The Path to LIBERTY

An Update on POET’s Cellulosic Project

Doug Berven, Director of Corporate Affairs
September, 2009
Presentation Outline

• Project Overview
• Technology Development
  – Feedstock Logistics
  – Cellulosic Ethanol Production
• Timeline and Milestones
• Market Development and Awareness
POET Company Profile

- 20+ years ethanol industry experience
- Over 1.5 billion gallons of production
- Largest producer of ethanol in the world
- Over 1,500 team members
- 11,000 farmer investors
- 30,000 producers delivering grain
- 26 ethanol plants in production
- Vertically integrated business model
- Technology leader in our field
Project LIBERTY Goals and Objectives

Goal: A commercial-scale cellulosic ethanol biorefinery.

Objectives:
• Integrate cellulosic ethanol technologies with existing corn-based, dry mill ethanol technologies
• Implement a sustainable biomass feedstock collection, storage, and delivery system
• Maximize alternative energy production and minimize traditional energy usage
• Enable replication at other existing or new biorefineries
Project Overview

- Excellent progress being made
- Partnership with DOE, State of Iowa – strong
- Industry leading collaborations paying off
- Farmers engaged
- POET is Confident and Excited
POET Biorefining – Emmetsburg
Emmetsburg, Iowa
Biomass Source for Cellulosic Ethanol

Source: National Renewable Energy Laboratory
http://www.nrel.gov/gis/biomass.html
Why Cobs?

• Consistency
• Higher ethanol yield
• Willingness of the farmer to collect cobs vs. stover
• One pass harvest system
• An additional $3 billion of annual income for farmers
• Represent 5 billion gallons of the 80-100 billion from biomass in US
• Offers a replicable model for expansion to multiple plants
• Logical first step toward 2\textsuperscript{nd} generation production
Corn Cob Collection/Processing

• Cobs
  – 12-25% of the above ground weight of the corn stalk
  – 2 times the bulk density of stover
  – 16% more carbohydrate than stover alone

• Collection Options
  – Separate corn & cob streams
  – Grain/cob co-mingled
Cob Harvests

**2007-2008** A total of nearly 13,000 acres in Iowa, South Dakota, and Texas. 13 equipment manufacturers using three cob harvest methods. Excellent farmer feedback. Feedstock analytics developed with NREL. Economic data collected and evaluated.

**2009** Planning for 20,000+ acres in Iowa & South Dakota. 15 equipment manufacturers. Four cob harvest methods: Towable carts, CCM, Flex-harvester, Baling. LIBERTY Field Day. Pre-Field Day activities. OEM specific demo days.

Nov. 3, 2009 LIBERTY Field Day
Cob Collection to Meet LIBERTY Goals

The market for corncobs at LIBERTY alone:
- average farmer has 700 corn acres
- ~40% of the corn acres in a 35 mile radius

<table>
<thead>
<tr>
<th>Year</th>
<th>Systems</th>
<th>Acres</th>
<th>Tons Collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>14</td>
<td>20,000</td>
<td>12,000</td>
</tr>
<tr>
<td>2010</td>
<td>100</td>
<td>100,000</td>
<td>70,000</td>
</tr>
<tr>
<td>2011</td>
<td>400</td>
<td>280,000</td>
<td>210,000</td>
</tr>
<tr>
<td>2012</td>
<td>450</td>
<td>315,000</td>
<td>252,000</td>
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</table>

770 BDT/day is equal to 246,400 BDT/year for a 320 day operating year
POET Biomass, LLC

• Serve the farmers
  – Information source
  – Sustainable harvesting
  – Technology evaluation

• Manage the biomass supply chain
  – Sourcing
  – Procurement
  – Harvest
  – Logistics
POET Research Center
Scotland, South Dakota
Process Technology Achievements

- December 2008  Lab scale performance in pilot facility
- January 2009  24/7 pilot plant operation
- February 2009  Process de-bugging
- March 2009  Lignin removal process completed
- April 2009  LIBERTY targets achieved at lab scale
- May 2009  Anaerobic digester installed
- June 2009  >5 fold reduction in enzyme cost
  Current total process cost – $1.00/gallon
  greater than corn based ethanol
Cellulosic Ethanol Pilot Plant
Cob Handling and Processing
Distillation & Evaporation
Anaerobic Digester
**Timeline/Milestones**

- **DOE selects LIBERTY**
  - CA signed
  - NEPA FONSI
  - TIA signed

- **Award 1**
  - Design reviews
  - Final engineering
  - Final budget and WBS
  - Financing package

- **Award 1 & 2 Overlap**

- **Award 2 Construction**

- **Award 2 Operations**

- **Annual Operations Reports**
Other POET Technology Advances

- BPX
- BFRAC
- Combined Heat and Power
- Methane Gas
- Zero Liquid Discharge
- Bio-based Products
Market Development

• Policy
  – E15, iLUC, Tariff, VEETC, RFS2, COOL

• Infrastructure
  – FFVs, FFPs, Pipelines

• Technology
  – Cellulosic Process, Biomass Logistics and Engine Optimization

• The Blend Wall is holding up Potential Investment!
Blend Wall

Renewable Fuel Standard
2007 RFS with Advanced Biofuel Carve Outs

REGULATORY CAP

Billion Gallons Production Capacity


First Generation Renewable Fuels

Advanced Biofuels

Cellulosic Ethanol

Previous RFS
60 Years of Progress?

Corn Prices vs. Oil Prices

- Orange line: Corn per bushel
- Green line: Oil per barrel

[Graph showing the comparison of corn and oil prices over 60 years, with a notable increase in oil prices starting around 1990.]
Corn Yields 1860 - Present

Source: Accenture
Potential for Food and Fuel

### Table: Potential Corn Production and Ethanol Production

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2018</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres (millions)</td>
<td>86.5</td>
<td>86.5</td>
<td>86.5</td>
</tr>
<tr>
<td>Bushels per acre</td>
<td>151.1</td>
<td>211.5*</td>
<td>300**</td>
</tr>
<tr>
<td>Total Corn Production</td>
<td>13.1</td>
<td>18.3</td>
<td>26</td>
</tr>
<tr>
<td>Total Production for Food and Feed</td>
<td>10.9</td>
<td>12.6</td>
<td>15.2</td>
</tr>
<tr>
<td>Total Ethanol from Corn (billions of gallons)***</td>
<td>9.2</td>
<td>24.7</td>
<td>48.6</td>
</tr>
</tbody>
</table>

* Same amount of land

* 40% more grain for food and feed

* 428% more corn for grain-based ethanol

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* DuPont Prediction.
** Monsanto Prediction.
***Ethanol yield based on current industry average of 2.8, and projected yields of 2.9 in 2018 and 3.1 in 2030.
Can We Do It?

U.S. Future Ethanol Production Potential Growth

With corn and cellulose
Land Use Impacts

• A study by Stanford recently concluded that there are 1 – 1.2 billion acres of idled agricultural land
• United States farms only 324 million acres
• Since 1960 corn production has tripled in bushels per acre
• By 2030 Corn production will double on same amount of land
• Deforestation is down 50% while ethanol increased 3X
Summary

- Moving to commercial cellulosic production
  - Feedstock development
  - Cellulosic ethanol technology
- Market development underway
- Cellulosic ethanol is no longer 5 years away – it is here today *if it is allowed*.
- The Status Quo has a lot at stake

- “The Path to LIBERTY”