



Environmental Energy Technologies Division

NEWS

FALL NEWSLETTER: VOL. 9, NO. 2

Driving Demand

Bennett-Nordman IEEE Standard

Nicotine and Ozone

SVOW

Renewables Portfolio Standard Report

Kerosene Lamp Particulate Study

Research Highlights

Sources and Credits

New ways of convincing homeowners of the benefits of energy efficiency improvements to their homes—and new language to use in discussing these benefits—is discussed in a report titled "Driving Demand" from Environmental Energy Technologies Division researchers. This issue also addresses how a new IEEE standard will help reduce the energy use of Internet-connected computers, health hazards posed by particulates formed from nicotine and ozone interactions, and a new website to help facilities managers optimize the use of energy storage and solar photovoltaic technology.

If you are new to *EETD News*, please subscribe [\[http://eetd.lbl.gov/newsletter/sub/newsletter_signup.php\]](http://eetd.lbl.gov/newsletter/sub/newsletter_signup.php).

—Allan Chen



EETD News reports on research conducted at Lawrence Berkeley National Laboratory's Environmental Energy Technologies Division, whose mission is to perform research and development leading to better energy technologies that reduce adverse energy-related environmental impacts. The Division's staff of nearly 400 conducts research on energy efficiency in buildings, indoor environmental quality, U.S. and international energy issues, and advanced energy technologies. The newsletter is published online once a quarter. For more information, contact Allan Chen, (510) 486-4210.

The *Center for Building Science News* was published between 1993 and 1998. It covered news of the Division's research in energy efficiency and buildings, the indoor environment, and energy analysis. You'll find all back issues, from Winter 1993 through Summer 1998, available here [\[http://eetd.lbl.gov/newsletter/cbs_nl/cbsnews.html\]](http://eetd.lbl.gov/newsletter/cbs_nl/cbsnews.html).

Fall Newsletter: Vol. 9, No. 2 [\[http://eetd.lbl.gov/newsletter/nl33/\]](http://eetd.lbl.gov/newsletter/nl33/)

Environmental Energy Technologies Division News [\[http://eetd.lbl.gov/newsletter/\]](http://eetd.lbl.gov/newsletter/)

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Environmental Energy Technologies Division

NEWS

Homeowner Motivations for Energy Efficiency Improvements



Hundreds of millions of dollars in public money are supporting home energy efficiency improvements. Researchers at the Lawrence Berkeley National Laboratory's (Berkeley Lab) Environmental Energy Technologies Division (EETD) are helping to ensure that these funds have their maximum impact with a new report that examines what motivates homeowners to seek out home energy improvements.

"Convincing millions of Americans to divert their time and resources into upgrading their homes to eliminate energy waste, avoid high utility bills, and help stimulate the economy is one of the great challenges facing energy efficiency programs around the country," says co-author Merrian Fuller.

"Usually, when policymakers address the issue of energy efficiency benefits, they examine the technical and economic potential of energy efficiency to reduce greenhouse gas emissions, but neglect the issue of how to motivate consumers to take advantage of home energy upgrade programs. This is often a missing element in policy discussions and a primary impetus for us in writing this report," she continues.

More than 2,000 towns, cities, states, and regions are recipients of American Reinvestment and Recovery Act funds aimed at building the green economy and are currently working to develop clean energy programs. This report is aimed primarily at policy makers and energy efficiency program designers in those locales. It looks at how to best provide incentives for comprehensive home energy improvements and energy efficiency-focused upgrades to residential buildings such as air sealing, insulation, window replacement or enhancement, duct sealing, furnace or heat pump replacement, water heater replacement, air conditioner replacement, solar thermal water heating, and high-efficiency lighting.

Targeted Marketing and Familiar Benefits Yield Results

Through lessons learned from 14 successful home energy efficiency programs around the country, the study draws numerous conclusions about the successful marketing and outreach of home energy improvement programs, as well as how to best design and implement them.

"It's important to find an appealing draw such as health, comfort, energy security, competition, or community engagement," says Charles Goldman, a co-author, "It's not enough to provide information about energy efficiency—programs must sell something that people already want."

The report also recommends studying the target population—"A blanket marketing campaign to reach 'everyone' will likely be

ineffective and expensive," according to the report. "Find and target early adopters, then tailor messages specifically to this audience. Demographics can help segment the market and select optimal strategies, but you can also segment the market by personal values, interest in hot issues such as health concerns, or likelihood of getting savings."

An interesting message of the report is that "language is powerful." It notes that words like "retrofit" and "audit" often have negative connotations and recommends experimenting with language that people have more experience with and using vivid examples to help personalize information so that homeowners themselves can reduce their energy bills and increase their comfort. The report uses the terms "home energy improvements" or "upgrades" instead of "retrofits," and "energy assessment" instead of "audit," while noting that "no one has found the silver bullet for the best language to use in the home performance improvement industry."

