



**Biomass Research &
Development
Technical Advisory Committee**

Mark P. Elless, Ph.D.
Designated Federal Officer
November 15, 2017
Washington DC

- I. TAC Business
- II. FY18 Budget Request
- III. BETO FOA & Event Updates
- IV. BETO R&D Updates

- Traveler Information Form:
 - Please complete this form (except SSN) and submit to Shaune Gaither at DOE.
 - Shaune will make your travel arrangements (flights) and reimburse your allowable expenses.
 - Contact information is Lashaune.Gaither@ee.doe.gov or 202-586-5674.
- Allowable Expenses:
 - Flights will be arranged by Shaune Gaither
 - Lodging location will identified for you at government per diem rates. You will make and pay for your own reservation and be reimbursed.
 - Continental Breakfast and lunches will be provided for each day of the meetings. You will be reimbursed at the per diem rate for dinners.
 - Other Expectable Expenses: baggage fees; cab/shuttles; parking; Wi-Fi

Reimbursement deadline for this meeting: November 30th, 2017

Meeting	Objectives
Q1 March 30-31	<ul style="list-style-type: none">• Receive overview presentation from BETO, USDA, NIFA, Office of Science, and EPA on priorities for 2017.• Review and select work plan for 2017 Committee activities.• Identify 1-4 quarterly focus topics.
Q2 June 15-16	<ul style="list-style-type: none">• Receive key presentation of selected quarterly focus topic.• Work in subcommittees to further develop key themes, ideas, and recommendations for the quarterly focus topic.
Q3 August 15-17	<ul style="list-style-type: none">• Receive key presentation of selected quarterly focus topic.• Work in subcommittees to further develop key themes, ideas, and recommendations for the quarterly focus topic.• Conduct a site visit.
Q4 Week of November 15 -16	<ul style="list-style-type: none">• Vote on Q3 topic final recommendations• Receive key presentation of selected quarterly focus topic.• Work in subcommittees to further develop key themes, ideas, and recommendations for the quarterly focus topic.• Vote on Q4 topic final recommendations.

FY18 Budget Requests for BETO

Program Area	Presidential Request (\$M)	House Mark (\$M)	Senate Mark (\$M)	CR FY17BA (\$M)	Notes
Advanced Development & Optimization	6		50	54	
Advanced Algae Systems	5		30	30	
Conversion	34.6		85	90	Senate: \$20M for Agile Biofoundry \$5M for Biopower \$5M for AD of wastes
Feedstock Supply and Logistics	6	27	20	20	
Strategic Analysis & Sustainability	5		5	11	
Total	56.6	90	190	205	

DOE has selected eight projects to negotiate for up to \$15 million in total DOE funding to optimize integrated biorefineries.

Objective: These projects will work to solve critical research and developmental challenges encountered for the successful scale-up and reliable operations of integrated biorefineries (IBRs), decrease capital and operating expenses, and focus on the manufacture of advanced or cellulosic biofuels and higher-value bioproducts. These investments support the development of bioproducts, a workforce in bioenergy, and help to spur the creation of a sustainable domestic bioeconomy.

Award Recipients:

Under Topic Area 1:

- Thermochemical Recovery International Inc.
(Baltimore, Maryland)

Under Topic Area 2:

- Texas A&M Agrilife Research
(College Station, Texas)
- White Dog Labs (New Castle, Delaware)
- South Dakota School of Mines
(Rapid City, South Dakota)

Under Topic Area 4:

- National Renewable Energy Laboratory
(Golden, Colorado)
- Clemson University
(Clemson, South Carolina)
- Purdue University
(West Lafayette, Indiana)
- Forest Concepts (Auburn, Washington)

DOE announced the selection of one additional project, for up to \$3.5 million, as part of BETO's Advanced Algal Systems Program funding opportunity

Objective: Reducing the production costs of algae-based biofuels and bioproducts through improvements in algal biomass yields.

Award Recipients:

- In Fiscal Year 2016, DOE awarded \$15 million for three projects.
 - Global Algae Innovations
 - Algenol Biotech LLC
 - MicroBio Engineering, Inc.
- In Fiscal Year 2017, DOE has selected one more project to NREL.
- Develop technologies that are likely to succeed in producing 3,700 gallons of algal biofuel intermediate (or equivalent dry weight basis) per acre per year (gal/acre/yr) on an annualized average basis.

When:

On Dec. 11, 2017

Where:

National Renewable Energy Laboratory
Golden, Colorado.

Purpose:

BETO will use this workshop as a kickoff meeting to provide participants with a summary of the intended R&D efforts, primary focus areas, and target goals of the consortium. Industry stakeholders will also attend to review the FCIC portfolio and research direction, and to provide valuable inputs and recommendations to ensure the FCIC is focused on solving industry relevant problems.

When:

On Dec. 12–13, 2017

Where:

National Renewable Energy Laboratory
Golden, Colorado.

Purpose:

BETO will use this workshop to seek feedback on how the new ADO program area can best serve our stakeholders in developing the bioenergy industry, as well as to raise awareness of existing assets from past investments and discuss future needs and opportunities for maximizing their value.

