

**Biomass Research and Development  
Technical Advisory Committee**

**August 17–18, 2016**

***Meeting Summary***

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## List of Acronyms

ARS – Agricultural Research Service  
BETO – Bioenergy Technologies Office  
Board – Biomass Research and Development Board  
CAAFI – Commercial Aviation Alternative Fuels Initiative  
Committee – Biomass Research and Development Technical Advisory Committee  
DOE – U.S. Department of Energy  
DPA – Defense Production Act  
FY – fiscal year  
gge –gasoline gallon equivalent  
GHG – greenhouse gas  
gpy – gallon per year  
NIFA – National Institute for Food and Agriculture  
R&D – research and development  
REAP – Rural Energy for America Program  
RFI – request for information  
USDA – U.S. Department of Agriculture  
VTO – Vehicle Technologies Office

## I. Purpose

On August 17–18, 2016, the Biomass Research and Development Technical Advisory Committee (Committee) held its third meeting of 2016. The Committee received updates from the U.S. Department of Energy’s (DOE’s) Bioenergy Technologies Office (BETO), as well as representatives from the U.S. Department of Agriculture (USDA), who delivered presentations about current USDA activities.

See Appendix A for a list of meeting attendees. See Appendix B to review the meeting agenda. Meeting presentations can be viewed on the Biomass Research and Development Initiative website at the following link: <https://biomassboard.gov/committee/meetings.html>.

**Background:** The Committee was established by the *Biomass Research and Development Act of 2000*, which was later repealed and replaced by Section 9008 of the *Food, Conservation, and Energy Act of 2008*. The Biomass Research and Development Board (Board) was established under the same legislation to coordinate activities across federal agencies. The *Food, Conservation, and Energy Act* has recently been amended by the *Agricultural Act of 2014*. The Committee is tasked with advising the Secretary of Energy and the Secretary of Agriculture on the direction of biomass research and development (R&D).

## II. Welcome

*Kevin Kephart, Committee Co-Chair*

*Paul Bryan, Committee Co-Chair*

Dr. Kephart and Dr. Bryan welcomed the Committee to the third meeting of the year and called the meeting to order.

## III. Committee Business for 2015 and DOE Updates

*Elliott Levine, Designated Federal Officer, DOE*

Mr. Levine provided an update and overview of the Committee’s activities. He started with a summary of what has been discussed by the Committee in 2016. These topics include the following:

Prior years’ recommendations:

- Continue R&D efforts to reduce required investment and operating expenses for production of biofuels and bio-products.
- Emphasize specific opportunities to develop a robust national bioeconomy.
- Suggest practices for valorizing societal benefits of the bioeconomy (e.g., rural jobs, technology leadership, national security, balance of trade, greenhouse gas [GHG]-emission reductions, etc.)

2016 recommendations:

- Advance tools of synthetic biology to create new products and better manufacturing methods.

- Develop new agricultural technology to enhance carbon sequestration.
- Utilize urban and agricultural wastes as feedstocks.

Third-quarter meeting:

- Focus on biomass-derived jet fuel as a product.
- Combine landscape design, regional feedstocks, biomass blending, and the depot concept to improve biomass supply, storage, and distribution systems.

Mr. Levine also provided the 2016 priority activities and goals of BETO:

- Feedstock Supply & Logistics: Produce an updated, fully integrated assessment of potential available feedstock supplies under previously established environmental and quality criteria.
- Advanced Algal Systems: Pursue new research in advanced biology and carbon dioxide utilization to address yield, productivity, and integration of downstream logistics at the pre-pilot scale.
- Conversion: Select and complete preparation of at least two pathways for validation at integrated bench or pilot scale in fiscal year (FY) 2017 of modeled mature \$3/gasoline gallon equivalent (gge) gasoline/diesel blendstock price and progress toward FY 2022 price goals (\$3/gge).
- New Fuels and Vehicle Systems Co-Optimization: Establish a link early in the R&D cycle of both fuels and engines for a systems-based approach and create optimized solutions for fuels and engines. Collaborate with the Vehicle Technologies Office (VTO).
- New Investments in the Integrated Production and Scale-Up of Drop-in Hydrocarbon Fuels: Make selections in October 2016 for new competitive awards for Validation Phase to scale up integrated production systems of drop-in hydrocarbon biofuels to accelerate advanced biofuel manufacturing.
- Defense Production Act of 1950 (DPA): Support the military-specification jet fuel in collaboration with the Department of Defense and USDA through the DPA.