Successful Program Design Requires Keen Understanding of Motivations

The report also examines program design practices that have proven successful in the field. The authors conclude that, "Success will require multifaceted approaches that acknowledge a deeper understanding of what motivates homeowners and contractors. Effective programs will tend to be tailored to the location, thoughtfully researched and piloted, personalized to the target audience, and more labor-intensive than simple incentive programs."

The study emphasizes that "contractors are the key point of sale for home energy improvements. They already understand the traditional renovation and home improvement market...It is imperative to design a program that contractors want to sell—and convince them that the opportunity is worth the time and money to get the appropriate training and equipment."

Learning From Successful Programs

The authors examined 14 residential energy efficiency programs, conducted an extensive literature review, interviewed industry experts, and surveyed residential contractors. The resulting report discusses lessons from first-generation programs, highlights emerging best practices, and suggests methods and approaches to use in designing, implementing, and evaluating these programs.

The programs they examined include the Bonneville Power Administration's Weatherization Program in the Pacific Northwest, the City of Houston's Residential Energy Efficiency Program, and other programs from such areas as Minneapolis, Kansas, Boston, New York, Pennsylvania, Vermont, and Washington D.C. This research was funded by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy, Weatherization and Intergovernmental Program.

—Allan Chen

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The report, *Driving Demand for Home Energy Improvements: Motivating residential customers to invest in comprehensive upgrades that eliminate energy waste, avoid high utility bills, and spur the economy* [<http://drivingdemand.lbl.gov/>], was written by: Merrian Fuller, Cathy Kunkel, Mark Zimring, Ian Hoffman, Katie Lindgren Soroye, and Charles Goldman. Soroye is currently with Pacific Gas & Electric.



Environmental Energy Technologies Division

NEWS

Collaboration Leads to IEEE Standard to Reduce Energy Use of Internet-Connected Computers

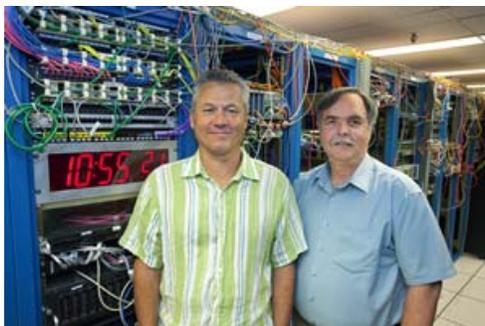


A newly approved standard to help reduce energy use by networked devices was driven in part by an informal collaboration between energy efficiency and network experts at Lawrence Berkeley National Laboratory (Berkeley Lab). The standard, adopted September 30 by the Institute of Electrical and Electronics Engineers (IEEE), the world's leading professional association for technology advancement, gives network managers and consumers of networking services the tools they need to reduce energy consumption in network-attached devices, network routers and switches, computers, and printers.

Bruce Nordman, a researcher in the Environmental Energy Technologies Division at Berkeley Lab, has long been examining the problem of energy use by idle electronics, including computers, printers, game consoles, and the like. Even when the systems are in sleep mode, they are still consuming—and wasting—energy. Nordman and his collaborator Ken Christensen, a faculty member of the University of South Florida, have developed approaches for cutting power consumption in idle devices.

The work was part of Nordman's research into making buildings more energy efficient. Electronics account for more than 10 percent of a building's electricity use, and more than half of this load (currently at least 150 terawatt-hours per year) is digitally networked, and the portion is rising.

About five years ago, Nordman learned that Michael Bennett, a senior network engineer in Berkeley Lab's Information Technologies Division, was involved in IEEE's Ethernet Working Group. Nordman called him, Bennett recalled, and said "We've got this idea...and it took off."



In 2005, Bennett was invited to speak at Google and was accompanied by other members of the IEEE working group. The topic of energy efficiency in networked devices came up, and the wheels started to turn. Bennett arranged for Nordman to give a tutorial on his research at an IEEE plenary meeting in San Francisco. While some in the audience understood the importance of the work, many others did not. "Most network chip designers weren't focused on energy use back then," Bennett said.

Nonetheless, under IEEE's procedural rules, a study group was formed to consider developing a standard, and after more than six months, a project was authorized. This led to the formation of the IEEE 802.3az-Energy-Efficient Ethernet Task Force, which Bennett chairs.

The task force considered two different approaches to address the issue. Nordman's proposal was to have networked devices automatically switch to lower speeds when not in use. The other idea was to have the devices go into low power idle mode.

Ultimately, the low power idle mode was adopted by the task force, but Bennett credits Nordman with the inspiration for the task force and believes his approach will continue to be influential (it has been referenced by the U.S. Environmental Protection Agency's ENERGY STAR program).

