Biomass Research and Development

Technical Advisory Committee

March 8–9, 2016

Meeting Summary

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List of Acronyms

ARPA-E	Advanced Research Projects Agency–Energy
ARS	Agriculture Research Service
BETO	DOE Bioenergy Technologies Office
Board	Biomass Research and Development Board
BRDI	Biomass Research and Development Initiative
BTEC	Biomass Thermal Energy Council
Committee	Biomass Research and Development Technical Advisory Committee
DOE	U.S. Department of Energy
EERE	DOE Office of Energy Efficiency and Renewable Energy
FARB	*Federal Activities Report on the Bioeconomy*
INFEWS	Innovations at the Nexus of Food, Energy and Water Systems
LPO	DOE Loan Programs Office
NIFA	National Institute for Food and Agriculture
R&D	research and development
USDA	U.S. Department of Agriculture

I. Purpose

On March 8–9, 2016, the Biomass Research and Development Technical Advisory Committee (Committee) held its first meeting of 2016. The Committee received updates from the U.S. Department of Energy's (DOE's) Bioenergy Technologies Office (BETO), as well as U.S. Department of Agriculture (USDA) representatives delivering 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 (BRDI) website at the following link: 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Background: The Committee was established by the Biomass Research and Development Act of 2000, which was later repealed and replaced by Section 9008 of the Food, Conservation, and Energy Act of 2008.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

Dr. Kephart welcomed the Committee to the first 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 activities for the upcoming year. He then went on to provide updates from DOE program offices with biomass-related activities. The draft *Federal Activities Report on the Bioeconomy* (FARB) was released on February 18. This report aims to educate the public on the wide-ranging, federally funded activities that are helping to bolster the bioeconomy. There are four upcoming BETO events: the Aviation Workshop on May 24–25, 2016; the Biorefinery Optimization Workshop on May 2–3, 2016; the *Bioenergy 2016* conference on July 12–13, 2016; and the Bioenergy Reducing Gulf Hypoxia in the fall of 2016.

IV. USDA Update on Biomass R&D Activities

Todd Campbell, USDA

Mr. Campbell started his talk highlighting the finalization of the Renewable Fuel Standard. He also highlighted the launch of the Great Green Fleet and announced that Farm to Fly 2.0 has expanded to Florida, Georgia, and Alabama. He provided an overview of the Biofuel Infrastructure Partnership and discussed ethanol markets. Mr. Campbell then presented highlights from the National Institute for Food

and Agriculture (NIFA) and the BioPreferred program, as well as updates on the Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program (9003).

V. BRDI Solicitation, Status, and Update

Daniel Cassidy, NIFA, USDA

Mr. Cassidy provided an update on the BRDI solicitation, noting that 414 concept papers were submitted to the request for proposals. Of these, 47 full applications were accepted, and 8 were identified as outstanding or very good. USDA and DOE are looking to make a joint announcement on awards soon.

VI. Overview of the DOE BETO 2016 and 2017 Budget, New Areas, and Activities

Jonathan Male, Director, BETO, DOE

Jonathan Male provided a presentation that informed the Committee on BETO's program, budget, achievements and focus areas, current and upcoming activities, and publications. The challenge is that more than $1 billion is spent every three days on U.S. crude oil imports, and transportation accounts for two-thirds of petroleum consumption and 26% of greenhouse gas emissions in the United States. The opportunity is that more than 1 billion tons of biomass could be sustainably produced in the United States, and biomass could displace up to 30% of U.S. petroleum use by 2030 and reduce annual carbon dioxide equivalent emissions by 400 million tons, or 7% of U.S. energy emissions. Mr. Male provided an overview of BETO's core focus areas and key challenges for biofuels. He introduced the administration's bioenergy goals and discussed BETO funding. He highlighted achievements for the overall program and for each program portfolio, including Feedstock, Conversion, and Demonstration and Market Transformation, as well as other initiatives such as the Defense Production Act. He then discussed 2016 goals and 2017 planned activities. Mr. Male announced some upcoming workshops, such as the Algal Biology Toolbox Workshop and Biorefinery Optimization Workshop, each planned for the spring of 2016. Upcoming reports to be released are the FARB, the *2016 Billion-Ton Update*, and the BETO strategic plan.

