

## **5th ANNUAL PENNSYLVANIA STATEWIDE PROJECT GRASS CONFERENCE**

Presentation by:

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A not-for-profit registered in the state of Vermont







# Perspective

- 5.12 million acres of crop land in PA in 2002 census
- @ 6 tons per acre = 30.7 M tons
- @ 100 gal. /ton = energy of 3 billion gal #2 heating oil
- PA heating oil demand in 2001:
  - 1.0855 billion gallons

# Fundamental premise

- If releasing sequestered carbon into the atmosphere threatens the viability of the biosphere, then the common sense solution is to keep sequestered carbon sequestered.



# Stone Age

- ☐ The Stone Age did not end because they ran out of stones.
- ☐ They got a better idea
- ☐ Metal tools

# Fossil Fuel Age

- ☐ The current Fossil Fuel Age will not end because we ran out of fossil fuels.
- ☐ It will end because we got a better idea.
- ☐ A viable biosphere is more important than easy sequestered carbon energy.



# Electranet

- From this, it follows that we must seek a new way to think about energy.
- One example: Al Gore's electranet as described in his September speech at NYU Law:

# Al Gore at NYU

"Today, our nation faces threats very different from those we countered during the Cold War. We worry today that terrorists might try to inflict great damage on America's energy infrastructure by attacking a single vulnerable part of the oil distribution or electricity distribution network. So, taking a page from the early pioneers of ARPANET, we should develop a distributed electricity and liquid fuels distribution network that is less dependent on large coal-fired generating plants and vulnerable oil ports and refineries. Small windmills and photovoltaic solar cells distributed widely throughout the electricity grid would sharply reduce CO2 emissions and at the same time increase our energy security.



# Gore continued

Just as a robust information economy was triggered by the introduction of the Internet, a dynamic new renewable energy economy can be stimulated by the development of an "electranet," or smart grid, that allows individual homeowners and business-owners anywhere in America to use their own renewable sources of energy to sell electricity into the grid when they have a surplus and purchase it from the grid when they don't. The same electranet could give homeowners and business-owners accurate and powerful tools with which to precisely measure how much energy they are using where and when, and identify opportunities for eliminating unnecessary costs and wasteful usage patterns."



# The 21st century model

- Small, renewable, carbon neutral
- Distributed
- Electricity made in our basements
- Everyone a Buyer / Seller / Producer
  - Sounds a lot like today's Internet
    - 1994: www?



# Energy: the power to

- ❑ shape or distort our:
  - ❑ culture
  - ❑ politics
  - ❑ economics
  - ❑ security
- ❑ Grass Energy shares this power



# Key Energy Questions

- ☐ Where does it come from?
- ☐ Limits & Consequences?
  - ☐ Carrying Capacities?
- ☐ Is the environment an "Externality"?
- ☐ Evaluation Framework?



# Evaluation Framework

- Best & Highest Use Metrics
  - Best for Community
  - Best for environment
  - Best for Economy
- Single metric era is over!

# Outline

- Today's talk is in several sections
  - A few words on energy
  - The state of grass
  - Some basic PA data
  - Supply & Demand
  - Culture of green bioenergy



# Biofuels from Grass

- Liquid biofuels are better known
  - biodiesel, ethanol
- Other solid biofuels are in use
  - Wood chips
- Today I will focus on grass
  - “herbaceous energy crops”

# grass

- Grass for Fodder
  - 1,000s of researchers
- Grass for Turf
  - 1,000s of researchers
- Grass for Energy
  - 25 researchers nation-wide?



# Things to think about

- ❑ You Got Milk, But do you "Got energy?"
- ❑ A new choice: Feed animals or feed Furnaces
- ❑ We must do better than simply stabilize the farm economy, we must grow it.
- ❑ We must buy more from farmers that yield fair & just profits.
- ❑ Renewable BioEnergy will be profitable

2002: 21% of rural jobs  
are in farming related jobs

- 2005: PA farms = 58,200
- PA: 56.7% farmers list farming as primary occupation
- PA: 20% of farms report income > \$75K
  - 80% below 75K
  - <http://www.ers.usda.gov/StateFacts/PA.HTM>



# Education & Employment

Rural Urban

- PA: High Sch degree @ 44% vs 33%
- PA: College degree @ 23% vs 39%
- PA: Employment @ 57% vs 62%

# 2005 Top PA Commodities

- Top 5 agriculture commodities
  - 1. Dairy products
  - 2. Cattle and calves
  - 3. Greenhouse/nursery
  - 4. Agaricus mushrooms
  - 5. Broilers
- Dedicated Energy Crops = 0%
  - Not even mentioned



# Farmer's basic question

- ☐ If I grow it,
- ☐ Can I sell it for a profit?
- ☐ Show me, don't tell me!

