



SERC

ENERGY NEWS

Lighting Africa's Product Awards

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The quarterly newsletter of the Schatz Energy Research Center

HUMBOLDT STATE UNIVERSITY

LED lighting products, many of which are solar charged, are streaming into the African market and displacing incandescent flashlights and fuel-based lighting. They hold the promise to improve peoples' lives and reduce global warming emissions that are associated with fuel-based lighting. Unfortunately, the quality of the products is highly variable; many of them fail in a matter of weeks or months and threaten to spoil the market for improved lighting systems. To help differentiate between better quality products and the rest, SERC worked with the World Bank Group's Lighting Africa Program over the last year to administer the Lighting Africa 2010 Outstanding Product Awards—the first awards program of its kind for off-grid lighting products in the African market. On May 18th, 2010, five products were given honors at the Lighting Africa 2010 Global Business Conference and Trade Fair in Nairobi, Kenya.

SERC was the key organization for coordinating and administering the product awards, from doing lab testing to ensuring the correct trophies were distributed to the winners during the awards ceremony. In Fall 2009 we drafted the rules and framework for the awards program. Companies who submitted products for consideration first sent samples to our Lighting Lab, where we conducted an initial screening process. Lighting Africa field agents procured samples of the finalist products that were sent to international testing laboratories for full testing according to the Lighting Africa Quality Test Method. In parallel, we conducted a series of focus groups and field trials with representative end-users in rural Kenya in January 2010. By April we were able to compile the final laboratory and field results that were the basis for final decisions by six expert judges. Finally, we designed a logo (see back page) for awards winners to use for marketing their products and helped to coordinate the awards ceremony on May 18th. The ceremony was a gala affair that included Kenyan television personalities, a troupe of acrobats, and a wonderful meal.

The awards process didn't stop with the ceremony. For one thing, there have been numerous press releases, blog posts, and tweets to publicize the results; we'll leave it to you to find them with some quick searching online. Also, in the days following the ceremony at the conference, we had a number of meetings with off-grid lighting



Representatives of the award-winning companies after receiving the awards at the ceremony on May 18th, 2010 at the Safari Park Hotel in Nairobi, Kenya.

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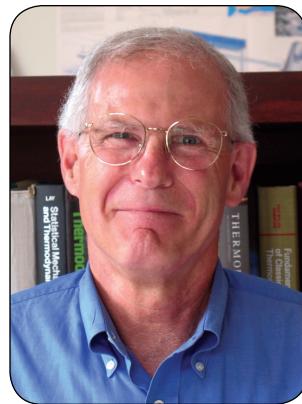
A Message from the Director

Peter Lehman

Last week I had the pleasure of participating in Climate Ride California (www.climateride.org), a bike ride from nearby Fortuna to San Francisco over five days. Participants raise money for bicycle and climate advocacy organizations and enjoy beautiful scenery, camaraderie, and plenty of fresh air while pushing the pedals. Caeli Quinn, one of the organizers, recruited me for their after dinner speaker series and I got to ride my bike the first day to Richardson's Grove State Park. I presented a talk about our renewable energy efforts in Humboldt County and SERC senior research engineer Greg Chapman drove our Toyota fuel cell vehicle down for riders to see and learn about. It was one of the most thoroughly enjoyable days I've experienced.

A topic that came up during my talk that night is Proposition 23, a ballot initiative in this November's election in California. Prop 23 is aimed at suspending AB32, the Global Warming Solutions Act, California's landmark law that is the first in the nation to directly address climate change. The proposition is sponsored by the Koch brothers, Kansas billionaires and owners of the petroleum company Flint Hills Resources, and other out-of-state oil companies like Valero Energy and Tesoro. AB32 is the one shining light in our national efforts to lower our carbon intensity and California is finally really rolling with policy initiatives that will actually effect change. Right now polls have Prop 23 trailing badly. Let's hope that Californians will continue to see through these transparent efforts to derail our pioneering climate efforts and send Prop 23 to the crushing defeat it deserves.

In this issue of our newsletter, Peter Alstone reports on our work that culminated in the Lighting Africa 2010 Outstanding Product Awards. These awards, which were given out at a trade fair in Nairobi, Kenya last May, honored companies that produced excellent LED lighting products for the African market. These new products will help displace fuel based lighting and will improve public health and reduce carbon emissions. Richard Engel reports on his progress to help institute renewable energy programs at Don Bosco University in El Salvador and our efforts here in California to introduce fuel cell and hydrogen energy topics to engineering students. Jim Zoellick reports on our continuing work with the Yurok Tribe to develop renewable energy on their reservation and improve their energy efficiency. And Greg Chapman describes our collaboration with Renewable Fuel Technologies, a start-up company that is developing torrefaction technology. Torrefaction takes woody biomass and produces an energy dense "bio-coal," a product that can



Renewable Energy in Central America: ¡Mucho Sol!