"It really was a classic example of collaboration," Bennett said of the interactions with Nordman. "It really speaks to the openness and collegiality of the Laboratory when a researcher in one division can pick up the phone, call someone he hasn't met, and this leads to productive research."

The new IEEE 802.3az Energy-Efficient Ethernet (EEE) standard defines mechanisms and protocols designed to reduce the energy consumption of network links during periods of low utilization, by transitioning interfaces on computers and network switches into a low-power state.

When IEEE 802.3az compliant products have been fully deployed in new and existing Ethernet networks, it is estimated that power savings in the U.S. alone could reach 5 terawatt-hours per year, or enough energy to power 6 million 100-watt light bulbs. This translates into a reduction of the Information and Communication Technologies (ICT) carbon footprint by roughly 5 million tons per year.

"The great advantage of using products supporting EEE is that there is no complex configuration necessary," Bennett said. "In most cases, energy will be saved automatically."

—Jon Bashor

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To read more about the IEEE 802.3az standard, see the IEEE news release [<http://www.businesswire.com/news/home/20101005007144/en/IEEE-Enables-Reduction-Network-Energy-Footprint-IEEE>].

Read more about Bruce Nordman's research [<http://eetd.lbl.gov/news-archives/news-comp-energy.html>] in this area.

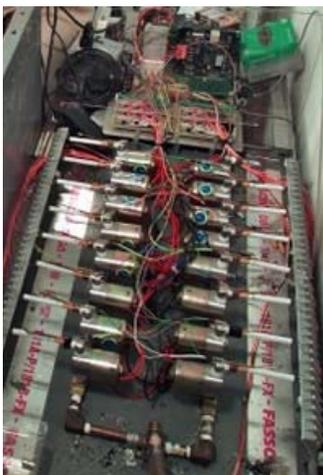


Environmental Energy Technologies Division

NEWS

Ozone and Nicotine Can Form Ultrafine Particulates; Asthma Hazard

A new study by researchers at Lawrence Berkeley National Laboratory's (Berkeley Lab) Environmental Energy Technologies Division (EETD) shows that ozone can react with the nicotine in secondhand smoke to form ultrafine particles that may become a bigger threat to asthma sufferers than nicotine itself. These ultrafine particles also become major components of thirdhand smoke—the residue from tobacco smoke that persists long after a cigarette or cigar has been extinguished.



Measuring the emissions of ultrafine particles. (Photo by Roy Kaltschmidt, Berkeley Lab Public Affairs)

A new study at Berkeley Lab shows that ozone can react with the nicotine in secondhand tobacco smoke to form ultrafine particles that may become a bigger threat to asthma sufferers than nicotine itself.

"Our study reveals that nicotine can react with ozone to form secondary organic aerosols that are less than 100 nanometers in diameter and become a source of thirdhand smoke," says Mohamad Sleiman, a chemist with the Indoor Environment Department of EETD, who led this research.

"Because of their size and high surface area to volume ratio, ultrafine particles have the capacity to carry and deposit potentially harmful organic chemicals deep into the lower respiratory tract where they promote oxidative stress," Sleiman says. "It's been well established by others that the elderly and the very young are at greatest risk."

The study's results have been reported in *Atmospheric Environment* [http://greenecology.org/science?_ob=ArticleURL&_udi=B6VH3-50N38RB-1&_user=8442934&_coverDate=07%2F29%2F2010&_rdoc=38&_fmt=high&_orig=browse&_srch=doc-info%28%23toc%236055%239999%23999999999%2399999%23FLA%23display%23Articles%29&_cdi=6055&_sort=d&_docanchor=&view=c&_ct=144&_acct=C000057778&_version=1&_urlVersion=0&_userid=8442934&md5=e43cc343e1629264325a7a77289cd255] in a paper titled "Secondary organic aerosol formation from ozone-initiated reactions with nicotine and secondhand tobacco smoke." Hugo Destailats and Lara Gundel, also with EETD's Indoor Environment Department, co-authored the paper with Sleiman, as did Chemical Dynamics Group researchers Jared Smith, Chen-Lin Liu, Musahid Ahmed, and Kevin Wilson, of Berkeley Lab's Chemical Sciences Division. The study was conducted under a grant from the University of California's Tobacco-Related Disease Research Program.

The dangers of mainstream and secondhand tobacco smoke, which contain several thousand chemical toxins distributed as particles or gases, have been well documented. This past February, another study, spearheaded by Sleiman, Destailats, and Gundel, revealed the potential health hazards posed by thirdhand tobacco smoke [<http://newscenter.lbl.gov/news-releases/2010/02/08/dangers-of-third-hand-smoke/>], which was shown to react with nitrous acid, a common indoor air pollutant, to produce dangerous carcinogens. This is the first study to show that ultrafine particles form from the reaction of nicotine with ozone.

