

**Biomass Research & Development
Technical Advisory Committee**

December 1-2, 2009

Meeting Summary

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List of Acronyms

Committee - Biomass Research and Development Technical Advisory Committee

Board - Biomass Research and Development Board

DOE - U.S. Department of Energy

USDA - U.S. Department of Agriculture

JBEI - Joint BioEnergy Institute

MSW - Municipal Solid Waste

BCAP - Biomass Crop Assistance Program

OMB - Office of Management and Budget

NAREEE - National Agricultural Research, Extension, Education, and Economic

NRCS - Natural Resources Conservation Service

FS - Forest Service

Farm Bill - Food, Conservation, Energy Act of 2008

EIA - Energy Information Association

EPA - Environmental Protection Agency

RFS - Renewable Fuel Standard

I. Purpose

On December 1-2, 2009, the Biomass Research and Development Technical Advisory Committee (Committee) held its final quarterly meeting of calendar year 2009. The purpose of the meeting was to receive updates and discuss recent activities of the Biomass Research and Development (Board), the U.S. Department of Energy (DOE), and the U.S. Department of Agriculture (USDA). The Committee also heard presentations on drop-in fuels and the Joint BioEnergy Institute (JBEI). In addition, the Committee approved their FY2009 annual recommendations and discussed the FY2010 Committee Work Plan. The one and a half-day meeting was held in Washington, D.C.

A list of attendees is provided in Attachment A and the meeting agenda in Attachment B. Meeting presentations can be viewed online at <http://biomass.govtools.us> (click on "Publications").

Background: The Committee was established by the Biomass R&D Act of 2000 (Biomass Act) which was repealed and replaced by Section 9008 of the Food, Conservation, and Energy Act of 2008. The Biomass R&D Board was established under the Biomass Act to coordinate activities across the Federal agencies. The Committee is tasked with advising the Secretary of Energy and the Secretary of Agriculture on the direction of biomass research and development.

II. DOE Update

Laura McCann, Biomass Program, U.S. Department of Energy

Laura McCann provided an update on the recent activities of DOE's Biomass Program. Currently, the Biomass Program has three active solicitations underway – the Integrated Pilot-Scale or Demonstration-Scale Biorefinery for Advanced Biofuels, Ethanol Blends Infrastructure and Outreach, and Algal and Advanced Biofuels. A status update on where those were in the process was given, as well as, a list of those awarded funds under the DOE/USDA Joint Solicitation. In addition, upcoming workshops being hosted by the Biomass program, including details on Biomass 2010 was discussed.

Gil Gutknecht asked what the four technical tracks for Biomass 2010 were. The first track is looking internally – coordinating between Office of Science and the Office of Biomass. The second will address feedstock logistics and production. The third is talking about drop-in fuels. Finally, the fourth is looking at the full biofuels life cycle.

Mark Maher wanted to know why infrastructure was not included in the list of Biomass 2010 tracks. It is not a major focus this year because it was last year, however it will be included in other sessions at Biomass 2010. Additional funding has been allocated for other infrastructure workshops.

Ralph Cavalieri inquired about other sources of funding available for biomass. In DOE the Vehicle Technologies Program and the Office of Science also have funds available for biomass. We are working to have someone at a future meeting to address these other program areas.

III. USDA Update

Bill Hagy, Bioenergy Program, Rural Development, U.S. Department of Agriculture
Bill Hagy gave the Committee an update on recent activities at USDA. He highlighted three areas of interest to the group: the Biofuels Interagency Working Groups, designing a new sustainability model, and how Farm Bill programs are being implemented.

The Committee members had the most questions related to the new Farm Bill Programs. Jim Martin wanted to know who was using the new Biomass Crop Assistance Program (BCAP). Those who are not growing Title I crops or algae have been using the program which is currently out of funds from the first apportionment, USDA is waiting on additional funding. Although, algae is currently not eligible, it is under consideration to be added to the program. Eric Larson followed up asking about what kind of payments people are receiving. BCAP can pay up to \$45 a ton.

David Bransby raised the issue about loopholes in the program and that the forestry industry was using this program in a way it may not have been intended, whereas the producers, who really need it, like those growing switchgrass, were being left out. USDA is aware of the issues with the forestry industry and they are working to address it in proposed rulemaking.

