

Kentucky Forum

Carbon Sequestration
Through Agriculture and
Forestry Management

Forum Summary



Kentucky Renewable
Energy Consortium



Kentucky Forum on Carbon Sequestration Through Agriculture and Forestry Management

On September 10, 2009, KREC – the Kentucky Renewable Energy Consortium – held the *Kentucky Forum on Carbon Sequestration Through Agriculture and Forestry Management* at the Frazier International History Museum in Louisville, Kentucky. The forum was organized by KREC with financial support from Energizing Kentucky.

Purpose & Goal of the Forum

There is a growing consensus in Kentucky that the Commonwealth's energy future will be greatly affected by energy and climate legislation at the federal and state levels.

Kentucky's transportation fuel and electric power sources will have to adhere to Renewable Portfolio Standards (RPS), Renewable Fuel Standards (RFS) and carbon-reduction requirements that will compel the state to expand its capacity to produce biofuels and seek carbon sequestration options to keep electricity rates at an affordable level and to protect the environment.

In response to these important challenges and opportunities facing Kentucky, KREC organized the *Kentucky Forum on Carbon Sequestration Through Agriculture and Forestry Management*. The forum was structured to present an informative and comprehensive look at carbon policy, biofuels and potential energy crops for the state. The event brought together people from various backgrounds with different areas of expertise and provided a dynamic discussion about Kentucky's options in a carbon-constrained future.

The Basics of CO₂ Sequestration

Carbon sequestration is "the capture of atmospheric carbon dioxide in a solid material or a carbon sink through biological or physical processes, such as photosynthesis¹." There are two ways to sequester carbon: geologically and biologically. Geologic sequestration involves pumping liquefied CO₂ underground. Biological sequestration involves sequestering carbon using natural media, such as trees, crops and soil. Biological methods of sequestering carbon were discussed at the forum and are the focus of this summary.



UofL President James Ramsey welcomes attendees and guest speakers to the forum. Dr. Ramsey spoke about the increasingly important role of energy in Kentucky and how "Energizing Kentucky" was formed to stimulate the efforts of government, business and education leaders to create a far-reaching and collaborative statewide energy policy.

As a new energy future emerges, climate legislation will be a part of that future.

Biological Sequestration

Agricultural Options

- Tillage
- No-till and Grassland
- Algae

Forestry Options

- Responsible Forest Management

1. <http://www.neo.ne.gov/statshtml/glossarys.htm>

In the future, Kentucky will have to reduce its net emission of carbon dioxide and provide more electricity to meet growing demand. This means that Kentucky will need to produce more energy while reducing the total amount of CO₂ emissions from that energy. In order to achieve these reductions while meeting future increases in demand, carbon sequestration will be necessary to keep electric rates low and the environment healthy.

Biological sequestration provides many benefits for Kentucky. Proper land management on farms and forests can sequester carbon in soil and trees and contribute to healthier farms and forests in general. Biological sequestration holds great economic promise for rural Kentuckians.

Biological Sequestration

Farms

Approximately 10% of Kentucky's land is used for cultivated crops. Relatively little of Kentucky's farm land is being used for carbon sequestration even though sequestration can take place on an active farm. Carbon dioxide is naturally sequestered in the soil through accumulation of plant litter and other biomass which collects as organic matter. The matter is broken down by weathering and biological degradation over time.

By modifying their tilling practices, farmers can continue to cultivate crops while sequestering carbon. Methods that significantly enhance carbon sequestration in soil include no-till farming, residue mulching, cover cropping, and crop rotation, all of which are more widely used in organic farming than in conventional farming. Because only 5% of US farmland currently uses no-till and residue mulching, there is a large potential for significant increases in soil-based carbon sequestration. Conversion to pasture land, particularly with good management of grazing, can sequester even more carbon in the soil. The end results are healthier fields and increased financial benefit to landowners.

Managed Forests

Approximately 47% of Kentucky is covered by deciduous forest. This means that forests are Kentucky's largest single land cover. Most of Kentucky's forests are privately owned and maintained. The Intergovernmental Panel on Climate Change concluded that "a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber fiber or energy from the forest, will generate the largest sustained mitigation benefit." Sustainable management practices keep forests growing at a higher rate over a potentially longer period of time, thus providing net sequestration benefits beyond those of unmanaged forests.