Released as a vapor by the burning of tobacco, nicotine is a strong and persistent adsorbent onto indoor surfaces. It is released back to indoor air for a period of months after smoking has ceased. Ozone is a common pollutant that infiltrates from outdoor air through ventilation. It has been linked to health problems, including asthma and respiratory ailments.



(From left) Musahid Ahmed, Lara Gundel, Kevin Wilson, and Mohamad Sleiman at the Chemical Dynamics beamline of Berkeley Lab's Advanced Light Source. (Photo by Roy Kaltschmidt, Berkeley Lab Public Affairs)

Says co-author Gundel, "Not only did we find that nicotine from secondhand smoke reacts with ozone to make ultrafine particles—a new and stunning development—but we also found that several oxidized products of ozone and nicotine have higher values on the asthma hazard index than nicotine itself."

Says co-author Destailats, "In our previous study, we found that carcinogens were formed on indoor surfaces, which can lead to exposures that are likely to be dominated by dermal uptake and dust ingestion. This study suggests a different exposure pathway to aged secondhand or thirdhand smoke through the formation and inhalation of ultrafine particles. Also, our group had previously described the formation of secondary organic aerosols in reaction of indoor ozone with terpenoids, commonly present in household products. But this is the first time that nicotine has been tagged as a potential candidate to form ultrafine particles or aerosols through a reaction with ozone."

To identify the products formed when nicotine in secondhand smoke reacts with ozone, Sleiman and his co-authors utilized the unique capabilities of Berkeley Lab's Advanced Light Source (ALS), a premier source of X-ray and ultraviolet light for scientific research. Working at ALS Beamline 9.0., which is optimized for the study of chemical dynamics using vacuum ultraviolet (VUV) light and features an aerosol chemistry experimental station, the researchers found new chemical compounds forming within one hour after the start of the reaction.

"The tunable VUV light of Beamline 9.0.2's custom-built VUV aerosol mass spectrometer minimized the fragmentation of organic molecules and enabled us to chemically characterize the secondhand smoke and identify individual constituents of secondary organic aerosols," says Sleiman. "The identification of multifunctional compounds, such as carbonyls and amines, present in the ultrafine particles, made it possible for us to estimate the Asthma Hazard Index for these compounds."

This study supports recommendations from the California EPA and the Air Resources Board that discourage the use of ozone-generating "air purifiers" that have been used to remove tobacco odors. However, the Berkeley Lab researchers caution that the levels of both ozone and nicotine in their study were at the high end of typical indoor conditions.

Says Sleiman, "We need to do further investigations to verify that the formation of ultrafine particles occurs under a range of real world conditions. However, given the high levels of nicotine measured indoors when smoking takes place regularly and the significant yield of ultrafine particles formation in our study, our findings suggest a new link between asthma and exposure to secondhand and thirdhand smoke."

—Lynn Yarris

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Berkeley Lab's Indoor Environment Department [<http://eetd.lbl.gov/r-indoor.html>] and its researchers.

Chemical Dynamics Beamline [<http://www.chemicaldynamics.lbl.gov>] at the Advanced Light Source.

The Advanced Light Source [<http://www.als.lbl.gov>] at LBNL.

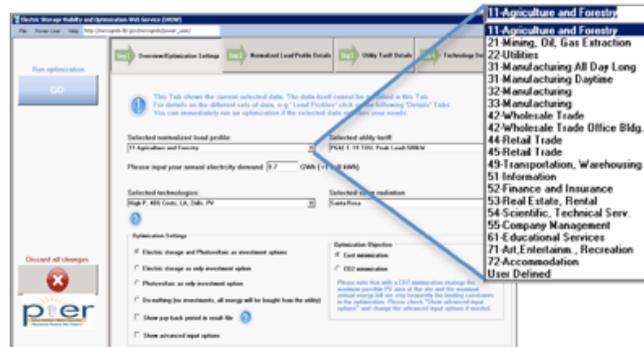
For more information on the University of California's Tobacco-Related Disease Research Program (TRDRP) visit the website [<http://www.trdrp.org>] or contact Kamlesh Asotra at kamlesh.asotra@ucop.edu or (510) 287-3366.



Environmental Energy Technologies Division

NEWS

Storage Viability and Optimization Web Service (SVOW)



On the SVOW startup page, users choose from pre-programmed settings or enter their own.

