



# SERC ENERGY NEWS

## SERC to Celebrate Our 25th Anniversary

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Spring 2014  
Volume 9, Number 2

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On the afternoon of Friday, May 16, Schatzers from far and wide will gather at Freshwater Park outside Eureka to commemorate the silver anniversary of the Schatz Energy Research Center. Catered food and general merriment will help us celebrate 25 years of clean and renewable energy work.

It all began with a phone call in May of 1989. Mr. Schatz called me up to ask questions about a proposal I had sent him to build a system to demonstrate using hydrogen to store solar energy. He had solicited ideas about hydrogen research from HSU and when I heard about the possibility, I sent him a proposal the next day.

Mr. Schatz didn't waste words. He started the conversation by saying, "This is Mr. Schatz. You sent me a proposal. I have questions." Our call lasted over an hour and when it was over, I suggested sending him a revised proposal based on our conversation. He agreed and I did. Less than two weeks later, a small envelope with a check for \$75,000 appeared in my mailbox and the great adventure that has become the Schatz Center had begun.

The first thing I did was to knock on Charles Chamberlin's door. Charles and I had collaborated on several projects before and I knew he was just the partner I needed. Our partnership has been a cornerstone for the lab ever since.

That first project, the Schatz Solar Hydrogen Project at HSU's marine lab in Trinidad, turned out to be just the beginning. When the fuel cell we bought for the project didn't work, Mr. Schatz told me, "Build your own." So Charles and I wrote a proposal to build a fuel cell lab and begin work to develop our own fuel cell. Along came another small envelope, this time with a check for \$300,000 and a small handwritten note that said, "Get to work!"

That experience led us to many more hydrogen projects and to many places. We introduced America's first PEM fuel cell car and built the first hydrogen fueling station in the late 1990s, near Palm Springs in southern California. We built fuel cell power systems for remote use in Alaska and for a radio telephone system in Redwood National Park. We've installed fuel cell test stations in a number of universities, including most recently in Abu Dhabi.



Top to Bottom: Directors Peter Lehman and Charles Chamberlin pose in front of the Schatz Solar Hydrogen Project in 1995. Director Arne Jacobson with Charles and Peter at SERC's 20th Anniversary party.



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The quarterly newsletter of the  
Schatz Energy Research Center

**HUMBOLDT**  
STATE UNIVERSITY

## A Message from the Director

Spring is a time of renewal and celebration. Here at SERC, we have much to celebrate as we reach our 25th anniversary. I joined SERC as a graduate student in 1993, a few years after it was founded. When I look back, I am amazed at all that this Center has accomplished. It is especially gratifying to review the list of SERC alumni and to reflect on where they are now. To date, 145 people have either worked or volunteered at SERC, and many are now working in the clean energy field. Their collective activities and accomplishments have made a real difference in the world. It will be great to see all of the alumni who can make it to the anniversary party on May 16.



Speaking of SERC alumni, two key SERC staff members are about to make the transition. Robert Hosbach, an integral member of our energy access and off-grid lighting team, has accepted a position working in the energy efficient appliance standards group at Lawrence Berkeley National Laboratory. Richard Engel, a senior research engineer who has been with SERC for over 14 years, is also moving on. Both will be deeply missed, and we wish them well on the next steps in their journey.

Although they cannot be replaced, we are in the process of hiring several new team members. We are excited to be able to announce that Dave Carter has accepted our offer to join SERC as a senior research engineer. Dave is a licensed civil engineer with almost a decade of professional experience. He is also an alumnus of SERC, having worked here as a student and just after his graduation back in 2004 and 2005. We are also in the process of hiring for four other positions. We are selecting candidates for two staff positions and one student position associated with the Lighting Global program and other activities related to energy access for low-income people living in off-grid areas. We are also reviewing applications for a position focused on alternative fuels for transportation.

I will close by thanking our Advisory Board for their input during a very productive meeting on April 11. This year's meeting was our second on-campus session, and we are very pleased with the support and guidance that the board is providing. We are already looking forward to the next meeting.

Goodbye until next time.

## SERC Speaks Up on State Energy RD&D Funding

Richard Engel

California is just now launching the first round of funding opportunities under its new Electric Program Investment Charge (EPIC) program, which will support research, development and demonstration (RD&D) for promising new energy technologies. Meanwhile, the State has already begun planning for the next round of EPIC funding, to become available starting in 2015. The California Energy Commission (CEC) recently released a draft 2015-17 Triennial Investment Plan and solicited public comments on funding priorities for this second round. SERC provided input on two important fields, forest biomass energy and offshore power, including wind and wave technologies.

Our letter on offshore energy points out how these untapped resources offer great potential for California's renewable energy portfolio. However, we note that California is at risk of falling behind on developing offshore wind and wave technologies. We also make the case that California's north coast is especially ripe for RD&D and eventual commercial development of coastal energy.

