Berkeley Lab, 25 Feb 2003.

"The CERTS Microgrid." Lecture presented at the Catholic University of Leuven, Belgium, 11 Oct 2002.

"DER Research at Berkeley Lab." Talk in the CERTS Review, Washington, DC, 10 Dec 2002.

"The CERTS Microgrid." Invited public lecture presented at the Vienna University of Technology, Vienna, Austria, 16 Oct 2002.

"The CERTS Microgrid." Presentation to the Energy System Evaluation Study Group, a visiting party of Japanese gas industry executives, Berkeley Lab, 16 Sep 2002.

"California's Electricity Crisis: What Happened and Why." Labwide talk presented with Joe Eto in Building 50 Auditorium, 26 January 2001.

"California's Electricity Crisis." Invited talk presented at PowerGen, Coventry, U.K., 5 December 2001.

"Microgrids and the Macrogrid: Is a Distributed Power Revolution Coming Soon?" Seminar presented at the U.C. Energy Institute, Oct. 27 October 2000.

"Diesel Generator Emissions Estimates." Talk presented at the Bay Area Air Quality Management District, San Francisco, CA, 9 August 2000.

"Development of a CERTS ISO Markets data Base, Ancillary Service Markets in California, Excessive Price Volatility in the California Ancillary Services Markets, and Integrated Analysis of Distributed Energy Resources." Research reports presented at the U.S. Department of Energy Transmission Reliability Program Review, 27 April 2000.

"Global Warming: Who cares About a Few Degrees?" Lecture delivered at the U.C. Extension English Language Program, Pacific Film Archive, 15 April 1998, 21 April 1999, 19 April 2000, and 20 Feb 2002.

"Overview of the California Restructuring Process." Seminar in the *Reliability under Restructuring: Ancillary Services Market* training seminar, Electric Energy Systems, University Enterprise Training Partnership, Instituto de Investigaci.:n Tecnol.:gica, Universidad Pontificia Comillas, Madrid, Spain, 6 October 1999.

"Survey of Electric Utility Industry Restructuring in California." Lecture delivered at the *Competitive Electricity Markets: Pricing, Investment and Environmental Impacts, Sharing West East Experience* seminar, Gothic Auditorium in Collegium Maius of the Jagiellonian University, Krakow, Poland, 11 October 1999.

"Simulation of the Future Polish Competitive Power Pool Using Elfin." Lviv Polytechnic, Lviv, Ukraine, 1 December 1997.

"Using Elfin to Model a Competitive Electricity Market." Invited lecture at the University of Mining and Metallurgy, Krakow, Poland, 27 June 1997.

"Modeling a Competitive Electricity Pool: The California Case." Invited lecture at the Dipartimento di Energetica, Politecnico di Milano, Italy, 23 June 1997.

Modeling a Minimum Renewable Purchase Requirement with NEMS. Presentation at the U.S. Department of Energy, Office of Utility Technologies, Second Analysis Workshop, 8-9 July 1997, Key Bridge Marriott, Rosslyn, VA." Modeling the Future for Renewable Generation in the California Pool." Presentation at the INFORMS Conference, San Diego, CA, 6 May 1997.

"Estimating the Environmental and Economic Effects of Widespread Residential PV Adoption Using NEMS and GIS. 1997." Briefing presented at the U.S. Department of Energy, Washington, DC, 1 March 1997.

"Modeling the Future for Renewable Generation in the California Pool." Briefing presented at the U.S. Department of Energy, Washington, DC, 1 March 1997

"Joint LBL-EDF-FEWE Work on Simulation of the Future Polish Competitive Power Pool Using Elfin." Berkeley Laboratory, Berkeley CA, 27 February 1997.

"Modeling the Future for Renewable Generation in the California Pool." Series of 2 lectures presented at the University of New South Wales, Sydney, Australia, 31 January 1997, and 5 February 1997.

"Power Sector Economic and Environmental Forecasting Under a Pool Structure Using Elfin." Class presented at Polish Foundation for Energy Efficiency (FEWE), funded by the German Marshall Fund, the Mott Foundation, and the Jurzikoski Foundation. Krakow, Poland, 4-7 June 1996.

"Information Flows in a Real-time NOx Taxed Power System." Briefing presented at the Workshop on Informatics Requirements for a Restructured Competitive Electric Power Industry, Berkeley Laboratory, Berkeley CA, 10 April 1996.