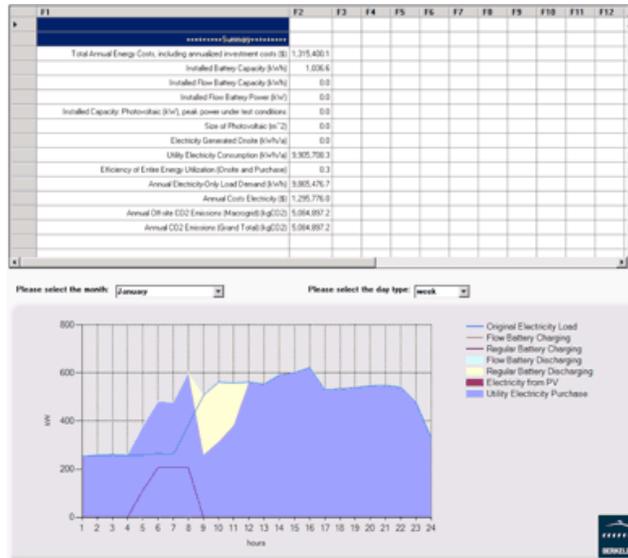
Owners and operators of non-residential facilities are considering the use of on-site electrical storage or photovoltaic (PV) generation to reduce their carbon emissions and energy costs. When doing so, however, it is difficult to determine which options (or combination of options) are the most efficient and cost-effective. Vendors can help, but they are unlikely to offer an unbiased presentation of the technical and economic benefits of their products.

To simplify the decision and provide an independent voice, Michael Stadler, of Lawrence Berkeley National Laboratory's (Berkeley Lab) Environmental Energy Technologies Division (EETD), has developed a web-based tool that helps building owners, operators, and managers determine not only their optimal energy system, but also how best to operate it.

Users can access the Storage Viability and Optimization Web Service (SVOW) for free by secure remote login and create a profile of their unique situation, specifying factors such as electrical load profile, local tariff, available technologies, and solar radiation at the site. This can be done using predefined inputs or by providing their own data.

"For example," says Stadler, "the current version contains California tariffs because the project was funded by the California Energy Commission's PIER Program, but a user could also define a tariff for his or her site. Users can define all of the parameters specifically if they want."

Once the selections have been made, SVOW analyzes the data and produces a table detailing an optimal combination of utility electricity purchase, installed on-site generation, and storage, in terms of cost, capacity, and carbon emissions. An accompanying graph shows an optimal operating schedule for a user-selected month and time range, identifying the best times for each technology to provide electricity. The results help users decide whether or not to pursue electric storage or PV options further.



Output from the SVOW shows both the optimal technologies to use and when best to use them.

The SVOW's analysis is performed by Berkeley Lab's almost technology-neutral Distributed Energy Resources Customer Adoption Model (DER-CAM), a mixed-integer linear program (MILP) written and executed in the General Algebraic Modeling System (GAMS™) optimization software (more information can be found at Microgrids at LBNL [<http://der.lbl.gov>]).

Although currently SVOW includes only electrical storage and PV technologies, Stadler is already working on an extension to include fuel cells and other combined heat and power (CHP) technologies likely to be used in non-residential facilities. "There are a number of other promising technologies we could include," he says, "and we'd like to add those to the mix."

The project was sponsored by the PIER Program and the U.S. Department of Energy.

—Mark Wilson

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More information about the Storage Viability and Optimization Web Service [<http://der.lbl.gov/microgrids-lbnl/current-project-storage-viability-website>] (SVOW).



Environmental Energy Technologies Division

NEWS

State Renewables Portfolio Standards Drive U.S. Solar Development



Researchers at the Environmental Energy Technologies Division (EETD) of Lawrence Berkeley National Laboratory (Berkeley Lab) have documented the design of and early experience with U.S. state-level renewables portfolio standard (RPS) programs designed to encourage solar energy.

According to the study, these state-level RPS programs have proven to be an important driver for solar energy deployment in the U.S., and have resulted in more than 250 megawatts (MW) of new solar capacity installed through the end of 2009. "These impacts are expected to grow considerably in coming years; however, states and utilities are likely to face a number of challenges in meeting aggressive solar energy targets," says EETD report co-author Ryan Wisler.

Currently, 29 states and the District of Columbia have enacted mandatory RPS policies that require retail electricity sellers to supply a minimum percentage or amount of their retail load with eligible forms of renewable energy. The RPS policies for 20 of these jurisdictions provide greater support to solar energy—the most common approach being a "set-aside" requiring a specific percentage of the RPS requirements to be met with solar energy or distributed generation (DG).

These policy designs are driven partly by the recognition that RPS policies have yet to yield significant renewable resource diversity, with wind energy being the dominant renewable technology installed to date. This is partly because of the attractive economics of wind energy, though this situation may change as the economics of large solar energy projects continue to improve significantly, as they have in recent years.

