

Biomass Feedstocks for a Rapidly Growing Biofuels Industry

Presented to
Biofuels, Food & Feed Tradeoffs
 St. Louis, Missouri

Presented by
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 Senior Scientific Advisor
 USDA's
 Research, Education & Economics Mission Area

April 12, 2007

Today's Discussion

- During conference planning, this presentation was to be about the "USDA/DOE Biomass Action Plan".
- In lieu of a published plan, I will help lay the groundwork for a discussion of impacts and tradeoffs by:
 - Reviewing some possible Future Directions in Energy
 - Looking at several Plans and Goals
 - Discussing possible sources of the feedstocks needed for this biofuels expansion, and
 - Presenting some of the actions underway in USDA.

Future Directions

Short Term Now

- Hybrid or Clean Diesel Vehicles
- Clean Coal Efficiency
- Energy Efficiency Standards
- Renewable Fuel Standards
- Nuclear Plant Relicensing
- Enhanced Oil Recover
- Biological Sequestration
- Methane to Markets*
- Federal Facility Management Plan
- Fuel Economy Standards
- Wind, Solar Tax Incentives
- Climate Leaders
- Climate VISION
- SmartWay Transportation

Mid Term

- Hybrid/Clean Diesel Vehicles
- Clean Coal Gasification
- Renewable/Efficiency Partnership*
- Cellulosic Biomass
- Advanced Nuclear
- Geological Sequestration*

Long Term

- Hydrogen*
- FutureGen*
- Zero Energy Homes & Buildings
- Bio-Energy Systems
- GenIV Nuclear/Fusion*



Source: June 30, 2005 White House Press Release on G-8 Summit

* Denotes International Partnership

History of Federal Energy and Environmental Policy

- 1978 – Public Utility Regulatory Policies Act (PURPA)
 - 1978 – Energy Tax Act (ethanol blends \$.40/gallon tax exemption)
 - 1992 – Energy Policy Act (tax credit for renewable energy production)
 - 1998 – Energy Conservation Reauthorization Act (included biodiesel credit)
 - 1998 – Alternative Motor Fuels Act (Encouraged cars fueled by alternative fuels)
 - 2000 – Biomass R&D Act (DOE/USDA joint R&D biobased industrial products)
 - 2002 – Farm Bill (First energy title in Farm Bill history)
 - 2002 – Job Bill – (included biodiesel fuel tax credit)
 - 2005 – Energy Policy Act of 2005 (RFS, production tax incentive through 2007)
 - 2006 – State of the Union – "addicted to oil"
 - 2006 – Advanced Energy Initiative
 - 2007 – State of the Union – Twenty in Ten
 - 2007 – Biweekly Energy Briefings to USDA Secretary
 - 2007 – Farm Bill – Increase Budgets for bioenergy R&D
- Federal Environmental Policies**
- 1990 Clean Air Act (CAA) – (first major environmental policy to have an impact on renewable energy).
 - 2006 – (EPA requires the use of ultra low sulfur diesel fuel (15 parts per million sulfur)
 - 2010 – Non-road diesel fuel regulations will take place

Adapted from article by Collins & Duffield, CHOICES, Jan. 2006

Future Directions — We are living in a new world of potential

- Growing need for clean and affordable supply of energy
- Opportunity for agriculture to supply some of that energy
- USDA agencies support renewable energy production
- USDA collaborates with other Federal agencies
- Government policies and initiatives support these efforts
 - Increase R&D Funding
 - Commercialization partnerships
- Potential beneficiaries of agriculture energy development?
- Proposed USDA FY 2008 budget for energy
 - \$397 million energy outlays
 - 68 percent increase compared to FY 2007
- The 2007 Farm Bill proposes expanding renewable energy for U.S. agriculture and rural areas

Desired Agricultural Energy Outcomes?



- Improve national **security** and the U.S. trade balance
- Help America transition to **renewable** sources of energy and other goods
- Realize important **environmental** benefits
- Realize significant, new, sustainable **economic** opportunities for rural America
- Realize secure sources of energy for **rural** America

Much Interest ... Many Plans

Much Interest ... Many Goals



30x'30
Goal: Replace 30% of present fuel needs with biofuels by 2030
(State of the Union Address 2006/2007 Biofuels Initiative)



25x'25
Goal: America's farms, forests, and ranches will provide 25 percent of the total energy consumed in the U.S., while continuing to produce safe, abundant, and affordable food, fuel and fiber by 2025.

