



U.S. Department of Energy
**Energy Efficiency
and Renewable Energy**

Bringing you a prosperous future where energy
is clean, abundant, reliable, and affordable

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U.S. Department of Energy Biomass Program

Growing a Robust Biofuels Economy



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Program Manager

Technical Advisory Committee
May 15, 2007

US Commitment to Ambitious Biofuels Goals

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- Cost-competitive cellulosic ethanol” by 2012
- **“20 in 10”**
 - Reduce U.S. gasoline* use by **20%** by 2017 through...
 - o **15%** reduction from new Alternative Fuels Standard at **35 billion** gallons/year
 - o **5%** reduction from enhanced efficiency standards (CAFÉ)
- **“30 in 30”**
 - Longer-term DOE biofuels goal
 - Ramp up the production of biofuels to **60 billion** gallons
 - Displace **30%** of U.S. gasoline consumption* by 2030

* light-duty vehicles only

Biomass R&D Initiative (BRDI)

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- Multi-agency effort to coordinate and accelerate all Federal biobased products and bioenergy research and development.
- Mandated under the Biomass Research & Development Act of 2000, further revised by Energy Policy Act of 2005 (Sec 937).
- BRDI coordinating bodies
 - Biomass R&D Board, a cabinet level council co-chaired by DOE and USDA – also includes DOI, DOT, EPA, DOC.
 - **Commissioned National Biofuels Action (NBA) Plan by Fall 2007.**
 - OBP heavily engaged
 - Will need and require TAC input
 - Biomass R&D Technical Advisory Committee

BR&Di
BIOMASS RESEARCH & DEVELOPMENT INITIATIVE

www.brdisolutions.com

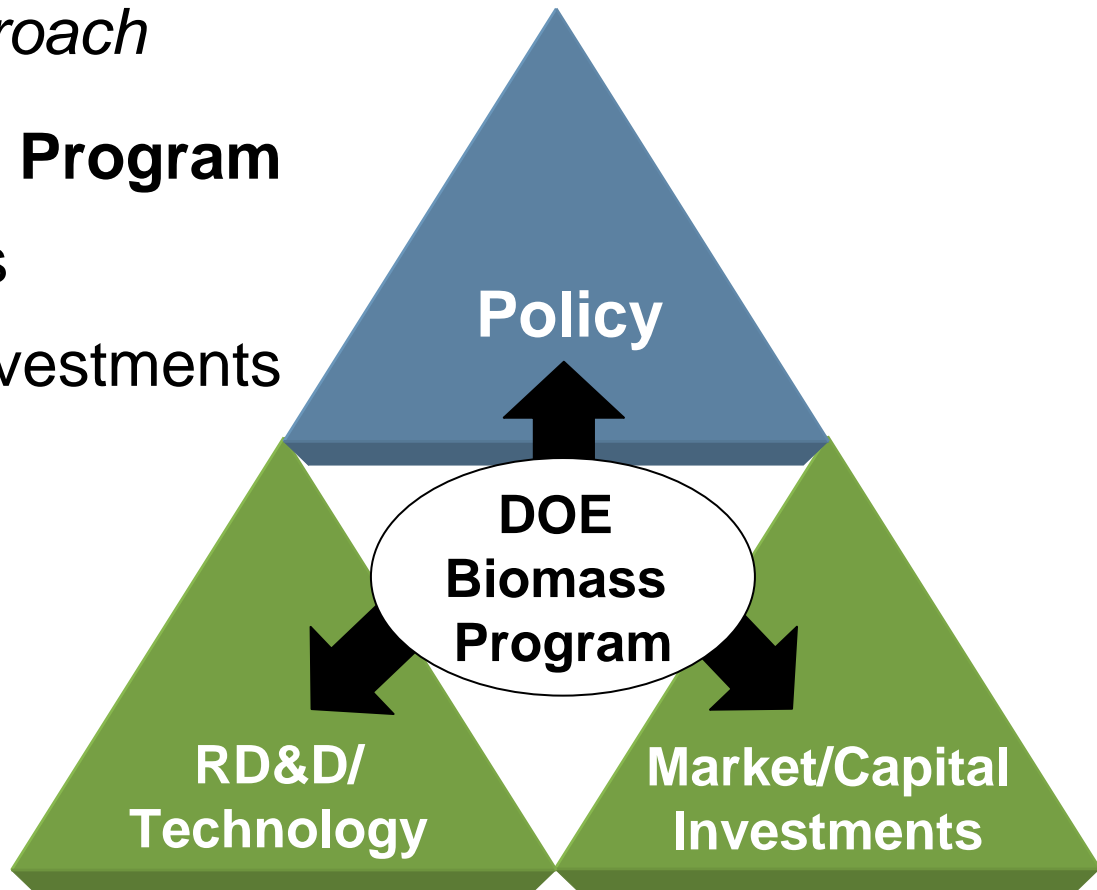
How Do We Achieve These Goals?

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Three-pronged approach

- **Effective RD&D Program**
- Effective policies
- Private sector investments



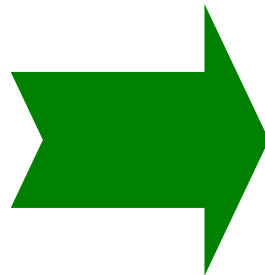
Biomass Program Mission

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Develop and transform our renewable and abundant biomass resources into cost competitive, high performance biofuels, bioproducts, and biopower.

