Sustainable Bioenergy and Economic Aspects

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Smart, Sustainable Growth

DuPont’s commitment:

*Creating shareholder and societal value while decreasing the environmental footprint along our value chains*

“Environmental footprint” = injuries, illnesses, incidents, waste and emissions, and depletable forms of raw materials and energy
DuPont Pro Forma Sales – 2010*

- **Agriculture** $7.8 B
- **Electronics & Communications** $2.8 B
- **Performance Chemicals** $6.3 B
- **Nutrition & Health** $3.0 B
- **Performance Coatings** $3.8 B
- **Performance Materials** $6.3 B
- **Safety & Protection** $3.4 B
- **Industrial Biosciences** $0.9 B

Total Company: $34.2B*

*Includes $0.2B in ‘other’ sales. Total company sales exclude transfers.

11/11/2011
### Megatrends → Opportunities

**Megatrend** | **DuPont Solutions**
--- | ---
Increasing Food Production | • Seeds, crop protection, food & nutrition products, and food packaging materials
Decreasing Dependence on Fossil Fuels | • PV, fuel cell components, energy efficient Tyvek® materials, lightweight composites for transportation, biofuels, biomaterials
Protecting People & the Environment | • Kevlar®, Nomex®, and Tyvek® for worker protection, SentryGlas®, safety services, environmental protection material solutions
Growing in Developing Markets | • Agricultural products, food packaging, materials for construction & infrastructure projects, PV...

**Strong Renewable Products Portfolio**

Megatrends Drive Opportunities for Tailored, Differentiated Offerings & Market Partnerships
According to the Center for Biobased Renewable Chemicals (CBiRC) we are entering into an age of Industrial Biotechnology.
Innovation Aimed at Global Megatrends

$1.7 billion in 2010
(prior to Danisco acquisition)

DECREASING DEPENDENCE ON FOSSIL FUELS *

PROTECTING PEOPLE & THE ENVIRONMENT *

CHEMICALS AND MATERIALS

ELECTRONICS

FEEDING THE WORLD *

85% of R&D Spend is on Innovation
Addressing Megatrends *
DuPont Growth Strategy

The Premier Market-Driven Science Company Creating Value for Our Customers

Building three world-leading, integrated competencies:

- Ag & Nutrition
- Bio-based Industrials
- Advanced Materials & Processes
Unlocking the potential

Agriculture → Sugar → Genencor Enzymes → DuPont Biorefinery → DuPont Biorefinery

- Industrial Enzymes
- Food & Feed Enzymes
- Fabric & Household Care
- Performance Proteins & Peptides
- Biomaterials
- Biochemicals
- Biofuels
World Energy

The opportunity to replace oil-based transportation fuels in existing vehicles & infrastructure is large

(in million tons oil equiv./ year)

<table>
<thead>
<tr>
<th>Source: IEA World Energy Outlook</th>
<th>Transportation</th>
<th>Stationary</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewables</td>
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<tr>
<td>Hydro</td>
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<td>Oil</td>
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11/11/2011
## DuPont and the Biofuels Industry

<table>
<thead>
<tr>
<th>Strategy Element</th>
<th>Product</th>
<th>Market Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Yielding Crops</td>
<td>✓Corn HTF Hybrids</td>
<td></td>
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<tr>
<td></td>
<td>✓Crop Protection Chemicals</td>
<td></td>
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<tr>
<td>Conversion of Cellulosic Feedstocks</td>
<td>✓Cellulosic Ethanol</td>
<td></td>
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<tr>
<td>Advantaged Products</td>
<td>✓Biobutanol</td>
<td></td>
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<tr>
<td>Biofuel Production Improvements</td>
<td>✓FermaSure®</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓MarketPoint®</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓Ethanol</td>
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</tbody>
</table>
Biofuels - Large Addressable Market Globally

- Growing ~10%/yr through 2020, >$100B market
- 27% of total transport fuel (from 2-3% today).
- Demand highest in OECD countries,
- 2030 - Non-OECD countries will account for 60%
- Drop-in fuels and non-food feedstocks essential

- Tremendous advanced biofuels capacity build-out:
  - Existing + in construction + planned = ~2 billion gallons 2015
  - 30-fold increase over currently announced capacity by 2030
  - 4-fold increase again required to 2050
Agriculture & Industrial Biotechnology

- Industry requirements:
  - Low cost cellulosic sugar source for fermentation
  - Biocatalyst productions of high value products
  - DuPont provides needed integrated solutions

- **Upstream**
  - Biomass Raw Material
  - Biomass Processing
  - Sugar
  - Microbe Engineering
  - Fermentation

- **Downstream**
  - Integrated Biorefinery
  - Metabolic Engineering

- **Markets**
  - ✓ Materials
  - ✓ Chemicals
  - ✓ Biofuels

- **Upstream Benefits**
  - Low cost
  - Localized feedstocks

- **Downstream Benefits**
  - High performance
  - Sustainable

(Date: 11/11/2011)
DuPont Enables Growth of the Biofuel Industry

Upstream Strategy

Cellulosic Ethanol: Non-food Feedstocks

- >60% greenhouse gas reduction
- Non-food sources and marginal land
- Multiple feedstocks available
- Excellent income for farmers

