

SERC ENERGY NEWS

Purdue Project Continues SERC's Commitment to Technology Transfer Peter Lehman

Continuing our long commitment to helping other universities get started in fuel cell research, SERC has recently begun building a fuel cell test station for Professor Neera Jain of Purdue University. As a new professor in Purdue's School of Mechanical Engineering, Neera is establishing a research program to study the operation of a fuel cell co-generation system designed for a home. The fuel cell will provide almost all the electricity needed for the home, while the waste heat generated will be used to heat water and space, resulting in very high overall efficiency.

The test station will be fitted with a Ballard 2.4 kW, water-cooled fuel cell, a programmable electronic load, and three increasingly larger hot water tanks, each fitted with an internal heat exchanger. The cooling water from the stack will be piped to the tank's exchanger to preheat water for domestic use. Custom software that we develop will enable Neera and her grad students to simulate electricity and hot water load profiles. By varying the profiles and operating conditions and measuring performance, Neera will be able to develop control algorithms for optimum efficiency.

This project with Neera and Purdue is the latest example of SERC's involvement in technology transfer to other universities and schools. We've been doing similar work for almost two decades.

Our work started in 1998 when we were contacted by the Merit Academy, a small charter school near Santa Cruz. The school had obtained a DOE grant to study fuel cell technology and wanted hardware so their students could do experiments. This led to us developing our first Stack-in-a-Box[®] fuel cell educational tool. Merit students visited our lab and helped assemble the fuel cell and the next March, we delivered it to the school with an associated curriculum. We had lots of fun doing fuel cell calculations and making fuel cell powered milk shakes. Later, the students travelled to Washington DC with their fuel cell to explain hydrogen technology and make ice cream for amazed attendees at the National Hydrogen Association

Left: Christine Parra of SERC leads Merit Academy students through a calculation involving our first Stackin-a-Box[®]. (1999) Right: SERCers Greg Chapman (left), Denise McKay (kneeling), and



Antonio Reis (right) deliver our first fuel cell test station to Professor Anna Stefanopoulou (standing left of Denise) and two of her grad students in the Lay Automotive Lab at the University of Michigan. (2002)

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A Message from the Director

As we celebrate our 26th year here at SERC, we are taking stock and looking toward the future. As part of this effort, we recently held our fourth all-team retreat (our prior retreats were held in 2003, 2008, and 2012). Our goals for this retreat were to review and refine SERC's five-year strategic plan. The session was a productive one, and I was impressed by the thoughtfulness and passion of our team. I give my thanks



and appreciation to everyone who participated.

Our work portfolio has grown rapidly over the past few years, and our staff and expenses have grown with it. In our strategic plan we identified three key challenges. First, we need to manage our finances carefully as we grow to ensure that we can cover our overhead costs along with our project costs. Second, we must increase the size of our team in proportion to our workload and budget; here, we should focus especially on bringing in new faculty principal investigators and project managers. Third, we need to adequate space to carry out our work.

Fortunately, we are making progress in all three of these areas. We added two members to our professional staff: Jerome Carman, who will focus (at least initially) on our clean transportation work, and Greg Pfotenhauer, who works on our biomass and off-grid energy access projects. We also hired several HSU students, including Andy Eggink, Yaad Rana, Jason McMack, and Jayati Thakor. In addition, Anna Partridge, an engineering student from Smith College and a student of Environmental Resources Engineering (ERE) alum Denise McKahn, is working with us over the summer. I am very pleased to welcome all of them to our team. Finally, as noted in another article, SERC and the HSU ERE department will jointly conduct a search for a faculty member with responsibilities split between the department and our Center. Applications are due on October 30 of this year. We hope that this will be the first of several new research faculty hires over the coming years.

We have taken two steps to increase our physical space. First, we are investing in an approximately 1900 ft² expansion that will sit to the west of our existing building. This addition is scheduled to be completed by August 2016 and will have space for eight open office workstations, two enclosed offices, a meeting room, and some flexible use work space. We also recently remodeled a 200 ft² room at SERC. In the near term, the room will house four staff and student workstations. This room will be converted to dedicated laboratory space once the expansion is complete.

In the mean time, our projects continue to keep us very busy. Happy summer solstice, and goodbye until next time.

Technology Transfer (continued from page 1)

annual meeting.

We've continued to build Stack-in-a-Boxes[®]. They've gone to places far and wide—Smith College, Southwestern Community College in North Carolina, Lawrence Hall of Science at UC Berkeley, SunLine Transit Agency, and we kept one ourselves. They continue to be a wonderful tool for teaching about hydrogen and fuel cell technology and to excite students about science.