"California's Proposed Renewables Portfolio Standard." Briefing presented at the Utility, Wind Modeling Planning Meeting, National Renewable Energy Laboratory, Golden CO, 23 February 1996.

"The Responsiveness of NEMS to Renewables Assumptions." Briefing presented at the U.S. Dept. of Energy, Washington D.C., 21 September 1995.

"NEMS at the Lawrence Berkeley National Laboratory." Briefing presented at the Berkeley Lab. DC Office, Washington D.C , 21 September 1995.

"An Environmental Power Sector Expansion Plan for Poland." Lecture presented at the TEMPUS Energy and Environment course for Polish energy professionals, funded by the European Union. Dobczyce, Poland, 23 June 1995.

"Preliminary Results on Production Costing for Poland." Seminar presented at the Energy Restructuring Group, Warsaw, Poland, 19 June 1995.

"Power Sector Production Cost Modeling Using Elfin." Seminar presented at the Warsaw Electricity Distribution Co., Warsaw, Poland, 22 February 1995.

"Intermittent NO<sub>x</sub> Emissions Reduction for Smog Abatement." Invited presentation to the IEEE Current Operating Problems Working Group, San Francisco, CA, 27 July 1994.

"Intermittent Power Sector NO<sub>x</sub> Emissions Reduction as a Smog Abatement Strategy." Invited talk presented at the Electric Power Research Institute, Palo Alto CA, 19 May 1992.

"Intermittent Electrical Dispatch Penalties for Air Quality Improvement." Oral Ph.D. Qualifying Exam, 3 Feb. 1992.

"Reliability Modeling in California Public Utility Commission Hearings: Theory and Practice." Invited seminar presented at the Powersym Plus Users Group Meeting, San Francisco, CA, 29 Apr. 1991.

"Variance Reduction in Monte Carlo Production Cost Modeling." Invited talk at Energy and Resources Group, U.C. Berkeley, 5 Apr. 1990.

"Introduction to Variance Reduction in Monte Carlo Production Cost Modeling." Invited seminar presented at the POWERSYM Plus Users Group Meeting, Miami, FL, 26 Mar. 1990.

"California's Electricity Sales Contracts." Invited talk at U.C. Berkeley Economics Department, 12 May 1989.

"Linear Programming Methods in Electricity Generating Capacity Expansion Planning." Invited talk at U.C. Berkeley Industrial Engineering and Operations Research Department, 15 Feb. 1989.

"The CALMS System and the Institutional Constraints of Field Research." Invited lecture in U.C. Berkeley Electrical Engineering Department Real-time Pricing Seminar Series. 2 Oct. 1987.

"EPRI's Load Management Strategy Testing Model as a Tool for Integrated Resource Planning." Invited seminar at the Puget Power Company, 20 Mar. 1987.

"Least-Cost Planning Project: Phase I, Model Calibration." Briefing with Ed Kahn and G. Alan Comnes at the Pacific Gas and Electric Company, 15 Dec. 1986.

"The CALMS System." Seminar at the Pacific Gas and Electric Company, 12 Oct. 1986.

"A Field Trial of CALMS -- the Credit and Load Management System." Seminar in LBL Building Energy Seminar series, 12 Jun. 1986.

## **Student and Other Work Supervised**

Han Zhu, visiting student from Tianjin U., 2015.

Gang He, U.C. Berkeley Energy and Resources Group Ph.D. student, 2015.

Chien-Yu Jacqueline Ko, U.C. Berkeley undergraduate student, 2012-2013 to present.

Gonçalo P. Mendes, visiting Ph.D. student from Technical University of Lisbon, 2012-2014.

Johannes J. Thiemann, Darmstadt University of Technology, Masters in Business Administration and Electrical Engineering candidate, fall 2012.

Alfonso DeCelis, Universidad Pontifica Comillas, Madrid, masters thesis, *Market Identification of Fuel Cell Opportunities in Onsite-Power Generation in the California Commercial Building Sector*, summer 2012.

Florence Bonnet, Ecole des Mines de Nantes summer intern, project on Regionalization of SEDS, May-Aug, 2010.

Sai Krovvid, Virginia Tech. student used DER-CAM with our assistance for his M.S. thesis, *Competitive Microgrid Electricity Market Design*, May 2010.

