Meeting Highlights: Kentucky Ag Council Agri-Energy Committee
Western Kentucky University -- November 23, 2009

The meeting began at the WKU Center for Research & Development building, which includes a business incubator program and the Innovation and Commercialization Center funded by the State Economic Development Cabinet. The Committee was given a tour of the Institute for Combustion Science and Environmental Technology and were briefed on the Institute's activities by its director, Dr. Wei-Ping Pan.

The Institute does applied research, works in partnership with international companies such as P & G, BASF, Corning. A primary focus of its efforts is to look at materials that can be blended with coal (animal waste, bio mass) to reduce emissions of contaminants such as mercury and CO2. Their experimental combustion tower is the newest system in a US university setting. They also are working on conversion of algae to bio-diesel. They have been part of the experiments in burning switch grass with East Kentucky Power and Light, on which the committee had seen a video and been briefed at a prior meeting.

Their facility is experimenting using up to 30% bio mass mixed with coal. Bio mass is an easy way to control / reduce CO2 emissions. Part of their work is to determine the optimal percent of bio mass-to-coal needed to achieve desired reductions in CO2. Based on our soil, climate etc., Kentucky and Tennessee have greater potential to produce switch grass than anywhere in the US.

The Institute has a staff of between 10 – 16 FTE's including post-docs and graduate students. Its annual budget is in the range of $2.3 - $2.5 million, and it is self-supporting from grants and contracts with the exception of 50% of Dr. Pan's salary that comes from his position at Western's Chemistry Department.

The Committee then drove to Western's Ag research farm where members were given a tour of an experimental facility that uses a continuous flow anaerobic digester to clean animal waste and that yields clean and reusable byproducts (water, fertilzer, energy). The test facility has been developed by a private company, Organic Alchemy, in partnership with WKU research faculty, and is working to achieve scalability and commercial viability.

Committee members then reconvened at the Ag farm's main building, where they were briefed on WKU's research farm initiatives by Dr. Jack Rudolf, Chairman of the Department of Ag. The University has been looking at various approaches to generating renewable fuels.

Among these was a project to recycle cooking oil from campus facilities. The goal was to involve students, and they did most of the work to build a small-scale refinery. The refinery will be operational soon, with a capacity to process 1000 gallons / week of

waste cooking oil, versus a level of 6000 gallon / year that is generated on campus. Therefore a next stage could be to develop a system to pick up waste oil around the city. Currently Griffin Industries has a contract to do this, but they are exploring a new arrangement. The City could use the biodiesel produced by this refinery. Glycerin is a by-product that can be used in cattle feed, and/or the glycerin can be mixed with compost to make it break down faster.

Another initiative in partnership with the City has been to take leaves that the City formerly hauled to a county landfill, and develop a composting system at the Ag Farm, which the school sells at a discount. They are in the process of developing an experimental system to capture the heat generated by composting, using it to heat water that then can be piped through floor tubes to heat a farm greenhouse. The addition of glycerin to the composting process raises the heat levels beyond 130 degrees. Another approach may be to put tubes into the root zones of plants.

Still another example of WKU's holistic approach has been an experiment to address the problem of dead animal removal, and a facility constructed to accelerate composting of animals in a way that leave zero residue.

Dr. Blaine Ferrell, Dean of WKU's Ogden College of Science and Engineering, provided a further overview of WKU activities, including its partnership with the USDA Agricultural Research Service laboratory located at WKU, with whom they collaborate on improving techniques for animal waste disposal. A key issue for farmers is the question of scale of their operations: a farmer may only break even with 200 head of cattle, and could be profitable with 300 head, however in today's regulated environment they often cannot get the permits needed to expand their herd size. He emphasized again the need to take a holistic approach to farming.

He also cited other work being done by faculty on growing algae as a feedstock for biofuels. He also pointed out that Kentucky Bio Processing, which grows drugs (proteins) in tobacco plants, has had to turn down additional projects from pharmaceutical companies because they lack additional greenhouse capacity, however, they cannot afford to build / operate the additional greenhouses needed. Solutions such as the compost-to-heat that Dr. Rudolph described could provide a more economical way to heat greenhouses in the future.

Dr. Ferrell thanked the KAC for bringing its Ag Energy Committee meeting to Western and it visit its 900-acre research farm. He encouraged the KAC to return, noting that a more in-depth discussion of the USDA waste management operation could be a whole day unto itself.

The Committee next heard a briefing by Mr. Peter Nelson, a principal with BioDimensions in Nashville, TN, who also was a co-author of the study performed by

Battelle for a 96 county region of the Mississippi River watershed, including 8 Kentucky counties in the Purchase Area Development District. Mr. Nelson summarized the study's key findings and its implications for Kentucky. Copies of the report's Executive Summary were distributed. ***(See KAC website for direct links to this report.)***

A broad goal of the study was to identify ways to create an $8 billion green industry for production of biomass in the 98 county region that does not affect food supply. This included an assessment of new crop varieties that could be grown in this region, such as camellina – a weed from Montana that is being used in Europe for it high level of plant oil and BTUs. Sweet sorghum is another plant that has high potential in this region.

