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Features

In Every Issue

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HUMBOLDT STATE UNIVERSITY

RePowering Humboldt with Community Scale Renewable Energy

In March of this year, along with our partner, the Redwood Coast Energy Authority (RCEA), we completed the three-year RePower Humboldt project funded by the California Energy Commission (CEC). A key deliverable, the *RePower Humboldt Strategic Plan*, identified future energy scenarios for Humboldt County in which local renewable energy resources could provide over 75 percent of local electricity needs and a significant portion of heating and transportation energy needs by 2030. The plan pinpoints biomass and wind energy as key resources. In addition, large-scale adoption of plug-in electric vehicles and heat pumps was found to be critical to the cost-effective reduction of greenhouse gas emissions. Now, the RePower Humboldt team is looking for opportunities to put the plan into action.

At our final project review meeting in Sacramento, CEC project manager Mike Sokol mentioned how impressed the CEC has been with the quality of our work. Now they have backed up this praise with a proposed award to begin implementing the *RePower Humboldt Strategic Plan*. The follow-on grant, a $1.75 million award, again partners SERC with RCEA and also includes the Blue Lake Rancheria as a new project partner. Our proposal was ranked third among 30 submissions and was one of only four awards in our research area.

The new project, called Repowering Humboldt with Community Scale Renewable Energy, is expected to begin in June of 2013 and will run through March of 2015. The purpose of the project is to demonstrate and validate key aspects of the *RePower Humboldt Strategic Plan*. The project will include two main elements: SERC will lead the design and installation of a first-of-its-kind woody biomass gasifier and fuel cell power system, and RCEA will implement a community-based energy upgrade program.

The biomass energy system will be installed at the Blue Lake Rancheria casino and hotel where it will supply about a third of the electric power needs. It will feature a Proton Power gasifier that turns sawdust-sized woody biomass into hydrogen fuel, and a 175-kW Ballard fuel cell that generates electricity from hydrogen. Waste heat from the system will be used to meet hot

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Photo credit: Malene Thyssen, http://commons.wikimedia.org/wiki/User:Malene (wave) and Bin vim Garten, http://commons.wikimedia.org/wiki/User:Bin_im_Garten (vehicle).

A Message from the Director

On April 5th, SERC hosted the first meeting of its new Advisory Board. The formation of the board represents an important milestone for our center. The board is a dynamic group with deep experience in the clean energy sector, and they are well positioned to help us enhance our ability to achieve our mission of promoting clean and renewable energy.

If renewable energy is to make a difference in addressing the major environmental problems of our times, it must continue to move from the margins into the mainstream. During the board meeting, the SERC team reported on the recently completed *RePower Humboldt Strategic Plan*, which confirms that Humboldt County is well positioned to play a leading role in this effort. As senior research engineer Jim Zoellick reports in this issue, the strategic plan includes an analysis of the potential to dramatically scale up the use of renewable energy in Humboldt County.

The results are interesting and promising. They indicate that Humboldt County can meet 75% or more of its electricity needs and a substantial percentage of its transportation and heating requirements by 2030 using renewable energy at only a modest increase in cost. Meeting these targets would result in reductions in greenhouse gas emissions that are on the order of 35% to 45% relative to the expected business-as-usual trajectory.

If successful, an effort to achieve these goals would have significance that goes well beyond Humboldt County. Back in 2009, President Obama set a target of reducing U.S. greenhouse gas emissions by 83% by 2050 (relative to 2005 baseline emissions). For the country to have a chance to meet that target, some regions need to lead the way by achieving substantial reductions much earlier. The challenge is a big one, and Humboldt County has the renewable energy resource base, prior track record, and environmental ethic to play a leadership role. The *RePower Humboldt Strategic Plan* provides a vision and a roadmap that we can use to move forward. And, as Jim explains, some next step activities are already underway in the form of a CEC funded project involving collaboration between SERC, the Redwood Coast Energy Authority, and the Blue Lake Rancheria.