David Dallinger, visiting Ph.D. student from Karlsruhe Institute of Technology, Mar-Jun, 2010.

Kumudhini Ravindra, visiting Ph.D. student from Indian Institute of Science, Bangalore, Jan-Apr, 2010.

Ilan Momber & Sebastian Beer, visiting students from Karlsruhe Institute of Technology, Masters thesis, *The Integration of Plug-In Electric Vehicles in Microgrids*, Dec 2009-Mar 2010.

Carlos Dierckxsens, visiting M.S. student from Katholieke Universiteit Leuven summer intern, 2009.

Olivier Mégel, Cal exchange student summer intern, 2009.

Gonçalo Ferreira Cardoso, visiting Ph.D. student from Technical University of Lisbon, Mar-Jul, 2009.

Christian Casillas, *Wind Generation: A step towards independence on the Atlantic Coast of Nicaragua*, ERG masters thesis, 2008.

Hirohisa Aki, visitor from National Institute of Advanced Industrial Science and Technology, Japan (IEEJ), 2008-2009

Ryoichi Komiyama, visitor from The Institute of Energy Economics, Japan (IEEJ), 2007-2009

Eric B De Caluwé, Katholieke Universiteit Leuven summer intern, 2007.

Ken-ichiro Nishio, visitor from CRIEPI, Japan, Sep. 2006-May 2007

Doug King, dissertation at Carnegie Mellon University, Ph.D. granted 2006

Cohen, Jesse. Master's Thesis, NEMS Disaggregation Engine, appears as LBNL-57955, Mar 2005.

Maribu, Karl. Visiting scholar from Norway, supervised Aug. 2004-Aug. 2005.

Zhou, Nan. Visiting scholar from Kyushu University, Japan, supervised Apr 2003-Apr 2004.

Bailey, Owen. Visiting student from Cornell supervised, 2002-2005. Also served on his Qualifying Committee oral exam at Cornell University, 13 Sep. 2004.

Deppe, Andreas. Micro Combined Heat and Power Systems: The Residential Market in the Northeast U.S. in 2010, Apr 2003. Supervised subcontract work for DOE.

Siddiqui, Afzal S. *Equilibrium Analysis of Forward Markets for Electricity and Reserves*. Ph.D. dissertation committee member, degree conferred May 2002.

Osborn, Julie, and Cornelia Kawann. Reliability of U.S. Electric System: Recent Trends and Current Issues. LBNL-47043, March 2001.

Servaites, Jonathan D. *The Impacts of Real-Time Selling and Net Metering on Life-Cycle Costs for Residential Fuel Cell Systems*. Thesis submitted in partial satisfaction of the requirements for the degree Masters of Science in the Energy and Resources Group of the University of California, Berkeley, May 2001.

Agras, Jean, Heidi Ries, Keith Parks, and Peter Larsen. *Benefits of Peak Load Reduction*, Report to DoE by Stratus Consulting, December 2000.

Britt, Eric. Market and Technology Assessment of Residential Fuel Cell Systems. Aug 2000.

Blanco, Raquel. *Distributed Generation: Customer Adoption Model*. Thesis submitted in partial satisfaction of the requirements for the degree Masters of Science in the Energy and Resources Group of the University of California, Berkeley, Dec 1999.

### Other Honors

Dec 2014	Chair	Chair, Benefits Evaluation Subgroup,
- Dec 2016		U.S. China Climate Change Working Group, Smart Grid
May 2015	Technical Advisor	San Diego Gas and Electric, Borrego Springs 2.0
- present		CEC funded microgrid demonstration
Oct 2014	Guest Co-Editor	IEEE Transactions on Sustainable Energy vol. 5(4)
		Special Section on Microgrids for Sustainable Energy Systems
Nov 2014	chair	Tianjin 2014 Microgrids Symposium

