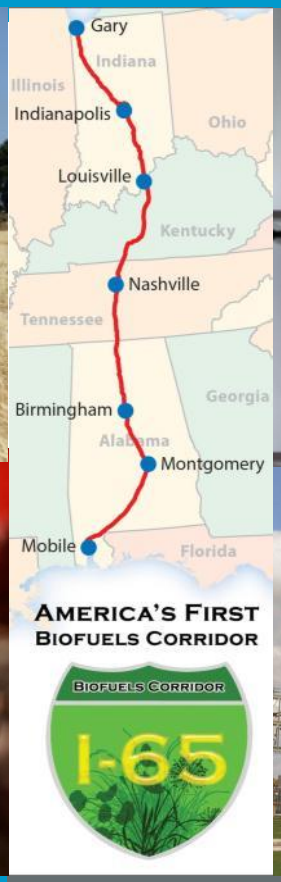
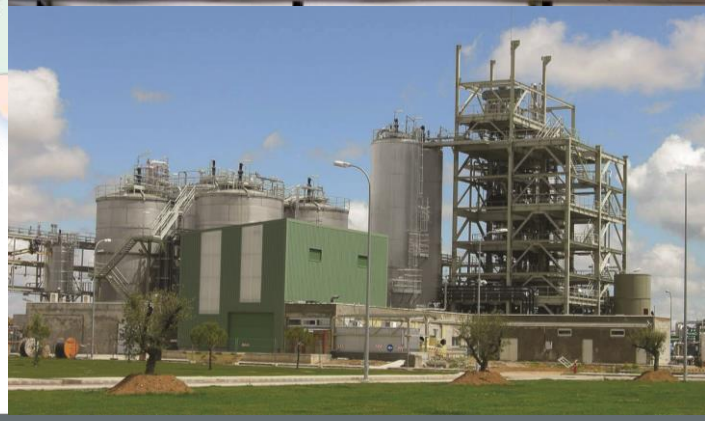
BIOENERGY TECHNOLOGIES OFFICE

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy





Biomass Research & Development Technical Advisory Committee

Mark P. Elless, Ph.D.
Designated Federal Officer

March 30, 2017

Arlington, VA

Biomass R&D Act and Authorizations

- The Committee was established by the Biomass Research and Development Act of 2000 (Biomass Act). This has since been amended by the Food, Conservation and Energy Act of 2008 (FCEA). The revised Biomass R&D Act outlines the Committee's objectives, membership requirements, and duties.
- The Biomass R&D Act also established the Interagency Biomass R&D Board and the Biomass R&D Initiative (BRDI).
- The recent Agricultural Act of 2014 (Farm Bill) reauthorized the Committee. The Initiative was also reauthorized, however the annual mandatory funding amount was cut to $3M mandatory/year.

Biomass R&D Breakdown

- Senior federal officials from 8 agencies
- Chaired by USDA and DOE
- Coordinates R&D activities relating to biofuels and biobased products
- Provides recommendations to the points of contact concerning administration of the BRDi

Biomass R&D Board

- ~30 members from academia, industry, and nonprofit organizations
- Advises the Secretaries of Energy and Agriculture on the technical focus and direction of the BRDi RFPs and procedures for reviewing and evaluating the proposal
- Evaluates and performs strategic planning on BRDi activities

Technical Advisory Committee

- Administered by appointees from the Secretaries of Agriculture and Energy
- Awards competitive grants to projects that integrate science and engineering research in the following three areas: feedstock development; biofuels and biobased products development; and biofuels development analysis

Biomass R&D Initiative (BRDi)

Biomass Board - Federal Composition

- **The Board is a panel consisting of senior-level representatives from these agencies:**
  - Department of Agriculture: Co-Chair
  - Department of Energy: Co-Chair
  - National Science Foundation
  - Environmental Protection Agency
  - Department of Interior
  - Office of Science and Technology Policy
  - Department of Transportation
  - Department of Defense

