

# DuPont Biofuels: Building a Sustainable Future

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TECHNOLOGY THAT *fuels*™



## Biofuel Industry - What's Needed?

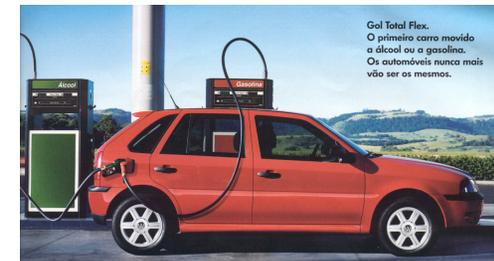
- More participation... there's room for everyone to create and capture value
- Strategic partnerships where appropriate across the value chain to enable speed of innovation, demonstration and validation of new technologies and solutions
- More help - \$ and legislation

# Applied BioScience at DuPont

...to Products

...Biorefinery

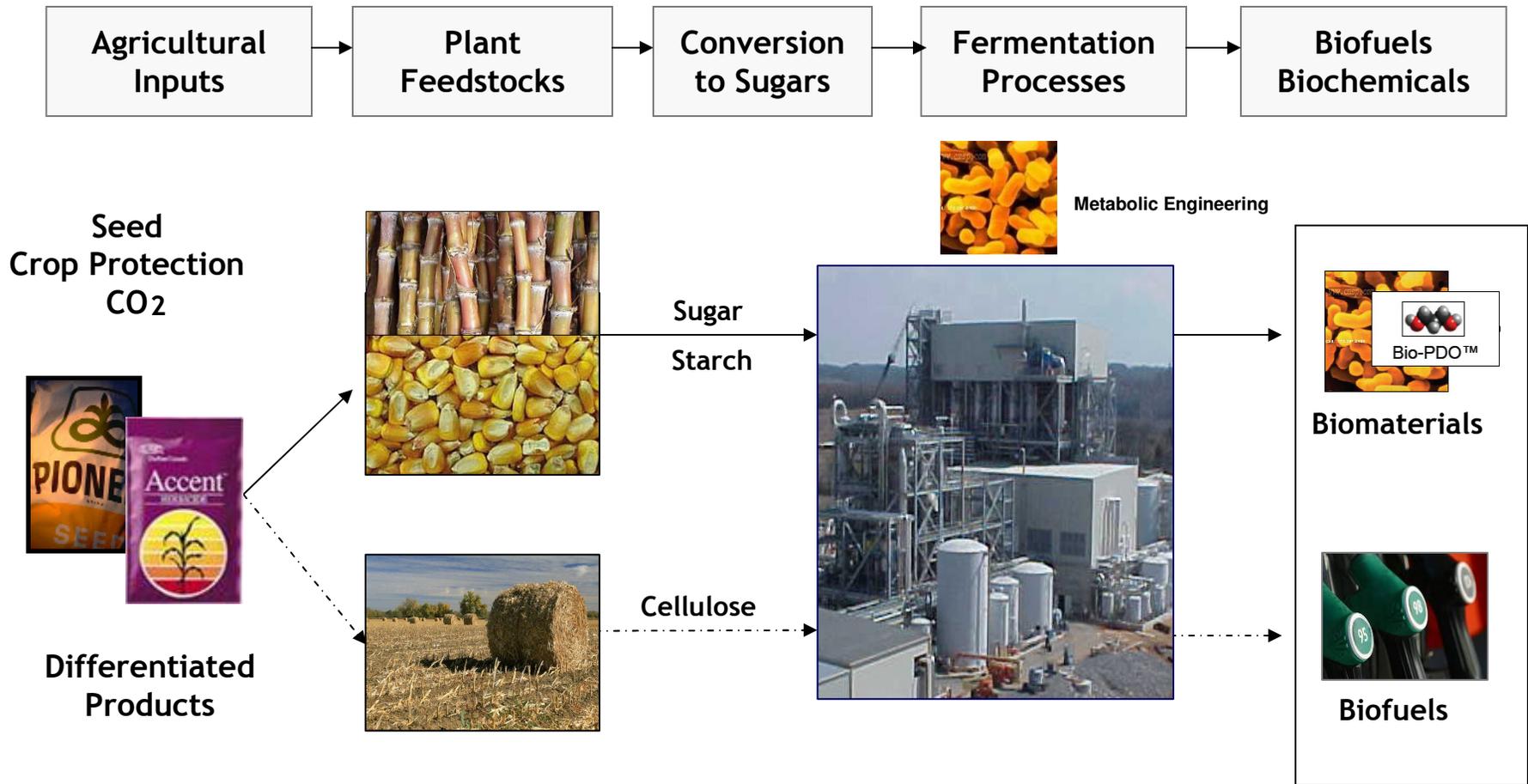
Biomass



DuPont is exploring “carbohydrate”  
business opportunities  
across the industry