The board also heard about SERC's education and outreach work. Over the past year, SERC's clean energy education programs have reached over 1,000 students and community members. In addition to activities in schools and university classes, SERC provides mentorship to students working to reduce the environmental impact of energy use on the Humboldt State campus through projects funded by the Humboldt Energy Independence Fund (HEIF). In this issue, senior research engineer Richard Engel writes about our work to support HEIF projects, one of the latest efforts in SERC's longstanding tradition of training and mentoring students.

The board was very interested in SERC's international project portfolio, including our work in support of quality assurance for off-grid lighting in Africa and Asia. In this newsletter, research engineer Kristen Radecsky recounts the recent successful technical training workshop that she helped lead for the Solar Lighting Laboratory at TERI University in New Delhi, India. This work is part of a broader effort associated with the Lighting Asia and Lighting Africa initiatives to develop a network of laboratories which can evaluate the quality and performance of off-grid lighting and energy systems that provide critical energy services to people in rural areas of Africa, Asia, and elsewhere.

Also in this issue, Richard reports about a new international project related to the use of solar powered mini-grids for rural electrification in India. The effort involves collaboration with partners including E3 and Black & Veatch.

I will close by extending a special thanks to our Advisory Board for taking the time to serve on our behalf. It was a pleasure having them here at SERC, and I look forward to more productive sessions over the coming years. Goodbye until next time.

Designing Solar Mini-Grids for Rural India

In rural India, despite decades of electrification programs, about 400 million people making up half of all households still do not have access to electricity. SERC has recently joined a consortium of U.S.- and India-based energy experts to assess the feasibility of building solar photovoltaic mini-grids as a solution to the high cost of electrification in remote areas. These systems would each consist of a single solar generation station per village with a distribution network to provide power to all nearby homes and businesses. If successful, this model could be widely replicated at lower cost than providing each home with a stand-alone solar system.

SERC's role in the project will include performing a literature survey of similar projects that have been installed in other developing countries, an assessment of how Indian energy policy and regulations affect the project, and field studies to estimate energy demand and willingness to pay for electricity in the participating villages. We will provide technical assistance to the rest of the team on several other project tasks.

The project is jointly funded by the U.S. Trade and Development Agency and Azure Power of India. San Francisco firm Energy and Environmental Economics (E3) is the lead consultant.

SERC Advisory Board

This spring we brought to fruition our long-discussed plan to convene a SERC advisory board. The inaugural meeting was held at SERC on April 5. The board is made up of the following leaders in the energy field:

- Rick Duke, Associate Director of Energy and Climate Change, White House Council on Environmental Quality
- Shannon Graham, Associate Director for Energy Consulting, Navigant Consulting
- Dan Kammen, Class of 1935 Distinguished Professor of Energy, Energy and Resources Group & Goldman School of Public Policy, UC Berkeley
- David Katz, founder of Alternative Energy Engineering, a leading renewable energy supply firm
- David Rubin, Director of Service Analysis, Pacific Gas & Electric Co.
- Jeff Serfass, President of Technology Transition Corp., Washington, D.C., Managing Director, California Hydrogen Business Council
- Andrea Tuttle, former director of the California Department of Forestry and Fire Protection and consultant for forest and climate policy

The advisory board's purpose is to help SERC with strategic planning and fundraising. We appreciate the time all of these SERC allies are taking out of their very busy schedules to gather and help us plan a long and successful future for the center.

Top to bottom: SERC directors and advisory board members listen to faculty research associate Dave Vernon discuss the newly funded aqueous phase reformation project and gather for dinner after a productive day.