The study estimates that, by 2025, the solar and DG set-asides already established under existing state RPS policies will require the equivalent of 9,400 MW of solar capacity, representing roughly a six-fold increase over the amount installed at the end of 2009. New Jersey, Illinois, Arizona, and Maryland represent more than two-thirds of that total. The RPS for California, by far the largest U.S. solar market, does not include a solar set-aside and is not included in that tally, though it will continue to drive solar additions significantly over the coming years as well.

Experiences thus far in meeting RPS set-aside targets have been somewhat mixed. Of the nine states that had active solar or DG set-aside obligations in 2008, only three fully met their targets through the purchase of qualifying renewable energy or renewable energy certificates. As Wisler explains, "The difficulties that some states have already faced in meeting solar targets demonstrate the importance of policy design details to ensure that program goals are achieved."

One issue highlighted in the report is that many states cap the costs that utilities may bear in meeting RPS targets. Therefore, the amount of funding allocated to procuring solar resources in several states has been below the level necessary to meet the existing targets. Wisler adds: "As solar targets in many states rise over time, current cost caps may increasingly become binding, thereby limiting future solar capacity additions at levels below what was originally envisioned. States may be able to mitigate this potential issue by developing cost caps that are appropriately matched to their solar targets."

A second challenge identified is to encourage long-term contracting for solar energy resources, because renewable project developers often require such contracts to secure financing. Berkeley Lab co-author Galen Barbose explains: "This is a major issue in restructured electricity markets, where competitive retail electricity suppliers often have an interest in meeting their RPS requirements through short-term transactions. As documented in our study, several states have recently developed innovative approaches to supporting long-term contracts for solar energy projects."

The research was supported by funding from the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (Solar Energy Technologies Program) and Office of Electricity Delivery and Energy Reliability (Permitting, Siting, and Analysis Division), the National Renewable Energy Laboratory, and the Clean Energy States Alliance.

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Report by Ryan Wiser, Galen Barbose, and Ed Holt, *Supporting Solar Power in Renewables Portfolio Standards: Experience from the United States*, may be downloaded [\[http://eetd.lbl.gov/ea/emp/re-pubs.html\]](http://eetd.lbl.gov/ea/emp/re-pubs.html) from the Electricity Markets and Policy web site.

A PowerPoint presentation of the same title that summarizes key findings can be found here [\[http://eetd.lbl.gov/ea/emp/emp-ppt.html\]](http://eetd.lbl.gov/ea/emp/emp-ppt.html).



Environmental Energy Technologies Division

NEWS

Kerosene and Diesel Lamps Emit High Levels of Particulates

.....(Photo: Evan Mills)

Research conducted by a team of scientists led by Dustin Poppendieck at Humboldt State University and Evan Mills, of Lawrence Berkeley National Laboratory's Environmental Energy Technology Department (EETD), shows that kerosene lamps used by more than one-quarter of the world's population in developing nations emit high levels of particulates, resulting in concentrations substantially exceeding ambient health guidelines.

The research was published in the journal *Indoor Air*. Researchers tested several types of simple wick lamps, hurricane lamps (which have a glass casing), and other types of light sources commonly found in developing nations. The conditions for the testing simulated the enclosed kiosks typically used by vendors in outdoor air markets in many developing nations. The scientists measured the concentrations in the air of a range of particle sizes, including the fine particulate (PM_{2.5}) that affects human health.

They found that vendors who use a single simple wick lamp in market kiosks will likely be exposed to PM_{2.5} concentrations that are an order of magnitude greater than ambient health guidelines. Exposure levels to particulates from simple wick lamps in most residential indoor environments may be even higher, as these spaces tend to have lower rates of air exchange (less ventilation) than kiosks. Using a hurricane lamp will reduce exposure to PM_{2.5} and PM₁₀ concentrations by an order of magnitude compared to using a simple wick lamp. Vendors who change from fuel-based lighting to electric lighting technology for enhanced illumination will likely gain the ancillary health benefit of reduced particulate matter exposure.

Up to 1.6 billion people conducting business and performing tasks after dark are exposed to high particulate matter concentrations as a result of these inefficient lighting sources. Inefficient wood and other biomass cookstoves in kitchens also contribute substantially to human exposure, which can lead to such health effects as respiratory disease. Broader efforts are under way to introduce and study the health and economic effects of clean light-emitting diode (LED) lamps into the developing world to reduce exposure to smoke from inefficient-burning light sources.

The research was sponsored by the Art Rosenfeld Fund at the Blum Center for Developing Economies at the University of California at Berkeley.

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J. Apple, R. Vicente, A. Yarberry, N. Lohse, E. Mills, A. Jacobson, D. Poppendieck. "Characterization of particulate matter size distributions and indoor concentrations from kerosene and diesel lamps." *Indoor Air* 2010; 20: 399–411. The article can be accessed at the Wiley Online Library [<http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0668.2010.00664.x/abstract>]; subscription required.