# DuPont's Biotechnology Value Chain

## *Creating a Carbohydrate Society*

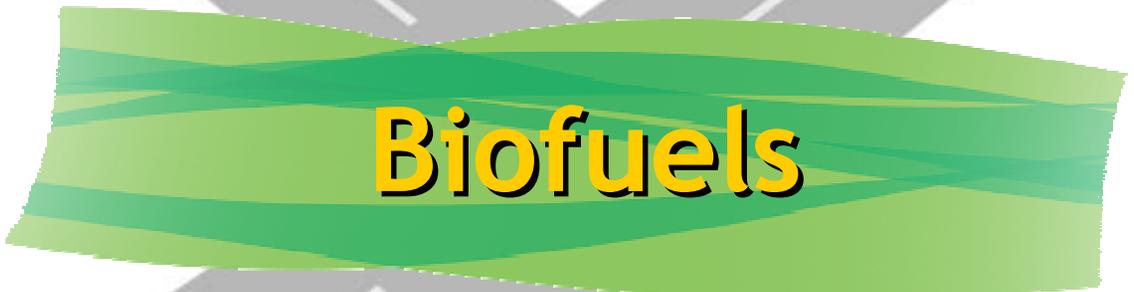


# Transportation Fuels Global Market

## *Abundance of Issues*

Increasing demand for  
transport fuel

Increasing concern  
over environment



**Biofuels**

Increasing concern over  
security of supply and  
rising cost

Increasing demand  
on agriculture ...  
food vs. fuel

World is undergoing a historic change...

- Energy is the globe's greatest economic threat and opportunity over the next decade

# BioFuels Growth - 2020 Estimates by Region

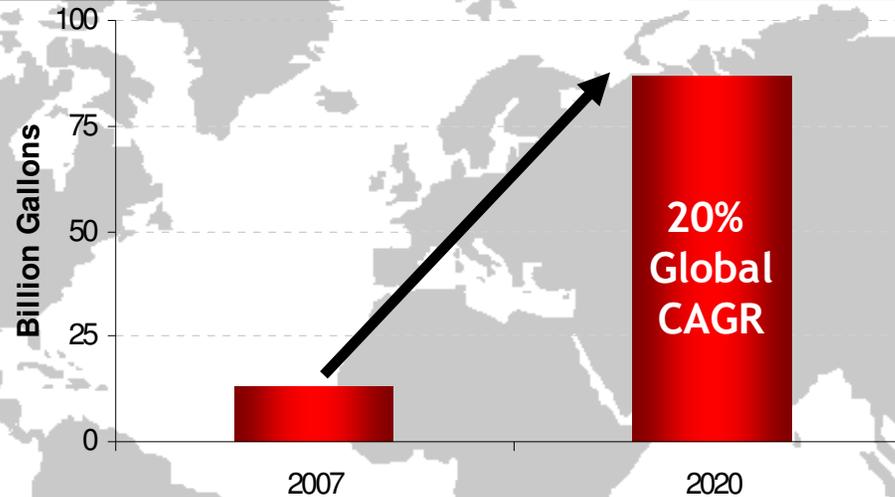
A \$100 billion dollar industry in the making!

## North America Biofuels

9.3 B gals growing @ 30%/yr.  
2020 - >30 B gals.

## EU & Eurasia Biofuels

1 B gals growing at 25%/yr.  
2020- > 20 B gals.



## South & Central America Biofuels

6.9 B gals growing at 3%/yr.  
2020- > 7 B gals.

## Asia Pacific Biofuels

2 B gals growing at 25%/yr.  
2020- > 30 B gals.

Source: EIA, F.O. Licht and DuPont estimates [Gallons shown are 2008 estimated]

# Current Biofuel Challenges

## Upstream



### Feedstock

Adequate Regional Supply  
Food v. Fuel Debate

## Downstream



### Refinery & Pipeline

Biofuel Compatibility  
With  
Existing Gas Refinery  
Infrastructure



### Retail & Consumer

Uncompromised  
Fuel Performance  
Compatibility with existing  
infrastructure

***Current biofuel solutions are inadequate to meet global needs***

# DuPont Technologies Address Market Challenges

## Feedstock Options



**PRODUCTION PER ACRE  
CELLULOSE CONVERSION**

**DuPont Danisco  
Cellulosic Ethanol LLC**

## Better Fuels



**REFINERY BLENDING  
FUEL COMPATIBILITY**

**MILEAGE  
ENGINE DURABILITY**

**DuPont BP Partnership**

DuPont will bring two much-needed transformative technologies to this quickly growing market:

- Ethanol production access to more plentiful and cheaper cellulosic feedstocks such as corn stover, that cannot be used as food.
- Development of a new, much better biofuel: butanol.

