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## **Smart Energy Put to the Test**

**High-profile projects developed by HSU and Blue Lake Rancheria show what renewable power independence could look like one day.**



HSU Engineering Student Ellen

Aparecida Nascimento Molina

**IT ALL STARTED WITH AN HSU ALUMNUS.** In 2009, David Carter ('05 Environmental Resources Engineering), an engineer at GHD, developed a plan for the Blue Lake Rancheria Hotel to boost its energy efficiency.

Around the same time, Engineering Professor Arne Jacobson was looking for a local business to partner with one of his classes. Carter suggested Jacobson connect with the Blue Lake Rancheria, which operates a casino and hotel about eight miles east of campus.

“I knew they’d make a great client for the University because of their interest in renewable energy projects,” says Carter, now a senior research engineer at the Schatz Energy Research Center.

Soon, Jacobson’s students were working on a solar water heating feasibility study for the Rancheria, setting the stage for a lasting partnership.

Over the past six years, that collaboration has grown to include innovative renewable energy projects that have attracted some high-profile partners and federal attention.

This summer, the Schatz Lab and the Rancheria received a \$5 million grant—the largest of its kind—from the California Energy Commission to build an electricity micro-grid at the Rancheria. Over the next two years, HSU students and Schatz researchers will work with Pacific Gas & Electric Co., international technology giant Siemens, Idaho National Lab, REC Solar, and other partners to develop a renewable energy grid.

The state-of-the-art system will consist of a 0.5 MW photovoltaic array provided by REC, a 1 megawatt-hour battery storage system, a 175 kW biomass/fuel cell power system, and several diesel generators. The Rancheria is a nationally recognized Red Cross emergency shelter and the micro-grid will be able to provide continuous, renewable electric power in the event of a natural disaster.

Once the micro-grid is complete, about 50 percent of the casino and hotel’s energy will come from renewable resources, outpacing the California Renewables Portfolio Standard by nearly half. A state mandate requires that 33 percent of California’s energy come from renewable resources by 2020.

From micro-grids to biomass, the Schatz Lab and the Rancheria are creating a national model for renewable energy projects. Last year, the Obama Administration named the Tribe one of 16 Climate Action Champions—along with communities like Seattle, San Francisco and Boston—that lead the nation in climate action.

**IN MANY WAYS**, partnering with the Rancheria was a natural step for the Schatz Lab, which had already made a name for itself with projects like the hydrogen fuel cell-powered car and LED lighting in developing countries. “The Tribal Council and Tribe in general have a real interest in renewable energy, which makes them a great partner for the type of work we do,” says Jacobson, who, in addition to being an engineering professor, serves as director of the Schatz Lab.

Jana Ganion, the Rancheria’s communications and energy director, attributes the Tribe’s commitment to sustainability in part to Native American culture and its emphasis on understanding and respecting the environment. “Native American tribes, traditionally, have a great respect for the carrying capacity of the land,” she says.

Ganion oversees renewable energy projects, climate action initiatives, and policy and communications for the Rancheria, which sits on 91 acres in the ancestral territory of the Wiyot people.

The Blue Lake Rancheria Tribal Council has worked diligently to define its vision, goals, and policies regarding the environment and its natural resources, she explains. “The message the Council has put forward is that you do not approach natural resources with a sense of entitlement. The approach is one of gratitude and balance.”

Arla Ramsey, vice chair of the Blue Lake Rancheria Tribal Council, says that both HSU and the Rancheria have been willing to take risks when it comes to clean energy. “We take chances sometimes with projects that have a little bit of the unknown to them. But if it’s going to end up giving us a cleaner, viable energy source, we’re willing to give it a try,” she says.

This summer, for example, Schatz Lab engineers wrapped up work on a biomass power system at the Rancheria that generates hydrogen fuel—a previously untapped technology. HSU researchers and other project collaborators worked to develop a new system that turns sawdust from locally sourced timber into hydrogen gas. Once it’s operational, the system will power a proton exchange membrane fuel cell that creates electricity for a third of the casino and hotel. The system burns clean, eliminating the pollution often associated with biomass.

“It was a risk because nobody else had done it before,” explains Ramsey. “But the researchers up at Schatz literally worked day and night on the engineering and now, nothing else compares to it.”