- **Partnerships**
- **Policy**
- **Interagency Coordination**



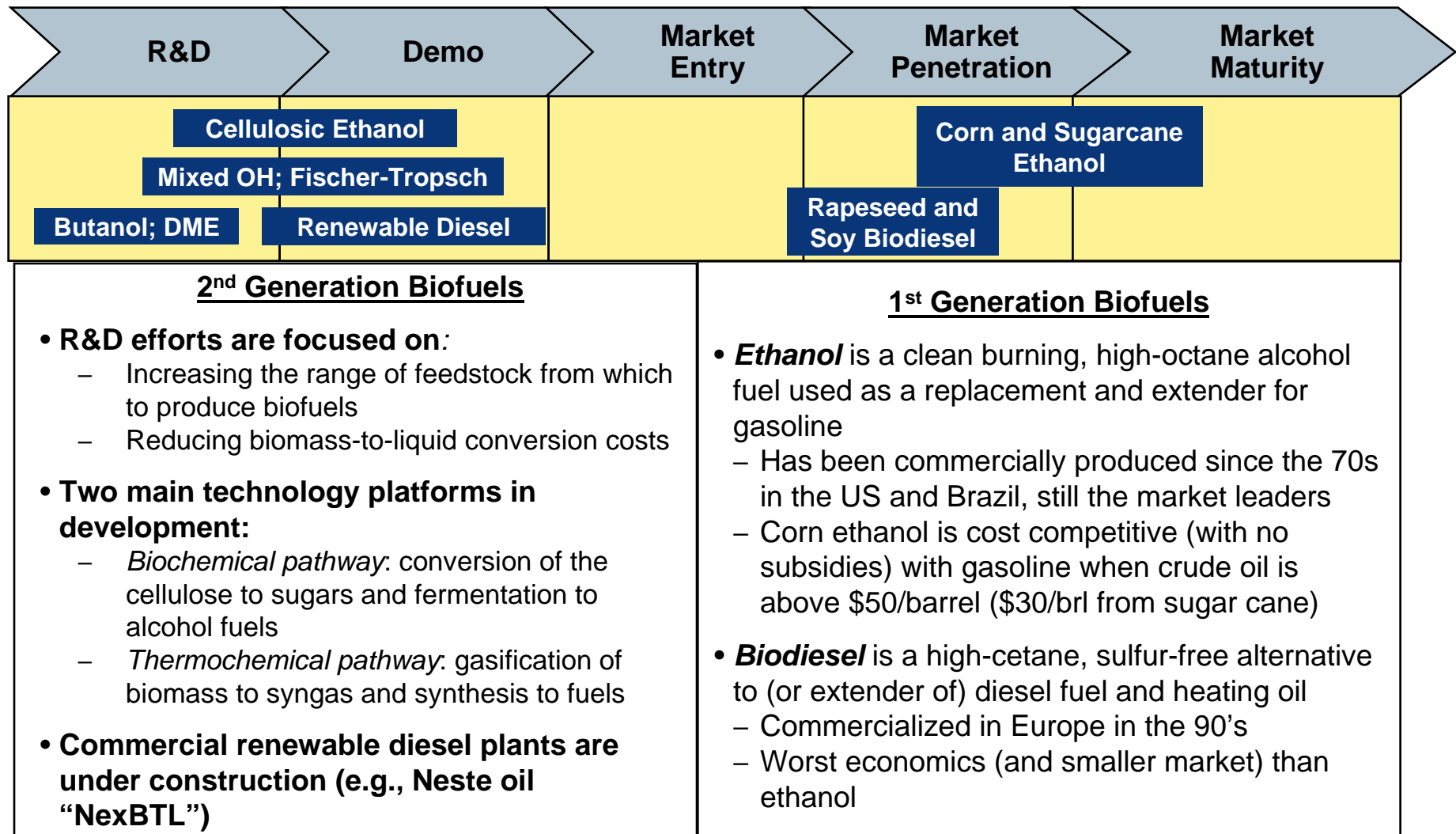
**Collaborative
R&D**



**Integrated
Biorefineries:
Systems
Integration and
Demonstration**

Core activities accelerate the technological advances needed to support a domestic bioindustry producing cellulosic ethanol and other biofuels in integrated biorefineries.

“First generation” biofuels are commercially developed technologies, but have high costs and limited scalability...



Targeted R,D &D: Overcoming Barriers

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Barriers

- High cost of enzymatic conversion
- Inadequate technology for producing ethanol from sugars derived from cellulosic biomass
- Limitations of thermochemical conversion processes
- Demonstration/integration of technology in biorefineries
- Inadequate feedstock and distribution infrastructure

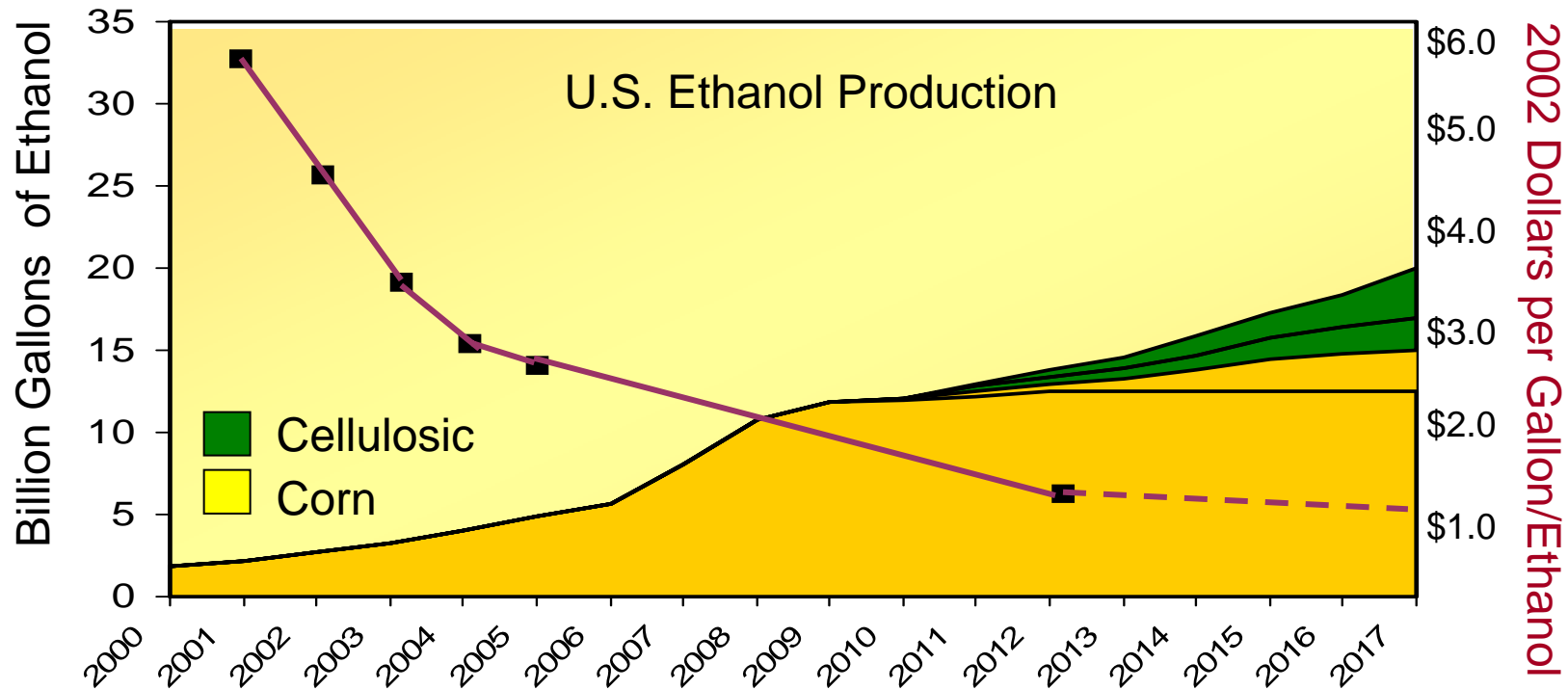
Solutions

- ➔ • R&D to improve effectiveness and reduce costs of enzymatic conversion
- ➔ • R&D on advanced micro-organisms for fermentation of sugars
- ➔ • Re-establish thermochemical conversion as a second path to success
- ➔ • Fund loan guarantees, commercial biorefinery demonstrations, and 10% scale validation projects
- ➔ • Form interagency infrastructure and feedstock teams