We do this together with partners to access key competencies for speed (e.g., Danisco), or to access market expertise (e.g., BP).

# DuPont Biofuels: *Three Strategies*



**Agricultural Inputs  
Seeds & Crop Protection**

**Solutions for Sustainable Feedstock**



**Biofuels From Biomass**

**Cellulosic Fuels**



**Advanced Biofuels**

**Biobutanol**



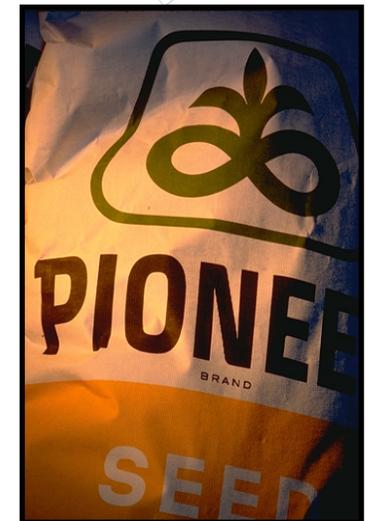
**The Alliance for Abundant Food and Energy brings together a broad group of visionary companies and organizations who understand that through greater innovation, agriculture can help meet both the world's future food and energy needs.**



**From seeds.... to harvest... to processing... to breakthroughs.... to fuel... and food.**

[www.foodandenergy.org/](http://www.foodandenergy.org/)