Commercialization Facility

- DuPont Danisco Cellulosic Ethanol (DDCE)
- Demonstration facility in Vonore, Tenn.
- Current feedstock focus: stover, cob, switchgrass, sorghum
- Commercialization: license & build

Advantages:

Low Cost, Low Carbon, Scalable, Sustainable
DuPont Cellulosic Ethanol Conversion Process

Milling
- High bulk density
- Minimize dirt, rocks

Pretreatment
- Minimal capital
- Facilitate enzymes
- Minimize inhibitors
- Mild process

Saccharification
- High solids
- High sugar yield
- High sugar titers
- Low enzyme loading
- Minimize inhibitors

Fermentation
- C5/C6 utilization
- High ethanol yield
- High ethanol titer

Separation
- Recover product
- Recover lignin
- Recycle water

Integrated Science is Key to Low Cost
Commercializing Cellulosic Ethanol

Two Feedstock Types

- Agricultural residue - Midwest
  - Development in harvest, storage and transport, densification, moisture issues
  - Next: grower programs
- Energy grasses – growth to full capacity:
  - Multiple grass sources available e.g. switchgrass
  - State of TN program - $30 million for upstream development
    - ~6,000 acres in 2010
Bio-PDO™ & Sorona® Business
A Case Study

Creating cost effective, superior performing renewable materials for large addressable markets
Bio-PDO™ Business

Enabling Building Block for Renewable Materials

- Most sophisticated microbial production system
- One of the world’s largest aerobic facilities
- Bio-PDO™ business advantages:
  - Significantly lower cost of manufacture
  - 50% smaller environmental footprint
- Large markets for new Bio-PDO™ applications:
  - Sorona®, Zemea®, Susterra®
- 35% capacity expansion by mid-2011

100 million lb facility in Loudon TN

Bio-PDO™
Propanediol
Bio-PDO™ and Sorona® Value Capture Model

Technology Leverages Installed Asset Base Across Value Chain

**Upstream**
- Low Cost Fermentation Process
  - Feedstock/site flexibility
  - Low capital/cost intensity
  - Renewable material

**Downstream**
- Polymer Asset Conversion Capability
  - Utilize existing assets
  - Rapid conversion
  - Knowhow enabled

- Global Fiber Partnerships
  - Proprietary applications
  - Enabling patents
  - Brand

*DuPont biotechnology advantage*

Proprietary technology repurposes available asset infrastructure

High Asset Productivity - Rapid Scale Up
DuPont plays across the value chain
# Biofuels Mandates and Targets Around the World

- Energy independence & security
- Reduction of greenhouse gases
- Rural development & support
- Green jobs

<table>
<thead>
<tr>
<th>Country / Region</th>
<th>Current mandate/ target</th>
<th>Future mandate/target</th>
<th>Current status (mandate [M]/target [T])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>F5, R7</td>
<td>n.a.</td>
<td>M</td>
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<tr>
<td>Brazil</td>
<td>E20-25, B5</td>
<td>n.a.</td>
<td>M</td>
</tr>
<tr>
<td>Canada</td>
<td>E5 (up to E6.5 in 4 provinces), B2 (nationwide) (2012) B2-B3 (in 3 provinces)</td>
<td>n.a.</td>
<td>M</td>
</tr>
<tr>
<td>Chile</td>
<td>E5, B5</td>
<td>n.a.</td>
<td>T</td>
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<tr>
<td>China (9 provinces)</td>
<td>E10 (9 provinces)</td>
<td>n.a.</td>
<td>M</td>
</tr>
<tr>
<td>Colombia</td>
<td>E10, B10</td>
<td>B20 (2012)</td>
<td>M</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>F7, R20</td>
<td>n.a.</td>
<td>M</td>
</tr>
<tr>
<td>European Union</td>
<td>5.75% biofuels*</td>
<td>10% renewable energy in transport**</td>
<td>T</td>
</tr>
<tr>
<td>India</td>
<td>F5</td>
<td>F20, B20 (2017)</td>
<td>M</td>
</tr>
<tr>
<td>Indonesia</td>
<td>E3, B2.5</td>
<td>E5, B5 (2015); E15, B20 (2025)</td>
<td>M</td>
</tr>
</tbody>
</table>

**R** = biodiesel (R2 = 2% biodiesel blend); **F** = ethanol (E2 = 2% ethanol blend); **MIL = million litres per day**. *Currently, each member state has set up different targets and mandates. **Lignocellulosic-biofuels, as well as biofuels made from wastes and residues, count twice and renewable electricity 2.5-times towards the target.*

Source: IEA analysis based on various governmental sources. For more information see also: [http://renewables.iea.org](http://renewables.iea.org)
Summary

Integrated science is critical to success
- Technical feasibility
- Market insight
- Environmental sustainability

Partnerships are essential
- Technology is complex
- Speed is critical
- Resources needed are significant

Government support is an important success factor
- High risk/large investments
- Value externalities

Geography specific strategies
- Regions require customized solutions