Environmental Energy Technologies Division

NEWS

Research Highlights**Berkeley Lab to Lead U.S.-China Clean Energy Research Center**

.....Berkeley Lab scientist Mark Levine, head and founder of the China Energy Group.

Lawrence Berkeley National Laboratory has been chosen to lead a consortium for a U.S.-China Clean Energy Research Center (CERC) on building energy efficiency. The Center will develop technologies for low-energy residential and commercial buildings, work on technology commercialization, and research how behavior affects building energy use.

The CERC will receive \$12.5 million from the U.S. Department of Energy over five years. Consortium partners will match that amount, to provide at least \$25 million in total U.S. funding, and the Center's Chinese counterparts will contribute an additional \$25 million. The consortium's seven research partners are: Oak Ridge National Laboratory, Natural Resources Defense Council (Beijing branch), ICF International (Beijing branch), National Association of State Energy Offices, Association of State Energy Research and Technology Transfer Institutions, Massachusetts Institute of Technology, and University of California, Davis.

The Center will also receive more than \$16 million of in-kind resources (primarily research staff) and cash over a five-year period from its industrial partners, who include Dow Chemical Company, General Electric, Honeywell, Schneider Electric, Saint-Gobain, Bentley, Pegasus Investment Advisors, Climate Master, and several other organizations.

For more information:

- Berkeley Lab's China Energy Group [<http://china.lbl.gov/>]
- Department of Energy announcement [<http://energy.gov/news/9657.htm>]

Wind Energy Paper Receives ARES Award

A conference paper, "Wind Energy Facilities and Residential Properties: The Effect of Proximity and View on Sales Prices," has won the American Real Estate Society (ARES) 2010 award for "Real Estate Sustainability" sponsored by the NAIOP Research Foundation. ARES is dedicated to producing and disseminating knowledge related to real estate decision making and the functioning of real estate markets.

The paper's authors are Ben Hoen, Ryan Wisler, and Peter Cappers of the Environmental Energy Technologies Division; Mark Thayer, of San Diego State; and Gautam Sethi, of Bard College. The paper is based on the Lawrence Berkeley National Laboratory report, *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis*. [PDF [[pdf/lbnl-2829e.pdf](#)]]

Berkeley Lab Researcher Receives GridWeek Leadership Award



.....Sila Kiliccote

Sila Kiliccote, a researcher in Lawrence Berkeley National Laboratory's Environmental Energy Technologies Division, has received the 2010 GridWeek Acceleration Award. She was presented the award for her research and work in promoting standards-based secure communications for new Smart Grid demand response applications. The award committee cited Kiliccote for her "leadership, vision, non-traditional approach, ability to create step function versus incremental change, and willingness to take risk." GridWeek is an annual gathering of Smart Grid stakeholders whose goal is "to explore Smart Grid's impact on the economy, utility infrastructure, consumers and the environment while answering the industry's most pressing questions."

More information about the GridWeek Leadership Awards [<http://www.gridweek.com/2010/#2010-10-13>].

DOE Proposes Higher Efficiency Standards for Refrigerators



Continuing a 40-year trend of improving refrigerator energy efficiency, the U.S. Department of Energy (DOE) announced a new efficiency standard for this essential home appliance. The standard, proposed to take effect in 2014, was negotiated between environmentalists, consumer advocates, and manufacturers. As proposed, it could save consumers as much as \$18.6 billion over thirty years, and would also eliminate the need for up to 4.2 gigawatts of generating capacity by 2043—equivalent to eight to nine coal-fired power plants nationwide. The savings would reduce cumulative carbon dioxide emissions by 305 million metric tons between 2014 and 2043.

The Environmental Energy Technologies Division's (EETD) Energy Efficiency Standards Group at Lawrence Berkeley National Laboratory contributed significantly to DOE's technical and economic analysis, including the analysis of life cycle costs and consumer national impacts. This is the third 25% or greater increase in efficiency from U.S. standards (1993 and 2001 were the other implementation dates). Energy Analysis Department Head James McMahon says, "a new top-freezer refrigerator in 2014 will consume less than 22% of the electricity annually of a new refrigerator sold in 1974."

For more information see the DOE press release [<http://www.energy.gov/news/9582.htm>].

EETD Researchers Contribute to UC San Diego's Efficient DC-Power Data Center

Researchers at Lawrence Berkeley National Laboratory (Berkeley Lab), in partnership with the Electric Power Research Institute and numerous high-technology private-sector manufacturers, have pioneered a direct current (DC) technology for data centers that eliminates the need for multiple conversions between AC to DC power, which are commonly used in AC-based data centers.