Mr. Levine then went on to provide updates from DOE Program Offices with biomass-related activities.

Updates on funding opportunities include the following:

- On July 14, 2016, BETO announced up to \$15 million for three projects aimed at reducing the production costs of algae-based biofuels and bioproducts through improvements in algal biomass yields. These projects will develop highly productive algal cultivation systems and couple those systems with effective, energy-efficient, and low-cost harvest and processing technologies.
- On August 2, 2016, BETO announced \$11.3 million for three projects that support the development of biomass-to-hydrocarbon biofuels-conversion pathways that can produce variable amounts of fuels and/or products based on external factors, such as market demand. This funding will develop new strategies for biorefineries, resulting in long-term benefits to the United States, including chemicals and products manufacturing.
- A request for information (RFI), was released on June 8, 2016, asking for input about specific aspects in the development of large-scale supply systems and technologies to eventually supply up to 1 billion dry tons of biomass feedstocks annually for a variety of end uses. BETO sought feedback from industry, academia, research laboratories, government agencies, and other

stakeholders to support a “Billion-Ton Bioeconomy.” The goal is to develop the components of processing and handling (unit operations) of biomass and demonstrate the viability of an Advanced Feedstock Supply Systems on-scale in the future. Responses were due June 30, 2016.

- A RFI on Cellulosic Sugar and Lignin Production Capabilities was released on July 20, 2016. It sought input from industry, academia, national laboratories, and other biofuels and bioproducts stakeholders to identify existing capabilities to produce lignocellulosic sugars and lignin for use by the research community. The purpose of this RFI is to develop a comprehensive list of suppliers who are willing and able to produce and sell cellulosic sugar and/or lignin for use by the research community. Responses were due August 24, 2016.
- The Co-Optima Funding Opportunity Announcement was released on August 1, 2016, with up to \$7 million in project funding to accelerate the introduction of affordable, scalable, and sustainable high-performance fuels for use in high-efficiency, low-emission engines. Submission deadline for full applications is October 16, 2016, at 5 p.m. Eastern Time.

Recent related events include the following:

- The Sustainable Transportation Summit was held on July 11–12, 2016, in Washington, D.C. The summit highlighted progress and achievements in sustainable transportation R&D and efforts to bring new technologies to market, including the President's EV [electric vehicle] Everywhere Grand Challenge. Topics included Pathways to Deep Decarbonization in Transportation, Adoption of New Vehicle Technology, Net-Zero Carbon Fuels, and The Future of Mobility.
- The Bioenergy 2016 Conference was held July 12–14, 2016, in Washington, D.C. This year's conference was focused on opportunities to grow future feedstock supplies and breakthrough technology barriers to achieve a stronger bioeconomy. Attendees discussed critical bioenergy issues such as: innovation and emerging pathways; vision for a national bioeconomy; feedstocks forecasting and supply analysis; marketplace exploration; and strategic public engagement.

Upcoming BETO events include the following:

- *Alternative Aviation Fuel Workshop*: September 14–15, 2016 in Macon, Georgia.
- *Biorefinery Optimization Workshop*: October 5–6, 2016 in Chicago, Illinois.

Recent reports released included the following:

- The *National Algal Biofuels Technology Review* was released on June 28, 2016.
- *2016 Billion-Ton-Report*, volume 1 was released in July 2016

Currently BETO is finalizing a 2016 Strategic Plan. The plan reflects the changing energy landscape and dynamics, concerns over GHG emissions, and public demand for alternative energy sources and environmentally friendly products.

Mr. Levine also offered updates from VTO's Office of Basic Energy Sciences and Advanced Research Projects Agency-Energy.