Co-chair

Co-chair

Duties of the Committee Regarding BRDI

- To advise the Secretaries of Energy and Agriculture through the points of contact with respect to the Biomass R&D Initiative.
- To evaluate and make recommendations in writing to the Board to ensure the following:

  (A) funds authorized for the Initiative are distributed and used in a manner that is consistent with the objectives, purposes, and considerations of the Initiative;

  (B) solicitations are open and competitive with awards made annually and that objectives and evaluation criteria of the solicitations are clearly stated and minimally prescriptive, with no areas of special interest;

  (C) the points of contact 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 Department of Agriculture and Energy; and

  (D) activities under this title are carried out in accordance with this title.

- The Committee Charter specifically calls for the TAC to make recommendations related to the BRD Initiative.

TAC Subcommittees

- ❑ **Conversion**
- ❑ **Sustainable Feedstocks, Production and Logistics**
- ❑ **Products Markets, and Systems**

Subcommittees develop:

- Problem Statements: Identify issues/challenges that must be addressed.
- Recommendations: Technical or R&D strategies that address the identified problem statements.
- Information Requests: Requests for speakers, data, reports, or other information that can be given or presented to the committee that assists them in developing their recommendations.

Subcommittees gain wisdom through:

- Assembly of subject matter experts to address cross-cutting challenges.
- Development of workshops and reports based on recommendations.
- Site visits to key resources.

Committee Recommendations and Annual Report

DOE and USDA General Counsel have advised that a broader biomass R&D scope is permissible. The TAC recommendations should be written to address the findings and needs of the Committee in the following areas:

- Specific Committee Reporting Obligations- BRDI
- Information Requests from the Board
- Subcommittee Recommendations
  - Feedstock Recommendations
  - Conversion Recommendations
  - Product, Markets and Systems

Recommendations are used to inform the Biomass R&D Board and provided to DOE and USDA Programs. A report of consented upon recommendations frame the TAC Annual Report

TAC Ground Rules

- TAC conforms to all Federal Advisory Committee Act (FACA) requirements: http://www.gsa.gov/portal/content/101010
- Meetings are announced in Federal Register and open to public.
- Subcommittees are permitted to work in closed sessions.
- Representative vs Special Governmental Employee (SGE)
- Co-Chairs are the spokespersons for the TAC
- Refer press inquiries to them
- TAC provides suggestions for information requests via DFO and Co-chairs.
- Final recommendations are formed by majority consensus.
- Public policy recommendations are not prohibited

Online Resources for TAC Members

The Board website (www.biomassboard.gov) contains numerous resources for TAC members:

- Meetings
  - Previous meeting agendas and minutes
  - Previous presentations
- Work Plans
  - Work plans for the last 10+ years
- Reports
  - Bioenergy roadmaps
  - Workshop summaries
  - DOE and USDA reports and portfolio analyses
  - Previous TAC recommendations
- TAC Library
  - Outlined in next slide

Online Resources for TAC Members (continued)

TAC Library:

- BRDI Materials
  - Solicitations and Awards
  - Annual Reports
  - Prior TAC Recommendations
- Related Solicitations and Awards
  - DOE FOAs
  - ARPA-E FOAs
- Additional Information
  - DOE and USDA factsheets
  - DOE and USDA roadmaps and research
  - BETO's Multi-Year Program Plan
- The online library is outdated but will be updated with information on recent FOAs.