Landowners who actively manage their forests can realize a double benefit – financial gains from selling carbon credits and healthier forests that allow owners to store CO₂ for long periods of time. The combination of responsible forest management and the relative stability of carbon stored in forests makes carbon sequestration through forestry a potential new source of revenue for Kentucky.



Kentucky Energy & Environment Cabinet Secretary Len Peters presented Governor Beshear's strategic energy plan, Intelligent Energy Choices for Kentucky's Future. Secretary Peters acknowledged the need for a carbon sequestration policy for the Commonwealth, "More than 90 percent of Kentucky's electricity is derived from coal-fired power, and we rank 13th in total carbon dioxide emissions. Carbon capture and sequestration is crucial to continued use of coal as an energy resource in Kentucky."

Kentucky's farms and forests can provide cost effective greenhouse gas emission reductions which can provide environmental benefits and economic opportunities for the Commonwealth.

Benefits of Biological CO₂ Sequestration

Kentuckians can take advantage of the future demand for carbon offsets by selling their sequestered carbon in the marketplace. Though carbon markets are currently in their infancy, and prices are often subject to political and policy changes, these markets continue to grow and will offer a new way for landowners to reap a financial benefit from their activities.

Carbon credit buyers are essentially buying a promise that a particular amount of carbon dioxide will remain sequestered for at least 15 years. For this reason, buyers require proof that the investment is verifiable and monitored. Aggregators, organizations that verify, monitor and combine carbon offsets, fill this need. Aggregators facilitate the process of verification and monitoring while helping landowners find buyers for their offsets. Additionally, aggregators combine the offsets provided by many different landowners into one larger contract. This helps mitigate the risk of loss from natural disaster, theft or other type of reduction in CO₂ storage capacity.

In Kentucky, aggregators are already at work helping Kentuckians sell their offsets. The Kentucky Corn Growers Association (KYCGA) and the Mountain Association for Community Economic Development (MACED) currently aggregate farm and forest offsets, respectively.

Energy Crops

In addition to sequestering carbon dioxide in fields and forests, Kentucky will increasingly turn to energy crops as a low-CO₂ fuel source for the future. The Kentucky Forum on Carbon Sequestration Through Agriculture and Forestry Management featured three biomass energy sources – miscanthus, switchgrass and algae. In addition to these three sources, corn and soybeans are already converted to ethanol and biodiesel commercially in the Commonwealth. Kentucky currently has a Renewable Fuel Standard (RFS) of 12% and will likely face a Renewable Portfolio Standard (RPS) of 20% in the future. If the Commonwealth chooses to increase its production of biomass to meet these mandates, energy crop production in the state will need to expand.

Three questions were addressed at the forum:

- Are energy crops economical?
- How will growing energy crops affect other agricultural commodities in Kentucky?
- What steps can Kentucky take to ensure the development of an energy crop industry in the Commonwealth?

Types of Energy Crops

Miscanthus

- No university research currently being conducted in Kentucky
- Currently being used commercially in Kentucky
- Probable yield of 10 tons of biomass per acre

Switchgrass

- Research is being conducted by the University of Kentucky's Department of Agriculture
- Demonstration test plots are currently planted
- Not yet commercially viable
- Probable yield of 6 tons of biomass per acre

Algae

- Research is being conducted at the University of Kentucky's Center for Applied Energy Research
- Fast-growing and highly effective at capturing CO₂
- 70% of bio oil from algae can be harvested by pressing
- Not currently commercially viable

Benefits of Energy Crops

Academic, governmental and agricultural communities are planning for tomorrow's energy needs. Energy crops will undoubtedly be part of Kentucky's future energy mix. The Commonwealth's 12% RFS, and the anticipated federally-mandated 20% RPS call for increased energy crop production in Kentucky. These two requirements, coupled with carbon dioxide regulation, will compel Kentucky to utilize energy crops for much of tomorrow's power.