BR&Di
Biomass Research and Development Initiative

VISION FOR BIOENERGY AND BIOBASED PRODUCTS IN THE UNITED STATES
Achieving a Sustainable Future

NATIONAL BIOMASS ACTION PLAN

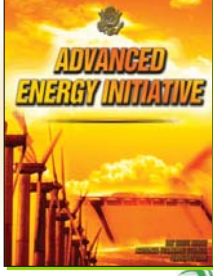
2006



Advanced Energy Initiative

“Change how we power our automobiles”

- Advanced battery technologies — plug-in hybrids
- Cellulosic ethanol costs
- Hydrogen fuel cells by 2020



“Change how we power our homes and offices”

- Clean Coal
- Nuclear Energy
- Renewable Energy

Biofuels Initiative

The Biofuels Initiative objective is to foster the production of biofuels to replace more than 75 percent of our oil imports from the Middle East by 2025 (+\$53M)


Achieving this ambitious goal will require looking at corn and other biomass resources to produce ethanol, including:

- Agricultural crops & residues
- Woody plants & grasses

Biomass Program has conducted a major solicitation in FY 2007 to validate near-term ethanol biorefineries in collaboration with industry (1st validation will occur in FY 2009)

Benefits (2030): Develop technologies to enable US to displace 2.6 MMBbl/d oil equivalent, keeping \$44 billion in the US economy to create jobs at home

From Lab... ..to Industry... ..to Consumers



BR&Di
Biomass Research and Development Initiative

VISION FOR BIOENERGY AND BIOBASED PRODUCTS IN THE UNITED STATES
Achieving a Sustainable Future

2006

BR + Di Vision and Goals

– Vision Statement –

By 2030, a well established, economically viable, bioenergy and biobased products industry will continue new economic opportunities for the United States, protect and enhance our environment, strengthen U.S. energy security, provide economic opportunity, and deliver improved products to consumers.

Vision Goals

	Units	2000	2004	2010	2015	2020	2030
Biofuels	Market share (%)	02	10	40	60	10	20
	Consumption (billion gasoline-equivalent gallons)	1.1	20	89	12	28	51
Biopower	Market share (%)	38	30	45	50	70	7
	Consumption (quadrillion Btu)	2.0	2.1	3.2	3.4	3.8	3
Bioproducts	Production (billion lbs)	18.8	17	28	26	35	55

NATIONAL BIOMASS ACTION PLAN

BR&Di
Biomass Research and Development Initiative

- Commissioned by the Biomass R&D Board
- Purposes:**
 - Define agency roles and activities
 - Identify gaps and synergies
 - Assess budgets
- Process**
 - Conducted Workshop Nov. 26-27, 2006
 - Breakout Sessions:
 - Feedstocks
 - Biochemical Conversion Technologies
 - Thermochemical Conversions Technologies
 - Technology Integration
 - Biofuels Infrastructure
 - Communication, Education and Outreach
 - Interagency Teams formed for each breakout session topic
 - Develop draft NBA Plan
 - Reviewed by Agencies
 - Then Presented to Board
- Product** – to be released soon

30x'30
Goal: Replace 30% of present fuel needs with biofuels by 2030
(State of the Union Address 2006/2007 Biofuels Initiative)

Renewable Energy Goals

	Goal Areas	Approach	Outcomes
President's Biofuels Initiative 30 x '30	Cellulosic ethanol – 30% gasoline displaced by 2030 – 60 billion gallons	Convened 30x30 industrial workshop Convened government biofuels implementation planning workshop	*R&D & policy strategies to provide basis for DOE R&D planning *Federal Implementation Plan to map agency roles