The Committee wrapped up with a discussion regarding USDA's efforts on creating a sustainability model. They will be developing a model that addresses social, economic and environmental factors.

IV. Biomass Research and Development Board

Steven Koonin, Under Secretary for Science, DOE

Bill Hagy gave a brief update on the Biomass Research and Development Board (Board). The four principals met on November 17, 2009 and talked about priorities for the Board. The first Board meeting will be held in early January and they will be making updates to the plan to reflect the current Administration's thinking on second and third generation biofuels.

Under Secretary Koonin, the new DOE co-chair for the Board, shared his views on biomass and gave the Committee feedback on the draft FY2009 recommendations. He also raised the importance of determining how the Committee should interact with the Biofuels Interagency Working Group that was created by the President in May. He believes the Committee should focus on research and development while the Biofuels Interagency Working Group should focus on commercialization.

Jim Matheson – What is your position on electric cars?

US Koonin: Currently we are in a transportation economy with significant headroom to pursue many technologies – from engine efficiency to batteries. Hybrids are coming in, but are an intermediate. I expect to see a stable state around electric hybrids – the current goal is 1 million plug-ins – but to get there we must have developments in battery technology. Ultimately cost will determine the pace by which this development occurs.

Eric Larson: *What are the top issues associated with carbon capture and storage and biomass*

US Koonin: *(1) cost (2) scalability (3) timeliness. Ultimately its integration will rest on economics*

David Bransby: *Municipal Solid Waste (MSW) as a feedstock has not been used in significant volumes, but it could take us to 2022 as filler until other feedstocks available.*

US Koonin: *Interested to see your numbers.*

Mark Maher: *Please comment on the intermediate blend wall.*

US Koonin: *The blend wall is real, but I would be surprised if DOE got involved with the EPA decision making process.*

Dallas Tonsager, Under Secretary for Rural Development, USDA

Under Secretary Tonsager, the new USDA co-chair for the Board also addressed the Committee. He gave a brief snapshot of his background and talked about the need to focus on all components of biomass. In addition, he emphasized the importance of thinking in terms of feasibility – market, financial, and environmental when focusing on renewable fuel goals.

He stressed the importance of understanding markets, commercialization, and challenges that still need to be addressed including: availability of materials, will producers grow crops for what we are willing to pay, and the need for an industry twice the size of what we have today.

David Bransby: *I was recently in China and their government can move fast. In the US current funding programs are still not adequate, and it is no easier to get a loan guarantee than it is to get a loan from a bank.*

US Tonsager: *I agree. We have process challenges. We are partnering with our lending partners to explore ways we can improve the delivery of our loan guarantee programs. Some of these new renewable energy industries will be viewed by the lending community as very risky. We are evaluating possible ways of spreading this risk around some no one party has all the risk in a venture.*

Jim Matheson: *How can we change world production?*

US Tonsager: *Using regionally available feedstocks makes the most sense, however we should investigate a wide diversity of feedstocks. Even though we may understand mechanically first, second, and third generation biofuels we are still missing the economic components. We need to look at everything, learn as we go, and eventually we will get a National biofuels strategy.*

Jim Martin: *The Billion Ton Study states that there are potentially 1.4 billion tons of annually renewable feedstocks that could be harvested. Where is the human power going to come from that could make that number a reality? Will there be hospitals and schools?*

US Tonsager: This would be a wonderful challenge to have as people have been moving out of these areas, not moving in. US Rural Development is working on this.

V. Drop-In Fuels

Valerie Sarisky-Reed, Biomass Program, U.S. Department of Energy

Valerie Sarisky-Reed, of the DOE Biomass Program, gave an update to the Committee on drop-in fuels, also known as advanced biofuels. Recent studies highlight the potential of advanced biofuels other than cellulosic ethanol. Compared to ethanol, this next generation of biofuels would be more similar in chemical makeup to gasoline, jet and diesel fuels. Their compatibility with the existing infrastructure may expedite rapid displacement of petroleum (hydrocarbon-based fuels) in the market. DOE is targeting breakthroughs in biofuel technology to make abundant, affordable, low-carbon biofuels a reality through its partnership with DOE's Bioenergy Research Centers and funding through the American Recovery and Reinvestment Act.