# A few details

- Now I'd like to spend a few minutes on creating, building and sustaining the:
  - Supply of biomass
  - Demand for biofuels
  - Culture Green Energy



# Supply Side

- Efficiency
- crops
- A 1000 pound round bale of hay contains the same number of BTUs as 52 gallons of heating oil or 75 gallons of Liquid Propane

# Efficiency

- ☐ First improve energy efficiency
- ☐ Reduce total demand for space conditioning BTUs
- ☐ Reduces acres required



# Dedicated Energy Crops

- ❑ Grasses: Reed Canary, Switchgrass, *Miscanthus x giganteus* ???
- ❑ Research needed to determine best candidates for a given soil type & micro climate
- ❑ 50% of land capable of 6 tons per acre?
- ❑ High Fiber, Low Ash [3% or less]
  - ❑ Not high protein







# Miscanthus x giganteus

Emily Heaton adjacent to one year's growth of stems in a 3-year old *Miscanthus x giganteus* stand on the University of Illinois South Farms, Urbana, IL. In Central and Southern Illinois, our typical annual yields for stands of 3 years and older are around 17 t/acre (highest 26 t/acre) of dry matter. Note: We dry a subsample of the actual harvest to constant weight at 80 C so that we can express the harvested yield as dry weight. Credit: Emily Heaton and Steve Long, University of Illinois.

[The energy of 1,700 gallons of #2 fuel per acre.]

# Soil Health

The management of grass for use as a low ash content biofuel means that a considerable amount of material will be left on the field, either through leaching or by loss of some of the plant parts. For example, at least 20% of switchgrass yield will be left on the field following a late spring harvest. Mowing followed by leaching, then baling, of reed canary grass in the summer probably also leaves at least 20% of the yield on the field. Grasses have lots of organic matter below the soil surface that remains as well. Both reed canary grass and switchgrass have vigorous root systems, both are very good for "soil health". Both would allow dairy farmers more flexibility with manure management options. Grass management with manure application would IMPROVE soil tilth. Grass management alone would improve soil tilth over annual row crop farming.

Prof. Jerry Cherney, Cornell University



# Farm Gate Economics

Establish / 10 year amortization	\$64.00
taxes per acre (not in land use)	\$20.00
fertilizer - manure	\$70.00
harvesting (8 bales @ 1,500 lbs)	\$93.00
Total costs	\$247.00
tons per acre	6
production cost per ton	\$41.17
Profit Margin	40.0%
Farm gate price per ton	\$57.63
Profit per acre:	\$98.80

# Hay to Pellet Fuel

**Pocono Northeast Resource Conservation & Development Council  
receives \$393,590 for biomass fuel (G&C)**

Pocono Northeast Resource Conservation & Development Council will receive \$393,590 for a mobile pelletizing unit at the council's Mayfield facility for pelletizing wild grasses for combustion in biomass fuel burning systems.



# Grass Pellet metrics

- ❑ 3% ash, or less
- ❑ 40 lbs per cubic foot
- ❑ 7% moisture
- ❑ Robust structural integrity
- ❑ Engineered combustion characteristics
- ❑ 14:1 net energy

# Adding value

- ❑ Grass in the field has low value
- ❑ Baling adds value
- ❑ Pelletizing adds more value
  - ❑ or making milk = densified grass
- ❑ Delivering fuel adds more value
  - ❑ or making cheese = densified milk