That's how we started; we then branched out into fuel cell test stations. Out of necessity as we developed our fuel cell program, we spent many years building and perfecting our test stations. When Professor Anna Stephanopoulou, director of the University of Michigan's Lay Automotive Lab, called and inquired about a test station, we agreed to build her a custom station. In the summer of 2002, we travelled to Michigan, installed the station, and trained Anna and her grad students in its use.

Fast forward thirteen years. In addition to Michigan, our test stations are now in use at universities as diverse as Auburn, Kettering, and UC Berkeley. A few years ago, we reached an international audience when we built and installed a test station at Masdar Institute of Science and Technology in the United Arab Emirates.

Each of our stations has been customized and has presented us with new challenges and the opportunity to break new ground. The test station for Neera and Purdue is no exception. It is the first station we've built that will enable use of fuel cell waste heat and the first to use a commercial fuel cell, not one we've built ourselves. And as always, there are new design problems to overcome and new equipment to spec out and procure.

It's been enjoyable working with Neera to design the station to exactly meet her research needs. We know we're assisting a new faculty member in getting her research off the ground so that she can help solve important energy problems. It's what makes our work so interesting and rewarding.

Greg Chapman (left) trains Professor Tariq Shamim (center) and a grad student in the use of our test station at Masdar Institute of Science and Technology in the United Arab Emirates. (2011)





Richard Engel (left) and SERC Director Peter Lehman deliver a test station to UC Berkeley as part of the Hydrogen Energy in Engineering Education project. Also pictured are Professor Dan Kammen (right) and Tim Lipman of UC Berkeley. (2009)

SERC Teams With Trinidad Rancheria on Energy Planning Mark Rocheleau

Thanks to a grant from the Bureau of Indian Affairs Energy and Mineral Development Program, SERC has begun a project with the Cher-Ae Heights Indian Community of the Trinidad Rancheria. The Rancheria owns a portfolio of properties that includes multiple tribal operations buildings, homes, the casino complex and restaurant, the Trinidad Harbor pier and boat launch facilities, as well as the Seascape Restaurant and its wastewater treatment plant.

Concerned about environmental impacts and ever-increasing energy costs, the Rancheria has hired SERC to perform an energy use assessment to determine ways in which energy consumption can be reduced as well as to examine the feasibility of producing renewable energy locally. Renewable energy resources being investigated include solar, wind, and biomass.

The Rancheria is taking the long view. Their goal is not only to reduce energy consumption and expenses, but also to substantially reduce the carbon footprint of all of their individual members and businesses while working towards energy independence. The project is set to wrap in December; we will provide a final update in our Winter edition.



Jason Soto (left) of Trinidad Rancheria and Jim Zoellick of SERC perform a solar assessment atop the Trinidad Rancheria Seascape Vacation Rental in Trinidad, CA.

Search for ERE/SERC Faculty Begins Allison Hansberry

The search for a new tenure-track faculty member in the area of energy resources engineering has officially begun. The position will be split between teaching and associated duties in the Environmental Resources Engineering (ERE) Department at HSU and research activities with SERC. The position announcement can be found at: www2.humboldt.edu/aps/docs/jobs/2016-17%20 (continued on last page)

Project Updates

NorthCAT Jim Zoellick

SERC is the home of the new North State Regional Office of the Northern California Center for Alternative Transportation Fuels and Advanced Vehicles (NorthCAT). The formation of NorthCAT was made possible



by a grant from the California Energy Commission. The UC Berkeley Institute of Transportation Studies is the project lead and, along with SERC, has joined with numerous other project partners to offer education, training, demonstration, and project deployment services to the Northern California region, which stretches from the San Francisco Bay Area north to the Oregon Border. One of SERC's key roles is to serve the rural North State region.

SERC has just completed an office space expansion to house the NorthCAT office. A space designed as a hydrogen generation and storage room but used for general storage has been converted into a five-person workspace. All that remains is to add a sign on the door reading "NorthCAT North State Regional Office." This new space will help us provide alternative fuel vehicle services to the region, and in conjunction with our larger facility, including our hydrogen fueling station, will allow us to host trainings, workshops, and demonstrations. We also have plans to add an electric vehicle charging station in our driveway, with interpretive signage to be funded by the CEC grant.