Energy crops from farms and forests will enable Kentucky to meet state and federal standards while benefiting the Commonwealth in a number of ways. Energy crops will:

1. Create jobs in rural areas through agricultural expansion
2. Promote responsible forest management practices for Kentucky's woodlands
3. Help decrease the amount of CO₂ emissions from Kentucky

The potential economic impact of expanded energy crop production in Kentucky is large. A white paper published as part of Governor Beshear's Biomass Task Force (<http://www.energy.ky.gov/biomass/>) predicts significant economic opportunities from biomass expansion. Assuming a 12% RFS and a 20% RPS, the white paper estimates that 26 million tons of additional biomass will be needed per year. This expansion is predicted to produce \$1.7 billion in revenue. To date, estimates furnished by the University of Kentucky have identified 11.9 – 14.6 million tons of biomass likely to be generated per year, given current economic and technological realities. While up to 14 million tons of biomass production has not yet been identified, the potential for biomass expansion in Kentucky remains great.

Business Applications

Kentucky's businesses can expect to be affected by a reduced carbon economy. Rising electric rates and transportation fuel costs will affect every company's bottom line. In addition to this, many of Kentucky's businesses emit significant amounts of CO₂. All proposed regulatory frameworks will compel them to reduce their net CO₂ emissions, either through efficiency, offsets or new power generation. The forum showcased three Kentucky businesses who have already adjusted their energy practices in anticipation of a reduced carbon economy.

Landfill Methane Gas

East Kentucky Power Cooperative (EKPC) is a Kentucky utility company that has already taken steps to generate power that avoids emitting greenhouse gasses and utilizes a local resource – landfill methane gas (LMG). LMG is generated by the breakdown of municipal solid waste in a landfill. For every one million tons of municipal solid waste, EKPC can generate .8 megawatts of electricity from methane that would otherwise be released into the atmosphere as a greenhouse gas. Another example of exploring landfill methane gas potential is the University of Louisville's feasibility study of replacing its coal burning power plant with a 6.5 mile gas pipeline that will connect the campus with a nearby landfill and provide power for the entire campus. Though the idea is currently in the proposal stage, it is an example of how organizations are looking for ways to diversify their energy sources in anticipation of a reduced carbon economy.

Wood Waste Utilization

Cox Interior, Inc., located in Campbellsville, Kentucky, produces a significant amount of wood waste. In the early 1990s, Cox began to search for an alternative way to dispose of their wood waste. The company reviewed their options and decided that biomass cogeneration was the best option for them. Today, Cox continues to provide for nearly all of its electricity needs through wood waste.



Greg Halich, Assistant Extension Professor at the University of Kentucky College of Agriculture, presented on the potential profitability of energy crops in a reduced-carbon economy.

In the process, Cox has seen its electric bills drop to nearly \$0, and occasionally sells electricity to its local provider. Perhaps just as important in the future, Cox can expect to largely avoid rate increases likely to come in a reduced-carbon economy.

Biofuels and Efficiency

United Parcel Service (UPS), located in Louisville, KY, uses a tremendous amount of fuel. As a result, the company is interested in improving energy efficiency and reducing its carbon emissions. UPS achieves both by minimizing the miles delivery trucks and airplanes travel and using biofuels in ground support equipment at airports. Collectively, these strategies prevented the emission of 3 million metric tons of CO₂ in 2008. Clearly, these efforts will help UPS transition into a reduced-carbon economy.

UPS believes that, “As a global transportation company, UPS acknowledges that greenhouse gas emissions impact the climate and pose a serious challenge to the environment—and ultimately the global economy. It is the responsibility of all segments of society to improve energy efficiency and to reduce carbon emissions in the atmosphere.”

Currently, existing businesses can look to the examples set by Cox Interior and UPS as they plan for a reduced-carbon economy.



Ernie Shea, Project Coordinator for the National 25x25 National Alliance presented “Solutions From the Land”, an overview of the organization’s initiatives and the potential for agriculture and forestry to deliver solutions to climate change in a reduced- carbon economy.

Opportunities and Challenges for Kentucky

A reduced-carbon economy poses many challenges and opportunities for Kentucky. Carbon sequestration, biomass development, economic development and university research are great opportunities for the Commonwealth. Governor Beshear has already begun to plan for development of these opportunities through publication of *Intelligent Energy Choices for Kentucky’s Future*, and the work of the Biomass Task Force. These actions will help Kentucky prosper in a reduced-carbon economy.