SERC's Richard Engel recently spent half a year away from the lab, on a Fulbright-sponsored assignment in El Salvador. He assisted Universidad Don Bosco in renewable energy program development, designing and teaching a Spanish-language course, developing preliminary designs for two on-campus renewable energy projects, and helping UDB to create its own energy research facility.

Surprisingly, tiny El Salvador, just twice the size of Humboldt County but crowded with some six million inhabitants, is one of the world's leading renewable energy users. Over 60% of its electricity comes from renewable sources, mainly hydropower, geothermal energy, and biomass used in sugar processing plants. The solar energy resource is also abundant, but has been little exploited to date for economic reasons.

Richard's class was a broad introduction to renewable energy and energy efficiency. Students in the course included UDB instructors, students starting out in UDB's new renewable energy master's program, and energy professionals working for public and private sector employers. The university's facilities for hands-on lab activities with renewable energy were very limited, but Richard collaborated with U.S. embassy personnel to secure a State Department grant that is being used to equip a new campus energy lab at UDB, set to open in September.



Richard shows his class how to measure angles for designing solar energy systems. Gina Navas, the woman holding the device, is a technical advisor to the president of El Salvador. *Photo courtesy Universidad Don Bosco.*

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be easily transported and used to produce electric power.

After a rainy spring and a short, foggy summer, we're finally enjoying some bright sunny autumn days in Arcata. Here's hoping you too get some crisp, sunny weather as our days get shorter.

Working with the Yurok Tribe on Energy Efficiency and Renewable Energy

Jim Zoellick

The Schatz Lab has a long-standing relationship working with the Yurok Tribe on energy projects. Starting in 1999, we installed a fuel cell power system at School House Peak that powered their cell phone repeater station. Since then we have installed a residential off-grid solar electric system and conducted energy planning and needs assessment work.

Currently we are conducting a feasibility study to examine the potential for wind- and hydro-electric energy generation on the Reservation. We have been collecting stream flow data on Pecwan and Ke'Pel Creeks for about two years, as well as wind speed data on McKinnon Hill for the past year. We are now analyzing the data, determining the energy generation potential, estimating project costs and potential revenues, and conducting life-cycle economic assessments. The final results of this study are due early next year.

We are also currently working with the Yurok Tribe on energy efficiency and solar electric improvements for their Tribal offices in both Weitchpec and Klamath. We have developed a preliminary design for a 13.6 kW_AC solar electric system for the Weitchpec office, applied for their California Solar Initiative Rebate, and are assisting them with securing a contractor who can install the system. We will also develop education and outreach materials and train Tribal staff. On the energy efficiency side of things, we are assisting the Tribe with hiring a contractor to perform a retro-commissioning of the Klamath office. This systematic, documented process will identify low-cost operational and maintenance improvements that can help bring the building's energy performance up to its original design intentions. We will also work with the Tribe to help them implement energy efficiency recommendations from both the retro-commissioning and from energy audits that we previously performed on their Tribal offices.

Renewable Energy in Central America continued

UDB and Humboldt State University are both eager to build on the work Richard and his UDB colleagues did together. HSU President Rollin Richmond and UDB's Rector Federico Huguet have signed a collaboration agreement, and plans are underway for follow-up exchange visits between the two institutions.

Richard enjoyed returning to Central America for an extended stay; during the 1990s he spent two years in neighboring Honduras as a Peace Corps volunteer. This time around, he kept a blog about his experiences at UDB and weekends spent taking his students on field trips to energy projects or exploring the countryside with his wife Basilia. See entrelosvolcanes.blogspot.com for more stories and photos.

Project Updates

New SERC Building

We're getting really close. Although our move-in date for the new SERC building has been pushed back several times, this time to November 1, the building is now in its final stages of construction. Most of the exterior concrete work, the sidewalks, the stairs, the entryway, and the exterior bench are now in place. Most of the interior painting is done, the elevator is installed, and the flooring is going in as I write this. We've contracted with a landscape architect and have an attractive design for landscaping around our picturesque hillside site. One of the surest signs that the move-in is close is that the moving boxes and labels have arrived at our old lab. We hope that by the time you read our next newsletter, we'll have some pictures for you of the SERC staff happily working in our new home.



