

Biomass Research and Development Technical Advisory Committee

2015 Recommendations

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Introduction

The Technical Advisory Committee (the Committee) for the Biomass Research and Development Initiative (BRDI) was authorized through section 9008(d) of the Food, Conservation, and Energy Act of 2008 and re-authorized in the Agricultural Act of 2014. In section (§)(d)(3)(B), the Committee is obligated to evaluate and make recommendations to the Biomass Research and Development Board to ensure that:

- ❖ Funds authorized for the Initiative are distributed and used in a manner that is consistent with the objectives, purposes, and considerations of the Biomass Research and Development Initiative [§(e)(2)].
- ❖ Solicitations are open and competitive, with awards made annually.
- ❖ Objectives and evaluation criteria of the solicitations are clearly stated and minimally prescriptive with no areas of special interest.
- ❖ The points of contact [§(c)(2)(A)] are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers predominantly from outside the Departments of Agriculture and Energy.
- ❖ Activities under this title are carried out in accordance with the title.

Committee Report on the Implementation and Conduct of the Biomass Research and Development Initiative

The Committee's 2015 reporting obligations and recommendations for BRDI are as follows:

1. Funds authorized are distributed and used in a manner that is consistent with the objectives, purposes, and considerations of the Biomass Research and Development Initiative.

No awards were made in 2015, although awards are anticipated in Q2 2016 that will obligate funds from two federal fiscal years (FY 2014 and FY 2015).

2. Solicitations are open and competitive with awards made annually.

Yes, awards have been made in an open and competitive manner. The Committee concurs with the decision to combine two years of funding (FY 2014 and FY 2015), and approves of the plan to proceed with this process.

There are problems, however, about the timeliness of BRDI awards. The process of solicitation, review, and award has been much too slow. In the current solicitation, eight months from agency receipt of full applications to award announcement is too long. The full application review process should be expedited due to the timing requirements that many awardees must meet.

3. Objectives and evaluation criteria of the solicitations are clearly stated and minimally prescriptive, with no areas of special interest.

Yes, the Committee is satisfied that the USDA National Institute of Food and Agriculture and DOE Bioenergy Technologies Office are fulfilling this requirement.

4. The points of contact [§(c)(2)(A)] are funding proposals under this title that are selected on the basis of merit, as determined by an independent panel of scientific and technical peers predominantly from outside the Departments of Agriculture and Energy.

No awards have been made as a result of the 2015 solicitation, but it is clear from USDA and DOE presentations that this requirement is in the process of being met.

The Committee recognizes that the pre-application review process effectively selects down the number of proposals that will be considered during the full application process. Pre-application screening was conducted quickly, and 85% of applications were eliminated. More transparency in the details of the pre-application selection process is needed.

In an effort to reduce review timeline, resource, and staffing constraints, and to achieve better synergies between USDA and DOE, the process should be reviewed, and, where appropriate, revised. The DOE division responsible for the pre-application review, and USDA, which leads the full process, should be better integrated.

5. Activities under this title are carried out in accordance with the title.

Yes.

The Committee makes the following recommendations for further improving BRDI:

- If the nation places a high priority on accelerating the development of a secure biobased economy, BRDI will require appropriations that are similar to what was provided prior to the funding cuts implemented in December 2012. With only \$3 million provided annually, this important translational portion of the value chain will limit the progression of basic research toward strategic applications.
 - The effects of the recent reduction in funding, and the concomitant loss of research and development (R&D) capacity, are manifest throughout the bioeconomy community.
 - Because this program is intended to allow strategic research for the bioeconomy, a greater amount of funding is required.
- The Committee recommends that strategic goals and related metrics for measurement toward goals be developed to reflect how BRDI affects the commercial state of technology and the industry. This information should be publically available to better communicate the successes of BRDI and emphasize progress toward commercialization.

2015 Recommendations on the Bioeconomy

In 2015, the Committee invited many experts to present their insights on measuring the environmental, national security, market, economic, and societal effects of an enhanced bioeconomy. The Committee also held a discussion session with the chairs of 7 interagency working groups that work on biomass issues. The Committee's objective was to initiate an on-going dialog with these key program managers in a wide variety of federal agencies. Based on the Committees' interactions with experts and the interagency working groups. The following key themes—which apply to all bioeconomy stakeholders, including federal R&D agencies and private industry—emerged.

- **Improve Profitability of Bioeconomy Industries**

- Establish the government’s role in mitigating economic risks and hastening development of technologies that reduce costs and enhance efficiencies, with an emphasis on leapfrogging advancements.
- Quantify the value of mitigating greenhouse gases and enhancing national security that the bioeconomy will provide, and develop mechanisms to use those values to accelerate investment.
- Develop the advanced decision-support tools or mechanisms needed to determine the economic value derived from societal benefits associated with the bioeconomy.
- **Bioeconomy Policy Drivers**
 - Support policies that enhance the growth of the bioeconomy.
 - Foster public-private partnerships for ongoing, essential R&D.
- **Stimulate Public Awareness and Acceptance**
 - Prioritize bioproduct performance and unique market niches.
 - Enhance market demand for bioproducts.
 - Demonstrate and communicate the benefits of the bioeconomy.