Geneva Grand Hotel, Hexi District, Tianjin  
13 & 14 November 2014

Dec 2013 11	invited speaker	U.S.-Japan Renewable Energy Policy Business Roundtable, Livermore, CA,
Nov 2013	best session paper	IECON 2013, Vienna, Austria
Oct 2013	invited editorial	Power & Energy Magazine.
Oct 2013	expert review panelist	National Centers of Excellence, Ottawa, Canada, 7-9 Oct
Sep 2013	chair	Santiago 2013 Microgrids Symposium Sheraton Hotel, Santiago, Chile 11-12 Sep 2012
Nov 2012	plenary speaker	Int. Conf. on Renewable Energy Res. & Apps. Best Western, Nagasaki, Japan 11 Nov 2012
Jul 2012	chair	Évora 2012 Microgrids Symposium Évora Hotel, Évora, Portugal 3-4 Sep 2012
May 2011	chair	Jeju 2011 Microgrids Symposium Seogwipo KAL Hotel, Jeju Island, Korea 26 & 27 May 2011
Aug 2010	convenor	CIGRÉ Study Committee C6.22 Working Group Paris, Jeju Is, etc. Aug 2010 - Dec 2012
Jul 2010	chair	Vancouver 2010 Microgrids Symposium Fairmont Pacific Rim, Vancouver B.C. 21-22 Jul 2010
Apr 2010	chair	Microgrids Session, CADER <sup>1</sup> Conference, Scripps Inst., La Jolla, CA, 27-28 Apr 2010
Sep 2009	chair	San Diego 2009 Symposium on Microgrids U.C. San Diego, La Jolla, CA, 18-19 Sep 2009
Jul 2009	chair	Natural Sci. and Engin. Res. Council of Canada

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<sup>1</sup> Communities for Advanced Distributed Energy Resources

Site Visit Committee, Vancouver, 21 Jul  
2009

Jun 2009	chair	Kythnos 2008 Symposium on Microgrids Kythnos Bay Hotel, Greece, 2-3 Jun 2008
Apr 2007	chair	Nagoya 2007 Symposium on Microgrids Mielparque-Nagoya Hotel, Japan, 6 Apr 2007
Jun 2006	chair	Montréal 2006 Symposium on Microgrids Mont-Tremblant Lodge, Canada, 23 Jun 2006
Feb & Mar 2006	fellowship	Japan Society for the Promotion of Science Kitakyushu, Japan, Feb & Mar 2006
Nov 2005	keynote	Int. Forum on Environment & Energy Industries Hachinohe, Japan, 17 Nov 2005
May 2005	participant	DER Integration R&D Development Forum CA Energy Com., Sacramento, 3-4 May 2005
Jul 2005	keynote	Toward Holonic Energy Systems U. of Tokyo, Tokyo, Japan, 11 Jul 2005
Jun 2005	chair	CERTS Berkeley 2005 Symposium on Microgrids Faculty Club, U.C. Berkeley, 17 Jun 2005
May 2004	member	Opening Panel, CEC-CPUC Joint OII on Cost and Benefit Methods for Deployment of Distributed Generation CEC Hearing Room, Sacramento CA
Dec 2002	member	Engineering Society Technical Committee Outstanding Working Group Award IEEE Power EDPGC Working Group on Implementing Technology to Limit Climate Change, 2003
Feb 2002	panelist	Distributed Generation Strategic Plan Workshop California Energy Commission Sacramento, CA
Aug 2001	member	Public Interest Energy Research Program Workshop

Nov 2000	member	DER Integration R&D Opportunities Sacramento, CA NSF/DOE/EPRI Sponsored Workshop Future Directions for Complex Interactive Electric Networks Washington, DC
Aug 2000	member	Alternative Energy Sources to Limit Climate Change IEEE Power Engin. Society Summer Meeting Seattle, WA
May 1998	chair	Panel on Current Status of Non-Traditional Energy IAEEE 21 <sup>st</sup> . International Conference Quēbec, Canada
Aug. 1997	member	Renewables Working Group Climate Change Technology Strategy National Lab Directors' Study
Dec. 1996	participant	NATO Linkage Grant U.C. Berkeley & FEWE, Krakow
May 1996	chair	Panel on Electricity in America IAEEE 19 <sup>th</sup> . International Conference Budapest, Hungary
Apr. 1996	organizer	Workshop on Informatics Requirements for a Restructured Competitive Electric Power Industry Berkeley, CA
Jul. 1994 – Jun. 1995	member	IEEE Emissions Task Force Current Operating Probs. Working Gr.
Mar. 1994 – Jun. 2013	member	Metric Transition Council, Lawrence Berkeley National Laboratory
Nov. 1993 – Feb. 1994	member	Renewable Energy Model Panel, DoE Office of Utility Technologies

7 Nov 2016