

LEO I. RAINER

EDUCATION **University of California Davis**, B.S., 1981, Mechanical Engineering

EXPERIENCE

2010-Present

Lawrence Berkeley National Laboratory

Principal Scientific Engineer Associate

Primarily responsible for the ongoing enhancement and maintenance of the Home Energy Saver (HES) project (hes.lbl.gov), including the management of the software engineering needed to implement both the web sites (GUIs) and web services (APIs) in a highly scalable cloud environment.

Current responsibilities include:

Provide scientific and program development support to the Department of Energy, Office of Energy Efficiency & Renewable Energy (EERE) Building Technology Office in support of the Home Energy Scoring Tool APIs. Requires extensive collaboration and coordination with PNNL.

Provide scientific and program development support to the EERE Weatherization and Intergovernmental Program in support of the Multifamily Weatherization Audit Tool (MulTEA). Requires extensive collaboration and coordination with ORNL.

HES tasks include management and implementation of budgets, developer team, simulation models, testing, engineering documentation, and user support.

Other LBNL projects include:

California Gaming Systems: Helped design and implement LBNL's first test lab focused on measuring gaming system performance and energy use. Presently leading work to develop novel benchmarking approaches that combine gaming performance and user experience with energy use indices.

REGCAP: Help maintain and update this advanced residential ventilation, thermal, and moisture simulation model. Added models to simulate dehumidifier and wood moisture performance.

1991-2010

Davis Energy Group, Inc.

Senior Engineer

Technical lead on a wide range of projects including:

Codes and Standards - Participated in California Title 20 (Appliance) and Title 24 (Buildings) Standards activities for over ten years. In 2003-2004, led the appliance standards review efforts for PG&E on eleven measures including evaporative coolers, pools and spas, consumer electronics, and unit heaters.

Monitoring - Led activities in the monitoring and evaluation of building energy efficiency measures including ground-coupled heat pumps, cool roof coatings, indirect-direct evaporative cooling, relocatable classrooms, and low-energy cooling systems.

Computer modeling - Developed DOE-2 algorithms and functions including ground-loop energy transfer, indirect-direct evaporative cooling, slab-on-grade heat loss, and radiant heat transfer.

1988-1991

Lawrence Berkeley National Laboratory

Research Associate

Developed commercial building prototypes and parametric analysis techniques for end-use load shape and energy use intensity studies. Designed a method for end-use disaggregation of monitored whole building energy use. Conducted research into the direct and indirect effect of trees on urban microclimate. Quantified the magnitude of various miscellaneous energy uses in residential buildings.

1984-1987

Enercomp, Inc.

Mechanical Engineer

Designed and programmed custom software for simulation of building energy use, collection of water flow data, and wind farm monitoring & control. Provided user support and interpreted California building energy standards for hundreds of Micropas users and building inspectors.

PUBLICATIONS

Rainer, L., Martien, P., Taha, H., 1989. "Measurement of Summer Residential Microclimates in Sacramento CA," Proceedings of the Workshop on Urban Heat Islands, Berkeley, California (February 23-24).

Akbari, H., et al. 1989, "Integrated Estimation of Commercial Sector End-Use Load Shapes and Energy Use Intensities," Lawrence Berkeley Laboratory, LBL-27512, Berkeley, California.

Rainer, L., Greenberg, S., Meier, A., "The Miscellaneous Electrical Use in Homes," *Proceedings of the 1990 ACEEE Summer Study on Energy Efficiency in Buildings*, 9.263-271, Pacific Grove, CA (1990).

Huang, J., Akbari, H., Rainer, L., Ritschard, R., 1991. "481 Prototypical Commercial Buildings for 20 Urban Market Areas," Gas Research Institute GRI-90/0326, Chicago, Illinois.

Sailor, D., Akbari, H., Rainer, L., 1992. "Measured Impact of Neighborhood Tree Cover on Microclimate," *Proceedings of the 1992 ACEEE Summer Study on Energy Efficiency in Buildings*, Volume 9, p. 149, Pacific Grove, California, August 1992.