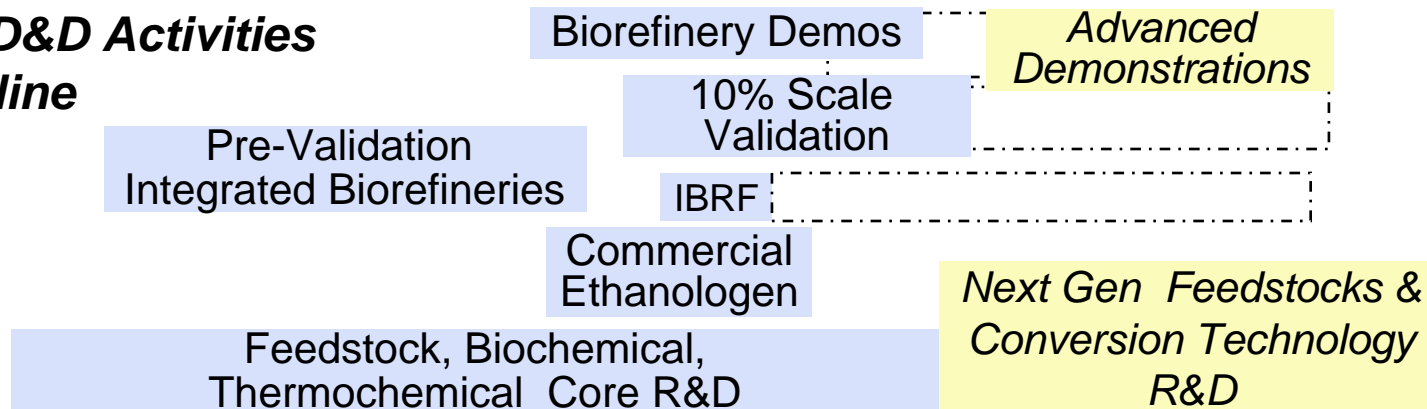
OBP organizes to deliver against barriers

Cellulosic Ethanol Growth

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OBP RD&D Activities & Timeline

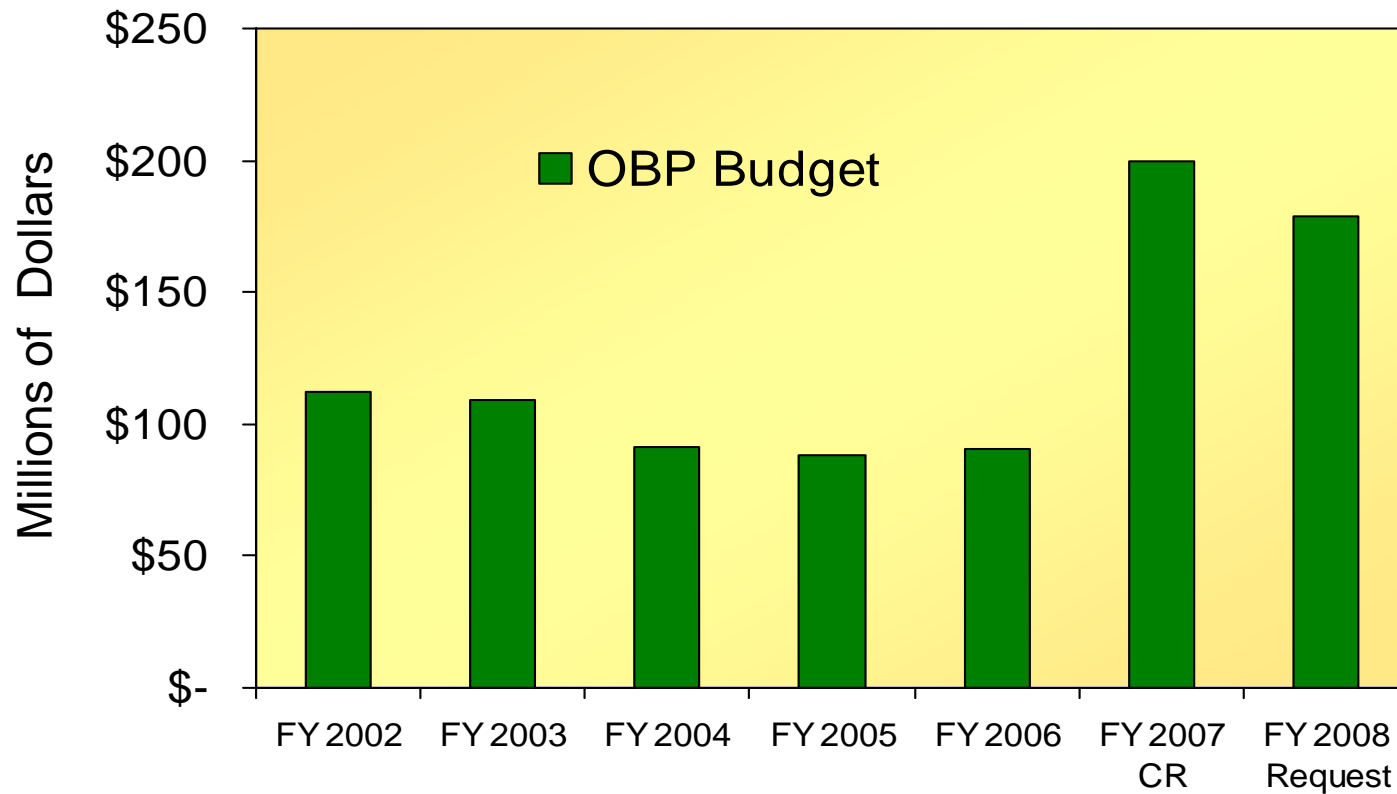


Impacts of the Advanced Energy Initiative

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Biomass Program Budget FY2002-FY2008



The Advanced Energy Initiative is providing a boost in funding for critical biomass technologies in FY 2007.