.....(Photo: William Tschudi)

The technology is being used at the California Institute for Telecommunications and Information Technology (Calit2) at the University of California, San Diego (UCSD), which is operating a set of servers in their campus data center on 380-volt DC (direct current) power. The new modular data center's sensors and other instruments measure the energy efficiency of information and communication technologies, and the infrastructure that supports it, to help researchers build greener IT systems and software.

William Tschudi, Environmental Energy Technologies Division (EETD) Program Manager explains the project's significance. "We're pleased to be part of this project to implement DC-power technology in a major, high-profile university. The DC power approach offers many advantages over traditional AC-powered systems. It eliminates several power conversions, and it will involve less equipment, which will improve reliability because there are fewer potential points of failure. It should also reduce capital costs and will help operators save energy and money. Power quality issues should also improve with the use of the DC power technology."



Interior of the GreenLight Instrument, with Berkeley Lab's Bill Tschudi (at left in distance) and other engineers during the powering-up of the all-DC energy system. (Photo: UC San Diego)

The project is one of the first U.S. installations to use system components specifically manufactured for this 380-volt DC power system topology. Switching to an all-DC power distribution is expected to increase the "computing work per watt," a barometer of energy efficiency in computing environments. In addition to significant energy savings, other potential benefits include improved power quality, reduced cooling needs, higher equipment densities, reduced heat-related failures, improved reliability (from fewer components), and greater ease of use of renewable sources.

The project is a strategic partnership between UCSD and its partners, including several members of the EMerge Alliance, an open-industry association leading the adoption of safe DC power distribution in commercial buildings through the development of standards. The EMerge Alliance is developing a 380-volt DC power standard for inclusion in its hybrid alternating current (AC) and DC microgrid platform. This open architecture focuses on reducing or eliminating inefficient AC to DC conversions that occur between power sources and digital devices in commercial buildings by converting and distributing power in DC form. Berkeley Lab is a member of the EMerge Alliance, and Tschudi is a member of EMerge Alliance's Advisory Council.

For more information:

- UCSD Data Center [<http://www.calit2.net/newsroom/release.php?id=1730>]
 - More information about the EMerge Alliance [<http://www.emergealliance.org/en/>].
 - *EMerge Alliance Advances DC Power Distribution Platform To Focus On Energy Efficient Data Centers* [PDF [[pdf/emerge-alliance-10-19-2010.pdf](#)]].
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Environmental Energy Technologies Division

NEWS

Sources and Credits

Sources

DOE's Consumer Information Fact Sheets

These web pages [<http://www.eere.energy.gov/consumer/>] provide information about energy efficiency and renewable energy for your home or workplace.

DOE's Energy Information Administration (EIA)

EIA [<http://www.eia.doe.gov/>] offers official energy statistics from the U.S. Government in formats of your choice, by geography, by fuel, by sector, or by price; or by specific subject areas like process, environment, forecasts, or analysis.

DOE's Fuel Economy Guide

This website [<http://www.fueleconomy.gov/>] is an aid to consumers considering the purchase of a new vehicle.

DOE's Office of Energy Efficiency & Renewable Energy (EERE)

EERE's [<http://www.eere.energy.gov/>] mission is to pursue a better energy future where energy is clean, abundant, reliable, and affordable; strengthening energy security and enhancing energy choices for all Americans while protecting the environment.

U.S. DOE, Office of Science [<http://www.er.doe.gov/>]

U.S. EPA, ENERGY STAR Program [<http://energystar.gov/>]

California Energy Commission [<http://energy.ca.gov/>]

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The mission of the Environmental Energy Technologies Division is to perform research and development leading to better energy technologies and the reduction of adverse energy-related environmental impacts.

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LBNL/PUB-821 Vol. 9, No. 2 [<http://eetd.lbl.gov/newsletter/n133/>], Fall 2010

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This work was supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

Ernest Orlando Lawrence Berkeley National Laboratory is a multiprogram national laboratory managed by the University of California for the U.S. Department of Energy. The oldest of the nine national laboratories, Berkeley Lab is located in the hills above the campus of the University of California, Berkeley.

With more than 4,000 employees, Berkeley Lab's total annual budget of nearly \$600 million supports a wide range of unclassified research activities in the biological, physical, computational, materials, chemical, energy, and environmental sciences. The Laboratory's role is to serve the nation and its scientific, educational, and business communities through research performed in its unique facilities, to train future scientists and engineers, and to create productive ties to industry. As a testimony to its success, Berkeley Lab has had 11 Nobel laureates. EETD is one of 14 scientific divisions at Berkeley Lab, with a staff of 400 and a budget of \$40 million.

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Fall Newsletter: Vol. 9, No. 2 [<http://eetd.lbl.gov/newsletter/n133/>]

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