



## Cooperative Extension Renewable and Alternative Energy



### ENERGY UPDATE

Nov, 2010

#### IN THIS ISSUE

- Home Heating Tips
- Innovative Digesters
- Home Energy Measurement
- Bioenergy Supply Chains

#### UPCOMING EVENTS

- Community Wind Conference**  
November 30- December 1, 2010 at Penn Stater Conference Center and Hotel, State College, PA  
<http://www.windustry.org/cwaa>
- Biogas Workshop and Tour**  
December 2, 2010 at Lancaster Farm and Home Center, Lancaster, PA  
<http://extension.psu.edu/energy/events/upcoming>

#### LINKS

- [PSU Renewable & Alternative Energy](#)
- [Coping with High Energy Prices](#)
- [Biomass Energy Center](#)

#### WELCOME!

Change is certainly in the air - the days are getting cold in the keystone state, the sun is setting much earlier, and the trees, squirrels, and other creatures are just about ready for winter. How about you? Are you ready for the cold and snow?

This month's newsletter features several articles that talk about home energy efficiency - tips for improving your home, and opportunities for measuring electricity use and savings. Also, some exciting recent events are highlighted that are part of our ongoing efforts to grow the energy future of the state.

Keep in mind that our extension web site, <http://energy.extension.psu.edu> contains a wealth of renewable energy and energy efficiency information, and is a great place to look for help, or just to learn more about the topic. We have several new programs that will be starting up soon as well, so be sure to stay tuned for further developments!

There is certainly a great deal to be thankful for, and we are thankful for the opportunity to help secure a bright energy future for the people and businesses of Pennsylvania.

As always, if you have a friend or colleague that would like to receive this newsletter, please have them email me at [dec109@psu.edu](mailto:dec109@psu.edu).

Sincerely,

Dan Ciolkosz  
Newsletter Editor  
Renewable and Alternative Energy  
Penn State Cooperative Extension

Home Heating Tips for Winter  
**Here is some useful info for the heating season**

According to U.S. Environmental Protection Agency (EPA), the average family spends \$1,400 a year on energy bills, with nearly half of that spent on heating and cooling. Energy-efficient heating and cooling equipment, sized and installed correctly, with properly sealed ducts, can save homeowners as much as 20 percent on their annual energy costs. The EPA recommends the following tips to more efficiently use energy to heat your home this winter.

Clean or change the air filter in your heating system monthly. Some filters only need to be changed every 3 months. Also, have your equipment checked seasonally to make sure it's operating efficiently and safely - check-ups can identify problems early. Dirt and neglect are the #1 causes of system failure.

Home sealing can improve your home "envelope" - the outer walls, ceiling, windows and floors -- and can save up to 10 percent in energy costs. Start by sealing air leaks and adding insulation-pay special attention to your attic and basement, where the biggest gaps and cracks are often found.

If you have a forced air furnace or heat pump, then a duct system is responsible for circulating warm air throughout your home. Leaky ducts can reduce your system's overall efficiency by 20 percent. Sealing your ducts can save up to \$140 annually on energy bills and help you consistently heat every room.



According to the EPA, one in four furnaces in U.S. homes is more than 20 years old. If your heating equipment has been poorly maintained and is 15 years or older, it's probably time for a more efficient replacement. Old furnaces cost more to operate per year than new, ENERGY STAR qualified models that are 15 percent more efficient than standard models. If you're replacing old equipment, make sure your new equipment is properly sized for your home -- bigger isn't always better. Correct size and proper airflow will ensure that your equipment works efficiently, saves you money, and helps protect our environment. One great resource for additional information is the US Department of Energy's ENERGY STAR website at <http://www.energystar.gov>. Also, check out Penn State Extension's Energy Efficiency Page: <http://extension.psu.edu/energy/energy-use>

George Hurd, Penn State Cooperative Extension, Adams County

## Innovative Biogas Concepts Under Investigation

### Penn State Studying "Dry Fermenters" for Possible Energy Production in PA

In September, Glen Cauffman and Bob Graves from Penn State spent five days in Germany with a representative from the Viessmann Group, a German energy company, visiting and learning more about high solids wet and dry fermenter type biogas production systems. Of particular interest were their Bioferm dry fermenters. "Dry" might better be considered "stackable" - moist organic materials that are not oozing or slumping and can be stacked to depth of 5-7' without producing high amounts of leachate (called percolate with these systems). The ideal materials for these systems are those that can be handled with a front end loader and stored in piles, wet bales or bunker type storages.

#### How it Works:

A mixture of the desired material is loosely piled in an air tight concrete vessel with a front end loader. The vessel has a liquid recirculation system that will collect any liquid that leaches (percolate) out of the pile, direct it to a storage tank and then pump it back over the pile with a sprinkling system on the ceiling of the concrete vessel. It is important to keep everything moist but not flush a lot of liquid through the material. The stack needs to remain porous enough throughout the 28 day batch process to allow liquid to drain to the bottom and biogas to escape to the top of the pile. The biogas is stored in a large flexible bag located on top of the vessel, and is dried and cleaned before being used to fuel a CHP (combined heat and power) unit. At the end of 28 days the sealed doors are opened, the material is removed and then about half of the removed material is mixed with fresh feedstock and the process starts all over.

We visited digesters (fermenters) that were owned and/or operated by individual farmers, groups of farmers, manufacturing companies, outside investors, a leaf and yard waste facility and the Munich Zoo. The systems we saw had from 3 to 6 vessels that allowed for regular addition of new material and also assured that biogas production was reasonably consistent. Germany's decision to guarantee a buyback price for green energy has encouraged development of a private based infrastructure for design, supply, construction and management of biogas production.

