

# Community Scale Biomass Workshop – C. Stish

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## Biomass Community Scale Project Workshop

Danville, VA September 7-8, 2011

*Report by Cassandra Stish – sponsored by Blue Rock Resources, Buckingham County & Resource Conservation & Development Council – some information supplied from presenter's websites as referral.*

**Overview:** This workshop was very informative and useful, laying out the case for biomass fuels as a way toward rural community prosperity, relief from dependence on fossil fuels and increased energy sustainability. The feasibility of switching to the biomass feed-stock in combustion boilers to replace fuel oil is overwhelming. The feasibility of switching to biomass feed-stocks in systems using natural gas or coal-fired boilers is less impressive unless one takes into account the profound positive impacts on the local agricultural economy. If a project is being considered and there is a choice of installing biomass or natural gas-fired systems, the biomass systems are favorable in all instances. There are many good engineers and scientists working on creating ways to make the biomass option more efficient.

One of the main impediments has been a steady, quality-controlled source of biomass materials for the growing number of projects that are coming on line. It is in this area that the biomass industry can benefit from, and most positively affect, Buckingham County in the immediate and near future. As the biomass and biofuels industries grow, the potential expands to include grass-derived plastics (bio-polymer industries), fuels and other products historically derived from oil and lately derived from corn or soy.

### **Presentations:**

**Al Weed** of Public Policy Virginia made an observation that tied the necessity of a successful biomass industry in Virginia to the policy-making of our General Assembly, citing the VA Wine Tour. Virginia had the vision to fight for viticulture in years past and dedicated money and created policy to support this activity. In comparison to Maryland, a state which did not and still doesn't support their viticulture, we have 250 producing vineyards in Virginia. Maryland has remarkably few. As the central Atlantic climate evolves, and we turn into the Napa of the East Coast – as many are saying is the case, Virginia is leaps and bounds ahead having established ourselves as a viticulture-friendly state. Al's pledge to help inform and guide our policy makers to keep biomass on their radar and as part of the policy vision for future legislation is important toward wide-spread success of this emerging industry.

**Delegate Poindexter** is the Chairman of the Renewable Energy Committee. His plea was for the biomass industry to get its message clear, weed out contradicting facts, hyperbole and language claiming biomass to offer a panacea for the energy concerns of Virginia. He calls on the industry to recognize that the energy question must be answered with diversified solutions to provide a wider base of reliability, price stabilization and sustainability over the long haul.

He went on to say that we must be honest in assessing and addressing the efficiency (btu's/kw/ton of fuel), availability of feed stocks, public opinion of logging, impact on short rotation crops, getting

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farmers to shift to growing Native Warm Season Grasses (NWSG's) from what they know, impact on local jobs, impact on local agri-businesses, types of jobs created and education to support them.

**Adam Sherman** from Vermont is especially well versed in using woody-biomass feed stocks in community scale projects. He is from the Biomass Energy Resource Center and is primarily focused on talking about woody-biomass to offset thermal energy usage which is approx. 30% of our energy consumption realized mainly in four heavy-use seasons.

Biomass crops are much more diverse in their potential uses than any other green energy generation methods. They are the only renewable energy source that can be refined to actually replace products typically only gained through refining fossil fuels.

|         | Heat | Electricity | Fuel Gas | Fuel Oil |
|---------|------|-------------|----------|----------|
| Solar   | X    | X           |          |          |
| Wind    |      | X           |          |          |
| Geo     | X    | X           |          |          |
| Hydro   |      | X           |          |          |
| Biomass | X    | X           | X        | X        |
|         |      |             |          |          |

Biomass crops: forestry residues, crop residues, grasses, hybrid poplar – test products include animal wastes and other traditionally incinerated by-products

**Woody-biomass can produce 16.5 million Btu/dry ton. Recovery relies heavily on moisture content and includes, whole pellets, hog chips, bole chips, whole-tree chips, paper-grade & screened bole chips.**

CHP = combined heat & power plants – combines heating and cooling. The energy generated from a small turbine can power the facility and electric chillers to create cooling from steam.

Air emissions will be a large consideration moving forward. Particulate matter is the largest problem to mitigate, but can be easily done with improved materials-handling techniques, storage and high-end combustors that reduce the CO impact.