VII. Office of Energy Efficiency and Renewable Energy (EERE) Strategic Plan and High Priorities

Rueben Sarkar, Deputy Assistant Secretary for Transportation, EERE, DOE

Rueben Sarkar presented on high-priority activities within EERE at DOE. He started by highlighting some of EERE's key planning drivers, including the President's Climate Action Plan, the DOE strategic plan, the *Quadrennial Energy Review*, and the *Quadrennial Technology Review*. He then focused on the EERE strategic plan, vision, and mission. He listed five core questions driving EERE activities:

- **Impact:** *Is this a high-impact problem?*
- **Additionality:** *Will EERE funding make a large difference relative to existing funding from other sources, including the private sector?*

- **Openness:** *Are we focusing on the broad problem we are trying to solve, and are we open to new ideas, approaches, and performers?*
- **Enduring Economic Impact:** *How will EERE funding result in enduring economic impact for the United States?*
- **Proper Role of Government:** *Why is this investment a necessary, proper, and unique role of government rather than something best left to the private sector?*

He then went on to provide details about EERE's strategies for the sustainable transportation goal and discussed the EV Everywhere Grand Challenge, SuperTruck and Super Truck II initiatives, Fuel and Engine Co-Optimization initiative, H_2USA public-private partnership, Materials Genome Initiative, Energy Materials Network, and Clean Cities program.

VIII. Overview of the 2016 Budget, New Areas, and Activities for USDA's NIFA

Dr. Sonny Ramaswamy, Director, NIFA, USDA

Dr. Ramaswamy started his talk by directing the Committee to the NIFA *FY 2017 President's Budget Proposal* booklet he handed out to the Committee. From the booklet, he focused on Small Business Innovation Research and Agriculture Food and Research Initiative activities. Dr. Ramaswamy emphasized the need to translate knowledge into solutions for consumers. He highlighted minority institutions and acknowledged that land-grant universities get the majority of funding, with the remainder going to universities, private institutions, and individuals. In the last few years, more funding has gone to non–land grant universities, becoming more competitive.

IX. Bioenergy and Bioproduct Development in Agriculture Research Service (ARS)

Dr. Gene Lester, National Program Leader, Quality and Utilization of Agricultural Products/Biorefining and Biofuels

Dr. Lester provided an overview of the ARS's Regional Biomass Research Centers. These include the Central-East, Southeastern, Northwestern, and Western Centers. He also discussed the Regional (Utilization) Research Centers, including the National Center for Agricultural Utilization Research and the Eastern, Southern, and Western Regional Research Centers.

X. The Food, Energy, and Water Nexus—Implications for Innovation and Biomass R&D

Dr. JoAnn Lighty, Division Director, Division of Chemical, Bioengineering, Environmental, and Transport Systems, National Science Foundation

Dr. Lighty is the co-chair of the Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) working group. She provided an overview of the INFEWS to the Committee. The INFEWS goals are to understand the systems through integrated systems modeling; create methodologies for effective data

integration/cyber elements; research innovative solutions and technologies; and support education, workforce, and community development. In 2015, they issued 17 workshop grants on the interactions of food, energy, and water. In 2016, INFEWS is issuing some solicitations on a traineeship track and on systems and interdisciplinary approaches.

XI. Advanced Research Projects Agency–Energy (ARPA-E) and Biomass R&D

Dr. Krishna Doraiswamy, Technology-to-Market Advisor, Transportation Energy Resources from Renewable Agriculture, ARPA-E

Dr. Doraiswamy provided on overview of the ARPA-E AgroEnergy initiatives to the Committee. ARPA-E's mission is to overcome long-term and high-risk technological barriers to the development of energy technologies. The AgroEnergy initiatives include Plants Engineered to Replace Oil, Transportation Energy Resources from Renewable Agriculture, Terrestrial Greenhouse Gas Biosequestration through Root Architecture, and Macroalgae as a potential biomass resource. He then provided highlights from each area.