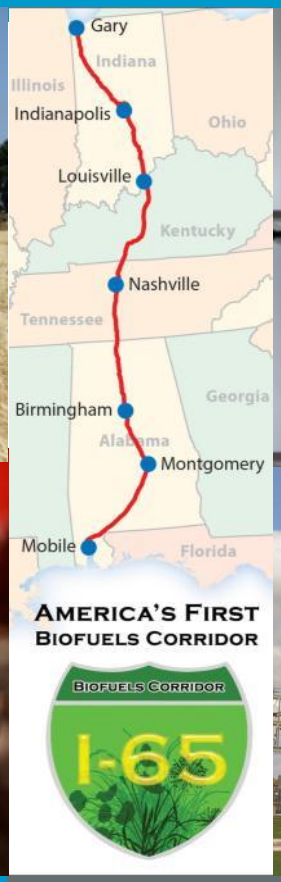
Travel Reimbursement

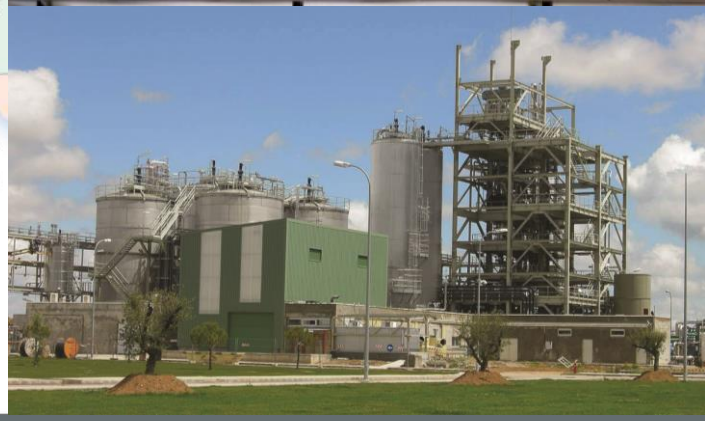
- Traveler Information Form:
  - Please complete this form (except SSN) and submit to Shaune Gaither at DOE.
  - Shaune will make your travel arrangements (flights) and reimburse your allowable expenses.
  - Contact information is Lashaune.Gaither@ee.doe.gov or 202-586-5674.
- Allowable Expenses:
  - 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: May 5, 2017

2017 Work Plan and Meeting Dates (tentative)

Meeting	Objectives
Q1 March 30-31	• Receive overview presentation from BETO, USDA, NIFA, and Office of Science on priorities for 2017. • Review and select work plan for 2017 Committee activities. • Identify 1-4 quarterly focus topics.
Q2 Week of June 12-16	• 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 Week of August 14-18	• 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 (location TBD). • Vote on Q2 topic final recommendations.
Q4 Week of November 13-17	• 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 Q3 topic final recommendations.





DOE Updates to the Technical Advisory Committee

Mark P. Elless, Ph.D.
Designated Federal Officer

March 30, 2017
Arlington, VA

BETO's Mission & Vision

Vision: A thriving and sustainable bioeconomy fueled by innovative technologies

Mission: Developing and demonstrating transformative and revolutionary sustainable bioenergy technologies for a prosperous nation

Strategic Goals: Develop industrially relevant technologies to enable domestically produced biofuels and bioproducts without subsidies

BETO reduces risks and costs to commercialization through RD&D.

From Challenge to Opportunity

THE CHALLENGE

More than $350 million is spent **every day** on foreign oil **imports**. Dependence on **foreign oil** can leave us vulnerable to disruptions in supplies and contributes significantly to our trade deficit.

Transportation accounts for 67% of petroleum consumption and 26% of emissions in the United States.

THE OPPORTUNITY

More than **1 billion tons of biomass** could be domestically converted into biofuels and products.

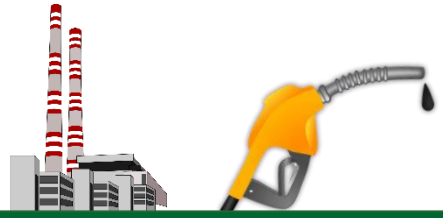
Biomass could displace **25%** of U.S. petroleum use annually by 2030, **keeping $260 billion in the United States**, adding **1.1 million direct jobs,** and reducing annual CO_2 emissions by 450 million tons or 7% of U.S. energy emissions.