Adapted from BR&Di – Biomass Research & Development Initiative

R & D Challenges for Fermentation

	Barrier	2006	2012 Goal
Feedstock	Minimum Ethanol Selling Price	\$2.26	\$1.07
	Installed Capital per Annual Gallon	\$3.04	\$1.85
	Yield (gallon/dry ton)	65	90
Pretreatment	Feedstock Cost (\$/dry ton)	\$53	\$35
	Xylan to Xylose	63%	90%
Conditioning	Xylan to Degradation Products	13%	5%
	Xylose Sugar Loss	13%	0%
Enzymes	Glucose Sugar Loss	12%	0%
	Enzyme Contribution* (\$/gal EtOH)	\$0.32	\$0.10
Saccharification & Fermentation	Combined Saccharification & Fermentation Time (d)	7	3
	Xylose to Ethanol	76%	85%
	Minor Sugars to Ethanol	0%	85%

*Model value, slightly lower than metric value

R & D Challenges for Thermochemical Conversion

	Barrier	2005	2012 Goal
Cleanup & Conditioning	Minimum Ethanol Selling Price	\$1.61	\$1.07
	Higher Alcohol Co-Product Value (% market value)	85%	69%
	Minimum Mixed Alcohol Selling Price (\$/gal ethanol equivalent)	\$1.80	\$1.25
	Installed Capital Cost (\$/annual gal MA)	\$2.71	\$2.00
	Operating Cost (\$/annual gal MA)	\$0.81	\$0.49
	Ethanol Yield (gal/dry ton)	56	67
	Mixed Alcohol Yield (gal/dry ton)	77	89
	Feedstock Type	Wood Chips	Biorefinery Residues
	Tar reformer exit methane (mol% - dry basis)	8.25	1.73
	Tar reformer light HC reforming (% CH ₄ conversion)	20%	80%
Tar reformer heavy HC reforming (% benzene)	70%	99%	
Tar reformer heavy HC reforming (% tar conversion)	95%	99.9%	
SMR Light HC reforming (% CH ₄ conversion)	73%	N/A	
Sulfur Removal	1ppmv (SMR)	50ppmv (MA)	
CO ₂ Recycle (lb/dry feed)	1.72	0.66	
Compression for fuel synthesis (psia)	2,000	1,000	
Single pass CO conversion	38.5	50	
Overall CO conversion	96.9	98.1	
CO selectivity to alcohols	80	90	

DOE's Actions

30x'30
Goal: Reduce 30% of present fuel needs with biofuels by 2030 (from the base case, 2005-2030, base case)

Funding Three Molecular Bioenergy Centers \$250 Million each.

Cellulosic Cost-share (FY07-10), \$385M Funding - Total \$1.2 B
6 Plants - 130 MM gal per year

Company	Funding Mil. \$	Ethanol Mil. gal.	Feedstock
Abengoa	\$76	11.4	Stover, wheat, straw, switchgrass
ALICO	\$53	13.9	Yard, wood, vegetative wastes
BlueFire	\$40	19	Green, wood wastes
Broin	\$80	31	Corn fiber, cobs
Iogen	\$80	18	Agricultural residues
Range Fuels	\$76	40	Wood residues, wood energy crops

DOE Regional Feedstocks

- Biomass Resource Assessment**
 - Regional Supply Curves and GIS
- Biomass Resource Development**
 - Field trials of dedicated feedstocks
 - Impact of residue removal on yields
- Crop Development**
 - Genetic evaluation of energy crops
- Education and Outreach**
 - BioWeb

"20 in 10"

ENERGY SECURITY for the 21ST CENTURY

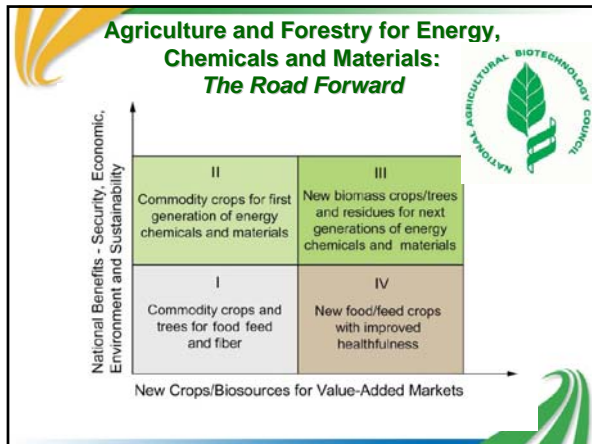
Reliable, Affordable, Environmentally-Sound Energy

- During his 2007 State of the Union Address, President Bush announced the goal of reducing U.S. gasoline usage by 20% in the next ten years — **"Twenty in Ten."** Goals include:
 - Increasing the supply of renewable and alternative fuels by setting a mandatory fuels standard to require **35 billion gallons of renewable and alternative fuels in 2017** – nearly five times the 2012 target now in law.
 - Reforming and modernizing **Corporate Average Fuel Economy (CAFE)** standards for cars and extending the **current Light Truck rule.**

THE ASPEN INSTITUTE

Energy: The New Normal?

