USDA – Update on Biomass R&D Activities

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Biomass Research & Development Board
Technical Advisory Committee
Crystal City, VA
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AGENDA

• USDA Research
  – ARS, NIFA (CAPs), FS, BRCs

• USDA Policies
  – 9003, BCAP, BIP, BioPreferred®

• USDA Partnerships
  – Navy, DOE, EPA
  – DPA & Farm to Fleet
  – Bioeconomy (BR&DB initiative)

• Farm Bill
Supply Chain Approach for Biofuels, Biopower, and biobased products

Feedstock Development & Production Research and Education

Feedstock Development & Production

Feedstock Logistics

Conversion Fuels & Power Chemicals

Conversion Scale-up/Integration

Fuel Testing/Approval Fuel Performance Environment Assmt

Enable Production

End Use Alternative Fuels Heat & Power Biobased Products
No one feedstock will meet all national biofuel needs

Use Region-based Strategies to Develop Sustained Feedstock Supplies

- Crop residues
- Perennial grasses
- Energy cane
- Non-food biomass sorghum
- Oil Seeds including Algae
- Woody Biomass

Biomass Research Centers
Why Forest Bioeconomy
Megacenters in 2050

Great Lakes
- Pop 18%
- GDP 17%

Northeast
- Pop 17%
- GDP 20%

N. Calif.
- Pop 5%
- GDP 5%

S. Calif.
- Pop 8%
- GDP 7%

Arizona
- Pop 2%
- GDP 2%

Front Range
- Pop 2%
- GDP 2%

TX Triangle
- Pop 6%
- GDP 7%

Gulf Coast
- Pop 4%
- GDP 4%

Florida
- Pop 6%
- GDP 5%

Cascade
- Pop 3%
- GDP 3%

Piedmont
- Pop 6%
- GDP 4%

Arizona
- Pop 2%
- GDP 2%

Gulf Coast
- Pop 4%
- GDP 4%

N. Calif.
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- GDP 5%

Cascade
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- Pop 6%
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Forest Service Bioeconomy Research

- Biomass survey.
- Siting tools.
- Wood-to-energy grants (none R&D).
- Wood Science.
- Biorefinery, wood deconstruction.
- Bio-based products.
- Nanotechnology.
- Policy formulation and coordination.
- National initiative.
- Research coordination.
- Nontimber forest products.
- Feedstock production, short rotation.
- Harvesting.
SE: Napiergrass hybrid 10-12 tons/ac

ARS

‘Liberty’ switchgrass

Central-East
Western
Northwestern

19.7 tons/ha (8 tons/ac)
Western Nebraska
Biomass Utilization Centers

USDA-Agricultural Research Service
ARS Regional Research Centers
(Bioconversion)

Western Regional Research Center
Albany, California

Southern Regional Research Center
New Orleans, Louisiana

National Center for Agricultural Utilization Research
Peoria, Illinois

Eastern Regional Research Center
Wyndmoor, Pennsylvania
Guayule natural latex rubber

Guayule, native US desert plant

Patagonia environmentally friendly wetsuits
NIFA-AFRI Coordinated Agricultural Projects

- Regional Projects facilitating the development of sustainable systems for the production of bioenergy and biobased products.
- University-led Public Private Partnerships
- Transdisciplinary whole systems approach
  - Focus on feedstock development, production, and delivery
  - Must partner with feedstock users & well-align with appropriate conversion technologies and industry for bioproduct production
  - Integrate Research, Development, Demonstration, Education, Outreach
- Sustainability Performance Analysis
  - Environmental
  - Economical (viable and competitive)
  - Social
- Focus on understanding risk and developing a value proposition that will attract investment
AFRI Biofuel Feedstocks and Project Locations
NARA: Feedstock to Fuels

FOREST RESIDUES PREPARATION
Primary feedstock targets include forest residues from logging and thinning operations. We are also considering mill residues and discarded woody material from construction and demolition, in regions where these materials are under utilized.