## **IV. USDA Update on Biomass R&D Activities**

*Todd Campbell, U.S. Department of Agriculture*

Mr. Campbell highlighted the various activities that USDA is conducting under the *Agricultural Act of 2014* or Farm Bill. The Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program (9003) now provides loan guarantees of up to \$250 million to develop, construct, and retrofit commercial-scale biorefineries and to develop renewable chemicals and biobased product manufacturing. For this announcement, USDA will seek applications in two cycles. Applications for the first funding cycle were due October 3, 2016. Applications for the second cycle are due April 3, 2017. The Repowering Assistance Program (9004) is accepting applications to encourage the use of renewable biomass as a replacement fuel source for fossil fuels used to provide process heat or power in the operation. To be eligible for payments, biorefineries must have been in existence on or before June 18, 2008. Applications will be accepted through October 24. The Rural Energy for America Program (REAP) announced \$43.2 million in loan guarantees and \$11.6 million in grants through REAP for projects in every state, as well as in the Virgin Islands, Western Pacific, and Commonwealth of Puerto Rico. Five awards made for biomass systems included a loan guarantee of a \$3.9 million loan to Lakeview Biodiesel, LLC to purchase assets with plans to upgrade the 10 million gallon-per-year (gpy) former Producer's Choice Soy Energy facility in Moberly, Missouri. The Small Business Innovation Research Program has more than \$8.3 million in available funding through the National Institute for Food and Agriculture for the Small Business Innovation Research program to support small businesses in the creation of advanced R&D projects that will lead to innovative solutions for American agriculture. Applications were due October 6. The Agriculture and Food Research Initiative Coordinated Agricultural Project and Alcohol-to-Jet had a major milestone reached in June when two commercial Alaska Airlines flights departed Seattle-Tacoma Airport fueled by 1,500 gallons of alcohol-to-jet fuel made by Gevo, Inc., blended at 20% with petroleum-based jet fuel.

To address the challenges and opportunities of advancing the billion-ton bioeconomy, the Agricultural Technology Innovation Partnership Foundation is coordinating a series of regional bioeconomy forums to garner input from a broad range of stakeholders. This input will help shape a multiyear implementation plan, to be prepared by the Biomass R&D Board by the end of the calendar year. Forums are confirmed for Atlanta, Georgia (September 16); Mineral Wells, Texas (September 29); Seattle-Tacoma, Washington (October 3); Orono, Maine (October 18); and Columbus, Ohio (November 15).

## **V. USDA Rural Development-Rural Business Cooperative Services**

*Mark Brodziski, Director, Energy Division Rural Business—Cooperative Service, USDA*

Mr. Brodziski provided an overview of the USDA Rural Business Cooperative Services Energy Programs. The Rural Business Cooperative Service utilized loan guarantees. Mr. Brodziski offered an overview of the key terms and definitions that the Cooperative Service uses for terms such as renewable biomass, biorefinery, biofuel, and advanced biofuel. He then provided overviews of the Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program (9003), the Rural Energy for America Program, and the Business & Industry Program.

## **VI. Overview of the Office of Science and Technology Policy and Its Role on the Biomass Board**

*Robert Strickling, Staff Director for Environment and Energy Office of Science and Technology Policy, Executive Office of the President*

Mr. Strickling provided an overview of the Office of Science and Technology Policy. Their responsibilities are to ensure that the policies of the executive branch are informed by sound science and technology and provide policy analysis and recommendations on interagency science and technology initiatives, federal R&D budgets, etc. He then provided more specifics about the Environment and Energy Division. Starting with the President's Climate Action Plan, he provided details on cutting carbon/GHG pollution, Soil Health Initiative Activities, Transportation, and Environmental Regulation.

## **VII. Advanced Biodigester Systems**

*John Haeckel, Chief Executive Officer, Clean Fuel Partners*  
*David Merritt, Dane County Commissioner's Office*  
*Stephen Dvorak, DVO, Inc.*

John Haeckel from Clean Fuel Partners first provided an overview of the company's experience with the Dane County Wisconsin Digester Project. He started by providing a basic overview of anaerobic digesters highlighting manure only and multiple waste stream options. He then provided specifics on the Dane County facility. Clean Fuel Partners purchased the facility in December 2015 at a cost of \$14 million, with \$4 million provided by Wisconsin through Dane County. The digester outputs 2 megawatts of generating capacity—solids separated and sold as bedding to farms outside the watershed, and liquids returned to farms for spreading. Since acquiring the digester, Clean Fuel Partners have brought the idle digester back online, purchased a new, larger centrifuge, and performed substantial deferred maintenance. The digester's success depends on throughput. Quality substrates are important and harder to find. There is increasing pressure on farms, governments, and waste generators to clean up discharge streams. New projects will continue to be complicated with multiple stakeholders involved and financial challenges of making treatment technologies work at small scales.