BETO's Critical Program Areas

Production & Harvesting

Feedstock Supply & Logistics
Works to reduce the cost, improve the quality, and increase the volume of sustainable feedstocks available for delivery to a biorefinery.

Advanced Algal Systems
Focuses on improving the productivity of algal biomass and enhancing the efficiency of cultivation and harvesting.



Conversion & Refining

Conversion
Develops technologies to convert non-food feedstocks into biofuels, bioproducts, and biopower.

Conversion
Intensification - at bench and pilot scale, conduct feedstock blend testing, separations, materials compatibility evaluations, and technoeconomic-driven verification tests

Distribution & End Use

Demonstration and Market Transformation
Aims to reduce investment risk in bioenergy production technologies by developing, building, and operating integrated biorefineries and helps address the final links of the supply chain to enable demand for end products.

Crosscutting Areas: Sustainability, Strategic Analysis, & Communications

BETO works to address risks and reduce costs across the supply chain.

Inter-Agency Collaboration

Other Federal Agencies

USDA — USDA focuses on feedstock production and rural development, co-chairs the BRDI Board with DOE, and partners with BETO on interagency efforts to support the bioeconomy.

FAA — BETO provides technical expertise on the Farm-to-Fly 2.0 initiative to produce renewable jet fuel.

EPA — The EPA administers the Renewable Fuel Standard and works with BETO on life cycle analysis for different fuel pathways.

DOT — The DOT invests in national infrastructure and works with BETO on challenges related to bioenergy transportation and logistics.

DOD — Under the Defense Production Act, the DOD partners with USDA and DOE to produce drop-in fuels for the military.

NSF — NSF supports innovative chemical, environmental and bio-engineering analysis which informs BETO research.

Key Partnerships of the Bioenergy Technologies Office

Department of Energy

Office of Energy Efficiency & Renewable Energy

Vehicle Technologies Office (VTO)

VTO partners with BETO on fuel and infrastructure characterization and new work on the co-optimization of fuels and engines.

Advanced Manufacturing Office (AMO)

AMO works with BETO to research and develop renewable, low-cost carbon fiber for lightweight vehicles.

Bioenergy Technologies Office (BETO)

BETO's mission is to accelerate the commercialization of advanced biofuels and bioproducts through targeted RD&D supported by public and private partnerships.

Fossil Energy — BETO collaborates with the Office of Fossil Energy to utilize biomass for carbon capture.

Office of Science — The Office of Science focuses on early stage basic science with eventual commercial applications for bioenergy.

ARPA-E — ARPA-E invests in innovative technologies including electro-fuels and the PETRO program for direct biofuel production.

ENERGY.GOV Loan Programs Office — The Loan Programs Office provides loan guarantees for commercial biorefinery projects.

EIA — BETO contributes data to the EIA to support their accurate energy forecasting for consumption and production.

The White House Office of Science and Technology Policy

BETO contributes to White House goals for the reduction of GHG emissions and oil imports under the Climate Action Plan.

National Laboratories

NREL National Renewable Energy Laboratory · INL Idaho National Laboratory · Los Alamos National Laboratory · Oak Ridge National Laboratory · Argonne National Laboratory · Pacific Northwest National Laboratory · Sandia National Laboratories · Brookhaven National Laboratory · Lawrence Livermore National Laboratory · Berkeley Lab

BETO partners with other DOE Offices, other Federal agencies, and the national labs to achieve U.S. goals on bioenergy

FOAs, RFIs, Reports, and Events

Co-Optimization of Fuels and Engines Initiative

On December 29th, 2016, the Energy Department announced up to $7 million for eight universities to accelerate the introduction of affordable, scalable, and sustainable high-performance fuels for use in high-efficiency, low-emission engines.

