San Diego Renewable Energy Innovators Win Fellowships to Commercialize Inventions

July 20, 2011

Catherine Hockmuth

Graduate students from the University of California, San Diego and San Diego State University working on three separate renewable energy technologies have been awarded a von Liebig Center Fellowship to pursue the commercialization of their research through the San Diego Regional Technology Acceleration Program.

The selected projects are: an Enhanced Thermography algorithm to monitor defects in wind turbine blades with a simple, handheld device; an innovative new way to manufacture flexible, 3-D organic solar cells at a much lower cost than conventional solar cells; and high-efficiency, mercury-free light bulbs that could replace incandescent and compact fluorescent bulbs in your living room.

An expert review panel composed of representatives from the private sector, investment community and the City of San Diego selected the renewable energy fellowship winners from a pool of 11 finalists. The panel chose winners based on the technological novelty of the project, the potential impact on fossil fuel usage, path to market and stage of development.

"Forward-thinking ideas that will increase energy-efficiency and the growth of renewables, while decreasing our customers' carbon footprint is exactly what our region needs," said James P. Avery, senior vice president of power supply for San Diego Gas & Electric (SDG&E), who served on the expert review panel. "Our residential customers are adopting solar quicker than any city in California, and SDG&E has signed 14 contracts since the beginning of the year for 1,225 megawatts of renewable energy so the solutions these projects provide could be put to great use."

The von Liebig Center was founded 10 years ago by the UC San Diego Jacobs School of Engineering to help faculty members turn their research into marketable products, launch companies, and educate students about how entrepreneurial companies of all sizes innovate and compete globally. Today, the von Liebig Center has evolved into a regional hub for industry partners, nonprofit organizations, government agencies and universities across Southern California to accelerate the translation of university discoveries into viable products or services through a combination of market-driven technology acceleration programs such as the renewable energy fellowship, and commercialization mentoring.

The program is designed to commercialize unique renewable energy technologies developed within research institutes and universities throughout the San Diego region. This program is run by the von Liebig Center in partnership with the UC San Diego Rady School of Management and San Diego State University. Funding for this program has been made possible by the U.S. Department of Energy (DOE) through its Office of Energy Efficiency and Renewable Energy. Other program partners include CONNECT and CleanTECH San Diego.

"We are very pleased with the quality of the applications and the enthusiasm demonstrated by the students and their faculty advisors that participated in this program," said Rosibel Ochoa, executive director of the von Liebig Center at UC San Diego, who will oversee the program. "This program offers the selected von Liebig

Fellows, the opportunity to focus over the period of one year on a technology development and commercialization plan that will increase the likelihood that their technologies will successfully translate into real-world solutions."

All von Liebig Fellows receive business mentoring from the von Liebig Center's technology and business advisors and are teamed with one to three MBA Fellows from the Rady School of Management or San Diego State University, who will provide business model development while learning about technology development by working with the von Liebig Fellows.

"Understanding customers and their needs is critical for successful translation of new technologies to market," said Lada Rasochova, director of the Entrepreneurship Programs and Rady Venture Fund manager at the Rady School of Management. Rasochova is working closely with the von Liebig Center to implement the program. "Business students bring product and business development expertise into the technology translation process. They will be working directly with technical students shaping the new products to meet market needs," said Rasochova.

Over the next 12 months, von Liebig Fellows will be awarded $45,000 to conduct proof-of-concept studies, technology development and preliminary market research to determine the commercial feasibility of their technologies. Fellows will receive mentoring from the von Liebig Center's technology and business advisors, networking opportunities and practical training on technology commercialization.