Things to consider:

- Forest impacts – long-term sustainability of the forests should this industry really get traction
- Carbon footprint – take a look at the long-term effect of more carbon combustion
- Supply reliability – put the products together and defragment the supply chain
- Economic viability – determine the capital costs and do a life-cycle analysis

There are many benefits of using biomass in place of fossil fuels like oil and gas for providing heat. The following are some of the important benefits of using woodchips or pellets for heating a school or other institutional building:

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Sustainably produced biomass is a local renewable energy source. And, unlike fuel oil, propane, and natural gas, biomass has a history of stable prices unaffected by global economics and political events. Over the last 20 years, the real price of wood energy is actually declining. In Vermont, woodchip prices have increased at less than the rate of general inflation over two decades, unlike oil and gas prices.

Modern institutional biomass systems burn cleanly. These larger-scale wood heating systems are significantly cleaner than wood stoves for three reasons. Unlike home woodstoves, institutional woodchip boilers have virtually no visible emissions or odors. Modern woodchip systems emit far less particulate matter (PM), an exhaust product of wood combustion known for its adverse effects on human respiratory health.

Burning wood for energy has a positive impact in moderating global climate change. Carbon dioxide (CO<sub>2</sub>) buildup in the atmosphere is a significant cause of global climate change. Fossil fuel combustion takes carbon that was locked away underground (as crude oil and gas) and transfers it to the atmosphere as CO<sub>2</sub>. When wood is burned, however, it recycles carbon that was already in the natural carbon cycle. Consequently, the net effect of burning wood fuel is that no new CO is added to the atmosphere.

**Wood chipped for fuel implies the productive use of a low-grade waste product. Wood fuel typically comes from either sawmill or timber harvesting residues. These residues are generally considered wastes or byproducts of the forest industry. Where woodchips come from sawmills, they are a waste that must be disposed of or sold. Where chips come from harvesting operations in the woods, the purpose is to remove low-grade trees from the forest that, when done sustainably, will improve overall forest health.**

**The cost of biomass fuel is generally less than half the cost of fuel oil on a btu basis. While all of these benefits are important from a public policy perspective, cost is probably the most compelling reason for a local school district to decide on woodchip heating. There are similar savings compared to natural gas, particularly when gas prices are high, and higher savings if compared to propane. These hard dollar savings often make the investment in biomass heating technology a win-win for school boards looking to reduce expenditures wherever they can.**

1. The money spent on biomass keeps energy dollars circulating in the local economy and supports jobs in the state's forest products industry.
2. Biomass energy projects have a diversity of positive impacts on local and regional economic development:
3. Jobs: Because biomass fuel is locally produced, harvested, and processed, its use creates and sustains jobs in the region's economy – supplier-side jobs and supporting industries.
4. Revenues & local spending: Biomass energy keeps dollars spent on fuel in the local economy— compared with fossil fuel systems, which generally export fuel dollars.
5. Building and maintaining biomass energy systems creates employment in the regional economy – plant managers, haulers, systems engineers, etc.

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6. By making new use of forest byproducts for fuel, biomass energy also strengthens the whole regional forest-products industry, giving it new local markets and improving the forest resource, along with creating jobs.
7. All the jobs and economic activity created by biomass projects also generate important local, state, and federal tax revenues – helps fund local infrastructure, education and public safety expenses.

**Mark Donehi** from Trane showed us a feasibility screening tool that he applied to a completed project so he could see how well the tool performed. It turned out that the tool was quite good for getting a red light/green light sense of a project in the early stages without having to spend thousands of dollars on an initial study. This tool is being made available for free – by request – from Public Policy Virginia.

Main point - Trane would be putting in more of these biomass burning systems if there was a reliable quality-controlled flow of materials. Plant managers cannot be worried about poor quality feed stocks. He is currently looking for reliable sourcing for the Charlotte Courthouse biomass project that was recently completed.

Mark Donehi – 2343 Highland Farm Road, Roanoke, VA 24017 540-563-2828 (ofc) 540-580-5939 (cell)  
email: mdonehi@trane.com

Langseth Engineering – Steve Langseth – developed the project feasibility tool mentioned by Mark from Trane. He says that the steam loops can run upwards of five miles. This made me think of the newly remodeled DES on Rt. 20 and the prisons as one project. Additionally, the courthouse/admin bldgs could be on a system and so could the BCMS/BCHS complex be on a system. Three solid systems in Buckingham could significantly impact the cost of power to the county and, as previously noted, the general economic well-being of the county. This factor cannot be denied and should be brought to the front of every discussion and decision-making process when the question of energy/heat source comes up.