Jim Matheson raised concerns that the cost targets seemed aggressive and a need to manage expectations. The cost targets are based on scenarios at a hypothetical plant (Nth plant) and that we will not be producing it for that cost. However, it is important to try and hit a cost target now, because it will motivate the industry to ramp up and meet the goal. The technologies that are being pushed forward are because they are economically viable.

VI. FY2010 Work Plan

Full Committee Discussion

The Committee held a discussion regarding their FY 2010 work plan. Next year the Committee would like to hear more about the following:

- Prioritizing the FY2010 Recommendations
- Sustainability
- Continuum – following science from lab bench to commercial plant
- Laboratories – validate the work industry/start-up companies are doing and examining how the Committee can help them be successful
- Hearing from those involved in research, commercialization, and involved in the industry
- Low Carbon Fuel Standard
- Fuel standards for ethanol, ethanol blends
- Invasive species
- ARPA-E
- Validation
- Presentation from the Council on Sustainability
- Examining the business of Biomass and what a future looks like
- Carbon markets
- Update on climate change legislation
- Update from the Energy Information Association (EIA)
- Hear what various Committee members are working on
- Environmental Protection Agency Update

- Update from the Coordinating Research Council on mid-level blends

VII. National Agricultural Research, Extension, Education, and Economics Renewable Energy Committee Update

Carol Keiser Long, Chair, National Agricultural Research, Extension, Education, and Economics Renewable Energy Committee

Carol Keiser-Long gave an update on USDA's National Agricultural Research, Extension, Education, and Economic (NAREEE) Renewable Energy Committee which is focusing on biobased products, animal waste, and a larger leadership role for USDA. Corresponding to USDA's efforts to develop a sustainability model, she talked about the need for a comprehensive database to be developed with good sustainability data. In addition, it needs to integrate agriculture into data sets including the Natural Resources Conservation Service (NRCS) and the Forest Service (FS) using accepted global standards and impacts.

The NAREEE Renewable Energy Committee will meet in February 2010 and there was a discussion about coordinating or meeting at the same time as the Committee to help minimize duplicate recommendations.

VIII. JBEI

Jay Keasling, Director, Joint BioEnergy Institute (JBEI)

Jay Keasling gave an overview of the Joint BioEnergy Institute (JBEI). JBEI is located in the San Francisco Bay area and is a scientific partnership led by Lawrence Berkeley National Laboratory and includes the Sandia National Laboratories, the University of California campuses at Berkeley and Davis, the Carnegie Institution for Science and the Lawrence Livermore National Laboratory.

JBEI's research is focused on the efficient conversion into fuels of lignocellulosic biomass. Lignocellulose is a mixture of complex sugars and lignin, a non-carbohydrate polymer that provides strength and structure to plant cell walls. By extracting simple fermentable sugars from lignocellulose and producing biofuels from them, the potential of the most energy-efficient and environmentally sustainable fuel crops can be realized. The primary mission of JBEI is to advance the development of the next generation of biofuels and is part of three new DOE Bioenergy Research Centers.

Mark Maher asked whether they have created a full development chain at a pilot facility. Jay Keasling said that although it is possible it has not been done yet. Amyris and LS9 are both spin off companies from the lab in the process of building pilot scale plants. However they start from sugars, not raw feedstocks. Novozymes and Genencor are working very hard on enzymes and although Amyris and LS9 use some of those enzymes there is not currently a company associated with the lab that takes the process from start to finish.

Dave Vander Griend inquired as to the difficulties around lignin stripping. Jay Keasling said they have investigated the costs, which depends on how many steps you have to go through to separate the lignin and what you can recover. Ionic liquids are currently a very expensive solution, but could be made economically viable if you were able to recover and reuse it. There are currently plans to build a pilot plant facility.

Finally, Eric Larson, noting that micro algae does not have much lignin, asked if JBEI has looked at algae as a potential solution. Jay Keasling said they'd looked at it a little bit, but it has not been a huge examination. Boeing is interested in using algal oils for jet fuel.