Improve Profitability of Bioeconomy Industries

***Problem Statement:** Costs attributed to biomass feedstocks in the bioeconomy value chain are too high, feedstock composition is too variable, and supplies are inconsistent for biorefinery operations. Low-cost feedstocks are available only in isolated cases. Feedstock producers must have sufficient confidence that economic returns will be realized, and that they have access to risk-mitigation tools, before they will make commitments to establish new feedstock production systems.*

Committee Recommendations:

- Decrease production costs and increase biomass yields.
 - Better utilize existing low-cost feedstock resources (e.g., waste streams and consolidated agricultural residues), and encourage innovation that increases the availability of lower cost feedstocks.
 - 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.
 - Encourage cropping systems that increase biomass productivity. For example, develop profitable cropping systems that include periods for cover crop production when primary crops are not being grown.
- Develop post-harvest processing and logistics systems that continuously provide feedstocks to processors. For example, develop and demonstrate improved feedstock logistics via better approaches to aggregating, processing, blending, and storage.

- Established specifications, standards, and mature technologies to create a biomass feedstock industrial commodity. Specifications should include limits for water content, chemical composition, and purity. Inexpensive tools for high-throughput, rapid-screening technologies that measure specifications related to quality assurance must be developed. For example, Loan Guarantee Program recipients could be required to report data on cost, feedstocks quantity, quality, and relationship to a finished product.
- Establish post-harvest processes that increase energy density, remove oxygen, improve handling, and reduce post-harvest losses.

Problem Statement: *The Committee has recognized each year since the 2013 report that capital and operating expenses for conversion facilities (CapEx and OpEx, respectively) have been the primary factors limiting the growth of advanced biofuels and commodity bioproducts. Conversion facilities encounter substantially higher CapEx costs per gallon of capacity than do starch/sugar ethanol plants or conventional petroleum refineries, and involve less-efficient unit operations than does conventional refining. Higher CapEx costs increase project-completion risks, and, thereby, reduce the likelihood of obtaining investment funding from the private sector. Additionally, large petroleum companies are reducing commitments to ongoing biofuels ventures and are making virtually no new investments.*

Committee Recommendations:

- Reduce CapEx and OpEx through technology development:
 - Encourage the integration of technologies and pathways that use existing infrastructure (e.g., refineries, filling stations, storage and distribution infrastructure). Expanded research is needed to better integrate biomass processing in the petroleum industry, and to incentivize petroleum companies to make investments in biofuels and bioproducts.
 - Provide incentives for the large, established companies to invest through focused efforts to build demand for biofuels/products.
 - Focus federally funded R&D on technologies that integrate with the petroleum industry and show value to petroleum stakeholders.
 - Develop fuel products that are compatible with the existing infrastructure, including new technologies that focus on alignment with existing petroleum infrastructure—for example, the efforts currently under way to develop renewable diesel and jet fuels.
 - Enable biomass technologies to take advantage of underutilized infrastructure and established facilities. For example, co-locate biomass post-harvest processing facilities with existing conversion facilities that offer synergies with biomass.
- R&D Pipeline:
 - Fund and manage a greater number of smaller R&D projects to establish a balanced R&D portfolio that will identify disruptive technologies offering the greatest opportunities for cost reduction. Technological breakthroughs are especially needed in the following fields:

- Feedstock densification, storage, and transport
- Pretreatments of raw feedstocks
- Fermentation
- Thermochemical processes
- Catalysis
- Separations

The government should develop advanced computational technologies on modeling and simulation of processes relevant to manufacturing of biobased products and fuels

- Explore more partnerships with other R&D funding agencies.
 - Fund projects involving integrated pilot/demonstration processes only when all of the components have been proven at a scale at which there is confidence that the integrated process will work, and only when process-integration issues are the final major risks to commercialization.
 - Demonstrate individual unit operations up to the smallest scale necessary to predictably scale up for commercial purposes before attempting large-scale integration.
 - Fund technologies at appropriate scale. Large-scale demonstrations and pioneer plants should be funded only if early indicators show that the costs and integration risks are all that remain to be established. Integrated demonstrations should be scaled up only if all components are known and proven.
- Establish and fund advanced manufacturing innovation centers. Emphasize centers where teams of researchers and projects can be coordinated for further testing in an integrated process context.
- Require that appropriate knowledge resulting from federally funded R&D is captured.

The 2015 Committee also agreed to reiterate the conversion recommendations submitted in 2014. They are included in Appendix A.

Analysis Recommendation:

- Conduct feasibility analyses contrasting large, centralized biorefineries and distributed pretreatment facilities.