Next, David Merritt from the Dane County Commissioner's Office provided an overview of the Dane County Digester project from the Office's perspective. The Clean Fuel Partners facility, is one of two digester facilities in the County along with the GL Dairy Biogas-Gundersen Health System facility. A Dane County Manure Digester is a system that consists of multiple components, including manure collection and digestion, fiber separation from digestate, fiber (phosphorus) export out of the watershed, and centrate application to fields to meet crop needs according to a land spreading plan. Dan County's actions with digesters were the result of two manure discharge events in 2005. A Manure Task Force was then formed by the County Executive. One of the Task Force recommendations was to develop regional anaerobic digester facilities to process manure. From 2006–2008, a community manure feasibility study was completed that evaluated options that would meet the county's nutrient-management goals. Anaerobic digestion was found to increase the availability of plant-available



nutrients, reduce odors and pathogens, produce a renewable fuel, and provide a consistent product for post-secondary processing of nutrients.

Stephen Dvorak from DVO, Inc. provided an overview of the status of digester technology. DVO was founded in 1989. They have 120 digesters operating at 90 sites in the United States, as well as international operations. Mr. Dvorak discussed the different technologies available and the outputs of digester reactions. The outputs include electricity and heat, as well as biosolids such as biochar and phosphorus.

## **VIII. Landscape Research-Past, Present, and Future Activities**

*Doug Karlen, USDA-Agricultural Research Service (ARS)*

*Mike Casler, USDA-ARS*

*Bill Belden, Antares Inc.*

Doug Karlen from USDA-ARS gave a presentation, called “Landscape Research: From a Vision to an Implementation Strategy Concept Background.” He gave a background on his history with landscape research. Then, he emphasized the importance of landscape diversity, highlighting how that diversity provides feedstock for bioenergy and bioproducts, enhances nutrient cycling, sequesters carbon, provides food, feed, and fiber resources, and others. He then discussed the multiple pathways for landscape research and discussed double cropping.

Mike Casler from USDA-ARS, provided a presentation on goals and accomplishments focusing on the sustainable production and distribution of bioenergy for the Central United States. The vision for the Midwest for sustainable biofuels is to create a regional system for producing advanced transportation fuels and bioproducts derived from perennial grasses grown on land that is either unsuitable for marginal or row crop production. In addition to producing advanced biofuels, the proposed system will improve the sustainability of existing cropping systems by reducing agricultural runoff of nutrients and soil and increasing carbon sequestration. He then discussed their outlook on elements such as distributed processing, land classes, crop types, and fast pyrolysis. He then provided details on all of the CenUSA bioenergy program areas including the following:

- Feedstock Development
- Sustainable Production Systems
- Feedstock Logistics
- System Performance
- Feedstock Conversion
- Markets and Distribution
- Health and Safety
- Education
- Extension and Outreach
- Commercialization.

Finally, Bill Belden from Antares Inc., gave a presentation called “Enabling Sustainable Landscape Design for Continual Improvement of Operating Bioenergy Supply Systems Private Sector Opportunities, Challenges, and Implementation Strategies.” His presentation included a high-level overview of projects, the importance of planned project activities, initial estimates/examples of potential impacts, and implementation strategies, challenges, and opportunities.