TRANSPORTATION
Feedstocks are transported from the collection site to a conversion facility. Chipping can take place at the loading or in a preprocessing facility.

PRE-TREATMENT
Wood chips are treated to make the sugar polymers (polysaccharides) accessible to degrading enzymes. These processes allow the lignin to be available for separation.

ENZYMATIC HYDROLYSIS
Specific enzymes are added to hydrolyze (cleave) the polysaccharides and generate simple sugars (monosaccharides).

FERMENTATION
Specialized yeast convert the monosaccharides into isobutanol.

BIOJET & CO-PRODUCTS
Aviation fuels can be generated from the platform molecules derived from wood sugars. Lignin can be used to generate co-products such as epoxies, structural materials and bio-based plastics. As an alternative, lignin can be burned to produce renewable energy.

1000 kg BONE DRY WOODY BIOMASS + DIESEL + HEAT, WATER, & CHEMICALS = ~300 kg LIGNIN AND ~260 LITERS ISOBUTANOL OR ~190 LITERS BIODIESEL

Successful Alaska Airlines Demo Flight
Energy Cane

Sustainable Production → Harvest → Deliver

Condensation → Hydrotreating → Intermediates: sugars, syrups, cellulose

Conversion to Fuel and Co-Products

Value to Consumer

Southeastern Bioproducts Initiative (LSU)
Two types of projects by Statute:

- Commercial-scale Biorefineries using Eligible Technology
- Biobased Product Manufacturing Facilities
9003 Biorefineries:
or Retrofitting of Commercial-Scale Biorefineries using Eligible Technology.

• Must produce an advanced biofuel
• May produce biobased products and renewable chemicals

Biobased Product Manufacturing:
and Retrofitting of Technologically New Commercial-Scale facilities that

• Convert Renewable Chemicals and other biobased outputs of Biorefineries (biobased products of biorefineries) into
• End-user products on a Commercial Scale
• Technologically New
Key points:
• Loans of up to $250 Million (no minimum)
• Loan amount cannot exceed 80% of eligible project cost (generally 50 – 60%)
• New technology is eligible
• Not limited to rural locations
• Competitive application process

9003 Program Status Update:
• Letters of Intent – March 6, 2017
• Phase One Applications – April 3, 2017

Funds Available
• Approximately $500 million
BCAP MATCHING PAYMENTS ($20/dry ton):

– Payment made to eligible biomass material owners harvesting and delivering to a qualified facility.

– 60 facilities are qualified. The listing is posted at www.fsa.usda.gov/bcap.

– FY 2017, $1.5 million are already contracted to support deliveries of 75,000 dry tons-wood biomass & corn stover, approximately $0.5 to Iowa corn stover.

– Since FY 2011 over $10.5 million was allocated to support the delivery of 436,301 dry tons of ag and forest residues.
Biofuels Infrastructure Partnership (BIP)

- BIP offers competitive grants from the U.S. Department of Agriculture (USDA) to state-led efforts to test and evaluate innovative and comprehensive approaches to marketing higher biofuel blends, such as E15 and E85.

- $100 million has been awarded to 21 states, with a more than 1:1 match from private and state resources, USDA estimates that the BIP grants will support nearly 5,000 pumps at over 1,400 fueling stations across the country.

- **BIP supported construction has been initiated in 19 of the 21 States and is scheduled for completion December 2017. Over 30 percent of the 1,400 stations have been completed.**

- **Environmental Assessments have been conducted on nearly 60 percent of the targeted fueling stations.**

- Funding was provided under Section 5(e) of USDA’s Commodity Credit Corporation (CCC) Charter Act.
Mission: Identify and expand new markets for biobased products

1) Federal Purchasing Program
   - By law, federal agencies and contractors are required to buy biobased products in categories designated by USDA
   - 97 diverse categories including cleaning products, bioplastics, lubricants, and adhesives representing about 15,000 products in BioPreferred catalog that qualify for federal purchasing preference

