

Storing solar energy for the swing shift

A team of Virginia Tech researchers is developing the technology to store solar energy in fuel cells for when the sun goes down. “Electricity generated via solar energy peaks in mid-day, but power consumption at home is typically concentrated from evening to early morning,” says Kathleen Meehan, an assistant professor and principal investigator on the project.

Solarized fuel cells would enable energy produced in daytime to be stored for evening and cloudy-day use, while eliminating the need for batteries, she explains. Energy would be stored as hydrogen and oxygen through water electrolysis. When the solar system cannot produce enough energy for the load, the fuel cell would be used.

Technology improvements are needed, however, before such systems are affordable and reliable — and the expertise to develop them is at Virginia Tech, she says. The team, which includes electrical, materials, chemical, and mechanical engineers is working on developing advanced solar cells with nanoscale conversion films; power tracking systems to divide solar power generated between the load and the electrolysis system, nanoscale catalysts to improve solar energy conversion to hydrogen optimized power conversion, and power conditioning for household and plug-in hybrid electric vehicle loads.

In addition to Meehan, principal investigators on the project are ECE’s Jason Lai, G.Q. Lu, and Lou Guido, along with Richey Davis of chemical engineering and Douglas Nelson of mechanical engineering.

POWER

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Researchers under the direction of Virgilio Centeno are using the testbed in the Power Engineering Laboratory to test the dynamic performance of Phasor Measurement Units (PMU).

ECE team joins China-sponsored Energy Security Group

National Academy of Engineering members Arun Phadke and James Thorp are part of a Chinese funded research team directed to improve the protection and security of the worldwide, interconnected electric power grid. China’s Ministry of Education and State Administration of Foreign Experts Affairs is sponsoring the five-year, \$1.2 million project, called the “Expertise-Introduction Project for Disciplinary Innovation of Universities.”

Phadke and Thorp are both leading experts in power system digital protection. Traditionally electric power networks have used the computer and communication networks in a variety of critical applications. However, researchers are looking at new configurations of power, communication and computer networks that could be more easily controlled and protected for optimum security, economy, and performance.

A new wind turbine now sits atop Whittemore Hall, installed by the Center for Power Electronics Systems (CPES) to support research in sustainable buildings.

The turbine is a vertical axis turbine, which has advantages in small places. The turbine is effective in winds as low as five miles per hour and can tolerate winds exceeding 100 miles per hour. The design is quiet and friendly to birds, who see it as a solid object and avoid it when it is moving.