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## D-Acres hosts innovative solar research project

By Laura Richardson

Consumers and installers of solar hot water systems have been stymied for years as to which type of collector performs best for their climate and weather conditions – sunny versus cloudy, warm versus cool. An answer will surface in the next year, thanks to local visionaries.

Bringing together two types of solar hot water systems, state-of-the-art meteorology technology, donated and surplus military equipment, and a non-traditional collaborative team, D-Acres of New Hampshire now hosts an innovative solar research project.

The D-Acres community building, center of activity for this non-profit organic farm and educational homestead in Dorchester, uses electricity from the grid-tied photovoltaic solar panels and solar hot water panels for heating and domestic hot water. The solar hot water panels traditionally come in two technologies – flat-plate or evacuated-tube collectors. Joshua Trought, executive director of D-Acres, wasn't sure which technology would be appropriate for this site and so invested in both, with the plan of correlating efficacy and weather conditions as a research project.

“We didn't feel like this kind of research was being done or which technology would perform at this latitude. We thought this would be a good opportunity to do some of the testing,” Trought said.

Flow meters and temperature sensors have been added to the in-flow and out-flow plumbing of the side-by-side solar hot water systems; those sensors are networked to a computer in the community building. The 40-foot-high primary weather station collects data on the temperature, wind speed and direction, humidity, full spectrum and UV sunlight, and precipitation to 1/100<sup>th</sup> of an inch. Three other networked weather stations collect temperature data from around the property to study micro-meteorological dynamics. Two additional temperature stations monitor garden temperatures and greenhouse temperatures, both critical to the running of the farm during cold snaps, but not tied in to the analysis.

These data, sent in real-time over the internet thanks to a Wild-Blue system provided by the NH Electric Cooperative, the local electric utility, will help determine which solar collector is most efficient under varying weather conditions, and provide a foundation for additional future research. Ultimately, technology recommendations may be derived from this research or there may be no appreciable difference. Consumers want to make the most cost-effective and appropriate choice when they invest in renewable energy systems, however empirical data for solar hot water and weather haven't been available. This analysis will answer a question plaguing installers and consumers for many years.

Adding value to the local community, the D-Acres weather station will soon be hooked in to National Weather Service in Gray, Maine, providing local residents with more accurate weather conditions for this anecdotally wild-weather locale. Currently the surrounding weather information is available for Plymouth, Laconia, or Lebanon, NH, each at least 30 minutes away and with very different micro climates.

Dr. Samuel Miller, meteorology professor from Plymouth State University and PSU meteorology major Matthew Bedard '09 provide the meteorology technical expertise, trouble shooting, and on-going analysis. Plymouth High School Director of Information Technology Tim Korade provides similar expertise and trouble shooting regarding the computer systems. Chip Mauck, from Sunweaver in Northwood, NH, installed the solar hot water systems and has provided support for the renewable-energy angle of the project. Financial support for this research has come from the Foundation for Sustainability and Innovation, the NH Electric Cooperative, and the members of D-Acres of New Hampshire.

With almost a year of grant-writing, team-building, planning, engineering, acquiring the appropriate equipment, installation, and debugging, the systems are now sending data in real time to Plymouth State University's Judd Gregg Center Meteorology Institute for analysis. Miller and Korade agreed that developing the system and finding the right components posed endless problems. "Theory is one thing, making it work is another," said Korade.

D-Acres, a 180-acre non-profit organic farm and educational homestead, focuses on cooperative and communal farm life, teaching sustainability on myriad levels: local foods, farming of livestock, fruits, and vegetables, forestry, black-smithing, furniture building and forest-based crafts. The farm has become the center of sustainable community life for many in the central part of the state, and the hostel and internship programs offer much to those from away. They run workshops on alternative building techniques, food preservation, and other "lost" skills. Full-moon potluck dinners, monthly brunches, and movie nights round out the community. More information on D-Acres can be found at [www.dacres.org](http://www.dacres.org).