XII. Federal Activities Report on the Bioeconomy

Harry Baumes, Director, Energy Policy and New Uses, Office of the Chief Economist, USDA

Mr. Baumes provided some background on the bioeconomy grand challenge charge to the Board in 2013. He then outlined the list of activities that have been accomplished leading to the FARB, which the Board released on February 18. This report aims to educate the public on the wide-ranging, federally funded activities that are helping to bolster the bioeconomy. The FARB details a vision for a billion-ton bioeconomy—tripling the size of today's bioeconomy by 2030. The vision for the billion-ton bioeconomy is to sustainably reach the United States' full potential of biomass-derived products as a way of expanding our nation's economy. In doing so, the bioeconomy will provide multiple economic, environmental, and social benefits to the nation. The goal of the billion-ton bioeconomy is to develop innovative ways to remove barriers to expanding the sustainable use of nation's abundant biomass resources for biofuels, bioproducts, and biopower, while maximizing economic, social, and environmental outcomes. Mr. Baumes put forth a series of questions, requesting feedback from the Committee to help further shape our vision and move forward to a tangible initiative. Below are some initial questions for feedback:

- Is a billion-ton bioeconomy feasible?
- What can federal agencies do to increase the likelihood of private financing?
- Working to develop a new bioeconomy initiative, what aspects of federal activities in the bioeconomy should be prioritized?
- What should the government's role be in developing higher value products?
    - Won't industry pursue chemicals on their own due to potential profits?
- How do biomass-derived feedstocks become tradable national commodities?
- Do you perceive a lack of qualified individuals to support a growing bioeconomy?

- If so, what can be done to address this gap?

XIII. DOE's Loan Programs Office (LPO) and the Bioeconomy

Kerri Neary, Technical Project Manager, Technical and Project Management Division, LPO, DOE

Ms. Neary provided on overview of the LPO activities related to bioenergy and biofuels. LPO is helping to bridge the commercial deployment funding gap. LPO's technology areas of interest are drop-in biofuels and waste-to-energy. Requirements for eligibility for loans include innovative technology, greenhouse gas benefits, location in the United States, and reasonable prospect of repayment. Outputs LPO can support in this area are bioenergy, biofuels, biochemicals, and bioproducts. Ms. Neary then provided the details of the loan application process.

XIV. Subcommittee Breakout Reports

The Committee than broke out into their Subcommittee groups for breakout discussions. Below is a summary of their subcommittee report outs.

Feedstocks and Logistics Recommendations

1. FARB questions
    a. Is a billion-ton bioeconomy feasible?
    b. What can federal agencies do to increase the likelihood of private financing?
        i. Drivers
            1. Coordination
            2. Consistent and stable policy
        ii. Discovery
            1. Cooperative R&D agreement
            2. Consistent research funding with large consortium and individual lead projects
        iii. De-risk
            1. Private finance
            2. Cooperative R&D agreement
            3. Small Business Innovation Research
                a. Phase III increase priority to help boost private capital
                b. Need mentors to assist small companies on business investment opportunities
            4. Crop Insurance
            5. USDA Venture Capital Rural Business Investment Corp.
            6. USDA Loan Guarantee Program
                a. Explore modifications to the program to support greater biomass-related activity
    c. Working to develop a new bioeconomy initiative, what aspects of federal activities in the bioeconomy should be prioritized?
        i. Brainstorming to maximize the level of support federal agencies
        ii. Closer relationships with the Board working groups and Committee
        iii. Identification of agencies outside the Board that may have meaningful roles
    d. What should the government's role be in developing higher-value products?
        i. Won't industry pursue chemicals on their own due to potential profits?

