The Future is Now for Cellulose Ethanol

USDA-ERS Biofuels Modeling Workshop
Washington, DC

February 27, 2007
Our Challenge

• Global Warming
  – The debate is over. It is the issue.

• Dependency on Foreign Oil
  – “For too long our nation has been dependent on foreign oil...it is in our vital interest to diversify America’s energy supply.”
    President George W. Bush, 2007 State of the Union

• 35 Billion Gallons by 2017
  – The vision is clear.
Why Cellulosic Ethanol?

• Corn-to-ethanol provided the foundation for the ethanol industry
• Joint study by the USDA and DOE concluded that the U.S. could produce 60 billion gallons of ethanol by 2030
• Opportunity to utilize the existing corn to ethanol infrastructure to accelerate cellulose ethanol production
U.S. Ethanol Plants
AS OF: November 2006

- In operation: 107 plants, 5.12 bgy
- Construction: 56 plants, 3.80 bgy
- Proposed: 108 plants, 6.96 bgy
Corn to Ethanol Reaching Maturity

- **RED** = Operating (23)
- **BLUE** = Construction (9) & Expansion (2)
- **GREEN** = Proposed (7)

- 20-35 MGY
- 35-60 MGY
- 100-120 MGY
- 200-250 MGY
Corn Biomass Advantages

- Consistent crop acreage to meet competing demand
- Continued improvements in crop biotechnology
- Established cropping practices
- Soil quality maintenance considerations understood
- Opportunity to coordinate with farm and energy policy
Why Broin?

- Extensive corn to ethanol infrastructure
- A technology provider committed to research collaborations with world-class leaders.
- Broin is about innovation and integration.
- Defining the future by building the first biorefinery of its kind to produce ethanol from stover and fiber.
US Ethanol Market Share
Including Plants Under Construction
November 2006

- Small Producers, 47.6%
- Cargill, 1.2%
- BROIN, 11.6%
- US Bioenergy, 5.1%
- VeraSun, 5.8%
- ASAlliances, 3.1%
- The Andersons, 2.8%
- Hawkeye Renewable, 2.3%
- Tate & Lyle, 2.2%
- Aventine, 2.1%
- MidWest Grain Processors, 1.6%
- Renew Energy, 1.3%
- ADM, 11.1%
- Abengoa, 2.1%
How Ethanol is Made

Source: Minnesota Ethanol Producers Association, Star Tribune research
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The Evolution of Biorefining

*BFrac™* and *BPX™*

- These two revolutionary technologies demonstrate our commitment to the biorefining industry.
  - Increasing the availability of ethanol
  - Lowering the cost to process
  - Producing a higher value animal feed product
A Kernel of Corn

Endosperm

Starch

Starch and Gluten

Hull and Fiber

Germ
Dakota Gold HP Distillers Grains Nutrient Profile

www.dakotagoldmarketing.com
How Ethanol is Made

Projects LIBERTY & BELL
Cellulose to Ethanol
“Bolt-On” to and Existing Plant
plus the addition
Alternative Energy Generation
Broin’s Projects LIBERTY & BELL

• What is Project LIBERTY?
  – Transformation of an existing conventional dry mill ethanol facility into a commercial scale biomass-to-ethanol facility
  – Additional value-added agricultural products for the U.S. farmer and greater economic impact to rural America
  – Project BELL is the test facility for scale up and validation.
Scotland, SD
Emmetsburg Site
Project LIBERTY

• Project LIBERTY deliverables:
  – 11 percent more ethanol from a bushel of corn
  – 27 percent more ethanol from an acre of corn
  – 24 percent reduction in water usage
  – 83 percent less fossil fuel consumption

• With LIBERTY we have a sustainable model to meet our renewable transportation fuel goals through ethanol.
Thank you