Meier, A., Rainer, L., Greenberg, S., 1992. "Miscellaneous Electrical Energy Use in Homes," *Energy*, Vol. 17, No. 5, Pergamon Press, 1992.

Nadel, S., et al., 1993, "Emerging Technologies to Improve Energy Efficiency in the Residential and Commercial Sectors," American Council for an Energy-Efficient Economy, Washington, D.C.

Rainer, L., Greenberg, S., Meier, A., 1996, "You Won't Find These Leaks With a Blower Door: The Latest in 'Leaking Electricity' in Homes," *Proceedings of the 1996 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Nadel, S., et al., 1998, "Emerging Energy-Saving Technologies and Practices for the Buildings Sector," American Council for an Energy-Efficient Economy, Washington, D.C.

Rainer, L., Hoeschele, M., Vincent, B., 1998, "Monitored Ground Source Heat Pump Performance in Northern California," *Proceedings of the 1998 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Konopacki, S., et al., 1998. "Demonstration of Energy Savings of Cool Roofs". Lawrence Berkeley National Laboratory Report LBNL-40673. Berkeley, CA.

Springer, D., Loisos, G., Rainer, L., 2000, "Non-Compressor Cooling Alternatives for Reducing Residential Peak Load," *Proceedings of the 2000 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Apte M.G., et al., 2001, *Report on HVAC Option Selections for a Relocatable Classroom Energy and Indoor Environmental Quality Field Study*, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA, 94720. LBNL-49026.

Apte, M.G., et al., 2002, "Energy and Indoor Environmental Quality in Relocatable Classrooms", *Proceedings of Indoor Air 2002*.

Shendell, D.G., et al., 2002, *Final Methodology for a Field Study of Indoor Environmental Quality and Energy Efficiency in New Relocatable Classrooms in Northern California*, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA, 94720. LBNL-51101.

Rainer, L.I., et al., 2003, *Energy Savings Estimates and Cost Benefit Calculations for High Performance Relocatable Classrooms*, Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA, 94720. LBNL-54230.

Sachs, H., et al., 2004, "Emerging Energy-Saving Technologies and Practices for the Buildings Sector: 2004," American Council for an Energy-Efficient Economy, Washington, D.C.

Sachs, H., et al., 2004, "Emerging Technologies/Practices: Finding the Next Generation," *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Apte, M.G., et al., 2004, "Designing Building Systems to Save Energy and Improve Indoor Environments: A Practical Demonstration," *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Rainer, L., et al., 2004, "What's On the T.V. – Trends in U.S. Set-Top Box Energy Use, Design, and Regulation," *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Springer, D.A., Rainer, L., Dakin, W., 2005, "Development and Testing of an Integrated Night Ventilation Cooling System," *ASHRAE Transactions*, Vol. 111, Part 2.

Springer, D.A., et al., 2008, "Comparative Performance of Four Prototype Mechanical Systems in a Desert Climate," *ASHRAE Transactions*, Vol. 114, Part 2.

Springer, D.A., et al., 2008, "HWSIM: Development and Validation of a Residential Hot Water Distribution System Model," *Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.

Hendron, R., et al., 2009. "Potential for Energy Savings Through Residential Hot Water Distribution System Improvements." Paper No. ES2009-90307. *Proceedings of the 3rd International Conference on Energy Sustainability*, July 19-23, 2009, San

Francisco, CA. New York, NY: ASME

Bourassa, N.J., et al., 2012, “The home energy scoring tool: a simplified asset rating for single family homes”, *Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings*, American Council for an Energy-Efficient Economy, Washington, DC.

Parker, D., et al., 2012, “Validation of the home energy saver calculation methodology”, *Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings*, ACEEE, Washington, DC.

Mills, E., et al., 2014, “Asset rating with the home energy scoring tool”, *Energy and Buildings*, Volume 80, September 2014, Pages 441-450.