Project Updates

Lighting Lab: TERI Solar Lighting Laboratory

Over the past several months, SERC has worked closely with the Solar Lighting Laboratory of The Energy and Resources Institute (TERI) in New Delhi, India to support their effort to join the network of test laboratories affiliated with the Lighting Global Quality Assurance Program. Lighting Global, which is affiliated with the Lighting Africa and Lighting Asia programs, is a joint initiative of the International Finance Corporation (IFC) and World Bank. The program supports the development of commercial markets for affordable, quality-assured lighting products for use in off-grid areas of Africa and Asia. Most products evaluated under the program are solar-charged LED lights for rural applications. A strong network of product testing laboratories is the backbone of the Lighting Global effort.

In March, SERC director Arne Jacobson and research engineer Kristen Radecsky traveled to New Delhi to complete a hands-on training with the Solar Lighting Laboratory. They worked alongside HSU graduate and SERC alum Brendon Mendonca and Lighting Global team member Kevin Gauna. The training covered all aspects of the Lighting Global Quality Test Methods. The methods verify the quality of products by checking product ratings, and measure product parameters such as daily hours of operation, lighting output, and solar power production. They also evaluate parameters related to product durability such as LED life, shock resistance, and workmanship of electrical and mechanical parts. The training's success will be an asset to the Lighting Global Quality Assurance Program, as the laboratory's strategic location at the TERI University in New Delhi, India will facilitate testing of products made and sold in India.

SERC research engineer Kristen Radecsky answers questions about solar module testing during the technical training session at TERI University in New Delhi, India.

SERC Helps HSU Tackle Campus Energy Use

SERC is in its third year of providing technical mentoring to HSU's Humboldt Energy Independence Fund (HEIF). This innovative program collects a small fee from each HSU student every semester and uses this pool of funding to implement energy efficiency and renewable energy projects on campus. Among the many projects completed to date are a photovoltaic system on a campus rooftop and a retrofit of playfield lighting in the Redwood Bowl stadium. HEIF projects include student participation from initial idea development to full design and implementation. Students also participate actively alongside faculty and staff in HEIF program governance.

SERC engineers Richard Engel and Tom Quetchenbach currently oversee two teams of paid student HEIF interns. This year's projects include:

- a comprehensive inventory of campus lighting. Results are being shared with campus building maintenance staff, who will use the data to set lighting retrofit priorities.
- development of energy-efficiency standards for campus remodels. Students are working with the campus Facilities Planning office to ensure such standards are used to specify new equipment, starting with energy-saving light fixtures.
- creation of computer models to design indoor and outdoor retrofit projects for stage lighting in the music department's main recital hall and roadway lighting for a campus entrance.

Tom and Richard support these projects by meeting regularly with the students, helping them plan their work, take field measurements, learn to use software, and solve other engineering problems.

The HEIF building standards team includes *(left to right)* interns Eric Sorensen and Danielle Burkhart and SERC mentor Tom Quetchenbach. *Photo credit Michael Fisher.*

RePowering Humboldt *(continued from page 1)*

water needs. We aim to achieve a biomass-to-electricity efficiency double that of a comparable-scale, conventional steam power plant. If successful, this project could open up a new market for distributed-scale, biomass combined heat and power systems.

The energy upgrade component will focus on services for residences and businesses in the Mad River valley community (City of Blue Lake, Blue Lake Rancheria, and surrounding areas), including energy efficiency, solar energy systems, heat pumps, and the installation of two electric vehicle charging stations. This energy upgrade will demonstrate a comprehensive, community-based energy services model that can be replicated throughout the state.

The RePowering Humboldt with Community Scale Renewable Energy project is an exciting effort that will help move Humboldt County toward a secure energy future. Watch for updates in future newsletters as the project unfolds.

All project documents for the RePower Humboldt project, including the strategic plan, a regulatory and policy guide on renewable energy and energy efficiency, and other technical reports and memos can be accessed on SERC's web page at www.schatzlab.org/projects/policyanalysis/repower.html.

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. 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 California Hydrogen Business Council, the International Association for Hydrogen Energy, the International Solar Energy Society, and the American Solar Energy Society.

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