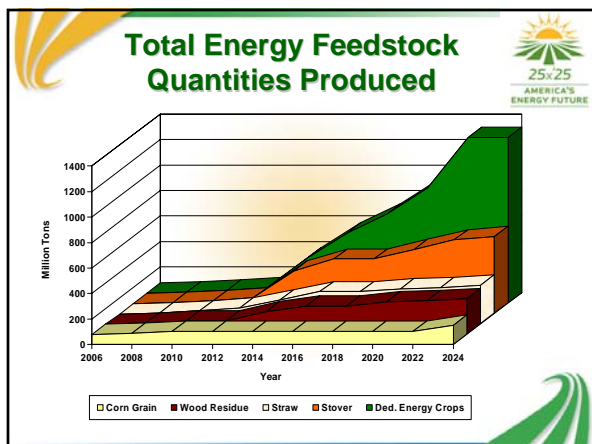
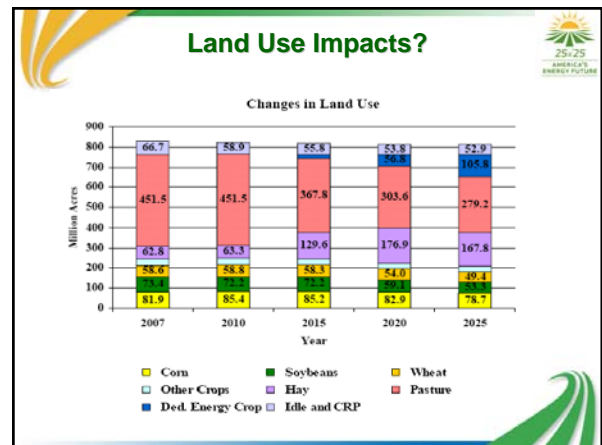
- Convened Experts for 4 day dialogue
- Generated 16 Unanimous recommendations on R&D Policy and Incentives – including
 - Stimulating and Deploying energy technologies
 - Promoting energy efficiency
 - Reducing US oil imports
 - Reducing carbon dioxide emissions
- Called for 100 Billion Gallons of Ethanol by 2025



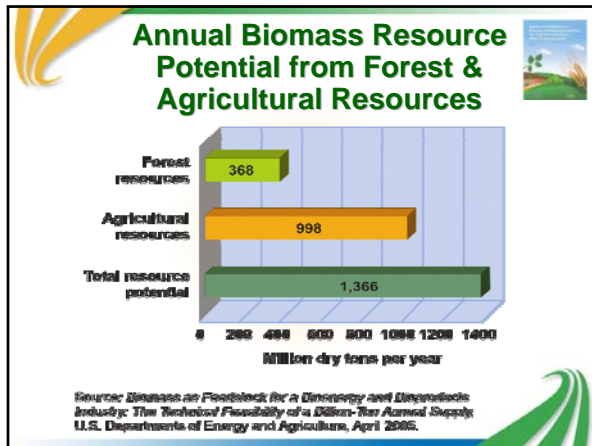
- ### NABC Road Forward
- Liquid Transportation Fuels
 - 50 Billion Gallons by 2025
 - 100+ Billion Gallons by 2035
 - Organic Chemicals
 - Glucose - \$0.04 per pound
 - Competitive price ethylene
 - Genetic modification
 - Organic Materials
 - New Fiber Crops
 - Genetic modification