Biomass Program Budget Overview

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Energy & Water Development Appropriation	FY06 Budget	FY 07 Budget	FY08 Request
Feedstock Infrastructure	479,000	9,967,000	10,000,000
Platforms Research & Development	15,140,000	50,530,000	59,400,000
Thermochemical Platform R&D	4,494,000	16,866,000	21,100,000
Bioconversion Platform R&D	10,646,000	33,664,000	38,300,000
Utilization of Platform Outputs	23,321,000	139,190,000	104,863,000
Integration of Biorefinery Technologies	11,073,000	104,403,000	96,863,000
Products Development	12,248,000	34,787,000	10,000,000
Cellulosic Ethanol Reverse Auction (EPACT Section 942)	-	-	5,000,000
Congressional Earmarks	51,778,000	0	TBD
Total	90,718,000	199,687,000	179,263,000

FY 2006 Major Activities

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- Significant Earmarks
 - Reevaluated portfolio
 - Cut back project funding levels and zeroed out projects
- First year of President's Advanced Energy Initiative
 - Developed RD&D strategy to meet the 2012 goal for making cellulosic ethanol cost competitive
- Initiated 2 Regional Feedstock Partnerships with USDA and the Sun Grant Initiative
- Hosted Two Workshops
 - “30 by 30” Industry workshop, August 2006
 - National Biofuels Action Plan Workshop, November 2006

FY 2007 Major Activities

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- Core RD&D aimed at 2012 goal
- Competitive solicitations
 - EAct Section 932 Biorefinery Project selections
 - Ethanol project selections
 - 10 Percent Biorefineries
 - May 2007 - “USDA/DOE Joint Solicitation” under the Biomass Research and Development Initiative
 - June 2007 - Biochemical Platform R&D “Development of Improved Cellulases with Increased Activities”
 - June 2007 - Thermochemical Platform R&D “Integrated Syngas Cleanup & Fuels Synthesis Technology Development”
- Regional Feedstock Partnerships
- 20 in 10 Biofuels Infrastructure Analysis and Strategy
- Integrated Biorefinery Pilot Plant Users Facility at NREL
- Major Strategy/MYPP review in Progress

FY 2008 Major Activities

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- Core RD&D activities aimed at 2012 goals
- Support for projects selected through competitive solicitations
- Select up to 10 10% validation scale solicitation projects
- Complete NBA Plan supporting 20 in 10 goals
- Biofuels Infrastructure RD&D coordinated with other DOE programs and other agencies
- Framework for implementing section 942 of EPACK 2005

Cellulosic Biorefinery Investments

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Announced competitive selections on February 28 to provide up to \$385 million over four years for cost-shared integrated biorefineries in six states

- **Abengoa Bioenergy Biomass of Kansas**

Capacity to produce 11.4 million gallons of ethanol annually using ~700 tons per day of corn stover, wheat straw, milo stubble, switchgrass, and other feedstocks. (bio/thermo)

- **ALICO, Inc.**

Capacity to produce 13.9 million gallons of ethanol annually using ~770 tons per day of yard, wood, and vegetative wastes and eventually energy cane. (thermo/fermentation)

- **BlueFire Ethanol, Inc.**

Sited on an existing landfill, with capacity to produce 19 million gallons of ethanol annually using ~700 tons per day of sorted green waste and wood waste from landfills. (bio)



Cellulosic Biorefinery Investments

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- **Poet**

Capacity to produce 125 million gallons of ethanol annually (~25% will be cellulosic ethanol) using ~850 tons per day of corn fiber, cobs, and stalks (bio)

- **Iogen Biorefinery Partners, LLC**

Capacity to produce 18 million gallons of ethanol annually using ~700 tons per day of agricultural residues including wheat straw, barley straw, corn stover, switchgrass, and rice straw (bio)

- **Range Fuels (formerly Kergy Inc.)**

Capacity to produce 40 million gallons of ethanol annually and 9 million gallons per year of methanol, using ~1,200 tons per day of wood residues and wood based energy crops (thermo)