Cornell University	University of Michigan	University of Michigan- Dearborn	University of Alabama
Louisiana State University	Massachusetts Institute of Technology	Yale University	University of Central Florida

Integrated Biorefinery Optimization FOA

Joint FOA with USDA, up to $22.7 million in support of the optimization of IBRs (DE-FOA-0001689) Released January 6, 2017

- DOE share of up to $19.8 million; USDA-NIFA share of up to $2.9 million
- Applications must be focused on lowering technical and financial risk, addressing challenges encountered with the successful scale-up, and reliable, continuous operation of IBRs

Four Topic Areas:

- **Topic Area 1:** Robust, continuous handling of solid materials (dry and wet feedstocks, biosolids, and/or residual solids remaining in the process) and feeding systems to reactors under various operating conditions
- **Topic Area 2:** High value products from waste and/or other under-valued streams in an IBR
- **Topic Area 3:** Industrial separations within an IBR
- **Topic Area 4:** Analytical modeling of solid materials (dry and wet feedstocks, and/or residual solids remaining in the process) and reactor feeding systems

Apply at *https://eere-exchange.energy.gov*

Submission Deadline for Concept Papers	**2/6/2017**
Submission Deadline for Full Applications	**4/3/2017**

Productivity Enhanced Algae and tool-Kits (PEAK)

Up to $8 million in Federal Share funding announced December 15th
(DE-FOA-0001628)

Goals: Achieve an annual average algal biomass productivity of at least 18 g/m^2/day, extrapolated from the combination of relevant seasonal data from the project and literature values for seasonal regimes not targeted by a given project, while achieving a minimum of 80 gasoline gallons equivalent per ton of biomass potential, by 2020.

Approach: Small teams will develop strategies to increase areal productivity AND biofuel yield via enhanced algal strains OR enhanced management of ecological or abiotic contributions to cultivation biology. Teams will also develop improved or novel algal toolkits and/or methods.

Apply at *https://eere-exchange.energy.gov*

Submission Deadline for Concept Papers	**1/13/2017**
Submission Deadline for Full Applications	**2/22/2017**

Project Development for Pilot and Demonstration Biofuels and Bio-products Manufacturing (PD2B3)

On December 28th, 2016, DOE announced up to $12.9 million for six projects related to the manufacturing of advanced or cellulosic biofuels, bioproducts, refinery-compatible intermediates, and/or biopower in a domestic pilot- or demonstration-scale integrated biorefinery.

Demonstration-Scale Integrated Biorefineries	**AVAPCO, LLC**
	LanzaTech, Inc.
Pilot-Scale Integrated Biorefineries	**Global Algae Innovations**
	ThermoChem Recovery International, Inc.
Pilot-Scale Waste-to-Energy Projects	**Rialto Bioenergy, LLC**
	Water Environment & Reuse Foundation

BETO-Driven Market Opportunities

Small Business Vouchers Pilot
U.S. DEPARTMENT OF ENERGY

Supporting Domestic Small Business Innovation - The SBV Pilot supports small businesses to bring new clean energy technologies to market faster by giving them access to state-of-the-art facilities and capabilities.

Transforming "waste streams" into revenues for rural economies - BETO-funded projects have transformed industrial waste gases into jet fuels, as well as converted sewage sludge into renewable fuel. Both technologies are currently being licensed for commercial applications.