The fellowship winners are:

Arun Manohar (UCSD): Structural Health Monitoring of Turbine Blades Using Advanced Infrared Thermography

Arun Manohar, a Ph.D. candidate in the Department of Structural Engineering at UC San Diego Jacobs School of Engineering, working with Professor Francesco Lanza di Scalea, has developed an Enhanced Thermography algorithm to enable portable, real-time testing of wind turbine blades with a handheld device. The device could be used at the blade manufacturing facility or in the field on working wind farms to quickly identify structural defects that have the potential to reduce wind power capacity. The technology is timely as the U.S. Department of Energy has stated that wind power could represent 20 percent of all electricity in the United States in 20 years. DOE has also cited reliability as one of four key challenges to reaching its wind power target goal. Manohar has tested his unique method using an infrared camera and strobe lights to heat a sample of composite material similar to that used in turbine blades and many other structures, including aircraft and spacecraft. The heat highlights defects and makes them more visible to the camera. Once the image is captured, an analysis is automatically conducted to identify deviations in the structure over a wide surface area in mere seconds. Current structure-defect analysis of turbine blades is time consuming and costly, sometimes requiring that individual blades be removed and returned to their manufacturer for X-ray or ultrasound testing. Over the next year, Manohar will test the Enhanced Thermography algorithm on an actual wind turbine blade that has been ordered from the manufacturer and demonstrate the system at conferences focused on wind energy and sustainability.

Shanel Miller, Beejal Mehta, Mihi Parikh, Kadir Toksoy (SDSU): Innovative production line for low-cost scale-up of a novel 3-D, flexible, organic photovoltaic cells

This San Diego State University team of graduate students in mechanical engineering has developed flexible, three-dimensional solar cells and a manufacturing method that promises to be more efficient and less costly than conventional processes for silicon solar cell manufacturing. The team has developed the underlying solar cell technology, manufacturing process and the manufacturing equipment to produce their solar cells at a significantly reduced cost. The process combines a roll-to-roll printing process, electrostatic spray and ultrasonic spray technology. While conventional solar cells are rigid, the SDSU team's flexible, lightweight and transparent solar cells will enable a wider variety of applications such as solar panels for tents, particularly for the military which could use them to charge electronic devices. Flexible solar panels would also be more portable for consumer electronics, and allow for more design-friendly integration into windows and buildings. Due to their 3-D architecture, the solar cells have demonstrated a twofold increase in efficiency in converting sunlight to energy

over conventional 2-D cells. The team, which is led by grad student Shanel Miller under the guidance of SDSU mechanical engineering professor Sam Kassenge, will focus its fellowship efforts on completing a fully functional production line to manufacture its solar cells on a larger scale.

Muchuan Yang (UCSD): Novel high efficiency and mercury-free light bulbs based on semiconductor nanowires

Muchuan Yang is a Ph.D. student in the Electrical and Computer Engineering Department at UCSD's Jacobs School of Engineering working under the guidance of Professor Deli Wang. Yang has demonstrated a new type of light bulb based on a novel design for a light-emitting module that is enabled by semiconductor nanowires. The new bulb promises higher energy efficiency and lower cost than an incandescent light bulb. Moreover, it is much more structurally robust compared to the incandescent bulb and compact fluorescent lamps (CFL). And, unlike CFLs, the new bulb contains no toxic mercury and is thus safer and more environmentally benign. The use of nanowires offers high lighting efficiency due to increased electric charge injection and enhanced light extraction. Nanowires also allow for more versatility in light bulb design and color because they can emit at different wavelengths and offer the option of combining ultraviolet light emitting nanowires with different color phosphors. Yang said this award is greatly helpful in bridging the gap between the laboratory invention and the envisioned commercial product, particularly with the unique opportunity of working closely with an MBA fellow at the UCSD Rady School of Management on the business model and market study. "There is much work yet to be done before these light bulbs become available commercially," said Yang. The next steps of technology development include possibly several cycles of engineering optimization and prototyping during the fellowship and thereafter, scaling up for production and commercialization outside of the university.

The San Diego Regional Technology Acceleration Program is interested in working with researchers to accelerate a broad range of renewable energy technologies and applications, including photovoltaic solar thermal energy, wind energy, electricity transmission and distribution, hydrogen and fuel cell technology, energy efficiency, advanced materials, building energy efficiency, energy analysis models, tools and software, energy storage, hydropower, tidal and wave power, biomass and biofuels, vehicles and fuels.

Media Contact: Catherine Hockmuth, 858-822-1359, chockmuth@ucsd.edu