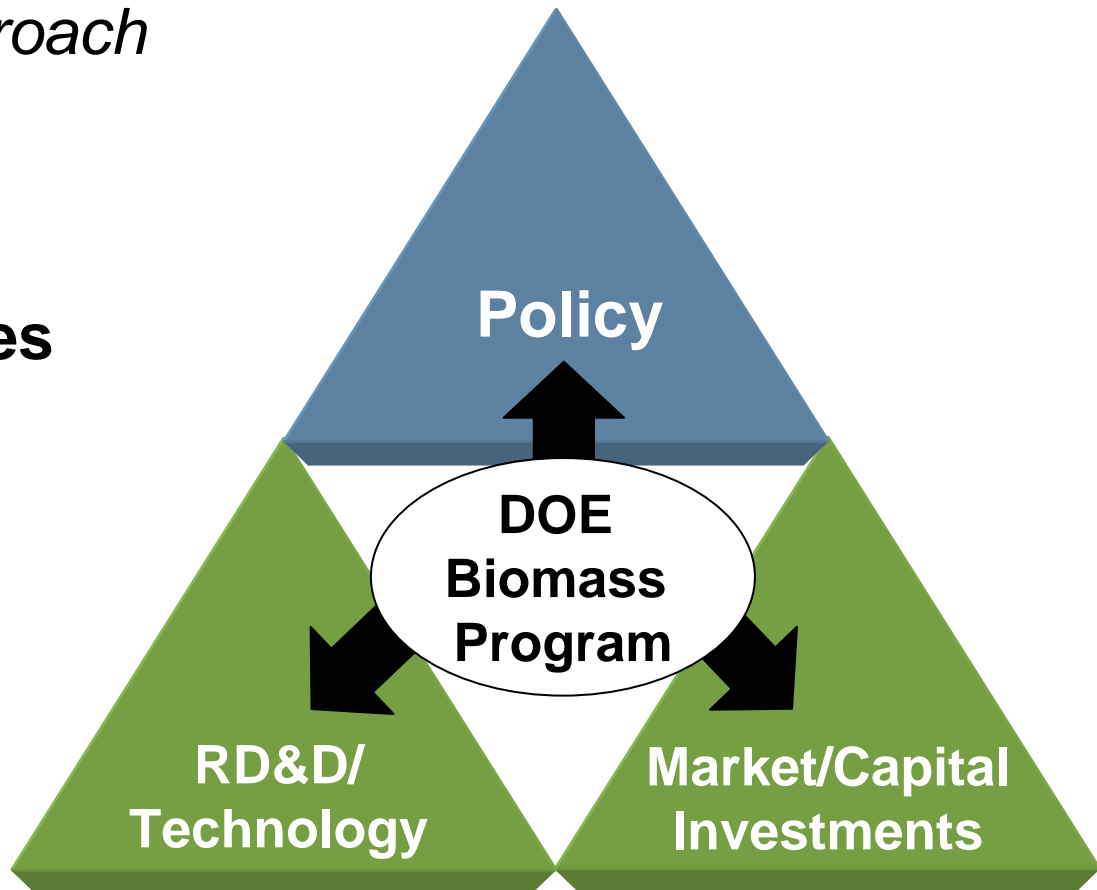
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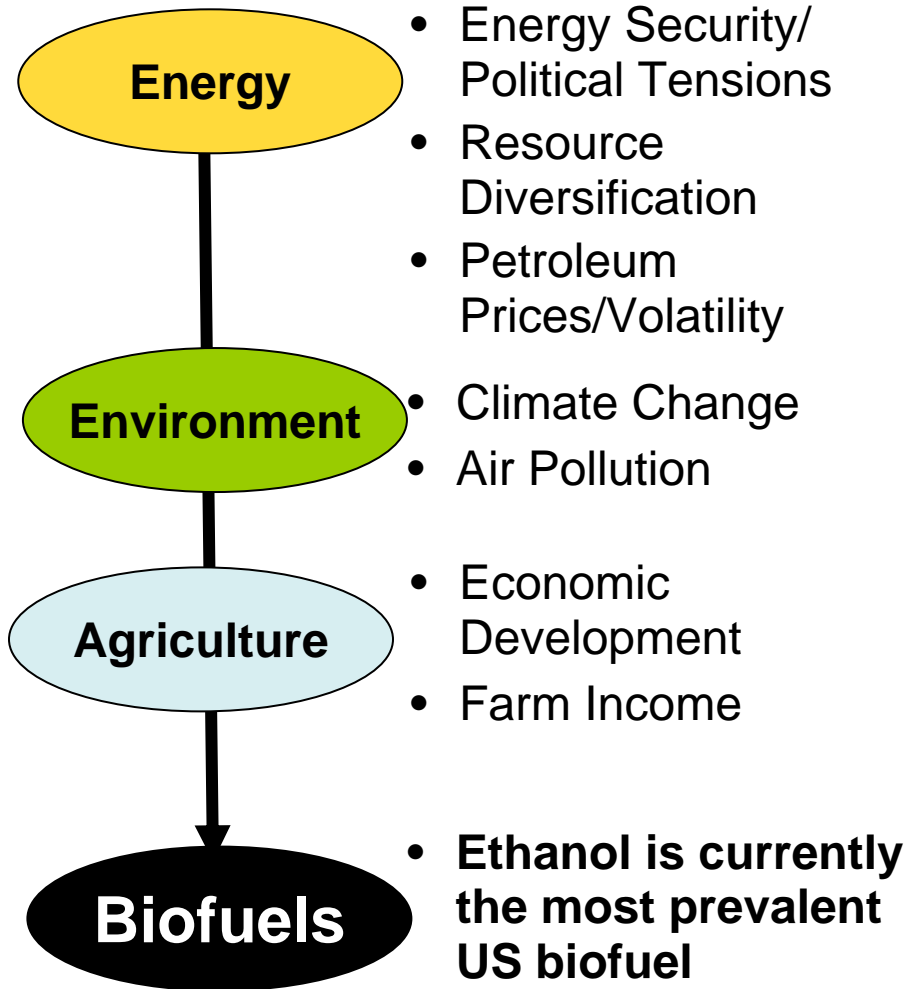


Three-pronged approach

- Effective RD&D Program
- **Effective policies**
- Private sector investments



Policy Drivers & Incentives Supporting Biofuels



Examples of Policies

United States

- Energy Policy Act of 2005 (federal policy)
- State tax credits, blend requirements...

Europe

- Tax credits: most common incentive
- EU set target for biofuels consumption (similar to RFS, but not a mandate)

Asia

- China, India, and Malaysia introducing policies to support biofuels
- Japan has tax credits in place

South America

- Brazil: Ethanol blending requirements in place and a requirement for biodiesel starting in 2008

Policies Accelerating Biofuels Production

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Energy Policy Act 2005 (EPAct 2005)

- Section 932: **Commercial Integrated Biorefinery**
 - Secretary Bodman recently announced six awards
 - \$53 million in FY 2007 budget request
- Section 941: **Revisions to Biomass R&D Act of 2000**
 - *Vision* document released November 2006; updated *Roadmap* due May 2007
- Section 942: **Cellulosic Ethanol Reverse Auction**
 - Request For Information and Options papers completed
 - \$5 million requested for FY 2008
- Sections 1510, 1511, and Title XVII: **Loan Guarantees**
 - DOE issued guidelines for the first Loan Guarantees under Title XVII in August 2006
 - Loans for conversion of Municipal Solid Waste and cellulosic biomass to fuel ethanol and other commercial byproducts also considered under this offering

EPAct 2005 goals are integrated into core technology priorities.

New Policies May Foster Market Expansion

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- National strategy for low level blends/
Regional strategy for E-85
- RFS with greater requirements for
cellulosic ethanol
- Stronger incentives for all biofuels
 - Extension of ethanol subsidies to 2015
 - Payments to lignocellulosic biomass
suppliers for residues and energy
crops
- Tougher greenhouse gas regimes
- State support – individual state mandates/
legislation



Ramp-up of ethanol production will require innovative and focused policies for infrastructure and feedstocks