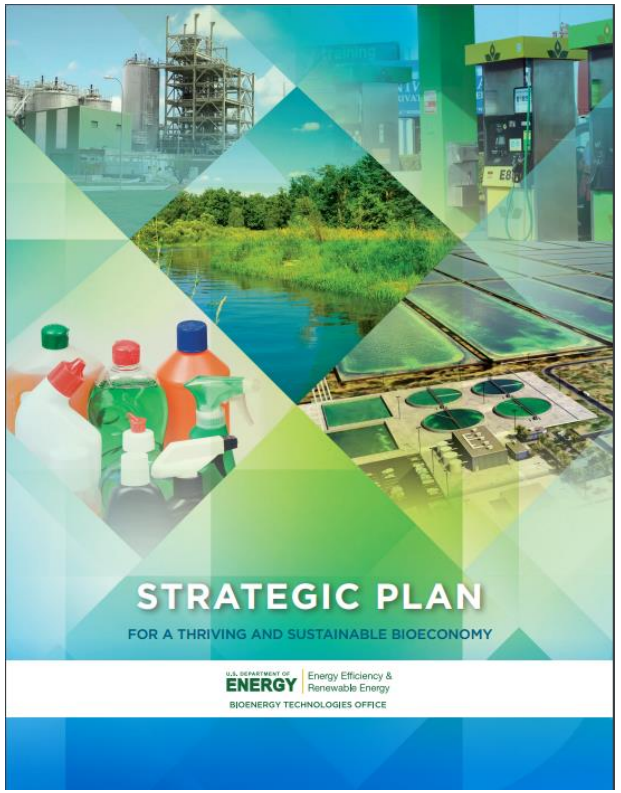
Increasing energy security by providing cost competitive military grade fuels - BETO will continue to implement clean energy solutions through initiatives like the Defense Production Act, which aims to bring renewable fuels to the U.S. military.

Using untapped resources to enhance energy security and job growth

BETO Strategic Plan

- The *Strategic Plan for a Thriving and Sustainable Bioeconomy*
- Framework to realize BETO's mission to develop and demonstrate transformative and revolutionary sustainable bioenergy technologies for a prosperous nation
- Released December 29th, 2016
- Director Jonathan Male will cover this further in his presentation on Friday.

Link to Strategic Plan



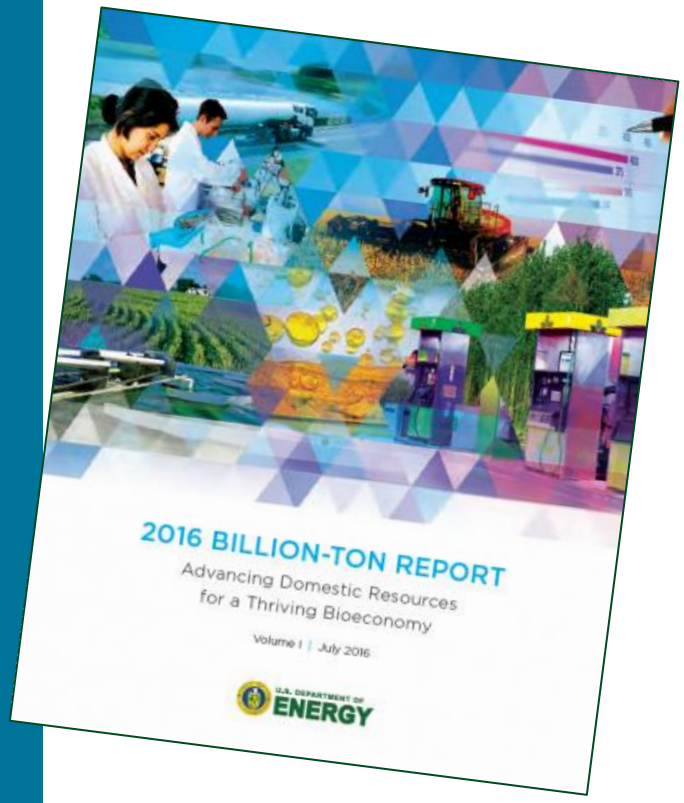
Billion-Ton Report Vol. 2

Billion-Ton 2016 (BT16) Volume 2

Volume 1 (released July 2016) concluded that the United States has the potential to produce at least 1 billion dry tons of nonfood biomass resources annually by 2040.

Volume 2 (released January 13, 2017) uses environmental models to investigate changes in greenhouse gas emissions, soil organic carbon, water quality and quantity, air emissions, and biodiversity for particular 2017 and 2040 biomass-production scenarios.

BT16 Volume 2 is a pioneering effort to analyze a range of potential environmental effects and identify strategies to enhance environmental benefits and minimize negative effects associated with a growing bioeconomy.



