

NMSU faculty work to improve aging electrical grid technology

By M. Therese Shakra

New Mexico State University

LAS CRUCES — New Mexico State University faculty from the Institute for Energy and the Environment and the College of Engineering were awarded a \$1 million Department of Energy grant to demonstrate a renewable energy-based microgrid in partnership with an electric



utility company. Algae-based biofuel will be tested and evaluated to facilitate the microgrid electricity generation and transmission.

There is a critical need to renew our nation's electrical infrastructure, the physical electricity network known as the grid. U.S. Secretary of Energy Dr. Steven Chu referred to this need through a popular comparison at the recent "Re-Energize America" conference at NMSU.

"If Alexander Graham Bell were somehow transported to the 21st century, he would not begin to recognize the components of modern telephony — cell phones, texting, cell towers, PDAs, etc. — while Thomas Edison, one of the (electric) grid's key early architects, would be totally familiar with the grid," he said. Chu also described how the National Academy of Engineering identified the single most important engineering achievement of the 20th century as electrification because of the grid, surpassing the Internet and the interstate highway system.

Addressing the advancement of this transformative but aging technology are engineering professors Abbas Ghassemi and Satish Ranade, and environmental engineer Luz-Elena Mimbela. They are spearheading the microgrid project with a secondary objective of developing energy-related technologies that can be used to reduce dependence on fossil fuel energy.

The Energy Technologies Research and Education



Photo for the Sun-News by Darren Phillips/NMSU

Electrical engineering students David Valencia and EvaMarie King work in the El Paso Electric Power Systems Laboratory at New Mexico State University. The laboratory, housed in the Klipsch School, was developed with a grant from El Paso Electric Company and the Air Force Office of Scientific Research.

Initiative includes defining the economic, public policy and physical concept to grow a microgrid subdivision in Las Cruces. The investigators can determine hardware solutions for distribution feeders in the existing nine residential-style buildings equipped with grid-tied photovoltaic (solar panel) systems ranging from 3-5 kilowatts.

A prototype subsystem at NMSU would allow developers and builders to successfully evolve projects wherein solar, wind and other renewable energy resources are integrated into a single package to the customer, residential or commercial. The approach includes working with the regional utility El Paso Electric, and must provide benefits, or at least be cost/revenue neutral for the developer and the electric company. Design studies with EPE will include power flow, fault and protection, and dynamic analysis.

The biofuels segment of the project includes the installation of equipment to demonstrate the produc-

tion, harvest, dewatering and extraction of algal biomass feedstock to produce algal oil or "biocrude." The integrated biorefinery development will evaluate the viability of biomass feedstocks to substitute fossil-based transportation fuels. This could become an additional renewable energy option (other than solar and wind) to facilitate microgrid evolution, including the ability to disconnect from the national grid when there is a general utility failure, build a local market for power production, and add smart features that will only get nominal deployment on the national grid.

Education and workforce development efforts will also be advanced through integration with the Electric Utility Management Program and the Renewable Energy minor on campus. The university's historical EUMP provides a competitive advantage in such technology transfer projects. The highly acclaimed program is designed to educate power system engineers who understand the

engineering aspects of electric power systems, as well as the economics, management, and societal aspects of the power engineering profession. Upcoming short courses in the program include Electrical Substations: Living with the Old While Creating the New, and Wind Energy Boot Camp.

IEE is comprised of WERC, a consortium for environmental education and technology development; SWTDI, a renewable energy resource development group; and CEMRC, a nuclear waste management and monitoring center. The Institute is a multidisciplinary Center of Excellence, focusing on energy, the environment and water. For more information on IEE, visit <http://iee.nmsu.edu> or call Abbas Ghassemi at (575) 646-2038.

"Eye on Research" is provided by New Mexico State University. This week's feature was written by M. Therese Shakra of the Institute for Energy and the Environment at NMSU.