25x'25 Projected Energy Contributions by Feedstock/Source

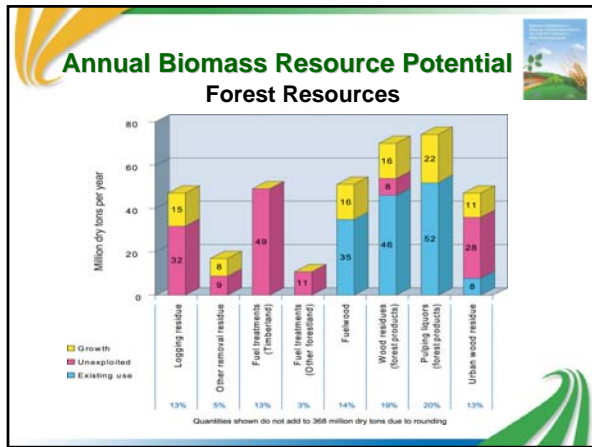
	Renewable Quads				
	2005	2010	2015	2020	2025
Transportation Fuels					
Grain Ethanol/Biofuels	0.23	0.914	1.046	1.155	1.450
Cellulosic Ethanol/Biofuels	0	0	1.757	3.980	6.128
Crop Oil		0.012	0.025	0.041	0.056
Animal Fat		0.018	0.037	0.057	0.079
Electricity					
Solid Biomass	0.12	0	2.293	4.666	6.607
Livestock Solid Biomass		0.505	0.524	0.571	0.571



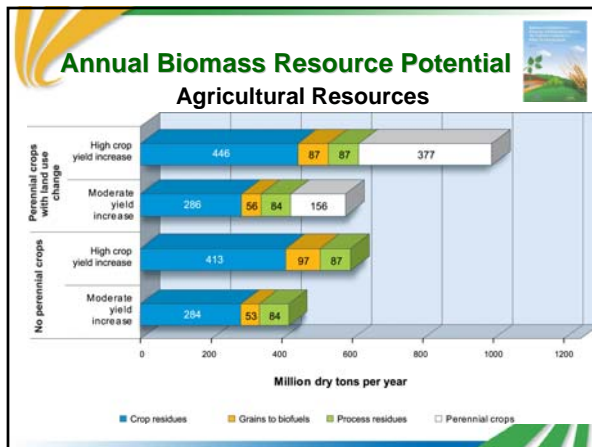
- ### Possible Feedstock Sources?
- Biomass as Feedstock for a Biorefinery and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply
- "Billion Ton" study indicates that enough biomass is potentially available to displace > 30% of current U.S. petroleum consumption, with no impacts to food, feed, or export demand
 - Requires a variety of biomass types



- ### Annual Biomass Resource Potential Forest Resources
- Primary
 - Logging residues from conventional harvest operations and residues from forest management and land clearing operations
 - Removal of excess biomass (fuel treatments) from timberlands and other forestlands
 - Fuelwood extracted from forestlands
 - Secondary
 - Primary wood processing mill residues
 - Secondary wood processing mill residues
 - Pulping liquors (black liquor)
 - Tertiary
 - Urban wood residues — construction and demolition debris, tree trimmings, packaging wastes and consumer durables





- ### Annual Biomass Resource Potential Agricultural Resources
- Primary
 - Crop residues from major crops — corn stover, small grain straw, and others
 - Grains (corn and soybeans) used for ethanol, biodiesel, and bioproducts
 - Perennial grasses
 - Perennial woody crops
 - Secondary
 - Animal manures
 - Food/feed processing residues
 - Tertiary
 - MSW and post-consumer residues and landfill gases



- ### Actions Underway in USDA
- Biomass Research and Development Board – Joint USDA/DOE
 - Energy Council – USDA
 - Bioenergy – Bioproducts Coordinating Council (BBCC) – USDA
 - Agricultural Bioenergy Bioproducts Research Education and Economics (ABBREE) Task Force– USDA REE

Biomass Research and Development Board

- A panel consisting of Senior Level representatives responsible for ensuring coordination among the following agencies:
- Co-Chaired by US Departments of Agriculture and Energy
- Responsible for coordinating Federal activities for the purpose of promoting the use of biobased fuels and biobased products.