IX. Overcoming the “Valley of Death”

Panel chair: Scott Brown, Founder and CEO, New Energy Capital

Jay Kouba, President & CEO, TetraVitae Bioscience

Mike Ladisch, Chief Technology Officer, Mascoma

Kevin Gray, Chief Technology Officer, Qteros

Bill Davis, CEO, Ze-Gen

Scott Brown, Founder and CEO of New Energy Capital served as the panel chair for the discussion about how to overcome the “Valley of Death.” He started the discussion noting that energy security, environmental security, and economic security all are intertwined. The market is being driven by regulations and incentives that have been drafted in response to national and environmental security risks. At the same time, the market is constrained by extremely low risk tolerance in the financial markets, particularly the debt markets. This is an industry that needs significant funding over a long period of time. Long-term federal support is appropriate to reflect the national interests served by addressing the national and environmental security risks. Private capital markets are not well suited to serve these ends.

Each member of the panel talked about the market, company approach and challenges that need to be addressed and/or overcome. In addition, the Committee asked the panel a few questions to help frame the discussion including: What resources could USDA/DOE provide to shorten the length of the valley? What do you see as important – big policy initiatives that are needed and would make a difference? What are the key ingredients for success?

Mike Ladisch, Chief Technology Officer, Mascoma

Mike Ladisch believes that there is an adequate existing infrastructure and enough biomass feedstock to support large commercial plants. The largest cost for the industry is enzymes. The fractional cost of enzymes is twice that of a feedstock such as wood and this is excessive for a commodity. To move forward, the industry is working on reducing enzyme costs. Mascoma's approach addresses the reduction of enzyme costs by using microorganisms that both produce their own enzymes and ferment sugars to ethanol. Mascoma has made significant process in reducing enzyme costs as part of its scale-up and research efforts.

Mascoma finds it helpful that the DOE and USDA are funding projects that reduce technology risk and thereby help the pathway to commercialization. Reducing the cost share requirements of 50% would assist these efforts. The leading cohort of advanced biofuel projects represents the birth of a new industry, but is more difficult to finance than projects in established sectors of the renewable energy industry. The loan guarantee program needs to find ways to address the differences in the risk, rather than judge projects in the emerging part of the industry on the same basis as projects in established sectors. Developed industries should not be judged in the same in the loan guarantee program as developing industries. Clarity on RFS II, carbon capture, trade policies, the definition of biomass materials and proposals for removing the blend wall will also assist the emergence of advanced biofuels.

Kevin Gray, Chief Technology Officer, QTEROS

Kevin Gray worked for Verenium prior to joining Qteros in mid-2009. Qteros is a technology development company focusing on biomass to ethanol conversion and does not intend to build/own/operate a plant, but may be a minority equity partner. Due to the difficulty of producing enzymes onsite at ethanol plants, Qteros is working on eliminating the enzyme step. The removal of a separate enzyme step should help reduce capital costs.

Having DOE/USDA continue funding research and development improving the process economics would be useful. In addition, scale up demonstration sites would be valuable.

Jay Kouba, President and CEO, TetraVitae Bioscience

Jay Kouba reminded the Committee that the “Valley of Death” is nothing new. Capital intensive industries have been around for the last sixty years. Since enormous capital is required for the start up of an enterprise, it is important to have investors believe in the process and not worry about seeing cash flow.

TetraVitae will use an existing facility and retrofit to reduce capital, whereas the bias today is toward single integrated biorefineries. The choices TetraVitae is making will almost guarantee they will not receive DOE funding. He would like to see government get out of the technology validation business and let the financial industry choose the winners and losers.

Bill Davis, Ze-Gen

Ze-Gen’s focus is waste. There are one billion tons of waste generated per year, and fifty percent is biomass (domestic). That equates to 50,000 MW of renewable power generation, meaning it would be the largest utility in the United States. Ze-Gen is using existing infrastructure and technology and does not anticipate having to build larger facilities.

Challenges facing Ze-Gen include getting up to scale. They are working toward a twenty times scale up, and then will double that size in order to have some profitability. The challenge the company faces is how you get from a very successful technology to a profitable operational plant.

DOE/USDA could help by ensuring that “waste” biomass does not fall through the cracks of Federal funding initiatives and ensuring that loan guarantees are not only for big projects, but also scale-path solutions.

Q&A

After the panel finished, it was opened up to questions from the Committee. Jim Matheson asked about how you fund innovation and still get to deployment. Bill Davis responded, that the companies who innovate, but don't deploy are not successful. The industry is seeing a lot more people who are familiar with how to run a capital intensive start-up company and less people who are just believers in the cause.