# Advantage: Grass

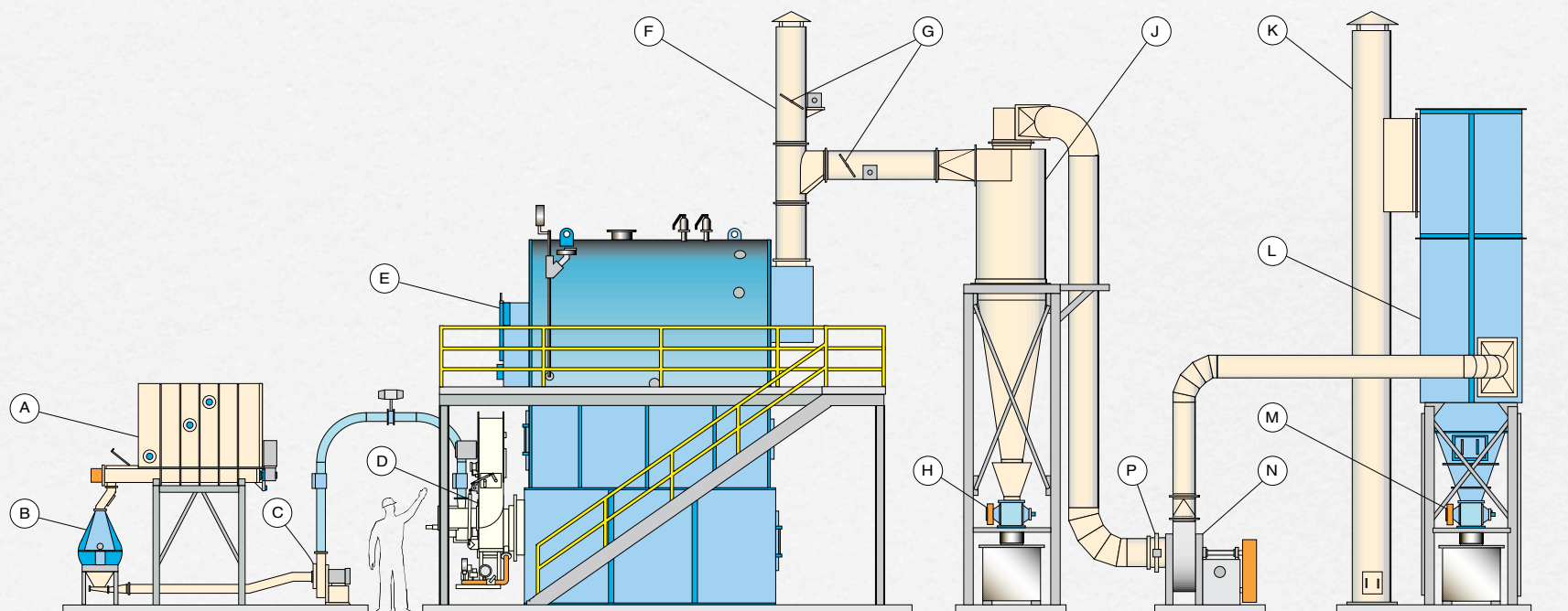
- ☐ Superior solar energy collector
- ☐ Perennial crop w/o Run-Off problems
- ☐ Fuel production does not degrade water
- ☐ Low tech / Off the shelf
- ☐ Nearly Carbon neutral
- ☐ Silver buckshot here today

# The Demand Side





MATERIAL LIST					
ITEM	QTY.	DWG NO.	DESCRIPTION	REMARKS	WT.
A	1		FUEL BIN		
B	1		HAMMER MILL		
C	1		FUEL TRANSPORT FAN		
D	1		ENERTEK NW-LI DUST BURNER		
E	1		FIREBOX STYLE FIRETUBE BOILER		
F	1		ABORT STACK		
G	2		ISOLATION DAMPERS		
H	1		AIRLOCK		
J	1		CYCLONE		
K	1		STACK		
L	1		BAGHOUSE		
M	1		AIRLOCK		
N	1		ID FAN		
P	1		DRAFT CONTROL DAMPER		



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# Benton Area School District

## □ Jump starting demand in PA

Pennsylvania will invest in a local clean-energy project, according to an announcement out of the Governor's office Thursday. The Benton Area School District will receive \$350,000 for a biomass-fired boiler-heating system designed to heat the elementary, the alternative school and the middle/high school buildings using a renewable source. Benton is the first school district in the state to receive such a grant. The flexible-fuel system could replace 37,000 gallons of heating oil a year and use local biomass materials such as native grass pellets, wood and corn pellets to provide 80% of the district's heating needs.



# Switchgrass Pellets

- ❑ My understanding is that Ernst Conservation Seeds will be supplying switchgrass for the Benton Area School District project.
- ❑ ERNST CONSERVATION SEEDS was founded in the early 1960's as Ernst Crownvetch Farms.
- ❑ Note: Averill Cook, my partner, is working with Ernst on their Switchgrass project.