Because of climate, soil, topography etc., the Mississippi River region has the potential to be a "cafeteria for biomass" – much different than the Plains states, which are a "one trick pony" with their dependence on corn and soybeans.

A major emphasis of this study was to look at the potential for plant feedstocks to be refined into specialty chemicals, instead of using them to create transportation fuel. The value added for specialty chemicals is significantly greater than for bio diesel, and there are some 1600 specialty chemical companies in the US, versus only 5 – 6 oil companies. This creates a much greater and more diversified market.

BioDimensions is interested in working with other Kentucky organizations and regions to determine the potential to expand this analysis to cover more of the state.

The Committee then heard an update from Mr. Frank Moore of the Kentucky Energy and Environment Cabinet, regarding the Governor's Executive Task Force on BioMass and BioFuels.

The Task Force carried out its work on an aggressive 90-day schedule from September 2, with its final report due November 30. The goal of this effort is to educate top policy makers regarding the state of this industry in Kentucky, and to help raise awareness of the opportunities that exist for its further development. The initiative brought together the Department of Energy, the Governor's Office of Agricultural Policy, the Kentucky Department of Agriculture, the Economic Development Cabinet and legislative representatives.

This field covers a wide range of agricultural products and activities. Kentucky has "lots of little pockets of activity". The timetable the Task Force looked at is between the present and 2025, with a target for the State of producing 25 million tons of biomass by that date. The effort is designed to make people knowledgeable and build support for greater bio mass production.

The role of the state is to facilitate development of these markets, to help put the right people together. The energy mix of Kentucky is very different from other states: the

Mississippi delta states have no coal, while West Virginia has no significant agriculture other than forest products.

A question, answer and discussion period followed in which Mr. Nelson and Mr. Moore addressed a number of questions further.

Mr. Moore suggested that the State's strategic plans for Agriculture and for Energy need to be closely aligned. The State's energy strategy currently address bio-based energy. He also underscored the value of having a consortium of groups working together to push these issues forward.

The issue of "sustainability" was raised; greater production of biomass could pit producers against environmental groups. The tradeoffs need to be understood, and standards established that promote biomass production.

Tod Griffin, chair of the KAC Agri Energy Committee, asked whether there is a need to change the psychology of farmers, to encourage them to become educated about and to pursue the opportunities for biomass crops. Perhaps there is a KAC role in public relations or education, to this effect. The KAC should look for ways that it can help ensure producers are part of this process.

The question of how to make production of new crops profitable for farmers remains critical. Other issues that were raised included:

- ramifications of large agribusiness or energy corporations tying up land through large scale, long-term leases, in order to control the markets;
- the need to help farmers and smaller, decentralized producers and logistics companies manage the supply chain;
- homeland security issues and the advantages of a decentralized energy network;
- providing "rural energy for rural America".

Intermediate processing of raw biomass into forms that are more economical to transport is a critical problem. Midwest Biofuels is creating bricks of miscanthus for blending with coal; these now can be shipped by barge. More industry partnerships are needed to promote such solutions.

Dr. Bruce Pratt briefed the committee on bio energy initiatives being undertaken at Eastern Kentucky University, primarily in the area of producing biodiesel from hetero tropic (versus photo tropic) algae. The process involves harvesting various forms of biomass from a 50 miles radius around Winchester (primarily switchgrass and wood products), extracting the sugars out of the biomass and feeding them to the algae. This is being done with San Diego-based General Atomic, and is supported by a DoD grant of $3.6 m, and grants from GOAP of $220,000 and from the Appalachian Regional Commission of $350,000.

The process can achieve a 5 –7 day turnaround and is yielding output that is 75-80% oil, versus norms of 50%. This is a critical issue, the ratio of the growth rate versus the amount of oil production (over time); the shorter the turnaround time, the more oil can be produced, improving the economics.

Another issue is the question of "co-product" versus "by-product". For example, what can be done with the leftover algae? Can it be a feedstock for a further process? Dr. Pratt suggested a coalition among the state's university efforts also would help improve communication and coordination of effort, and lead to more corporate partnership opportunities.

Scott Maas informed the Committee about important USDA initiatives to fund feasibility studies for renewable energy projects at the farm level, i.e., to promote the use of anaerobic digesters. Kentucky farmers are not taking sufficient advantage of these opportunities, in comparison with other states such as Iowa and Nebraska. He would like the KAC's help in getting the word out to more farmers so that funds that are allocated to Kentucky do not remain unused.

Chairman Griffin summarized the discussion by noting the importance of getting more information out to the KAC membership about these developments: new technologies, new market opportunities to grow and process crops. We need to involve groups such as the Kentucky Livestock Coalition in this process, and work closely with USDA Rural Development.