For the full article, including photos and descriptions of a dry fermenter facility, go to <http://extension.psu.edu/energy/field-crops/case-studies>

Bob Graves, Penn State Department of Agricultural and Biological Engineering

## Kilowatt Meters for Home Assessment

### Easy Ways to Track Your Energy Use

Have you ever wondered how much your refrigerator costs you to run every month? Well, maybe you haven't until the recent rise in electricity prices. How about the true difference in energy use from changing your light bulbs to compact fluorescent? Sure, we are told that certain products save energy, but do they really live up to their promise?

There is a way you can answer all of these questions. You can assess your electric usage per appliance in your home by acquiring a kilowatt meter. This is a simple device that plugs into the wall and your appliance, and displays how many kilowatt hours (kwh) are being used during the period it is plugged in. Your utility bills will show you how much you are paying per kwh, and after a bit of simple math, you can estimate how much each appliance is costing you every week/month/year. I encourage you to refer to Dennis Buffington's article "Monitor Your Electricity Usage" in the July 2009 Newsletter. Dennis introduced the Kill A Watt™ device in his article and has been using them for his programs.

So what is a benefit of using kilowatt meters? You can take advantage of determining which appliances are costing you the most, and to make you aware of those in which you should limit the running time. Yes, you can't help but to run certain appliances such as your refrigerator/freezer (we can't let something as good as ice-cream melt), but you do have an option on many more appliances in your house. Also, don't forget about Energy Star™ products, which have been proven to use energy more efficiently. Check to see if your refrigerator, air conditioner, dishwasher, clothes dryer, etc. is labeled with the energy star label. If not, the next time you replace appliances go for the more efficient versions.

Here is an example to show what a kilowatt meter can do for you. I need to give credit to Dennis Buffington for this example as it is based off of his CFL vs. Incandescent display. I am simply going a step further and finding cost difference based off of a few assumptions.

We will compare a 50watt incandescent light bulb with its compact fluorescent(CFL) equivalent. The assumptions for this example will be an 8 hr/day usage of each light bulb, a usage charge of \$0.09/kwh (post deregulation approximate cost), and the average of 10 bulbs used per day. Keep in mind your usage charges may be different.

The incandescent bulb used a measured 0.05 kwh over the course of 1 hour vs. the CFL usage of 0.01kwh (see the photos below).



Incandescent over 1 hour



CFL Over One Hour

To figure out your savings from switching to CFL, use the following Equation:  
Monthly cost = kw/h x 8hr/day x 31 days/month x \$/kwh x 10 bulbs  
CFL = \$2.20/month  
Incandescent = \$11.20/month

Of course, you could also keep the meter plugged into your device for a full month and read the monthly energy use directly from the screen display - but that requires more patience.

Light bulbs are only the beginning of what can be made more efficient in a house, and the careful use of meters like these can help you know what you are actually saving. Chances are that the answers you find may be surprising! If you are willing, please share your results with me (email me at [DLD5033@psu.edu](mailto:DLD5033@psu.edu)), and I will compile all the results and report back in a future newsletter.

(remember that any mention here of a specific brand is for descriptive purposes only, and is not an endorsement of a product)

Darryl Dressler, Penn State Cooperative Extension, Mifflin & Juniata Counties.

## Building the Supply Chain

### Experts Discuss the Future of Bioenergy Supply

Experts from industry, government, and academia gathered in State College on November 11th to take part in the Cellulosic Supply Chains Short Course. Hosted and sponsored by the Penn State Biomass Energy Center, the event featured cutting edge presentations that addressed the growing need for supply chain development in the bioenergy industry.



A supply chain isn't something tangible that can be picked up or felt, but it is still a vital part of our energy future. The supply chain, in a simple sense, is the system that moves things from their source to their final user. In the case of bioenergy, that means moving biomass from the fields and forests to the people and facilities that need them. Doing this in an effective manner is a very big challenge and it is something we will need to deal with if we want bioenergy to grow in a healthy and sustainable manner in Pennsylvania.

One of the fascinating presenters at the short course was Tim Volk of the State University of New York, who discussed the potential for fast growing willow as an energy crop. David Maciejewski, one of the participants, talked about plans that are now underway for a willow plantation at East Lycoming School District near Williamsport.

Laurence Eaton of Oak Ridge National Laboratory provided insights into the upcoming revised "billion ton" study, due to be released soon, and Evelyn Thomchick of the Smeal College of Business discussed supply chain configurations for a successful industry. Ben Spong of the Appalachian Hardwood Center at West Virginia University gave an update on forest biomass, and charted some of the trends for future uses of biomass from the forest. Sustainability was a recurring theme during the day, and Marc McDill of Penn State challenged the group to think carefully about how we approach that issue.

Much of the day's discussion focused on the challenge of growing the industry in the current atmosphere of uncertainty. "We need a coordinated strategy - investors need to have some guarantee" said Mike Jacobson of the School of Forest Resources. John Punako of Biomass Fuel Stocks of PA countered by asserting that "the model for the future is being built every day in the state of Pennsylvania - school districts, small companies, one step at a time, are building the future of bioenergy".

The event also included a forest tour on the previous day that showcased bioenergy harvest research at the Penn State Experimental Forest in Stone Valley. While the short course did not settle on a "single answer" for bioenergy supply chain systems, it was abundantly clear that careful development of the supply chain will be crucial for the future of the industry in Pennsylvania and the nation.

Dan Ciolkosz, Penn State Department of Agricultural and Biological Engineering

## About Renewable & Alternative Energy

For more information on Cooperative Extension's Renewable and Alternative Energy Resources at Penn State visit our home page at <http://energy.extension.psu.edu>

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