1. Target chemical industry for listening session
2. Government should continue laboratory- and bench-scale research to feed to industry

e. How do biomass-derived feedstocks become tradable national commodities?
   i. Strategic Feedstock Reserve to provide incentive for feedstock zones
      1. Create value for sustainability and other additional externality factors
      2. Private or public land that would need management
         a. Road development impacts
         b. Wildlife habitat impacts
   ii. Quality and trading standards
      1. "Dry ton"
      2. Example: A FOA for oil seeds
f. Do you perceive a lack of qualified individuals to support a growing bioeconomy?
   i. If so, what can be done to address this gap?
      1. Plenty of young professionals ready to get into the field. Is there security in the sector? Is the uncertainty not attracting leaders to the sector?
      2. Must create the market and the work force will follow
      3. Incubator programs have switched to other sectors based on markets.
g. We are planning other listening sessions and workshops in the next three months; what other topics need to be covered?

2. Potential Feedstock Subcommittee deep dive topics
   a. Priority
      i. Ecosystem services
         1. Biomass remediation
         2. Environmental Protection Agency: RE-Powering America's Land
         3. Mine land reclamation
         4. Utilization of invasive species?
         5. Food/energy/water
         6. Logistics
      ii. Feedstock-specific workshop topics
   b. Others topics to consider
      i. Aviation fuels
         1. Feedstock supply
      ii. Biomass to Btu (British thermal units)
         1. Clean Power Plan
         2. Energy Information Administration study on densified fuel production
         3. Electric Power Research Institute or Federal Energy Regulatory Commission

Conversion

1. What is the role of government?
   a. Analysis should be conducted to include a projected timeline to better understand milestones and set realistic goals in moving forward growing the bioeconomy.

b. More transparency on issues and more public-private partnerships should be established to address challenges. More conversation could be facilitated by the government with academic and industry sectors to open dialogue on barriers.
c. Bioeconomy will not flourish at current cost structure—two options for government to close the gap: (1) tax fossil fuels to capture the social/environmental disadvantages and (2) subsidize the bioenergy industry at a higher level.
d. There needs to be strategic planning that comes from the top levels of government driving the bioeconomy, which will need mandates and other economic incentives to help drive production and investment.
e. We understand bioenergy/products are not currently economically mature markets. In order to achieve broader goals, there needs to be a commitment from the government to lower the costs of production through some mechanism.
f. There should be considered looks at the export potential for ethanol and targeting non-U.S. use, to look at comparative advantage to having the United States as worldwide provider. This could help build up production and technology capability. Could look at international trade agreements to enable this export market.

2. What is the government's role in high-value products?
    a. There is concern that there is not a large enough market in products to ensure enough of a demand driver for bioproducts in the bioeconomy.
3. Workforce development
    a. There is a lack of qualified individuals; however, retraining programs could take care of this issue. Moreover, there is the recognition that if the large enough industry demands, a job force would emerge.
    b. Programming could be created and standardized, including at the community college level, to allow for growth.
4. Financing
    a. Stable policy is required.
    b. Government should lead the demand by establishing itself as primary consumer. For example, creating artificial demand through the United Sates by securing large purchases of biofuels, allowing for some subsidies to bring down the cost to 'competitive.'
        i. Changes to existing purchase models may need to be revised, such as only contracting fuel purchases on a 1-year basis.
5. Extra comments
    a. In continuing mission for the FARB, can agencies provide success stories, ongoing research focus areas, and/or specific programs dedicated to the bioeconomy? Perhaps create (or expand existing) databases to show interested stakeholders the work already done to advance the industry.
    b. Even if we have the knowledge to break through technology barriers, the industry still needs to show it can be profitable.
    c. In order to develop a larger bioeconomy, there is a need to assign costs (penalties) to the fossil fuel industry, and/or show relieve for the benefits of a renewable fuel.