Farming looks mighty easy when your plow is a pencil, and you're a thousand miles from the corn field. – Dwight D. Eisenhower

Corn Stover Bioeconomy

- Applied IBSAL model to determine resources to utilize sustainably-available corn stover from 17 top corn-growing states
 - 272 ethanol plants producing 25 million gal/year
 - 6.8 billion gallons of fuel per year
- Economic impacts
 - Value of harvest and transport equipment = \$30 billion
 - Land area for storage = 35,320 acres at \$8.8 million
 - Workforce harvest, storage, and transport = 50,567
 - Results highly sensitive to biomass availability and length of harvest window; not sensitive to biorefinery size

Biorefinery size and supply chain risk

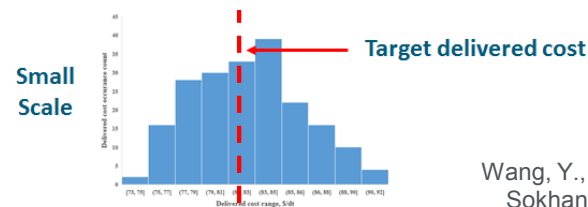
- Developed IBSAL model of corn stover supply to industrial sugar refinery in Ontario
 - Level of complexity increases with biorefinery size
 - Logistics resources are highly sensitive to corn yield and farm participation rate



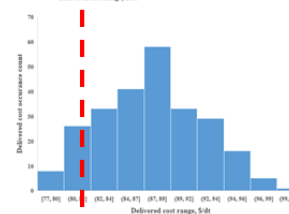
Paper featured on cover *Biofpr*

Ebadian, M., S. Sokhansanj, and E. Webb. 2017. **Estimating the required logistical resources to support the development of a sustainable corn stover bioeconomy in the USA.** *Biofuels, Bioproducts, and Biorefining (Biofpr)* 11:129-149.

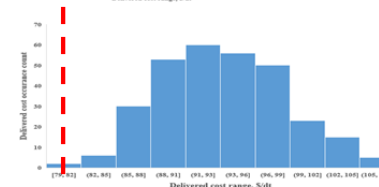
Cover photo courtesy of Antares Group, Inc.



Medium Scale



Large Scale



Wang, Y., M. Ebadian, S. Sokhansanj, E. Webb, and A. Lau. 2017. **Impact of the biorefinery size on the logistics of corn stover supply – A scenario analysis.** *Appl Energy* .198:360-367.

- **Achieved the 2017 \$84 feedstock cost target associated with the following MYPP milestone:**

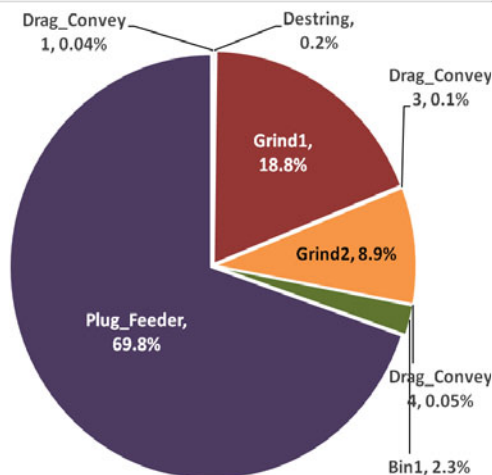
By 2017, validate efficient, low-cost, and sustainable feedstock supply and logistics systems that can deliver feedstock to the conversion reactor throat at required conversion process in-feed specifications, at or below \$84/dry ton (2014\$) (including grower payment/stumpage fee and logistics cost).

- FY13-17 R&D accomplishments resulted in a 45% reduction in delivered herbaceous feedstock cost for a final cost of **\$82.86/dry ton** (2014\$)
- Major Outcomes
 - The cost of pellet production (~\$7/ton) is now lower than the FY13 SOT cost of grinding alone
 - Least cost formulation and blending significantly improved feedstock quality, nearly eliminating quality dockage
 - Distributed depots reduce feedstock cost compared to centralized preprocessing
 - First documented analysis of depot cost benefit

	2013 SOT	2017 SOT	% Difference	Explanation
Grower payment	\$42.23	\$22.95	-46%	Least-Cost Formulation / Blending
Harvest and collection	\$20.27	\$16.70	-18%	Least-Cost Formulation / Blending
Storage and queuing	\$4.54	\$6.46	42%	
Transportation and handling	\$15.31	\$13.26	-13%	Depots
In-plant receiving and preprocessing	\$46.03	\$22.24	-52%	Fractional Milling & High-Moisture Densification
Dockage	\$21.22	\$1.25	-94%	Least-Cost Formulation / Blending
Total	\$149.58	\$82.86	-45%	

- Biorefinery Operational Reliability Modeling: Quantifies the impact of feedstock attributes causing down time and reduced throughput for individual unit ops and the integrated supply chain
 - Go/No-Go: First quantitative comparison of “conventional” and “advanced” feedstock supply systems
 - Foundation for the operational reliability focus of the Feedstock Conversion Interface Consortium

Downtime by Equipment



Downtime by Feedstock Attribute