Beyond campus, the partnership is having a big impact on the community.


In 2012, for example, students in an engineering capstone class co-taught by Jacobson and Professor Margaret Lang created a biodiesel production system for the Blue Lake Rancheria Transit System, a public bus that connects Arcata to the Mad River Valley. The system uses waste oil from the casino restaurant kitchen to fuel the buses. Their design reduces greenhouse gas emissions by 80 tons, and also results in \$5,000 savings for the Rancheria annually, which in turn is used to maintain the transit service.

Engineers from the Schatz Center also installed two dual-port electric vehicle charging stations at the Rancheria earlier this year.

The Schatz Lab’s partnership with the Tribe has also provided numerous hands-on learning opportunities for student researchers, interns, and volunteers.

Ellen Aparecida Nascimento Molina is a foreign exchange student from Brazil in Engineering who is interning for the Rancheria, where she’s analyzing the feasibility of installing solar photovoltaic modules on the hotel, casino, and other buildings. Molina is exploring how much energy the modules could generate and how much it would cost to install and maintain them. She’s also working on energy efficiency measures throughout the property.

Regardless of whether her work is implemented, interning for the tribe has been an invaluable experience, she says. “Before coming to HSU, I had no experience in renewable energy.” Now, she’s considering a career in environmental consulting. “It’s been amazing because it’s opened my eyes to possible careers.”

Jacobson says the partnership is having a multi-layered impact. “It’s not only benefiting the Rancheria, but also our students and the community,” he says. “On a larger level, it’s contributing to our understanding of renewable energy in the state and the country. Ultimately, our hope is that this work will have a lasting impact for years to come.” 

## Renewable Energy Projects

### Micro-grid

An energy system that integrates a new photovoltaic and storage battery with existing biomass and diesel generators. It will be developed with high-profile partners including PG&E, and Siemens, and is slated for 2016 completion.

### Residential Solar

In 2015, HSU students and Schatz Lab staff volunteered to install two residential solar arrays for tribal housing at the Rancheria. The solar panels generate approximately 75 percent of the residents’ electrical need, and were obtained through the California Public Utility Commission’s SASH (Single-family Affordable Solar Homes) program, facilitated by GRID Alternatives, the California program manager. The volunteers received training in solar installation, in part to serve as an introduction to the solar industry as a potential career.

### Biomass

A system slated to come online in 2015 that generates electricity to power a third of the casino’s energy needs. It turns sawdust from locally-sourced timber into hydrogen gas, which is converted into electricity via a fuel cell.

### Electric Vehicle Charging Stations

Two dual-port electric vehicle charging stations installed in 2015 at the Blue Lake Rancheria Tribal Office that allow motorists to charge four vehicles simultaneously.

### Biodiesel

Developed in 2012, the system uses waste oil from the Tribe’s commercial kitchens to power the Blue Lake Rancheria public bus system. It reduces greenhouse gas emissions by 80 tons and saves \$5,000 a year.



LEFT TO RIGHT: Level-Two electric vehicle charging stations. Redwood sawdust biomass fuel provided by Humboldt Redwood Company. The biomass system’s flare, which burns waste fuel and converts it to carbon dioxide.

## More Hands-On Learning Opportunities

Academic departments across campus are working with the Rancheria to expand hands-on learning opportunities.

## **Tribal Geography**

Geography Professor Matthew Derrick's students have visited the Rancheria several times to research contemporary topics facing Native Americans such as tribal land use, and the establishment of reservations.

## **Kinesiology Projects**

Jason Ramos, a Kinesiology graduate who chairs the Blue Lake Tribal Gaming Commission and sits on HSU's Advancement Foundation Board of Directors, created a \$25,000 endowment in the Kinesiology Lab to fund equipment and research.

## **Learning Lab**

Plans are underway to develop a hands-on learning lab, where local elementary, middle, and high school students can visit the casino and hotel to observe Schatz Lab projects and learn about careers in science, technology, engineering, and mathematics.

### [Marketing & Communications](#)

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The word "LOYALTY" is written in a bold, sans-serif font. The letters are a vibrant green color. The 'O' is a solid circle, while the other letters have a slight shadow or gradient effect, giving the logo a three-dimensional appearance.