As with any significant change, a reduced-carbon economy has its challenges. Foremost among these challenges will be to fund research into, and formulate policy on, the sustainability of Kentucky’s reduced-carbon future. Sustainable policies and programs are needed to fully develop carbon sequestration and bioenergy. State policy should reflect this priority, and state leaders should support Kentucky’s transition to a reduced-carbon economy by recognizing it as an economic development opportunity, and enact legislation that will facilitate carbon sequestration and bioenergy development. Finally, funding research and forming policy will best be done with sustainability in mind. Kentucky’s immensely beautiful – and valuable – natural resources should be preserved and sustained for our current needs and for future generations.

Moving Forward

There are many options available to Kentucky as it develops a biofuels industry infrastructure and carbon sequestration resources. Experts from these fields came together at the forum to share their research, experience and thoughts on the various technologies Kentucky might utilize in a carbon-constrained future.

Perhaps the most important information revealed at the forum are the challenges and opportunities that will emerge in a reduced-carbon economy. Kentucky’s reliance on traditional sources of energy such as coal and oil leaves it vulnerable to carbon-reduction and renewable energy standards likely to be enacted in the future. Developing a strong biofuels industry in Kentucky and utilizing the Commonwealth’s carbon sequestration resources will ease the otherwise difficult regulatory and financial burdens that will likely accompany any future legislation.

A Call to Action

The purpose of this document is to convey what we learned at the forum to a wider audience, and to initiate a call to action.

Legislation will likely compel Kentucky to embrace sequestration techniques and biomass production in order to lower carbon emissions while keeping energy costs affordable. Kentucky should plan for and take action to respond to the changing energy landscape. Through the forum and this document, KREC hopes to educate Kentuckians about these emerging energy and environmental issues, and to initiate a continuing dialogue about Kentucky's future in a carbon-constrained world.

Actions we can take now include:

- Work to proactively establish carbon sequestration capacity and aggregation networks
- Support research to bridge the gap between University of Kentucky biomass estimates and desired production levels
- Provide businesses with information/case studies to aid successful implementation of carbon reduction practices and renewable energy production



Tom FitzGerald of the Kentucky Resources Council spoke on climate change and its impact on rural Kentucky.



Leah MacSwords of the Kentucky Division of Forestry discusses forest management in the Commonwealth.



Forum Speakers

James Ramsey, President, University of Louisville
Len Peters, Secretary, Kentucky Energy and Environment Cabinet
Cam Metcalf, KPPC, University of Louisville J.B. Speed School of Engineering
Ernie Shea, National 25x25 Initiative
Greg Halich, University of Kentucky, College of Agriculture
Tom FitzGerald, Kentucky Resources Council
Adam Andrews, Kentucky Corn Growers' Association
Scott Shouse, Mountain Association for Community Economic Development
Roger Thomas, Governor's Office of Agricultural Policy
Leah MacSwords, Kentucky Division of Forestry
Frank Moore, Kentucky Department for Energy Development and Independence
Ray Smith, University of Kentucky College of Agriculture
Michael Wilson, University of Kentucky Center for Applied Energy Research
Meredith Boyd, East Kentucky Power Cooperative
Betty Williamson, Kentucky Woodland Owners Association
Ruth Logsdon, Cox Interior, Inc.
Bill Jacob, UPS Airlines

The Forum was a Carbon-Neutral Event

KREC purchased 20 tons of CO₂ offsets from the CarbonFund.Org to offset forum activities and airline flight time to make the forum a carbon-neutral event.

KREC is administered by KPPC – the Kentucky Pollution Prevention Center – at the University of Louisville J.B. Speed School of Engineering. KREC acts as a clearinghouse and resource to exchange knowledge on renewable energy and energy efficiency activities of importance to Kentucky.

www.kppc.org/KREC

Energizing Kentucky is a partnership of the University of Louisville, the University of Kentucky, Berea College and Centre College which encourages Kentucky to focus on a coherent and integrated energy policy.

www.energizingkentucky.org



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