

January, 2010 Issue



## ENERGY UPDATE

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### UPCOMING EVENTS

Laurel Highlands Farm and Family Expo  
Friday March 12, 2010 at University of Pittsburgh at Johnstown  
PA. Contact Craig Altemose, 814-355-4897, [cea10@psu.edu](mailto:cea10@psu.edu)

Montgomery County Renewable Energy Conference

Saturday, March 28th, 2010  
Montgomery County 4-H Center Creamery, PA Contact: Andrew Frankenfield, 610-489-4315, [adf13@psu.edu](mailto:adf13@psu.edu)

Biomass CHP and Thermal Systems Short Course

March 17-18, 2010 at Penn State Conference Center and Hotel, State College, PA. Contact Dan Ciolkosz, 814-863-3484, [dec109@psu.edu](mailto:dec109@psu.edu)

### WELCOME!

As the new year get underway, we continue to learn about new initiatives on Renewable Energy moving forward around the state. Its refreshing to know that so much is going on. We finished the year helping out with a Fuels for Schools Workshop in Clearfield and conducting some meetings on energy efficiency and feedstock development. In this issue we discuss some our recent activities in wind, biogas, biomass, waste to energy and combined heat and power projects.

Sincerely,

Greg W. Roth  
Program Leader  
Renewable and Alternative Energy  
Penn State Cooperative Extension

## Community Wind Program Underway Tours of Wind Facilities a First Step

Of all the renewable energy possibilities, none have sparked the public's interest or fascination more than wind energy. Yet, none have been as controversial or plagued with misinformation as wind, and this is especially true of utility or large-scale wind farms. To address this issue, we have initiated a Community Wind Extension education program. I am heading up the program out of the Clinton County extension office and am collaborating with faculty on campus as well as some of my fellow extension educators.

There is interest in the development of wind



## LINKS

[PSU Renewable & Alternative Energy](#)

[Coping with High Energy Prices](#)

[Biomass Energy Center](#)

resources in our county, but few of our public officials have much first hand experience with this issue. One of the first activities in our program has been to develop several tours for government officials, educators, business people, and landowners to the top of the Eastern Continental Divide and to the Allegheny Ridge Wind Farm. The Allegheny Ridge Wind Farm the farm is located in Cambria and Blair Counties, near Portage. It has 75 turbines strung along a network of 22 miles of roads and is currently the largest wind farm in the state. The tours usually lasts approximately two hours and features discussions on surface and environmental impacts, wildlife issues, best management practices, local economic development, and regulatory and planning processes. Tour participants have learned about the development of the wind farm, and the strategies that have been deployed to protect water quality on this site. They also learn about bat mortality studies on the site and why this issue is important. They also learn about the operation of the wind farm, the maintenance issues, and the energy generation potential. People on the tour have an interest in knowing about utility-size wind and also the potential of the development of community-owned, wind generation models, much like many of the wind farms developed in the midwest. Often their knowledge is limited, and they come on the tour with information that may not be based in fact. Maybe it is something they 'heard,' but when you have concerns about the environment or consider investing in wind energy or you have constituents who want answers, then you need good information, and they get that here.

Our goal is to expand the program to develop more online resources, and also to work with our 4-H and youth education programs to develop some educational programs for them.

For more information about wind energy, contact me at [daw45@psu.edu](mailto:daw45@psu.edu).