## **IX. Aviation Biofuel Update**

*Steve Csonka, Executive Director, Commercial Aviation Alternative Fuels Initiative*

Mr. Csonka from the Commercial Aviation Alternative Fuels Initiative (CAAFI) provided an overview of the progress and challenges of the Sustainable Alternative jet fuel industry. He first provided an overview of CAAFI, which is an aviation industry coalition established to facilitate and promote the introduction of sustainable alternative jet fuel. The goal is the development of non-petroleum, drop-in, jet fuel production with equivalent safety and performance, comparable cost, environmental improvement, and security of energy supply for aviation. The commercial aviation commitment to decouple carbon growth from demand growth is currently being converted into pending regulation. The industry has met challenges that include proving technical viability and identifying versatile solution, and modest amounts of sustainable alternative jet fuel coming online. Challenges that remain include risk, affordability, financing, execution, more feedstocks, and processes. CAAFI is working with a full range of public-private-partnerships to break down barriers, lower risk, and facilitate supply. Mr. Csonka then ran through the latest airline offtake agreements with United, Alaska Airlines, Cathay Pacific, British Airways, Southwest, and FedEx. He then went through example feedstocks and conversion pathways under consideration by region.

## **XI. Subcommittee Breakout Reports**

Draft recommendations below that are under development fall under three key themes.

- Improved Profitability of Bioeconomy Industries
- Bioeconomy Market Drivers
- Stimulate Public Awareness and Acceptance

### **Improve Profitability of Bioeconomy Industries**

- Continue and expand R&D to address technical challenges and gaps to reduce feedstock, capital, and operating costs and risks throughout the supply chain by supporting efforts to increase yields, improve efficiencies, and innovate around bottlenecks.
- Leverage existing programs and develop new programs as needed that are designed to de-risk technology, feedstock supply, and market penetration in order to stimulate private investment and financing. (This is shorter-term.)
- Focus on low-value or negative-value feedstocks for early technology advancements (municipal solid waste or wet waste) to move conversion technology forward without feedstock cost barriers (feedstock cost reduction). (This is shorter-term.)

- Improve the science and understanding of indirect land use; emphasize low-carbon-intensive crops; and further consider nutrient and land-management best practices.
  - Increase densification of biomass, implement sustainable landscape design, and better enable lands to produce 1 billion tons of biomass (feedstock cost reduction).
- Continue to develop technologies and integrated system components from feedstock to products. Further cost reduction will allow products and fuels to be ready to take advantage of the policy push. (This is longer-term.)
  - Focus public R&D on feedstocks and production processes that require minimal inputs (e.g., water, nutrients, chemicals, and energy) to achieve socially, economically, and environmentally sustainable yields.
- For large-scale systems, breakthrough technologies are needed to reduce capital expenditure. Invest research funds in increasing smaller, modular systems as another path to cost reduction. Leverage existing infrastructure to reduce costs, particularly in the area of product distribution (capital cost reduction).
  - Better enable the approval and certification process of bio-replacements, either direct replacements or functional replacements. This can be done through better standardization of requirements across the infrastructure (capital cost reduction).
- Conduct research with a focus on automated and intelligent systems that can help reduce labor demand (operating cost reduction).
- Continue support for a national network of advanced manufacturing institutes for bio-applications.

## Bioeconomy Market Drivers

- Support policies that enhance the growth of the bioeconomy, such as implementing the Renewable Fuel Standard mandate; increasing federal funding for research; incentivizing use of bioproducts and biofuels; and expanding the BioPreferred program.
- Focus research on areas where we know the market is ready to accept and promote bioproducts/biofuels as they are available. Support initiatives for product and market development.
  - There is a role for government to help create markets through collaborations, cooperative research and development agreements, and shared equipment (e.g., access to national laboratories via the Small Business Vouchers Program).
  - There is a need to identify the markets that will provide a market pull in the “low-oil/low-carbon” environment that we are in. One clear market is jet fuel, but others (biochar) could exist and be better enabled to take the first steps in advancing the bioeconomy.
  - To improve the competitiveness of biofuels with fossil fuels, focus on promising biofuel and bioproduct market segments, including biodiesel, biochar, and aviation fuels, and feedstocks such as urban wastes, that have good prospects for near-term profitable, beneficial application.

- Promote and/or support policy drivers or other incentives for biofuel technology development. Long-term stable policy reflecting the benefits of biofuels and showing the real cost of fossil fuels are needed to drive technology innovation, behavior, and to stimulate adoption of biobased fuels and products.

### **Stimulate Public Awareness and Acceptance**

- The bioeconomy requires a value proposition that is better understood and embraced by the public. Conduct analysis to determine a framework to characterize and quantify the environmental, economic, social, and national security benefits of the bioeconomy.