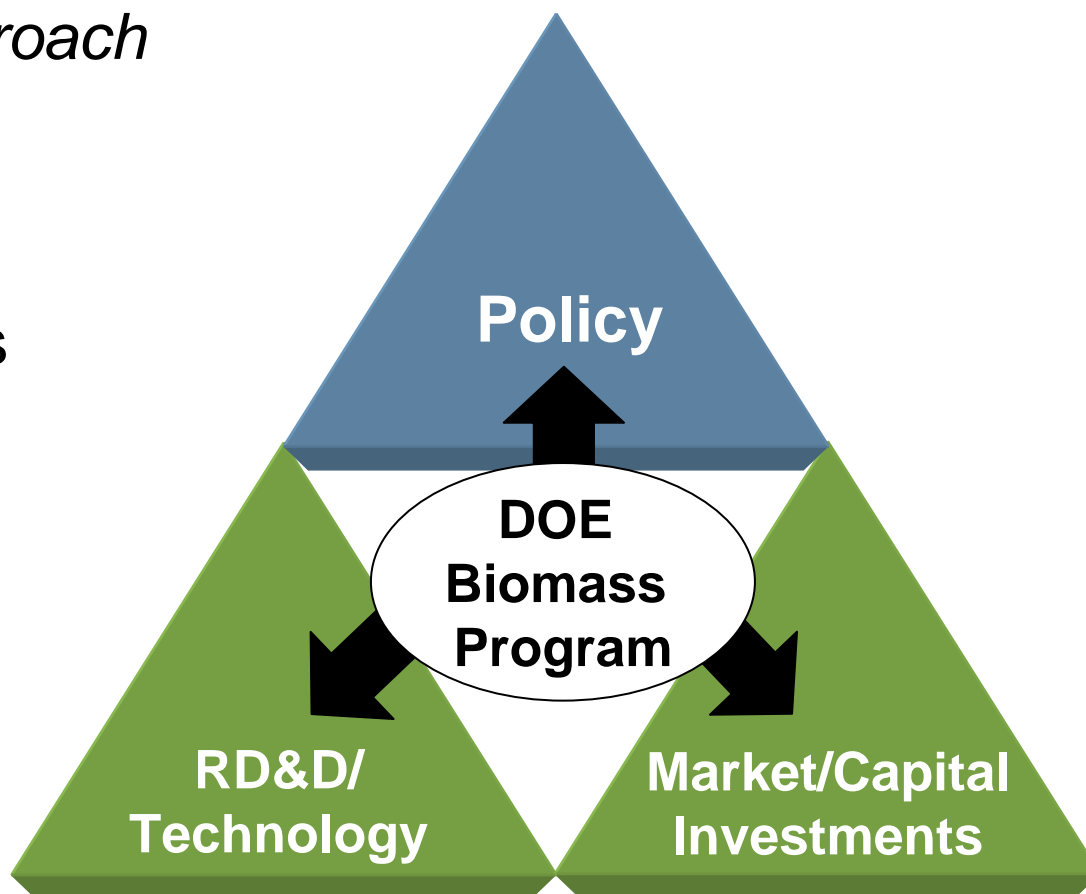
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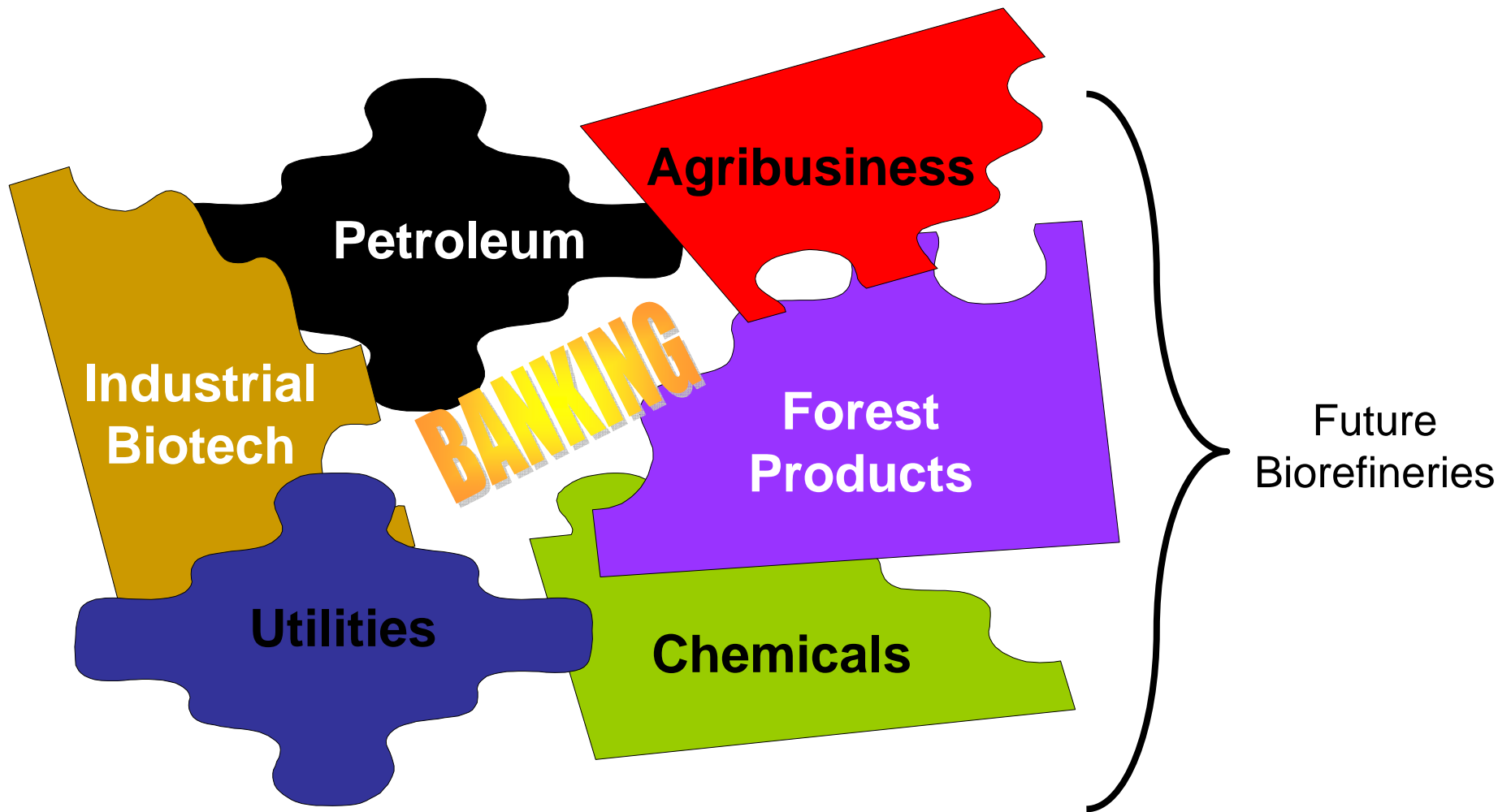
Three-pronged approach

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The future of biofuels will depend on the creation of new partnerships among several industries