- U.S. Department of Agriculture (co-chair): *Thomas Dorr, Under Secretary for Rural Development*
- Department of Energy (co-chair): *Alexander Karsner, Assistant Secretary of Energy Efficiency and Renewable Energy*
- National Science Foundation: *Dr. Bruce Hamilton, Director, Bioengineering and Environmental Systems Division*
- Environmental Protection Agency: *In transition*
- Department of Interior: *Johnnie Burton, Acting Assistant Secretary, Land and Minerals Management*
- Office of Science and Technology Policy: *Dr. Sharon Hays, Chief of Staff*
- Office of the Federal Environmental Executive: *Dana Arnold, Chief of Staff*
- Department of Transportation (new): *Dr. Ashok G. Kaveeshwar, Administrator, Research and Innovative Technology Administration*


The Biomass Research and Development Technical Advisory Committee

- The Advisory Committee is responsible for providing guidance to the Biomass Research and Development Board on the technical focus of the Biomass Research and Development Initiative.
- Official functions of the Advisory Committee include:
 - Advise the Secretary of Energy, the Secretary of Agriculture, and the points of contact concerning
 - the technical focus and direction of requests for proposals issued under the Initiative; and
 - procedures for reviewing and evaluating the proposals.
 - Facilitate consultations and partnerships among Federal and State agencies, agricultural producers, industry, consumers, the research community, and other interested groups to carry out program activities relating to the Initiative
 - Evaluate and perform strategic planning on program activities relating to the Initiative
- The Advisory Committee holds quarterly, public meetings.
- Meetings are announced in the Federal Register.




USDA's Energy Council

- Purposes:
 - Oversight of implementation of President's National Energy Plan including EPAct of 2005.
 - Coordination of USDA Energy Related Programs.
 - Review and evaluation of key policy and program decisions on energy matters.
 - Development of Initiatives to transform and generate alternative energy sources.
 - Assist and oversee continued implementation of Title IX of 2002 Farm Bill.
- Chair: Tom Dorr, RD
- Co-Vice Chairs: Keith Collins, OCE; Mark Rey, NRE
- Ex-Officio Members: DOE, EPA, DOC, DOI, DOT
- Methods:
 - Coordinate Secretary's bi-weekly energy briefings
 - Established four standing oversight committees
 - Research and Development
 - Commercialization
 - Outreach/Marketing
 - International Relations
 - Provides leadership for Biomass Research and Development Initiative




Biobased Products and Bioenergy Coordination Council (BBCC) Members

Chair – Gale Buchanan, Under Secretary REE
 Vice Chair – Rodger Conway, Director, OEPNU
 Working Chair: Bob Fireovid (ARS), Working Vice Chair: Bill Goldner (CSREES), Secretary Marion Buford (FS)


<ul style="list-style-type: none"> • Agricultural Marketing Service • Agricultural Research Service • Cooperative State Research, Education and Extension Service • Farm Service Agency • Foreign Agricultural Service • Forest Service • Global Change Program Office 	<ul style="list-style-type: none"> • Natural Resources Conservation Service • Office of Budget and Program Analysis • Office of Energy Policy and New Uses • Office of the Assistant Secretary for Administration Office of the Under Secretary for Research, Education and Economics • Rural Business-Cooperative Service • Rural Utilities Service
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<http://www.ars.usda.gov/bbcc/>



Biobased Products and Bioenergy Coordination Council (BBCC)

- Program Scope
 - Helping farmers and forest landowners to provide Food, Feed, Fiber, and Fuels
 - Resolving technology and market barriers for biofuels and bioproducts
 - Leading biobased products development and Federal procurement.
 - Providing information and education to support the bioeconomy and energy efficiency.
- Coordination
 - Representation and participation from all agencies and programs
 - Develop 5-year plan and annual priorities
 - Work with Energy Council Committees
 - Utilize the different agency education and training programs
 - Provide information about policy implications within USDA
- Integration
 - Link basic/applied/developmental research and commercialization
 - Fully develop and use demonstration and pilot opportunities
 - Provide formal and informal education/training across mission programs
 - Promote energy conservation and efficiency in other programs
- Measures of Success
 - Enhanced rural economic outputs
 - Focused loans and grants
 - Accelerated technology commercialization
 - Tailored education and training



BBCC Vision and Goals

Growing Energy and Opportunity in America – Linking Land Conservation, Innovation, and Value

- Vision
 - Reduce dependence on foreign oil imports
 - Improved National security
 - New economic and environmental opportunities for America's farmers, ranchers, and forest landowners
- Goals
 - Conserve and reduce energy in farm and forest operations
 - Acquire renewable energy & biobased products from America's lands without supply and market disruption
 - Produce energy and biobased feedstocks sustainably




The National Agricultural Research, Extension, Education, and Economics Advisory Board (NAREEEAB)