Many rural northern California communities generate substantial volumes of biomass residue in their forestry sectors, and these resources offer significant biomass energy development opportunities. The EPIC program has a substantial focus on biomass energy funding initiatives. SERC voiced general support for these initiatives, with an emphasis on field deployable densification technologies, such as torrefaction, and efficient energy conversion technologies, such as gasification. These technologies are critical to the economic viability of biomass energy development.

Visit the CEC's EPIC page to view comments from SERC on [biomass](#) and [offshore energy](#).

SERC hosted two middle school students for a job shadow event in March. Senior research engineer Greg Chapman led the participants through the operation and maintenance of the hydrogen fueling station and fuel cell vehicle. The students also spent time in the lighting laboratory gaining hands-on experience with off-grid product testing.



# Regional Sustainable Transportation Planning

Colin Sheppard

This winter, SERC was part of two groups that won proposals from the California Energy Commission (CEC). The first is a regional alternative fuels planning project for Northwest California (including the counties of Del Norte, Humboldt, Mendocino, Trinity, Siskiyou, and Shasta). In partnership with the Redwood Coast Energy Authority, this effort will build upon our electric vehicle planning work and evaluate the opportunities and challenges for our region to transition away from a petroleum-fueled transportation system. All alternative transportation fuels will be included in the evaluation: electricity, hydrogen, biofuels, and compressed natural gas. The project will involve substantial engagement with regional stakeholders and include outreach, education, and training for planners, policy-makers, and fleet managers.

The second proposal funded by the CEC is to establish the Northern California Center for Alternative Transportation Fuels and Advanced Vehicle Technologies (North CAT). Led by U.C. Berkeley and with SERC as the northern satellite office, the Center will become a clearinghouse for outreach, training, demonstration, and dissemination of best practices surrounding alternative fuel transportation technologies. To accommodate this effort, we will be expanding the amount of office space at SERC. The funding will also be used to cover associated overhead and to coordinate with our Bay Area partners. Participation in the North CAT will increase the visibility of SERC's sustainable transportation activities and open up exciting opportunities to advance alternative fuels throughout Northern California.

## 25th Anniversary *(continued from page 1)*

Four corporations have licensed our fuel cell patents, seeking to commercialize the technology.

Fast forward to today and our energy work has broadened considerably. We're involved in developing standards for LED lighting products and in providing energy access in Africa and Asia. We've branched out into bioenergy, with projects to install a biomass-fired fuel cell power system here locally and another to characterize technologies such as biochar and torrefaction, in an effort to reduce the cost of getting energy rich biomass to market. We're also involved in helping to plan electric and alternative fuel infrastructure here in northern California and in India. It's amazing how far we've come.

It's the people at SERC who have made this happen. Over these 25 years, 145 people have contributed their efforts to our enterprise. We're lucky that one of them, Arne Jacobson, returned to SERC after getting his PhD to become our director and to lead our international work. Many more have gone on to interesting and important energy careers around the world.

We have much to celebrate as we look back over a quarter of a century. And we can be proud that we're continuing our work to make this a greener planet.

## Project Updates

RePower Humboldt Jim Zoellick

Numerous SERC staff are busy working on the RePower Humboldt with Community Scale Renewable Energy project. Most of our recent efforts have been focused on the design of the biomass gasification to fuel cell project at the Blue Lake Rancheria. We also met recently with Redwood Coast Energy Authority staff at the Blue Lake Elementary School to scope out the installation and testing of a mini-split heat pump system. The [RePower Humboldt Strategic Plan](#) indicated that use of heat pumps could be a cost effective way to utilize local renewable energy resources to meet heating demands while reducing greenhouse gas emissions. However, heat pump performance can vary significantly in different climates, so the strategic plan recommended conducting a heat pump pilot study to examine performance characteristics in the Humboldt climate. Blue Lake Elementary will receive one or two heat pump systems to be installed in individual classrooms. These systems will be equipped with monitoring instruments. At the same time, we will measure the energy consumption and performance of the small natural gas furnaces that currently provide heat to these classrooms. This will allow us to evaluate the energy efficiency, cost-effectiveness, and greenhouse gas impacts associated with the heat pump systems compared to conventional heating systems. This information can then be used to inform decisions about the potential future installation of heat pump systems throughout the county.



Dana Boudreau of RCEA displays air flow measuring equipment that will be used in the heat pump study.