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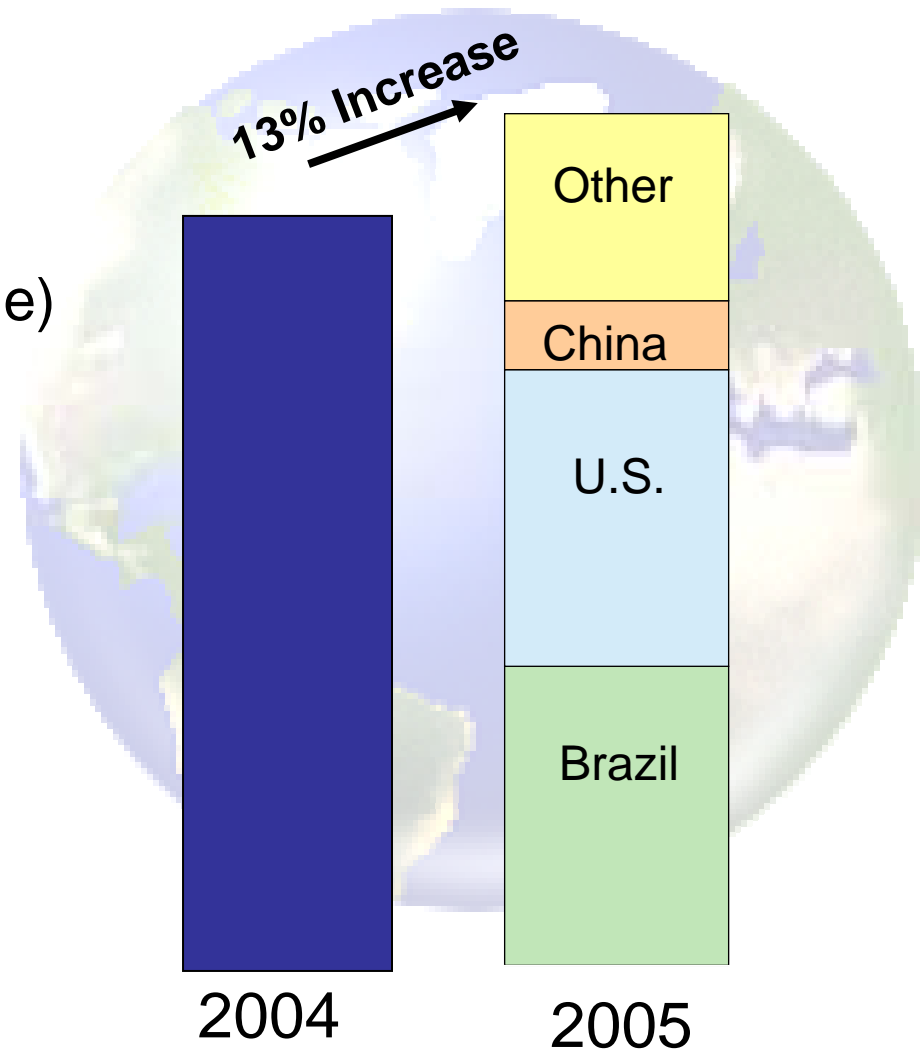
Source: Navigant

Global Ethanol Status

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- 2005 Production:
12,150 million gallons
 - o 35% -- U.S. (corn)
 - o 35% -- Brazil (sugarcane)
 - o 8% -- China (feedstock unknown)
 - o 22% -- Other Countries (wheat, barley, beet)
- 2004 Production:
10,770 million gallons



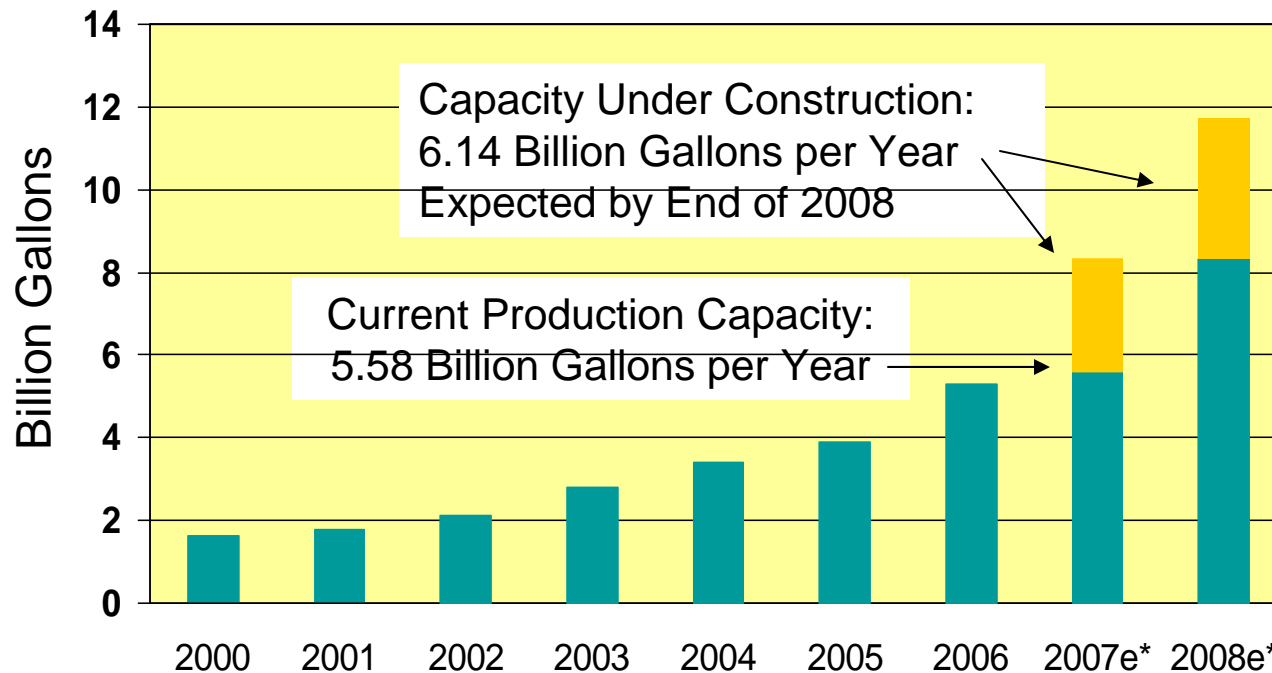
The market is placing bets on biofuels

US Markets Driven by High Prices and RFS: Building Capacity

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U.S. Ethanol Production Capacity