- Provides advice to the Secretary of Agriculture and land-grant colleges and universities through REE Undersecretary on top priorities and policies for food and agricultural research, education, extension and economics. The Board –
 - Reflects the broad interests of food, fiber, and agricultural stakeholders nationwide.
 - Holds regional and national stakeholder listening sessions, and
 - Develops consolidated advice based on stakeholder input that is vital to the current and future success of food, forestry, and agricultural programs.
 - Consults with appropriate agricultural committees of the U.S. Congress
- Includes 31 Members, each of which represents a specific category of U.S. agricultural stakeholders, as mandated by Congress.
- March and October 2006 meetings - focus groups on REE's responsibilities with respect to energy and bioproducts agriculture.

<http://www.ree.usda.gov/>

Recommendations of the NAREEE Board

- Take the **lead** on strategies for development of a bioenergy and bioproducts based economy.
- Announce a holistic and coherent **vision** of its role and strategy in bioenergy and to convey the message to the public.
- Undertake a **focused effort** to request the increased funding required to develop a nationally visible program.
- Take a **portfolio approach** while identifying which new intermediates for current and new applications may hold the most promise for potential commercialization.
- Develop a **systems approach** including economics, engineering and social management to evaluate research directions and alternatives.
- Seek **additional funding** for new and enhanced research and education bioenergy and bioproducts initiatives.

Agricultural Bioenergy Bioproducts Research Education and Economics (ABBREE) Task Force

- Formed in October 2006 by Dr. Buchanan
- Advises the REE Under Secretary on matters relating to agricultural bioenergy and related bioproducts via bi-weekly meetings
- Comprised of individuals with bioenergy and bioproducts expertise from all REE Agencies
 - Joseph Dunn (REE)
 - Ghassem Asrar (ARS)
 - Carmela Bailey (CSREES)
 - Chavonda Jacobs-Young (CSREES)
 - Neil Conklin (ERS)
 - Mark Miller (NASS).
- Initiating various educational forums including a monthly seminar series focusing on USDA research in bioenergy and related bioproducts and "Bioenergy Day"
- Planning for a REE bioenergy and related bioproducts workshop for fall 2007

USDA – REE – ABBREE

Energy Science and Education Workshop

- Committee: Bill Goldner (CSREES), Frank Flora (ARS), Neil Conklin (ERS), Mark Miller (NASS).
- Purpose:
 - Set Vision and Goals
 - Identify Program Areas of Focus
 - Identify Critical Cross Cutting Issues
 - Establish Agencies' Responsibilities
 - Suggest Process to Achieve Goals
- Outcomes:
 - Vision and Goals Established
 - Program Areas of Focus Established
 - REE Responsibilities and Comparative Advantages Identified
 - Agencies' Responsibility Accepted
 - Cross Cutting Issues Integrated into Program Areas
 - Initial Program Priorities Identified
 - Process for Moving Forward Presented

USDA – RESEARCH EDUCATION AND ECONOMICS MISSION AREA

ENERGY SCIENCE AND EDUCATION

VISION:

Building A Prosperous Future Where Agriculture Produces and Uses Energy Efficiently and Effectively



USDA – RESEARCH EDUCATION AND ECONOMICS MISSION AREA

ENERGY SCIENCE AND EDUCATION

GOALS:

- Develop comprehensive, integrated intramural and extramural **research** program that effectively explores the role of agriculture as both a user and producer of energy.
- Establish energy science, **education and extension** activities related to agriculture with university and industry partners as well as other federal and state agencies.
- Initiate comprehensive **technology transfer** programs for agriculture energy research to agriculture producers, suppliers and users.

