

# Ethanol and Cellulosic Ethanol Overview

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# U.S. Ethanol Industry Today

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- Annual production capacity in 2006 of 5.3 bgy
- 110 plants in 19 states with 5.3 bgy capacity today (*January, 2007*)
- 73 plants under construction, combined with 8 expansions, will increase industry capacity by an additional 6 bgy (*January, 2007*)
- Dozens of additional plants in various stages of development

# Nationwide Economic Benefits of Ethanol Demand in 2005

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- Added \$41.1 billion to gross output
- Created 160,231 jobs in all sectors of the economy
- Increased economic activity and new jobs from ethanol increased household income by \$6.7 billion, money that flows directly into American consumers' pockets
- Contributed \$2.7 billion of tax revenue for the Federal government and \$2.3 billion for State and Local governments
- Reduced imports by 170 million barrels of oil, valued at \$11.2 billion

# What's Leading Industry Growth?

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- Renewable Fuels Standard
- Sustained high gas and oil prices
- State ethanol programs
- E85 growth
- Concerns about MTBE contamination resulting in new East Coast markets
- Need to expand U.S. fuel supply
- Environmentally-friendly profile

# RFS vs. RFA Projections

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<u>Year</u>	<u>RFS</u>	<u>RFA Projections</u>
2006	4.0	5.3
2007	4.7	8.4
2008	5.4	10.6
2009	6.1	11.4
2010	6.8	
2011	7.4	
2012	7.5	

# Technology Moving Industry Forward

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- Cutting edge technologies are reducing energy consumption, improving refinery efficiency, developing new co-products, using new feedstocks
  - Corn fractionation
    - ❖ Increases starch availability for ethanol production
    - ❖ Increases protein content of DDGS, improved flowability
  - Cold starch hydrolysis
    - ❖ Decreases energy use and production costs
  - Corn oil extraction
    - ❖ A dedicated crude oil source for biodiesel production
    - ❖ Higher protein feed content, improved flowability
  - Biomass Gasification
    - ❖ Energy source for both steam and power generation
    - ❖ Increases overall efficiency of energy generation while reducing emissions

# What about Cellulosic Ethanol?

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- **Technology and cost are limiting factors.**
- **Current technology for cellulosic ethanol is the acid hydrolysis process.**
  - Capital costs are almost 4 times that of dry mill ethanol.
  - Operating costs are 50% above corn dry mill costs.
- **Enzymatic and thermochemical processes holds promise for lower costs, but are not yet commercialized.**
- **Cellulose ethanol expected to first be commercialized by current producers who have cellulosic feedstocks at their grain-based facilities.**

# Processing Routes to Cellulosic Ethanol

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- Enzymatic or “Sugar Platform”
  - Pre-treat+enzymes+ferment+distill
  - Highest profile approach
- Gasification or “Thermochemical Platform”
  - Gasify+syngas conversion
  - Better fit for Minnesota??

# President Bush's Advanced Energy Initiative (AEI)

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2012 Goal: Fund additional research in cutting-edge methods of producing ethanol, not just from corn, but from wood chips and stalks, or switch grass. Our goal is to make this new kind of ethanol practical and competitive within six years.

2017 Goal: Increase RFS to 35 bgy

# Cellulose Ethanol Proposed Policies in the 109<sup>th</sup> Congress

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- Various proposals ranging from \$1 to \$20 billion in R&D, loan guarantee, grants and commercial production funding for cellulose ethanol
- Increase RFS “carve-out” for cellulose ethanol
- Begin RFS “carve-out” for cellulose ethanol prior to 2013
- Extension and/or increase of VEETC for cellulose ethanol

# Announced Cellulosic Ethanol Projects

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## ■ **Abengoa**

- Demonstration-scale (1 mgy) cellulose ethanol facility under construction in Salamanca, Spain (wheat straw)
- Pilot cellulose ethanol plant planned in York, Nebraska
  - ❖ Co-located with grain-based ethanol facility

## ■ **Broin**

- Commercial-scale (125 mgy) biorefinery planned in Emmetsburg, Iowa (corn fiber and corn stover)
- Convert a 50 mgy grain-ethanol facility
- Utilize advanced corn fractionation and lignocellulosic conversion technologies

## ■ **logen**

- Built and operates demonstration-scale (1 mgy) cellulose ethanol facility in Ottawa, Ontario (wheat, oat and barley straw)
- Proposed commercial-scale cellulose ethanol facility in southeastern Idaho (wheat straw)

# Cellulosic Ethanol Policy Proposals 85<sup>th</sup> Minnesota Legislative Session

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Cellulosic Biofuels Production Incentives

Bioenergy Production Incentives