# Demand in Vermont

- 90% State money > 70% Jan 2007
- 25+ schools w/ Wood Chip systems
  - 22,000 gallons or more/yr.
- 2007 pellet fuel and whole kernel corn systems start to be installed in smaller schools



# BCC Vermont projects

- ☐ Religious facility
- ☐ Vermont Technical College
- ☐ Extended living facility
- ☐ 8 unit sub division
- ☐ 5 projects in Maine etc.

# Culture - VT projects

- Vermont Technical College
  - 3 track curriculum
  - operations & service training
- Develop curriculum for elementary schools
- Shelburne Farms
- In discussions w/ UVM



# Global Culture

- ❑ Our local efforts in developing biofuels are essential contributions to a new global culture supporting a renewable, green economy.
- ❑ The biosphere knows no boundaries and sees no differences amongst us.
- ❑ We must learn to do the same

## Islam, Aikido, and Environmental Sustainability

Within the traditions of Islam, Aikido, and the way of the western pilgrim are the seeds for developing a common understanding of a positive, peaceful, and sustainable future. Aikido teaches that maintaining one's own balance in the world, whether in self-defense or in life, is the key to harmony. Western philosophy, going back to ancient Greece, teaches that *balance and moderation are key to living in harmony with the world.* Although oft honored in the breach, biblical teachings in both Judaism and Christianity speak of living in harmony with nature, and of humankind's responsibilities as steward of the environment.



## Islam, Aikido, and Environmental Sustainability

### 2

Today, and in future generations, our ecosystem is ultimately the source of our daily bread, our health, happiness, and source of life. There is no question that Americans have been living far beyond our ecological footprint. However, we now have a unique opportunity as *we stand at a fateful tipping point*. If we can learn to move thoughtfully and expeditiously in balance with our own humanity, our global ecological footprint, and the sustainable needs of our most immediate environment, *we can forge a common ground*. From this common ground *diverse cultures can reach across the chasms of distrust and self interest to collaborate with one another to protect our global, regional, and local environments*. As we de-escalate our relatively unintelligent and abusive exploitation of sequestered carbon, we have to keep in mind that *we can maintain and improve health and human prosperity under such conditions by increasing social capital and knowledge sharing exponentially*.

## Islam, Aikido, and Environmental Sustainability

### 3

Many have not yet recognized that our global economy is currently moving from a low knowledge sharing, highly concentrated, nonrenewable energy dominated economy to a more intelligent, high knowledge sharing, less concentrated, more equitable, renewable energy economy. These forces are easily visible in the massive, rapid, global expansion of the World Wide Web. However, the transition will not be immediate, and will not necessarily unfold without very painful discontinuities. Time, energy, and significant capital will be essential for conversion, if a smooth landing is desired.



## More intelligent, high knowledge sharing

### ☐ Today

- ☐ Engineered biofuels
- ☐ Heating units that are internet appliances
- ☐ Emerging Global culture

### ☐ Tomorrow

- ☐ biofuel micro-CHP units
  - ☐ Plug-in, biofueled Hybrid transportation
  - ☐ Gore's distributed eletranet

# We can:

- ☒ Develop a new 21st century energy strategy
- ☒ Create a bioenergy economy
- ☒ Grow the farm economy globally
- ☒ Leave Sequestered carbon in the ground
- ☒ Forge a common ground



# I leave you with:

- ☐ Our Grandchildren's future depends upon our success.
- ☐ Got energy?
- ☐ Thank you for your attention
- ☐ Q&A

Live Green or Die!

# Resources

- Grass Energy Collaborative papers
  - Vermont's Green Gold
  - Grass Energy chapter - Farm Energy Handbook
  - GEC Working paper [40+ pages]
  - [www.jockgill.com](http://www.jockgill.com)

Balance and moderation are key to living in harmony  
with the world.



## Islam, Aikido, and Environmental Sustainability

### Credit

- ☐ Michael D. McDonald, Dr.P.H.
- ☐ President
- ☐ Global Health Initiatives, Inc.
- ☐ Coordinator
- ☐ National Disaster Risk Communication Initiative
- ☐ Principal Investigator
- ☐ Disaster Knowledge Management System
- ☐ Resilience Networks
  
- ☐ <http://www.greaterdemocracy.org/archives/000511.html>

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Live Green or Die!