USDA/REE ENERGY SCIENCE PROGRAM FOCUS

- Renewable Energy
 - Bio-Based Sources
 - Other Sources - Wind, Solar, Geothermal
- Energy Efficiency and Sustainability
 - Production Systems
 - Management Systems

USDA/REE ENERGY SCIENCE RENEWABLE ENERGY PROGRAM

- Biobased Resources
 - Feedstocks

Sources	Inputs	Handling
• Crops	• Fuels	• Harvesting
• Residues	• Fertilizer	• Storage
• Wastes	• Water	• Transportation
	• Varieties	
 - Conversion Processes
 - Biological
 - Thermochemical
 - Thermal
 - Products
 - Fuel & Co-products
 - Bio-based
- Other Renewable Energy Resources
 - Wind, Solar, Geothermal

USDA/REE ENERGY SCIENCE ENERGY EFFICIENCY AND SUSTAINABILITY PROGRAM

- Production Systems
 - Inputs
 - Fuels
 - Nutrients
 - Water
 - Practices
 - Precision farming
 - Plant breeding/genetic selection
 - Pest Management
- Management Systems
 - Material Handling
 - Building Design
 - Processing

Working Together to Develop - - -

Biofuels, Food & Feed Tradeoffs

April 12-13, 2007 St. Louis, Missouri

National Renewable Energy Goals

	Goal Areas	Approach	Outcomes
National Biomass Initiative	Biofuels – 68 billion gallons by 2030 Biopower – 10 quads by 2030 Bioproducts – 55 billion pounds by 2030	Vision workshop to update goals; followed by peer review. (final Sept. '06) Three Region-specific Roadmap workshops	*Roadmap of R&D and policy strategies and timelines (regional and national perspective) *Guidance to R&D Board *Guidance for annual joint USDA/DOE solicitation *Used to monitor progress by agencies
President's Biofuels Initiative 30 x '30	Cellulosic ethanol – 30% gasoline displaced by 2030 – 60 billion gallons	Convened 30x30 industrial workshop Convened government biofuels implementation planning workshop	*R&D & policy strategies to provide basis for DOE R&D planning *Federal Implementation Plan to map agency roles
20 in '10	Reduce U.S. gas use by 20% in 10 years (2017)	RFS for 35 billion gallons of renewable and alternative fuels	*Facilitated growth in short time frame with expanded scope of fuel sources
Aspen Institute	Ethanol – 100 billion gallons by 2025	Convened experts for 3-4 day dialogue	Generated 16 unanimous recommendations on R&D, policy, and incentives
25 x '25	Wind, Solar, Biofuels – 25% energy displaced by 2025 – 32 quads	Holding planning meetings and established workgroups**	Roadmap of R&D and policy recommendations. (draft: Oct. '06)

Adapted from BR&DI – Biomass Research & Development Initiative

**Much Interest ...
Many Plans Many Goals**

ADVANCED ENERGY INITIATIVE

Biomass as Feedstock for a Biorefinery and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply

BR&Di

Biomass Research and Development Initiative

VISION FOR BIOENERGY AND BIOBASED PRODUCTS IN THE UNITED STATES

NATIONAL BIOMASS ACTION PLAN

THE ASPEN INSTITUTE

30x'30
Goal: Replace 30% of present fuel needs with biofuels by 2030

Twenty in TEN
Goal: Reduce greenhouse gas by 20% in the next ten years

25x'25
Goal: America's farms, forests, and ranches will provide 25 percent of the total energy consumed in the U.S., while continuing to produce safe, abundant, and affordable food, feed and fiber by 2025

**ABBREE Process
to Establish Future Directions for
USDA's Energy Science and Education Programs.**

- ✓ Set Vision and Goals
- ✓ Establish Program Focus
- ✓ Build on Comparative Advantages
- ✓ Seek Input
- ✓ Conduct Workshop to Finalize Program Direction

Activities and Events (October 2006 – 2007)

Sept. 2007	REE Energy Science & Education Workshop: Vision, Goals, Programs
April – Sept.	Seeking Additional Input and Developing Plans for Workshop
March/April	Seeking Input from Regional Associations
March	Budget Hearings Senate Ag Committee
FEB.	The BBCC Presents Vision and Goals for USDA Bioenergy Programs
FEB.	Input Sought on REE Energy Plan - ARS & CSREES Admin. Councils
FEB.	NAREEE Advisory Board - Energy Recommendations
JAN.	USDA Budget Submitted with Request for Increase Funding for Energy
JAN.	Energy Science & Education Workshop Planning Committee Charged
JAN. 2007	REE Agency Heads Engaged on REE Energy Science & Education Plan
DEC.	Proposed Vision and Goals for REE Energy Program Developed
NOV.	Established ABBREE Advisory Committee
OCT. 2006	NAREEE Advisory Board - Focus - USDA Bioenergy Responsibilities