In other NorthCAT news, SERC has participated in the development of a NorthCAT Center Development Plan and SERC staff will attend a NorthCAT strategic planning meeting at UC Berkeley in August. Plans are also in the works to hold NorthCAT stakeholder outreach meetings in the North State region later this year to solicit input and spread the word about the new Center. Finally, a NorthCAT web page is under development and should go live by the end of this month.

North Coast PEV Charging Infrastructure Kristen Radecsky

As the number of plug-in electric vehicles (PEVs) in Humboldt County grows, publically available charging stations are crucial to continued PEV adoption success. According to the International Council on Clean Transportation, one out of every five new light-duty vehicles in the Eureka area is a PEV – the third highest percentage of all metropolitan areas in the United States.

One of the many benefits PEV drivers enjoy is that the majority *(continued on last page)*

Project Updates (continued from page 3)

of charging occurs overnight at home; however, there is still a need for PEV charging in public locations. Currently, there are eight active Level 2 PEV chargers available to the public in Humboldt County. SERC has partnered with the Redwood Coast Energy Authority (RCEA) to design and oversee the installation of an additional ten dual Level 2 charging stations in Humboldt County, each of which will be capable of charging two PEVs simultaneously. The work is funded by the California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology (ARFVT) Program and is part of a regional effort to install PEV charging stations in the North Coast (Humboldt, Trinity, and Del Norte counties) and Upstate (Shasta, Siskiyou, Tehama, Colusa, and Glenn counties) regions.

The ten dual charging stations are slated for deployment this summer in nine locations: Greenway building in Arcata, North Coast Unified Air Quality Management District building in Eureka, St. Joseph Hospital in Eureka, McKinleyville Safeway shopping center, Trinidad library, China Flat Museum in Willow Creek, Rio Dell City Hall, Fortuna City Hall, and 4th St. parking lot in Ferndale. The charging stations are sited in convenient locations for PEV drivers to charge their vehicles while completing daily tasks such as attending work, shopping, or visiting museums and libraries.

Since over half of Humboldt County's energy-related greenhouse gas emissions come from transportation, successful PEV adoption is a positive step toward a low-carbon, sustainable transportation future for the North State region. SERC plans to continue working with RCEA and our Upstate partners to support the goal of adding more PEV charging station infrastructure throughout the North State region.



Ten dual charging stations, such as the one pictured above, are slated for installation on the North Coast. *Photo credit www. evsellc.com*.

Faculty Search (continued from page 3)

Vacancies/7650_1617_ERE-SERC_EnergyResourcesEngineering_ Vacancy.pdf

The search committee consists of faculty colleagues Peter Lehman (committee chair), Arne Jacobson, Eileen Cashman, and Andrea Achilli. The deadline for applications is October 30 and the new faculty member would start in the fall of 2016.

The primary professional responsibilities for the new faculty member are teaching; research, scholarship, and creative activity; and service to the University, profession, and community. These responsibilities include advising students, participation in campus and system-wide committees, maintaining office hours, working collaboratively and productively with colleagues, and participation in traditional academic functions.

As detailed in the announcement, successful candidates will demonstrate

- potential for effective teaching and teaching experience using a variety of methodologies
- ability and interest in teaching a broad range of engineering courses, including upper and lower division courses
- expertise in renewable energy systems, energy efficiency, power systems engineering, and/or clean transportation, and research experience to allow her/him to work productively with colleagues at SERC
- commitment to and/or experience promoting and fostering a learning environment that is supportive of individuals from diverse backgrounds
- record of, or potential for, successfully raising funds to support development of a robust research program
- commitment to and/or record of involving students in research and scholarly activity.

Applications have already begun arriving and we are hoping for a robust response and a successful search.

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 Kevin Fingerman and David Vernon. Research and administrative staff include Nick Bryant, Jerome Carman, Dave Carter, Greg Chapman, Richa Goyal, Allison Hansberry, Meg Harper, Andy Harris, Asif Hassan, Malini Kannan, Ga Rick Lee, Marc Marshall, Jason McMack, Carolyn Ortenburger, Janoah Osborne, Kyle Palmer, Greg Pfotenhauer, Tom Quetchenbach, Kristen Radecsky, Yaad Rana, Mark Rocheleau, Doug Saucedo, Colin Sheppard, Jayati Thakor, and Jim Zoellick. SERC docents and volunteers are Isabel Contreras, Julia Gomez, Christopher Long, Murielle Manka, Lorenzo Pagano, and Anna Partridge.

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