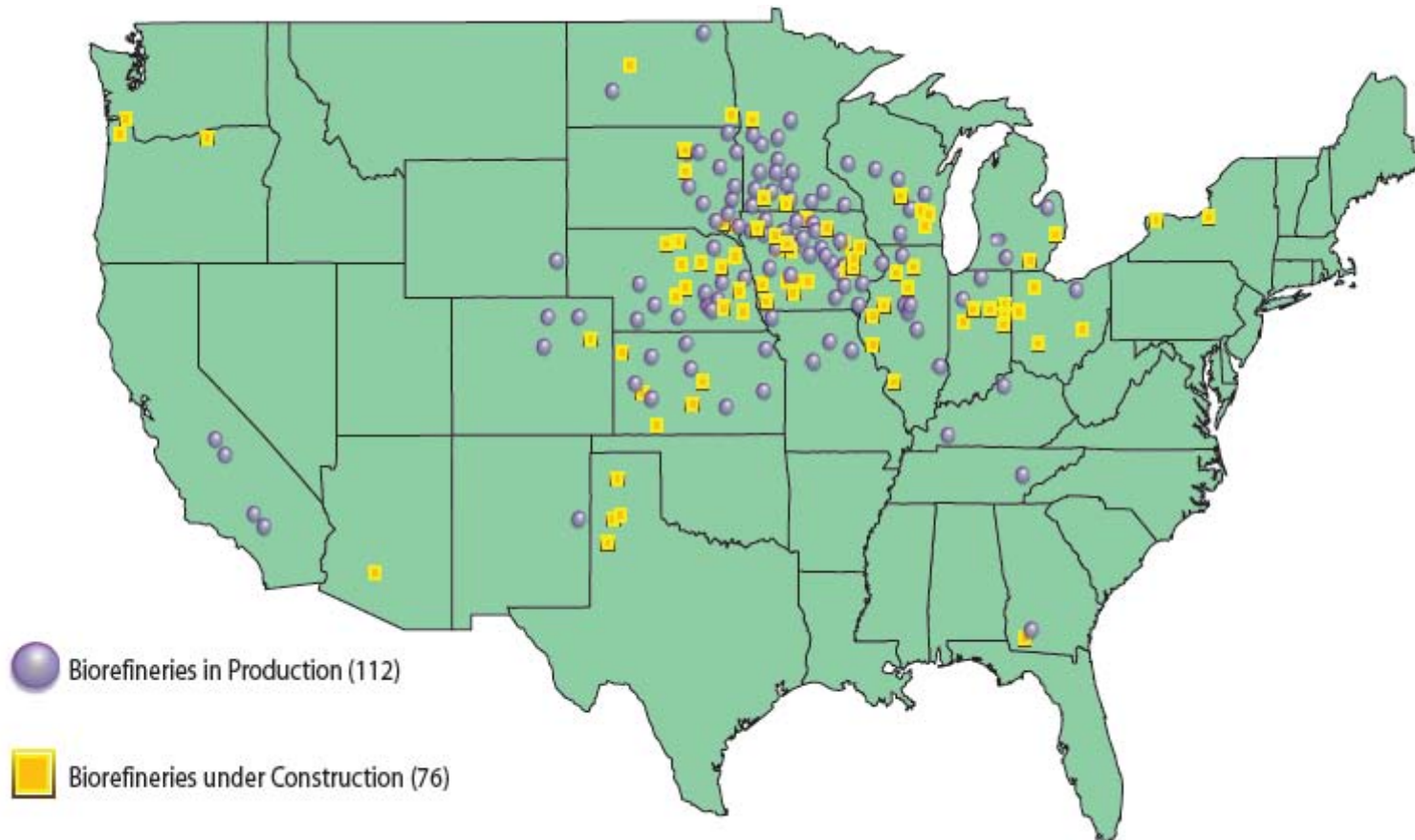
Total Capacity with Current & New Construction:
11.7 billion gallons per year

*Estimated as of February 7, 2007.
Source: Renewable Fuels Association.

While biofuels represent only 3% of US transportation fuels today, production is growing rapidly.

Ethanol Plants Focused on Midwest; “Destination” Plants Increasing

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Source: Renewable Fuels Association
1.29.07

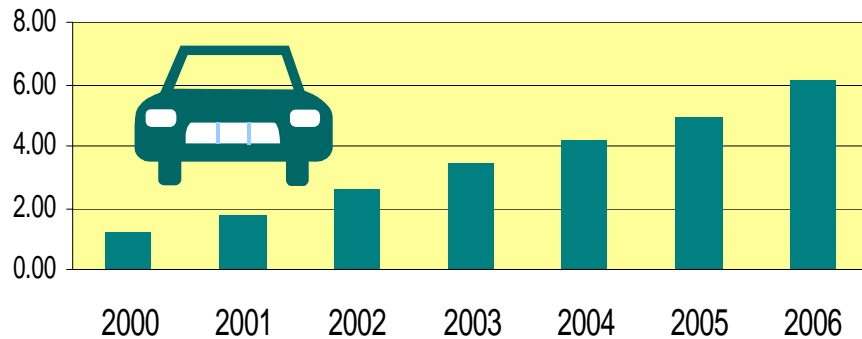
One of the drivers for destination ethanol plants is to produce DDGS closer to market.

U.S. Ethanol Infrastructure

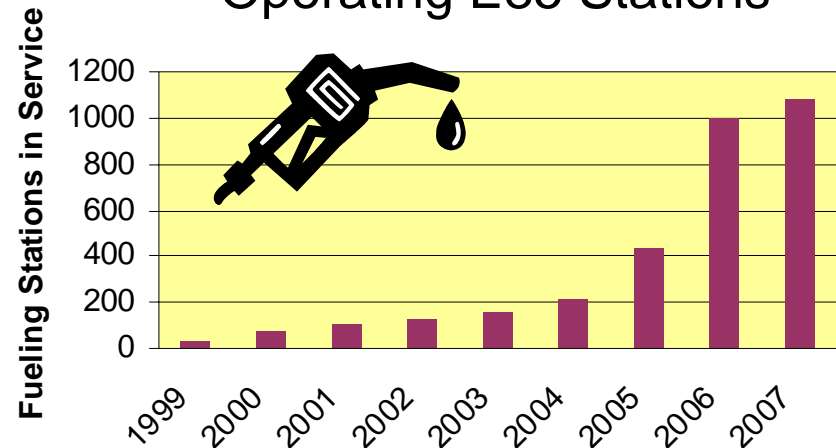
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FFV's in Service (millions)



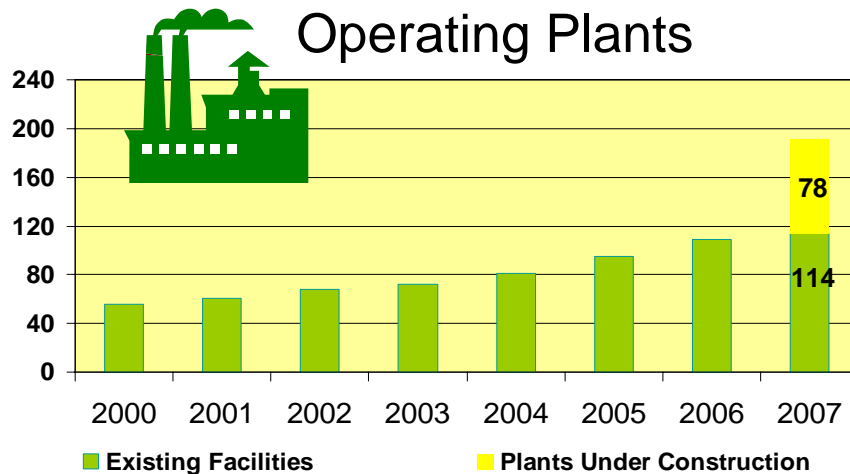
Operating E85 Stations



Source: Alternative Fuels Data Center, March 8, 2007

As of 3/8/07

Operating Plants



Source: Renewable Fuels Association

As of 2/25/07

Existing infrastructure lags behind projected biofuels production growth

Contact Info

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THANKS