## Stand-Alone Torrefaction Richard Engel

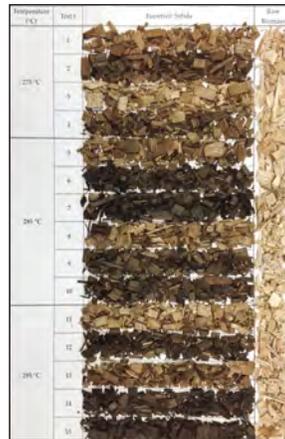
As we reported previously, SERC is collaborating with Renewable Fuel Technologies (RFT) to assess performance of RFT's biomass torrefier. The torrefier converts wood waste from logging or forest thinning, roasting it to make a renewable energy product that can replace coal in power plants. The testing is funded by a grant from the California Energy Commission. The goal of the assessment is to determine whether waste heat from the torrefier can be used to make the device self-powered for off-grid use at timber harvest sites. Such use could make recovery of waste material at these sites more cost-effective.

This past fall, SERC engineers made multiple trips to RFT's *(continued on page 4)*

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fabrication and testing facility in Hayward, CA. We first procured about three tons of tanoak wood chips in Humboldt County and delivered them to RFT. Tanoak is of special interest because it is abundant in northwest California but considered of low value as a timber species.

We next performed a series of test runs with RFT engineers, in which we varied the moisture content of the feedstock, operating temperature, and residence time of the material in the roaster. We collected operating data such as temperatures, material flow rates, and electric power use during each run. In addition, we collected samples of the raw wood chips used for each run as well as the solid, liquid, and gas outputs from the process for later laboratory analysis. All of these data allowed us to perform a rigorous energy and mass balance for the process, key to determining the feasibility of stand-alone operation.



An array of torrefied wood chips shows the effects of varying temperature and processing time. The raw biomass is shown in the column on the right.

Our tentative conclusion is that such operation may be feasible, though the design may need further modification to reduce heat loss to the surroundings. We are now working to prepare our final report to the Energy Commission.

## Lighting Lab *Kristen Radecky*

The Solar Lighting Laboratory of [The Energy and Resources Institute \(TERI\)](#) in New Delhi, India is open and ready for business. Last year, SERC director Arne Jacobson and I traveled to New Delhi to complete a hands-on training for the Solar Lighting Laboratory and have since evaluated the laboratory's work testing off-grid lighting products. Through SERC's support and the Solar Lighting Laboratory's hard work, TERI has established the first Asian laboratory within the [Lighting Global Quality Assurance Program](#) test laboratory network.

TERI's Solar Lighting Laboratory will be evaluating off-grid lighting products using the International Electrotechnical Commission's standard TS 62257-9-5. The test methods verify products by checking product ratings; measuring key product parameters such as daily hours of operation, lighting output, and solar power production; and evaluating parameters related to product durability such as LED life, shock resistance, and workmanship of electrical and mechanical parts.

In other news, in response to demand from the off-grid lighting market, the Lighting Global program has decided to extend the existing quality assurance framework to include larger solar home system kits. Compared to the lighting products we currently test, these plug-and-play direct current kits can provide more power for lighting as well as other uses, such as

mobile phone charging, radios, fans and even TVs. Over the next two years, SERC will partner with the [Fraunhofer Institute for Solar Energy Systems](#) to adapt existing test methods and standards to reliably assess and report the quality of these larger systems.

While expanding our scope, we are also working with our wide range of stakeholders to refine our current test procedures and ensure a reliable and rigorous quality assurance framework that can be sustained for years into the future. As part of this process, Arne and other team members presented to stakeholders at the Global Off-Grid Lighting Association quality assurance symposium in Cologne, Germany in April.

We also remain committed to better promoting and communicating information about the products that have met our Quality Standards in the off-grid lighting market. As part of this ongoing effort, we have re-designed the [Lighting Global](#) website to enable interested parties to more easily view and compare 48 solar lighting products produced by over 20 different manufacturers that have met the Lighting Global Minimum Quality Standards.



Director Arne Jacobson at the TERI grand opening in March. *Photo credit Sanjay Kumar.*

[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 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.

SERC advisory board members are Rick Duke, Shannon Graham, Dan Kammen, David Katz, Jaimie Levin, David Rubin, Jeff Serfass, and Andrea Tuttle.

SERC co-directors are Arne Jacobson, Peter Lehman, and Charles Chamberlin. Faculty research associates are Andrea Achilli, Kevin Fingerman, and David Vernon. Research and administrative staff include Nick Bryant, Greg Chapman, Richard Engel, Meg Harper, Andy Harris, Robert Hosbach, Ian Hunter, John Hunter, Billy Karis, Amit Khare, Patricia Lai, Marc Marshall, Allison Oakland, Carolyn Ortenburger, Tom Quetchenbach, Kristen Radecky, Mark Rocheleau, Mark Severy, Colin Sheppard and Jim Zoellick. SERC docents are Jake Coniglione, Onomewerike "Robo" Okumo, Greg Pfothenauer, and Yaad Rana.

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