Don Woodring, Economic and Community Development Educator, Clinton County

## Challenges of Forage Sorghum as a Bioenergy Crop Late Season Lodging Can Be a Problem

Forage Sorghum is of interest as an energy biomass crop. Being a rapid growing annual, sorghum has the potential to fit into a traditional crop rotation on a short term basis and can yield 5 to 10 tons per acre of dry matter. In trials at the Penn State Agronomy Farm this year, sorghum yields averaged 6.5 tons of dry matter. Because of these characteristics, forage sorghum has also been evaluated for the past two growing seasons by our Farm Operations team. In 2008, two varieties of forage sorghum were grown. Both varieties grew to a height in excess of 10 feet tall and stood upright until the end of the growing season. Usually the crop would have been harvested just after the first killing frost however it was decided to let the sorghum in the field and follow the winter dry down and harvest strategy often used for switchgrass. However by mid December the plants had fallen over even though there was not any unusual weather event to attribute the crop going down. The sorghum was left to continue to dry until it was harvested on March 5, 2009. In 2009 growing season, one variety was planted and grew much like those from the previous year with plant height in the 10-12 ft range. From the 2008 experience, the intent for 2009 was to harvest the crop as soon as the moisture level was low enough to store the crop as round bales. Unfortunately, an unusual wet snow event on October 16, 2009 flattened the crop. The biomass was harvested and removed on November 10, 2009 but the mowing had to be done from one direction as to be able to adequately pick the material off the ground. Based on the past two years experiences, the lack of stalk strength and lodging is of concern so forage sorghum is not a crop to be left in the field to dry and harvest in mid winter like can be done with switchgrass or sudangrass. At this point forage sorghum is still a viable option for biomass production as long as it is harvested early in the fall. We will continue to look at forage sorghum management issues such as shorter varieties and lower seeding rates to see if we can improve the winter standability of the crop for biofuel purposes.



Don Rill, Agronomist Research Technician, PSU Farm Services  
Greg Roth, Professor of Crop and Soil Sciences

## Farm Show Energy Exhibit a Hit

## Lots of Interest in Biomass Densification

One of our traditions in the College of Agricultural Sciences has been to work closely with the Pennsylvania Department of Agriculture in support of the Pennsylvania Farm Show. The show annually attracts over 500,000 visitors and is a great way to discuss issues related to agriculture such as bioenergy with the public. This year, we featured displays on biomass energy, biodiesel and biomass densification. Our booth was busy throughout each of the eight days of the show.



One of the topics that attracted the most interest was the potential for pelletizing biomass as a domestic heating fuel. I pointed out to folks that the potential of biomass as a heating fuel in our state is great: we use over 600 million gallons of fuel oil each year for residential heating, which could be replaced with many homegrown biomass feedstocks. Biomass also lends itself to local use of the resource, since hauling bulky materials can be expensive. Also, biomass heating can be very energy efficient, due to the low inputs of most of the feedstocks, the minimal processing and the local nature of the production and utilization. In addition, we have numerous Pennsylvania manufacturers of pellet stoves and biomass furnaces. Many of the visitors to the booth this year were intrigued by the concept and I was pleased to learn about several ventures underway to develop biomass as fuel. I came away with the feeling that there is a definite need to better understand the art and science of biomass densification and will be working to try to develop a meeting or workshop on this topic in the next six months.

We also had a kid friendly display with sandboxes filled with either canola seeds or wood pellets and small bales of switchgrass for the sandbox participants to sit on while they played in the feedstocks. Parents of the kids milled about the booth. As a result we were able to discuss the potential of renewable energy feedstocks with a lot of folks who might not have otherwise stopped by. And a lot of folks got to see and feel some canola seeds on their visit.

The booth also provided us a backdrop for news interviews and radio spots. To hear one of the Penn State radio spots produced at the booth, follow this [radio link](#).

Greg Roth, Program Leader, Renewable and Alternative Energy, Penn State

## Short Course to Focus on Combined Heat and Power Next Topic in Bioenergy Short Course Series

Biomass heat and CHP (Combined Heat & Power) systems are a tremendous opportunity for providing clean, renewable, affordable energy for buildings and facilities. However, it is necessary for designers and developers to understand the unique aspects of biomass energy systems if they wish to create systems that are efficient, productive, and cost effective. This 1.5 day course is designed for engineers, architects, researchers, and project developers to develop their skills in this important area and to interact with national leaders in the research design and manufacture of advanced biomass energy systems.



The short course will address issues such as feedstock availability and sustainability, fuel storage and handling systems, combustion and gasification systems, steam turbine and Organic Ranking systems and design configurations for commercial biomass systems. The course will also address market and economic issues as well as carbon foot printing and emission of these systems. On day 2 of the workshop a special breakout session will focus on the design of commercial and institutional thermal biomass systems.