FARB and the Billion Ton Bioeconomy Initiative

The ***vision*** for the Billion Ton Bioeconomy Initiative is to triple the size of today's bioeconomy by 2030 and provide multiple economic, environmental, and social benefits to the US.

The ***goal*** of the Billion Ton Bioeconomy Initiative is to develop and provide 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.

The Billion Ton Bioeconomy Initiative: Challenges & Opportunities

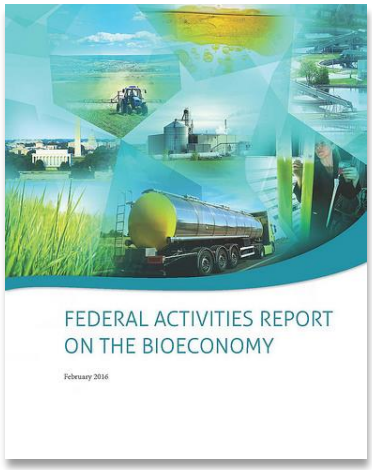
- In November 2016, the Board released **The Billion Ton Bioeconomy Initiative: Challenges & Opportunities** report.
- Includes stakeholder feedback from 5 bioeconomy listening sessions with over 400 participants:
  - 4 in-person sessions held in conjunction with major bioenergy industry events in FY16
  - 1 public webinar held in May 2016
- Incorporates stakeholder input on the **challenges to and opportunities for expanding the bioeconomy**
- Provides approaches to removing barriers
- Prepares for the Action Plan

Challenges to Expanding the Bioeconomy

Opportunities in Building a Billion Ton Bioeconomy

- Develop feedstock and fundamental innovations that reduce cost and technology risk in the supply chain
- Quantify, communicate, and enhance beneficial effects and minimize negative impacts
- Increase public education on biomass-derived products in a bioeconomy
- Enable the testing and approval of new biofuels and bioproducts
- Ensure a ready workforce to meet the needs of the bioeconomy
- Support analysis as a foundation for stable, long-term policies
- Develop bioproducts that can accelerate biofuel production
- Seek opportunities to utilize low-cost waste resources
- Expand the market potential for biomass
- Encourage private-sector financing

A Path Forward for the Bioeconomy Initiative



Federal Activities Report on the Bioeconomy

- Released in February 2016

Challenges & Opportunities

- Released at Q4 TAC Meeting in November 2016

Action Plan

- Target release this summer at annual conference—Bioeconomy 2017

Upcoming Activities

Bioeconomy Initiative: (Federal Only) Action Plan Workshop

- **Date:** April 5-6, 2017
- **Location:** DOE HQ
- **Goal:**
  - To develop a roadmap of cross-cutting federal activities and collaborative actions to catalyze the expansion of a sustainable domestic bioeconomy

BIOECONOMY INITIATIVE

Bioeconomy 2017 and Program Management Review

Bioeconomy 2017

- Will be held July 11-12, 2017 at the Sheraton Pentagon City Hotel
- Convene key representatives from across the bioenergy supply chain, including industry, federal agencies, and Congress
- You can participate! After last year's success, the Interactive Poster Session will happen once again and there is a new Technical Session with a call for abstracts open.

The 2017 Program Management Review

- Will be held July 13th at the Sheraton Pentagon City Hotel
- Results of the Project Peer Review will be presented by Lead Reviewers, along with an overall assessment of BETO's portfolio presented by the Steering Committee
- The Program Management Review will take place the day after BETO's annual conference, Bioeconomy 2017