2) Certification Program – USDA Biobased Product Label
   - Manufacturers may apply for certification and ability to display the USDA Certified Biobased Label on product
   - Independent third party certification partnership with ASTM International to verify biobased content of product
   - FP on label indicates product qualifies for federal purchasing preference
   - Currently about 2,800 certified products.
Designating Intermediate Categories for Federal Purchase

- **Round 11 – Proposed Rule was published on Jan. 13, 2017.**
- USDA accepting public comments through April 13, 2017.
- Designates approximately **12 categories of intermediates** for mandatory federal purchasing
  - Many of these products are already included in the BioPreferred Program under the voluntary certification initiative.
  - The intermediate ingredients and feedstock materials proposed for designation are the primary ingredients in hundreds of finished, consumer products that are purchased by federal government agencies as well as the general public. Designation of those finished products will be accomplished in a future rulemaking (Round 13) and will significantly expand the number of products that are subject to the procurement preference.
Economic Impact Study Released in October 2016 – State by State Analysis
USDA Partnerships

With Navy and DOE
• Defense Production Act

With Navy
• Farm-to-Fleet Program

With EPA
• Feedstock review, risk assessments
Defense Production Act (DPA) Title III Advanced Drop-In Biofuels Production Project (ADBPP) Biofuels 2

- FOA announced January 19, 2017 BY DPA Title III Office

- Objective: to further increase domestic advanced biofuels production capacity by establishing additional Integrated Biofuel Production Enterprise (IBPE) capabilities

- $55 million in funding available (likely 1 facility)
  - This does not include any CCC funds
  - The Commodity Credit Corporation (CCC) Charter Act (15 U.S.C 714 et seq)
    - CCC funding would be used to support and develop new and expand existing markets for agr commodities

- Solicitation closes May 25, 2017
Farm-to-Fleet

• There have been six fuel procurement solicitations to date; Inland/East/Gulf Coast and the Rocky Mountain/West Coast/Offshore (3 of each)

• Rocky Mountain/West Coast/Offshore solicitation, posted January 6, 2017 and closes February 21, 2017

• The Commodity Credit Corporation (CCC) Charter Act (15 U.S.C 714 et seq)
  • CCC funding would be used to support and develop new and expand existing markets for agr commodities

• To date, one award made under farm to Fleet Program
  • To Alt Air for 77.7 million gal military spec bio-marine diesel
  • CCC Biofuels Production Incentive - $0.1586 per gallon biofuel
  • Actual payment to date - $7.963 million (Feb. 5, 2017)
A Path Forward for the Bioeconomy Initiative

FARB
- Released in February 2016

Challenges & Opportunities
- Released at Q4 TAC Meeting on November 17, 2016

Action Plan
- Target release FY17 in first 100 days of next administration

THE BILLION TON BIOECONOMY INITIATIVE: ACTION PLAN
A BILLION DRY TONS OF SUSTAINABLE BIOMASS HAS THE POTENTIAL TO PRODUCE

1.1 MILLION Direct Jobs and keeps about $260 BILLION in the U.S. (direct contribution and inflation adjusted)

75 BILLION* kWh of electricity to power 7 MILLION households. Plus 990 TRILLION BTUs of thermal energy.

50 BILLION gallons of biofuels displacing almost 25% of all transportation fuels.

50 BILLION POUNDS of biobased chemicals and bioproducts, replacing a significant portion of the chemical market.

450 MILLION TONS of CO₂e reductions every year.

PROJECTIONS BASED ON:

* Includes 27 billion kWh and 90 TBtu from livestock anaerobic digestion
THANK YOU
Bridgestone makes its first tires with guayule rubber.

Cooper CS4 tire made completely out of rubber from guayule, a desert shrub that can be grown in the U.S.
In February, the Biomass R&D Board released the Federal Activities Report on the Bioeconomy (FARB).

The report aims to educate the public on the wide-ranging, federally funded activities that are helping to bolster the bioeconomy.

**The vision** for the Billion Ton Bioeconomy is to sustainably reach the 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 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.