Products Markets and Systems

1. Best of the Committee
    a. Transition for new administration
2. Expand on last year's statement to enforce Renewable Fuel Standard
    a. Define what enforcement entails
3. Deep dive
    a. Value chain on one topic/pathway/product
        i. Prescriptive/advocacy perception
    b. Markets, regulations, or logistics with examples
        i. Horizontal rather than vertical
4. For feedstocks—work on succession plan for NIFA AFRI CAP
5. Identify and quantify externalities of bioenergy
    a. Pathways to monetize these
    b. Values adding to sale on decision to regulate (CAA example)
6. Restructure to better align with new goals

XV. Public Comment

Ben Bell-Walker, Biomass Thermal Energy Council (BTEC)

Thank you, members of the Committee, for the opportunity to provide a few comments today. My name is Ben Bell-Walker. On behalf of the Biomass Thermal Energy Council, I would like to congratulate the TAC on the leadership role it has played in advancing inter-agency cooperation to advance best practices in biomass utilization, as described in the recent Federal Activities Report on the Bioeconomy. Going forward, one area in which we think the TAC's role could grow even further is in a stronger focus on the development of an infrastructure around proven technologies that utilize solid biofuels for thermal-led combined heat and power and for heating and cooling needs.

As the Committee is no doubt aware, the total efficiency of a thermally led biomass combined heat and power system can top 80%, while standalone electric power generation applications for biomass tend to hover around 25% conversion efficiency. Simply put, an "all of the above" energy strategy that largely excludes one of the most efficient uses for waste biomass feedstocks for the roughly 1/3 of national energy use dedicated to heating and cooling, can't be said to live up to its name.

BTEC has been a proud collaborator with bodies such as the Federal Energy Management program, for example, as it works to implement Executive Order (EO) 13693, "Planning for Federal Sustainability in the Next Decade," the successor to EO 13514, which stipulates biomass thermal energy as a path for government agencies to meet their agency greenhouse gas reduction goals, as the GSA's "Green Proving Grounds" program and the Department of Veteran's Affairs are already doing. In addition, we have actively engaged with the USDA Forest Service State Wide Wood Energy Teams, and USDA Rural Development to act as a force multiplier for such programs as BCAP and projects funded under the Woody Biomass Utilization Grants (for example the biomass project prefeasibility calculator housed at www.woodenergyproject.com).

Finally, as we have previously reported to this body, we are rapidly moving forward with a private sector-led effort to establish a method of test and an eventual efficiency standard for commercial bioheat systems. We—BTEC—have released for comment a draft of the protocol, and we are at the prime stage to accept stakeholder feedback on this important effort. There remains an opportunity for a member of the TAC to participate as an observing project partner.

Thank you again for the opportunity to address the Committee. Our remarks will be posted to the post-event notes, and I welcome any comments you may have at this time.

Seth Coan, Earth Stewards Land Conservancy

The Earth Stewards Land Conservancy is focused on repurposing surface mines for conservation and biomass production. The coal industry is going through tough times. This could be a model that works with the industry and incentivizes partnerships to benefit all stakeholders. Your consideration on this topic and any assistance you can offer would be appreciated.

XVI. Closing Comments

The meeting was adjourned.

Appendix A: Committee Member Attendance—March 8–9, 2016

Co-Chairs	Affiliation	Attended?
Kevin Kephart	South Dakota State University	Yes

Members	Affiliation	Attended?
Dean Benjamin	Verso Corporation	Yes
Joseph James	Agri-Tech Producers LLC	Yes
Randy Jennings	Tennessee Department of Agriculture	Yes
Coleman Jones	General Motors Corp.	Yes
Maureen McCann	Purdue University	No
Bruce McCarl	Texas A&M University	Yes
Shelie Miller	University of Michigan	Yes
Marina Moses	American Academy of Microbiology	Yes
Neil Murphy	State University of New York	No
David Nothmann	Battelle	Yes
Kimberly Ogden	University of Arizona	Yes
Manuel Garcìa Pèrez	Washington State University	Yes
William Provine	Dupont	Yes
Anna Rath	NexSteppe	No
Patricia Scanlan	Black & Veatch	Yes
James Seiber	University of California	Yes
Abolghasem Shahbazi	North Carolina A&T State University	Yes
John Tao	O-Innovation Advisors LLC	Yes
Kelly Tiller	Genera Energy Inc.	Yes
Valerie Thomas	Georgia Tech.	Yes
Alan Weber	MARC-IV Consulting/Weber Farms	Yes