Pam Contag wanted to know if guaranteed 10-15 year access to biomass would be huge to a small company. If so could the Government facilitate this to help ensure success? Mike Ladisch responded that although there are policies in place that are helpful (DOE supports ethanol development, USDA ARS supports corn and soybeans) the level and continuity of funding must remain constant even when oil prices may seem attractive.

X. Public Comment

There were no public comments.

Attachment A: Committee Member Attendance

Co- Chairs	Affiliation	Attended?
Gil Gutknecht		YES
W. Henson Moore		YES

Members	Affiliation	Attended?
Robert Ames	Tyson Food, Inc	YES
William Berg	Dairyland Power Cooperative	YES
David Bransby	Auburn University	YES
Ralph Cavalieri	Washington State University	YES
Pamela Reilly Contag	Cygnnet Biofuels	YES
Bob Dinneen	Renewable Fuels Association	YES
Scott Faber	Food Products Association (GMA/FPA)	NO
Richard Hamilton	Ceres Inc.	YES
Douglas Hawkins	Rohm & Haas	YES
Dermot Hayes	Iowa State University	NO
E. Alan Kennett	Gay & Robinson Sugar	NO
Charles Kinoshita	University of Hawaii	YES
Craig Kvien	University of Georgia	YES
Eric Larson	Princeton University	YES
Jay Levenstein	Florida Department of Agriculture and Consumer Services	YES
Mark Maher	General Motors	YES
Timothy Maker	Biomass Energy Resource Center, Inc.	NO
Jim Martin	Omni Tech International	YES
Jim Matheson	Flagship Ventures	YES
Mary McBride	CoBank	YES
Mitchell Peele*	North Carolina Farm Bureau	NO
Michael Powelson	The Nature Conservancy	YES
J. Read Smith	Agricultural Energy Work Group	YES
David Vander Griend	ICM	YES
Edwin White	State University of New York	YES
Rodney Williamson	Iowa Corn Promotion Board	YES

Total – 23 of 28 members attended

Attachment B: Agenda

Day 1:

December 1, 2009

- 8:45am – 9:15am *Breakfast (to be provided for Committee)*
- 9:15am – 9:30am *Welcome*
Co-Chairs Henson Moore and Gil Gutknecht
- 9:30am – 10:00m *Presentation: DOE Update on Biomass R&D Activities*
Laura McCann, Biomass Program, U.S. Department of Energy
- 10:00am – 10:30am *Presentation: USDA Update on Biomass R&D Activities*
Bill Hagy, Rural Development, U.S. Department of Agriculture
- 10:30am – 10:45am *Break*
- 10:45am – 11:15am *Vote: FY 2009 Annual Recommendations*
Full Committee
- 11:15am – 11:30am *Presentation: Biomass R&D Board Co-Chair*
Steven Koonin, Under Secretary for Science, DOE
- 11:30am – 12:00pm *Presentation: Drop-in fuels*
Valerie Reed, Biomass Program, U.S. Department of Energy
- 12:00pm – 1:00pm *Lunch (to be provided for Committee)*
- 1:00pm – 2:00pm *Discussion: FY 2010 Work Plan*
Full Committee
- 2:00pm – 2:15pm *Presentation: Biomass R&D Board Co-Chair*
Dallas Tonsager, Under Secretary for Rural Development, USDA
- 2:15pm – 3:15pm *Discussion: Committee / Board Interface*
Full Committee
- 3:15pm – 3:30pm *Presentation: NAREEE Update*
Carol Keiser-Long, NAREEE Committee Chair
- 3:30pm – 4:00pm *Presentation: JBEI*
Jay Keasling
- 4:00pm *Adjourn*

Day 2:

December 2, 2009

- 8:00am – 8:30am *Breakfast (to be provided for Committee)*
- 8:30am – 10:30am *Panel: Overcoming the “Valley of Death”*
Panel chair: Scott Brown, Founder CEO, New Energy Capital
Jay Kouba, President & CEO, TetraVitae Bioscience
Mike Ladisch, CTO, Mascoma
Kevin Gray, CTO, Qteros
Bill Davis, CEO, Ze-Gen
- 10:30am – 10:45am *Recognition of departing members*
- 10:45am – 11:00am *Public Comment*
- 11:00am *Adjourn*