An extensive group of nationally known instructors has been assembled for the course to provide the newest developments in this fast growing field.

For more information and registration details, visit <http://www.bioenergy.psu.edu/shortcourses.asp>.

Daniel Ciolkosz, Extension Associate, Department of Agricultural and Biological Engineering

## New 80mm Plastocannon Fires Off Plastic Fuel Producing an Energy Feedstock from Waste

Researchers at Penn State's College of Agricultural Sciences have dubbed it the 80-millimeter Plastocannon because this machine looks much like a Howitzer, not because it's a weapon. In fact, it is designed to fortify societies, not destroy them.

James Garthe, agricultural engineer at Penn State, has been working for 15 years to reclaim value from plastic items wantonly discarded after serving their intended use. "Plastic is energy," Garthe explains, "and if plastic items cannot be recycled for one



reason or another, our team wants to use high temperature combustion to reclaim value from plastic trash."

"Plastic is a hydrocarbon, much like gasoline or diesel fuel," Garthe states. The Plastofuel™ concept densifies the plastic so it can be economically marketed as a fuel. The Plastocannon is the newest prototype machine being tested, and its diameter of 80 mm is double the 40 mm researched to date. "The enlarged diameter will produce more fuel per hour, which excites our industry partners that want to help commercialize the Plastofuel™ energy efficient processing system," Garthe notes exuberantly.

"I often tell people that if I gave them a container with gasoline and one with the same amount of plastic trash in it, they would pitch away the plastic, yet would find a way to pour the gasoline into their fuel tank," Garthe notes. He continues with, "And yet, pound for pound, both have about the same energy content when burned. Plastic is in the wrong shape and form, but we're working to change that...working to derive energy from a resource most of us have been conditioned to pitch out. Times they are a changin'"

For additional information, contact James Garthe by calling 814.865.7154, or e-mailing him at [jwg10@psu.edu](mailto:jwg10@psu.edu).

Jim Garthe, Agricultural and Biological Engineering

## Making and selling Electricity - "nothing is as easy as it seems!"

### Interconnection Issues



Running an engine generator set or combined heat and power unit (CHP) on biogas and selling the electricity back to the power company sounds easy; experiences indicate there are many steps to go through and many possibilities for problems. Discussions with owner operators of digesters imply there is no one size fits all solution. I am not an expert on power generation, distribution and regulation; but it is important to remember that our basic systems have developed to accommodate large sources of power (central generation) that feed electricity out towards many sizes and types of users. Removing a load from somewhere along these lines and then substituting a source that is putting power back on the lines may not always be helpful.

Some specific and usually costly electrical interconnection issues related to biogas systems I have heard about in the last year include:

Failure to involve power supplier early in the project. Common problems have included - delay in interconnection and resulting flaring of gas; significant increase in project cost due to interconnection equipment requirements; delay and or cost increase due to rebuilding of high voltage utility lines serving the farmstead; ...

- Variation among PUC regulated utilities, REAs and municipal power systems.
- Contract negotiation, execution and payment with the utility. Common items have included unexpected low payment, lengthy periods of time before payment is received, ...
- General lack of understanding of all the items on a utility bill and what ones are included in net metering arrangements.
- Large penalty charges when a CHP system drops off line even if the cause is related to the power distribution system.
- Failure to make use of Public Utility Commission and the procedures in place for helping with relations between private utilities and customers. Contact the Pennsylvania PUC for more information.
- Relying on what "somebody told me..." or the experience of other projects or the opinions of consultants or suppliers. Ultimately not only is there variability among power suppliers but there also will be variability based on the location on any given suppliers grid and time of day power is delivered to the utility.

Pennsylvania and its farm community have been pioneers in adoption of anaerobic digestion and biogas production since the late 1970s. Early adopters and innovators are continuing to add knowledge that can make it easier for those who follow. It is important to learn from these experiences and continue to improve the overall process. For more information on biogas visit [www.biogas.psu.edu](http://www.biogas.psu.edu).

Robert Graves, 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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