Total: 19 of 22 members attended

Appendix B: Agenda—March 8 and 9, 2016

Day 1: Technical Advisory Committee Meeting **March 8, 2016**

8:30 a.m. – 8:45 a.m.	Welcome *Committee Co-Chair(s)*
8:45 a.m. – 9:10 a.m.	Presentation: Committee Business for 2015 and DOE Updates *Elliott Levine, Designated Federal Officer, DOE*
9:10 a.m. – 9:30 a.m.	Presentation: USDA Update on Biomass R&D Activities *Todd Campbell, USDA*
9:30 a.m. – 10:00 a.m.	Presentation: BRDI Solicitation, Status, and Update *Daniel Cassidy, NIFA, USDA*
10:00 a.m. – 10:15 a.m.	Break
10:15 a.m. – 11:00 a.m.	Presentation: Overview of the DOE BETO 2016 and 2017 Budget, New Areas, and Activities *Jonathan Male, Director, BETO, DOE*
11:00 a.m. – 11:45 a.m.	Presentation: EERE Strategic Plan and High Priorities *Rueben Sarkar, Deputy Assistant Secretary for Transportation, EERE, DOE*
11:45 a.m. – 12:00 p.m.	Public Comment • *Seth Coan, Earth Stewards Land Conservancy* • *Ben Bell-Walker, BTEC*
12:00 p.m. – 12:45 pm	Lunch
12:45 p.m. – 1:15 p.m.	Presentation: Overview of 2016 Budget, New Areas, and Activities for USDA's NIFA *Dr. Sonny Ramaswamy, Director, NIFA, USDA*
1:15 p.m. – 1:45 p.m.	Presentation: Bioenergy and Bioproduct Development in ARS *Dr. Gene Lester, National Program Leader, Quality and Utilization of Agricultural Products/Biorefining and Biofuels*

1:45 p.m. – 2:30 p.m.	Presentation: The Food, Energy, Water Nexus—Implications for Innovation and Biomass R&D *Dr. JoAnn Lighty, Division Director, Division of Chemical, Bioengineering, Environmental, and Transport Systems, National Science Foundation*
2:30 p.m. – 3:00 p.m.	Presentation: ARPA-E and Biomass R&D *Dr. Krishna Doraiswamy, Technology-to-Market Advisor, Transportation Energy Resources from Renewable Agriculture, ARPA-E*
3:00 p.m. – 3:45 p.m.	Presentation: Federal Activities Report on the Bioeconomy *Harry Baumes, Director, Energy Policy and New Uses, Office of the Chief Economist, USDA*
3:45 p.m. – 4:00 p.m.	Break
4:00 p.m. – 4:30 p.m.	Presentation: DOE's LPO and the Bioeconomy *Kerri Neary, Technical Project Manager, Technical and Project Management Division, LPO, DOE*
4:30 p.m. – 5:30 p.m.	Discussion: Committee 2016 Instructions/Work Plan
5:30 p.m.	Close Meeting

Day 2: Technical Advisory Committee Meeting March 9, 2016

8:30 a.m. – 8:45 a.m.	Welcome *Committee Co-Chair(s)*
8:45 a.m. – 11:00 a.m.	Breakout Session: Subcommittee Breakouts
11:00 a.m. – 11:45 a.m.	Presentation: Subcommittee Breakout Reports
11:45 a.m. – 12:00 p.m.	Public Comment
12:00 p.m. – 1:00 p.m.	Lunch
1:00 p.m.	Meeting Adjourned