Bioeconomy Policy Drivers

Problem Statement: *Feedstock value is insufficient—and potential market risks too high—to convince producers to dedicate acres to biomass production. Address the risk premium associated with switching or rotating to new dedicated bioeconomy feedstocks for producers. The risks associated with perennial small-seeded species are often high relative to the existing commodity crops that benefit from many decades of R&D investment. There are existing federal programs that help to cross that divide (e.g., the Biomass Crop Assistance Program [BCAP] and 508(h) Risk Management Agency [RMA process]); however, additional effort is needed.*

Committee Recommendations:

- Develop a suite of risk-management tools and insurance programs that include bioenergy crops (as specified by Title 1 of the 2014 Farm Bill), and conduct necessary research that provides data for USDA and RMA to implement new, actuarially sound policies that aid feedstock producers. Better decision-support tools that incorporate the ability to customize for regional approaches, farming systems, crop rotations, conversion technologies, and production alternatives should be developed.
- Develop model trading rules and mechanisms for new biomass feedstocks, including both annual and perennial crops.
- Leverage state and federal conservation programs to promote biomass production for environmental services. For example, determine the utility of using biomass feedstock crops to remediate excess phosphorous in soils. Large, multistate watershed remediation projects could benefit from regional approaches.
- Complement other state and federal programs that provide a benefit for farmers to adopt best practices. For example, provide incentives for sustainable land-management best practices, using third-party auditing to certify and assure implementation of best practices and measure progress toward goals.

Analysis Recommendations:

- Research socioeconomic drivers that influence producer decisions about feedstock production. For example, determine how feedstock production for the bioeconomy affects biomass utilization for wildlife habitat, management of Concentrated Animal Feeding Operation drainage areas, production field waterways, and riparian buffer zones.
- Analyze on a national scale (in addition to local/regional tools development) the effects of optimizing land and resource use for farm sustainability.

Problem Statement: *The social, economic, and environmental benefits of the bioeconomy are not sufficiently understood, making it difficult to understand the true value of transitioning to a sustainable bioeconomy from a fossil-fuel-based economy. This lack of understanding also complicates policy decisions about how and how much to provide incentives for various elements of the bioeconomy.*

- Analyze regional economic, environmental, and security benefits; for example, the socioeconomic value for a bioenergy crop derived from reduced fertilizer applications that also minimize runoff into watersheds. This is an inherently difficult challenge for

economists; however, it must be addressed in order to develop policies that motivate producers.

- Compare legitimate side-by-side life cycle sectors analyses of the bioeconomy (e.g., starch, sucrose lingo, oil seeds) and the petroleum economy (e.g., import oils, tar sands) using the best available tools and baselines.
- Enhance the greenhouse-gas benefits of a bioeconomy by re-establishing the petroleum life-cycle analysis baseline and contrasting it with the effects of “marginal” petroleum production (e.g., tar sands production).

Problem Statement: *More economic and risk-mitigation innovations for biorefineries are needed.*

Committee Recommendations:

- The Department of Defense and General Services Administration should explore an increase in the number and duration of purchasing agreements for biofuels and bio-based products.
- Consider policies that would credit emissions reductions.

Problem Statement: *Some regulatory and policy issues impede the growth of the bioeconomy. On the basis of production cost alone, biofuels cannot compete with low-cost producers, and, therefore, cannot displace their market share.*

Committee Recommendations:

- Enforce the Renewable Fuel Standard.
- Issue a public Request for Information (RFI) asking for identification of regulations and standards that are obstacles to biofuel and bioproduct development.
 - Despite advances in petroleum production technology, the vast majority of the world’s oil reserves still lie outside of the United States, mostly in the Middle East and Venezuela. The Middle East reserves are also the cheapest to produce by far, with total costs below \$20 per barrel; often, significantly below. Therefore, on the basis of production cost alone, biofuels cannot compete with these low-cost producers; and, therefore, cannot displace petroleum’s market share. In light of the recent Paris climate-change agreement, and all of the work on climate change that preceded it, lower-carbon fuels must displace a significant percentage of current petroleum production, and not merely occupy market share at high-price margins and for demand growth. Accordingly, it is absolutely vital that policy mechanisms account financially for the value of low-carbon fuels in mitigating climate change. Without such mechanisms, biofuels production volumes—and, therefore, their effectiveness in mitigating climate change—will be severely constrained.

Stimulate Public Awareness, Outreach, and Acceptance

Problem Statement: *The benefits of the bioeconomy must be made evident to the public, elected officials, and policy makers. There are many other benefits of the bioeconomy beyond competitive replacement in petroleum markets. Without public support, the larger policy changes that are necessary for an expanded bioeconomy will not be made.*

Committee Recommendations:

- Develop a large public outreach program to identify the benefits of biofuels and bioproducts. The program must be objective and based on science, and should highlight bioeconomy benefits and effects. The outreach program should address a diverse audience, including intermediate buyers, end users, industry participants, and the general public.
- Add climate, environmental, economic, social, public health, and national security considerations to the public value proposition, and better communicate those elements to the public to drive market demand.
- Describe the economic effects, such as wealth and job creation, rural development, and resource and supply diversity.
- Develop a coordinated education and engagement campaign for policy makers, rather than using only traditional methods, such as publishing white papers.