H₂E³ Project Scales Up, Reaches Out

SERC recently asked for and received \$15,000 in supplemental funding from the U.S. Department of Energy for our Hydrogen Energy in Engineering Education (H₂E³) project. The funding is being used to fabricate an additional 30 benchtop electrolyzer/fuel cell lab kits. The kits have been used successfully in introductory engineering and thermodynamics classes at Humboldt State University and at University of California at Berkeley.

This fall our focus is on bringing H₂E³ curriculum to other CSU and UC campuses. We have established contacts at a number of other universities and expect to spend some time on the road in the coming months, introducing the lab equipment and lesson plans to new instructors and students. We will also be developing a set of videos to help instructors get familiar with using the H₂E³ test stations and lab kits.

Gasification: Torrefaction of Wood Samples

Although SERC's three-year biomass gasification project is winding down, we are continuing to research biomass and its role as a renewable fuel. Our latest endeavour is torrefaction.

Torrefaction is a mild form of pyrolysis in which biomass is heated in an inert environment to a temperature between 200

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Product Awards continued

manufacturers to discuss the test and focus group results. We heard time after time that the feedback we were able to provide was incredibly valuable even if they hadn't won an award, and that they would use the results to improve their products. Lighting Africa, with the help of SERC, is building on the success of the Product Awards by continuing to differentiate among off-grid lighting products using a Standardized Specifications Sheet and eventually a Quality Seal.

Though Dr. Arne Jacobson, the original principal investigator for the project, is on sabbatical this year at the Department of Energy, the SERC Lighting Lab is continuing our partnership with Lighting Africa. Right now we're providing a broad range of technical support services to the program that include laboratory testing, supporting international test laboratories, market research, and other supporting activities.

For more information on the Lighting Africa 2010 Outstanding Product Awards visit www.lightingafrica.org/node/109966.



Project Updates continued

and 300 °C. During the process, water and volatiles are removed and the hemicelluloses break down, yielding a dry, blackened solid product with a lower moisture content and higher energy content on a mass basis than the initial biomass.

In addition to improvements in the fuels properties, torrefaction also makes the biomass more friable, making it easier to grind or densify into pellets or briquettes. These characteristics increase the opportunities for torrefied biomass to be co-fired with coal or used as fuel pellets, fireplace logs, and barbecue briquettes for residential use.

Using a laboratory electric furnace equipped with a nitrogen purge system, SERC conducted torrefaction experiments using wood chips. The torrefied wood was tested for moisture content and heat of combustion using an adiabatic oxygen bomb calorimeter. We found that the energy density increased by as much as 25%. Best of all, the torrefied wood is hydrophobic and picks up much less moisture from the air than does raw wood.

We are currently working with Renewable Fuels Technologies (RFT) of San Bruno, CA. RFT is developing a mobile bio-coal processor unit for on-site conversion of waste wood biomass into torrefied wood. Our scope of work includes heat of combustion testing of wood samples produced from their bio-coal processor unit.

Looking Back

5 years ago... SERC partnered with HSU's Environment and Community Masters Program to co-sponsor the Sustainable Futures Speaker Series. This interdisciplinary speaker series stimulates cross-disciplinary discussion, debate, and collaboration around issues related to energy, the environment, and society. Each semester the series brings leading scholars from a range of academic disciplines, as well as prominent government officials and inspiring activists to Humboldt State University. The poster at right shows speakers for fall 2010. Visit our website at www.schatzlab.org/education/speaker_series.html for additional information on our fall 2010 speaker series.



SERC Energy News is published quarterly by the Schatz Energy Research Center at Humboldt State University.

The mission of SERC is to promote the use of clean and renewable energy in our society. SERC meets its mission by performing research and developing new technology; designing, building, operating, and demonstrating clean and renewable energy systems; providing training for professionals; and educating the public about a sustainable energy future. SERC's affiliation with the Environmental Resources Engineering program at HSU provides a rare opportunity for undergraduate and graduate engineering students to acquire hands-on experience with cutting-edge energy technologies.

SERC is a member of the National Hydrogen Association, the International Association for Hydrogen Energy, the International Solar Energy Society, and the American Solar Energy Society.

SERC co-directors are Peter Lehman, Charles Chamberlin, and Arne Jacobson. Faculty Research Associates are Eileen Cashman and Steven Hackett. Research and administrative staff include Andrea Alstone, Peter Alstone, Nir Berezovsky, Christopher Carlsen, Greg Chapman, Richard Engel, Ruben Garcia, Meg Harper, Patricia Lai, Marc Marshall, Brendon Mendonca, Tirian Mink, Allison Oakland, Tom Quetchenbach, Mark Rocheleau, Scott Rommel, Lucas Scheidler, Charlie Sharpsteen, Colin Sheppard, Alina Taalman, and Jim Zoellick.