### **XVI. Closing Comments**

The meeting was adjourned.

## Appendix A: Committee Member Attendance—August 17–18, 2016

<b>Co-Chairs</b>	<b>Affiliation</b>	<b>Attended?</b>
Kevin Kephart	South Dakota State University	Yes
Paul Bryan	Consultant	Yes
<b>Members</b>	<b>Affiliation</b>	<b>Attended?</b>
Dean Benjamin	Verso Corporation	Yes
Esteban Chornet	Enerkem	No
Steve Csonka	Commercial Aviation Alt. Fuels Initiative	Yes
Vonnie Estes	Consultant	Yes
Emily Heaton	Iowa State University	No
Joseph James	Agri-Tech Producers, LLC	Yes
Randy Jennings	Tennessee Department of Agriculture	No
Coleman Jones	General Motors Corp.	No
Man Kit Lau	BioAmber Inc.	Yes
Maureen McCann	Purdue University	No
Bruce McCarl	Texas A&M University	Yes
Christine McKiernan	BIOFerm Energy Systems	No
Ray Miller	Michigan State University	Yes
Shelie Miller	University of Michigan	No
Marina Moses	American Academy of Microbiology	No
Neil Murphy	State University of New York	No
David Nothmann	Valent USA	No
Kimberly Ogden	University of Arizona	Yes
Manuel Garcia Pèrez	Washington State University	Yes
William Provine	Dupont	No
Anna Rath	NexSteppe	No
Patricia Scanlan	Black & Veatch	Yes
James Seiber	University of California	No
Abolghasem Shahbazi	North Carolina A&T State University	Yes
Don Stevens	Cascade Science and Technology Research	Yes
John Tao	O-Innovation Advisors LLC	Yes
Kelly Tiller	Genera Energy, Inc.	Yes
Valerie Thomas	Georgia Institute of Technology	Yes
Alan Weber	MARC-IV Consulting/Weber Farms	Yes

**Total: 18 of 31 members attended**

## Appendix B: Agenda—August 13–14, 2016

### Day 1: Technical Advisory Committee Meeting:

Wednesday August 17, 2016

- 8:30 a.m. – 8:40 a.m.      Introduction and Welcome  
*Committee Co-Chairs*
- 8:40 a.m. – 9:00 a.m.      Presentation: U.S. Department of Energy (DOE) Update on Biomass Research and Development (R&D) Activities  
*Elliott Levine, DFO, U.S. Department of Energy*
- 9:00 a.m. – 9:15 a.m.      Presentation: U.S. Department of Agriculture (USDA) Update on Biomass R&D Activities  
*Todd Campbell, U.S. Department of Agriculture*
- 9:15 a.m. – 9:45 a.m.      Presentation: USDA Rural Development – Rural Business Cooperative Services  
*Mark Brodziski, Director, Energy Division Rural Business – Cooperative Service, U.S. Department of Agriculture*
- 9:45 a.m. – 10:15 a.m.      Presentation: Overview of the Office of Science and Technology Policy and its role on the Biomass Board  
*Robert Strickling, Staff Director for Environment and Energy Office of Science and Technology Policy, Executive Office of the President*
- 10:15 a.m. – 10:30 a.m.      *Break*
- 10:30 a.m. – 11:30 a.m.      Panel: Advanced Biodigester Systems
- *John Haeckel, Chief Executive Officer, Clean Fuel Partners*
  - *David Merritt, Dane County Commissioner’s Office*
  - *Stephen Dvorak, DVO, Inc.*
- 11:30 a.m. – 12:15 p.m.      Presentation: Aviation Biofuel Update  
*Steve Csonka, Executive Director, Commercial Aviation Alternative Fuels Initiative*
- 12:15 p.m. – 12:30 p.m.      Public Comment
- 12:30 p.m. – 1:15 p.m.      *Lunch*
- 1:15 p.m. – 2:15 p.m.      Panel: Landscape Research – Past, Present, and Future Activities
- *Doug Karlen, USDA-ARS, Landscape Research: From a Vision to an Implementation Strategy Concept Background*
  - *Mike Casler, USDA-ARS, CENUSA I –Goals and Accomplishments: Review of a NIFA CAP Addressing the Challenge*