We must consider grants to be able to move forward quickly and take advantage of tax credits and Tobacco Commission funding.

**Consider using a performance contractor – Trane, Honeywell, etc. to serve as an ESCO – Energy Service Company.** Project may be a little more expensive in the short-run, but logistically easier to manage with these professionals on board managing the project through the performance contract period.

**LW Wilson from Piedmont Geriatric Hospital** – runs the facility that was previously burning sawdust but found that the moisture in the winter months and quality control were causing performance problems with the system. In 2006, the Conservation Management Institute approached the Piedmont Geriatric Hospital with a proposal to serve as a pilot project for the use of native warm season grasses as a biomass feedstock in south-central Virginia. The PGH is a state owned and operated facility near Burkesville, VA that is unique in that it produces its own steam for heating and hot water using a converted coal boiler. The primary fuel had been sawdust from nearby forest products processing

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facilities. There was some concern over the long term availability, cost, and quality of the material. They were also in the process of building a new wing to the hospital that would dramatically increase the demand for steam. They already had two fuel oil boilers that were used as peaking boilers and as a backup when the biomass boiler was taken off line for maintenance. The plan was to start using the fuel oil boilers to provide steam for the new wing, so comparisons are made against fuel oil for cost analysis.

This situation was fortuitous since it provided existing equipment and an existing application (direct firing for steam) for testing. The project relied on donations - a supply of native warm season grasses from a producer near Deerfield, VA, and donated shipping from the VA Department of Game and Inland Fisheries, donated and rented equipment from Robertson Equipment Supply in Bedford, VA to process and blow material into the hopper system at the boiler. The used small grants from several sources including the Virginia Department of Mines, Minerals, and Energy plus support from the Conservation Management Institute, to conduct a pilot project to determine if native warm season grasses could serve as a boiler fuel utilizing existing farm equipment with minimal modifications (if any) to the feed system at Piedmont.

- Successful demonstration of the use of native warm season grasses at Piedmont Geriatric Hospital as completed with a 150-hour test fire starting on July 7, 2008 and continuing through Sunday, July 13, 2008.
- Volume requirements of the material were significantly lower to produce the target steam level due presumably to improved efficiency of the boiler as a result of lower fuel moisture content.
- Fuel moisture content of the native warm season grass material used was less than 15% whereas sawdust ranges widely from under 10% to over 50%.
- 13#/hour of NWSG (a low-impact/low-input/high-yield crop)
- 1 cutting/year after the nutrients are returned to the crown of the plant
- Yields can range (depending on cultivar and management) from 1-10 tons/acre
- PGH was paying \$148/ton – less than half the cost/btu value/ton than fuel oil
- 44 days running produced 3,943 #'s steam comparative numbers for the same production:

**Fuel oil 35k gallons >\$100K vs. NWSG 401 tons <\$56K – \$44K savings. Better than \$1000/day!**

**The intention is to enter into long term contracts with local farmers to produce material on a stable basis.** This has also spurred interest with other boiler facilities in the Commonwealth (e.g. Catawba Hospital). Clearly this is a win-win for the local community and the hospital.

Biomass procurement, logistics and contracting: **Terry Godwin**

Inventory management, storage and transportation will be the primary hurdles for a producer to deal with. While Terry did not support the use of an aggregator, it seems that most of the other presenters were in favor of one for the sake of accountability, price and quality control. Answering the following questions will help determine the operational procedures for both supplier and consumer of biomass products

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- What is the minimum hauling distance between each repository of product? Determined by fuel costs, market prices and demand.
- What is the most efficient means to move material? Rail, trailer truck.
- How many days worth of operation can be stored on site?
- How many days of operation can be stored at the main storage facility?
- How will the materials be stored? Most facilities use a below-grade storage system to allow for trucks to easily dump material into the storage space. The material can be covered with aluminum ribs and plastic tarps
- Grass bales for burning can be stored under tarps, off the ground to stay drier. Grass bales for polymer have more rigorous storage requirements.