Bioenergy Upcoming Workshops & Events

- **Bioeconomy Initiative: Action Plan Coordination Meeting**
  - April 5-6, 2017: Washington, DC
- **American Association of Community Colleges**
  - April 22-25, 2017: New Orleans, LA http://www.aacc.nche.edu/newsevents/Events/convention2/Pages/default.aspx
- **39th Symposium on Biotechnology for Fuels and Chemicals**
  - May 1-4, 2017: San Francisco, CA http://www.simbhq.org/sbfc/
- **IBR Optimization Merit Review**
  - May 14-19, 2017: Washington, DC
- **Functional Replacements to Enable the Bioeconomy**
  - June 1, 2017: Denver, CO
- **7th International Conference on Algal Biomass, Biofuels and Bioproducts (IABBB)**
  - June 18-21, 2017: Miami, FL http://www.algalbbb.com/

Online Resources for TAC Members

The Board website (http://www.biomassboard.gov) contains numerous resources for TAC members:

- **Meetings**
  - Previous meeting agendas and minutes
  - Previous presentations
- **Work Plans**
  - Work plans for the last 10+ years
- **Relevant Agency Reports**
  - Bioenergy roadmaps
  - Workshop summaries
  - DOE and USDA reports and portfolio analyses
  - Previous TAC recommendations
- **BRDI Materials**
  - Solicitations and Awards
  - Annual Reports
  - Prior TAC Recommendations
- **Related Solicitations and Awards**
  - DOE FOAs
  - ARPA-E FOAs

Links for Additional Information

- Federal Advisory Committee Act (FACA) requirements:
  - http://www.gsa.gov/portal/content/101010
- Biomass R&D Board and TAC Website:
  - www.biomassboard.gov
- TAC Library:
  - http://biomassboard.gov/committee/tac_library.html
- Federal Register call for new nominations to the TAC:
  - https://www.federalregister.gov/articles/2016/05/25/2016-12319/biomass-research-and-development-technical-advisory-committee
- Bioenergy KDF:
  - https://www.bioenergykdf.net/
- BETO Website:
  - http://www.energy.gov/eere/bioenergy/bioenergy-technologies-office
- BETO MYPP:
  - http://www.energy.gov/eere/bioenergy/downloads/bioenergy-technologies-office-multi-year-program-plan-march-2016
- ARPA-E Website:
  - http://arpa-e.energy.gov/
- Office of Science Website:
  - http://science.energy.gov/

New TAC Members

Welcome

- **Dr. Charles Abbas**, Archer Daniels Midland
- **Dr. Katrina Cornish**, Ohio State University
- **Dr. William Frey**, Georgia Pacific
- **Dr. Beth Hood**, Arkansas State University
- **Dr. Raymond Huhnke**, Oklahoma State University
- **Matthew Rudolf**, Environmental Certification Services
- **Dr. Michael Wolcott**, Washington State University

New TAC Co-Chair

Congratulations

Dr. Kelly Tiller

SGE Paperwork

Special Government Employee (SGE)

- Conditions for Expert and Consultants
- I-9 Form – Employment Eligibility Verification
- SF-61 Form – Appointment Affidavits
- Waiver of Compensation
- Certificate for Experts and Consultants
- Expert-Consultant Order-DOE
- Conditions of Employment for Experts and Consultants Fact Sheet

- If you are planning to attend the meeting on March 30-31 in DC, you can complete the paper work in the presence of a DOE official and at that time you will also be sworn in. At the meeting please bring your passport or other approved form of ID as noted in the attached I-9 form.

- If you are not able to attend you can have the forms notarized and submitted. The date that the SF-61 is notarized will be your entrance-on-duty date. Please note that the notarized documents will serve as the official swearing-in. The forms can be faxed or e-mailed to me and following up with the originals. The forms can be mailed to:

  Department of Energy
  Office of Human Capital Officer
  Executive Resources Office (HC-40)
  1000 Independence Avenue, S.W.
  Washington, D.C. 20585
  Attn: Pattie Barfield

- Please have the notary complete the I-9 form (Employment Eligibility Verification); (verification of citizenship); you would show your passport or other forms of identification as noted on the I-9 form. If the notary public will not sign the certification portion, please forward a copy of the identification used when the forms are returned.