**NWSG's – Alamo test in Tennessee – Jon Walton** Warm Season Grasses Procurement, Contracting & Logistics

'Alamo' is the type of grass tested over 4 years by Tennessee to determine several factors bearing on the viability of using NWSG's for biomass/biofuels/biopolymers. 'Alamo' grows 6-10' tall and yields 6-12 tons/acre. They have been managing 450 acres under 3 year contracts with growers.

### Pros

- NWSG's can be grown on poor soils
- Drought tolerant
- Flood tolerant
- Disease and insect resistant
- High-capacity hay operations can manage this crop without problems
- Existing machinery can harvest and bale the crop
- Is suitable for high-end refining into fuels or polymers – higher-paying market than biomass for combustion heat & power

### Cons

- Establishment of a stand can be difficult
- Some increase in equipment wearing down can be expected
- Quality control at the farm level is critical
- Harvest timing
- Handling the sheer volume of the material
- Stem length & diameter can be problematic for some equipment
- Quality control and BMP's at the farm-level are difficult to manage without an aggregator

The farmers participated in an incentive contract that paid them \$450/acre on the first year (to mitigate risk), \$250 acre +40/ton (less risk & encourages better management) for the second year, \$150/acre the third year, after the contract period – market yields were avg \$55/ton.

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UTenn assumed all the cost of seed, establishment and initial crop management as part of the study.

**The cost of seed is approx \$15/lb - \$6# live seed/acre**

## **Environmental- Ecological Impacts – Verl Emrick, VATech**

- Biomass contains less sulfur & nitrogen  
Some biomass feed stocks are limited and or less sustainable than others (grass is preferable to long-term use of woody biomass)
- Biomass production can provide additional and diverse eco-systems for a variety of animals and birds.
- Something to work toward -- Environmental Impact Verification – “We only use certified sustainable biomass products – Grown & Harvested with the Best Management Practices” – this would be the job of the aggregator. Sub-par production would be discouraged. No market for slash & burn forestry products.
- NWSG’s are deep-root plants – are able to re-create top-soil due to the way that the roots interact with the soil and the microbial environment. Over the long-term the net result would be to have increased top-soil quality, increased aquifer capacity and a sustainable crop that provides habitat for various species. It is not clear if the NWSG’s sown in mono-typical stands would have a significant impact on some species. Diversification of the species – perhaps in a border of legumes & wild flowers – could qualify a stand of Switch grass for WHIP monies.
- Deep root grasses are ideal for use in watersheds, Cheapeake Bay Water shed area, and other sensitive ecologies, as they create a bio-filtration system that can remove nutrients and pollutants from run-off. Once a year mowing allows for the nutrients in the plants to be returned to the soil before harvesting, therefore the soil is actually improved by the presence of NWSG’s with little or no inputs required.

## **Brian Becker - Project Time-Line from feasibility study to going online – 2 -3 years.**

Some things to consider when making a choice between natural gas and biomass – there is an alarming and increasing number of scientifically verified reports that Deep Rock Fracturing is linked to the increase in earth quakes, water-table pollution and other environmental problems. If this trend continues, the stability of the natural gas market could be impacted negatively. Here are a few recent stories about “Fracking” and natural gas...

<http://dallasmorningviewsblog.dallasnews.com/archives/2011/09/seismic-activit.html>

..... Add to that the prospect of increased seismic activity that could accompany gas fracking in West Dallas. In July, an earthquake rattled the area between Waxahachie and Cleburne, in the thick of Barnett Shale country. Another hit Cleburne on June 25. On June 12, another was reported. The same area saw eight other earthquakes on Oct. 31 and Nov. 1, 2008. All were low-level, never surpassing 3.0 on the Richter scale. Mere coincidence? Perhaps. But I wouldn't take the fracking industry's cynical denials as proof that there's no connection.

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"It also caused the Great Depression, the Black Plague, the October Revolution and the breakup of the Beatles," guffawed Chris Tucker of Energy in Depth, an oil and gas industry group based in Washington, when contacted by the Houston Chronicle after the Virginia earthquake prompted increased speculation about linkage.

Still, there is no question that the fracking process involves a man-made increase in seismic activity...

<http://themoderatevoice.com/120738/fracking-the-dc-earthquake-and-unclean-water/>

<http://www.truthistreason.net/emergency-order-halts-natural-gas-drilling-state-says-fracking-is-causing-seismic-activity>