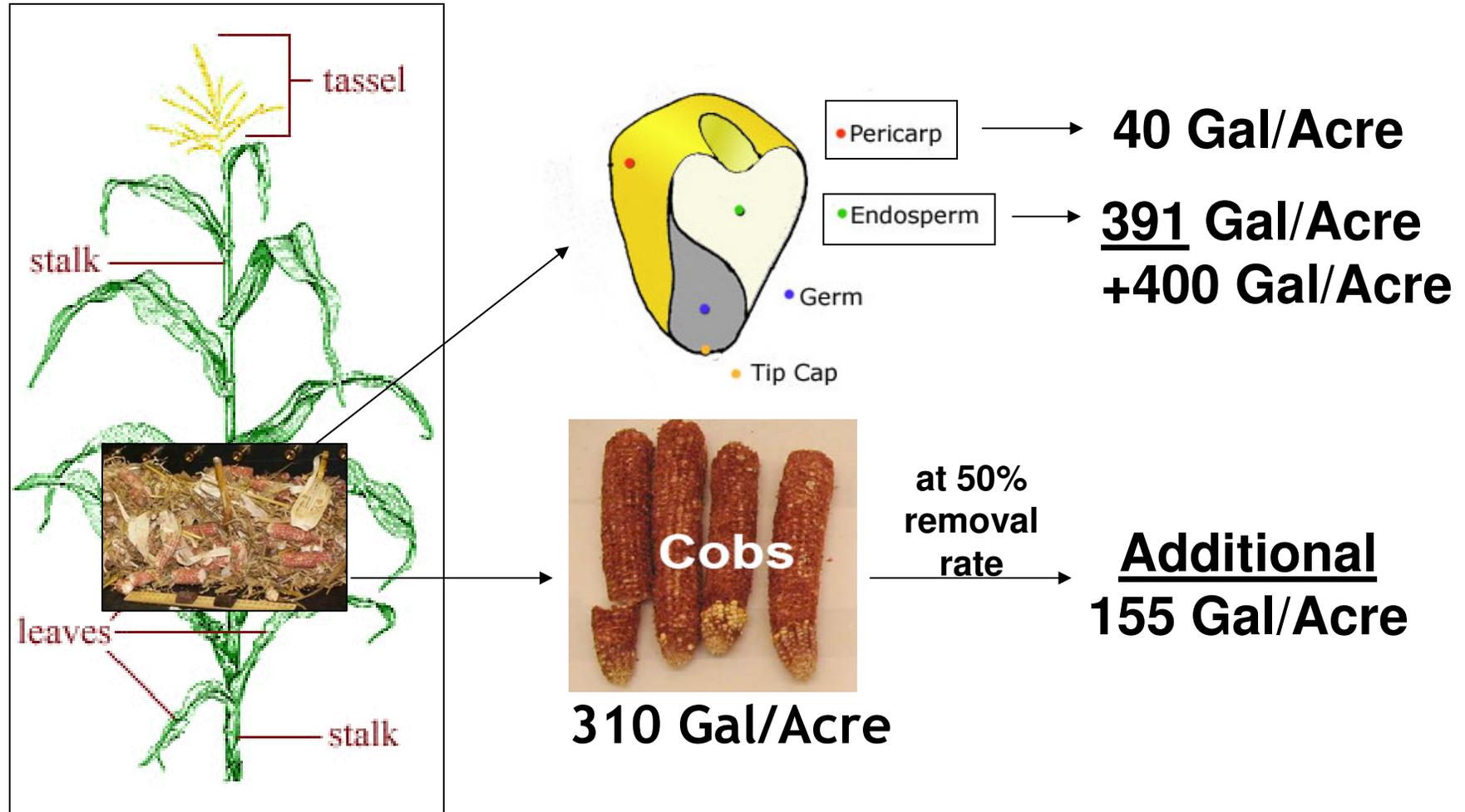
# Corn Grain for Ethanol Plants



**Pioneer's products targeted for ethanol production**  
**“more bushels per acre & more ethanol per bushel”**

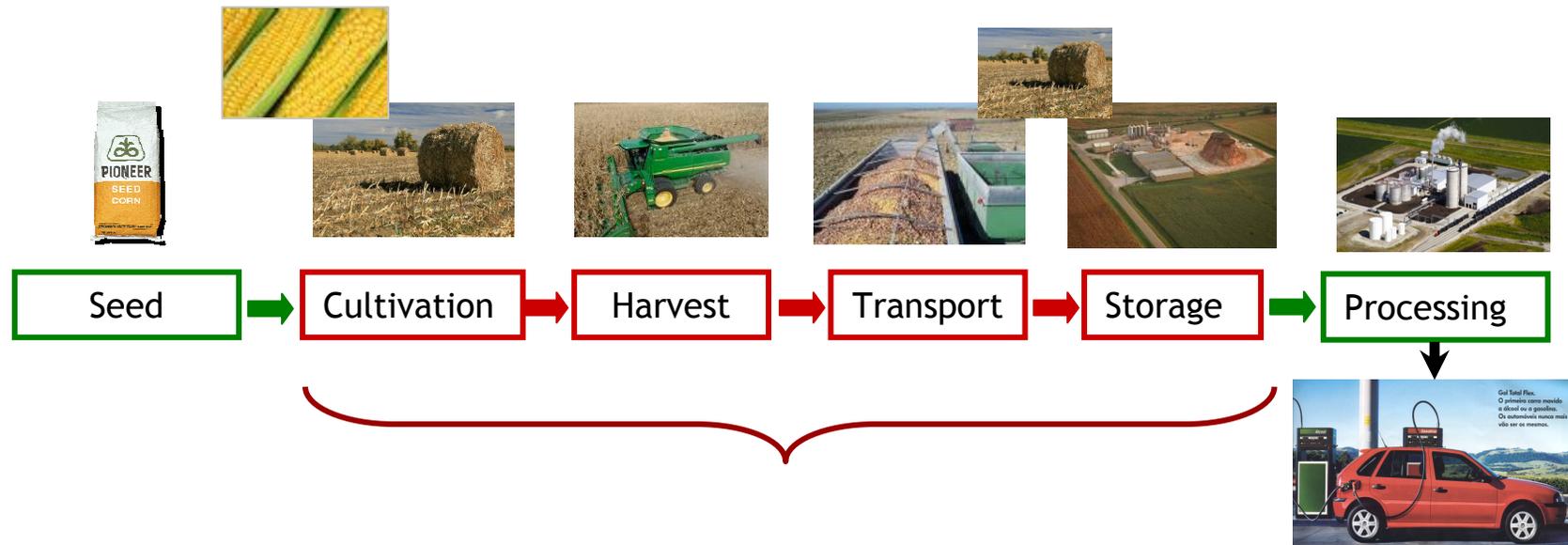
# Cellulosic Ethanol

## *Developing Enabling Technology*



# Cellulosic Feedstock

*Value Chain Issues Require Integrated Technologies & Innovations*



Key challenges ....

- ✓ biomass vs. corn grain collection, storage, transportation
- ✓ requires innovation - science & technology
- ✓ requires technology expandable to any biomass

# DuPont Danisco Cellulosic Ethanols LLC

**DANISCO**

First you add knowledge...

**DU PONT**

*The miracles of science™*

May 2008

*DuPont Danisco Ethanol is the leading low-cost  
integrated solution for converting non-food biomass to ethanol*



# DuPont Danisco Cellulosic Ethanol

The world's first robust, integrated solution for biomass-to-ethanol



Pretreatment



Enzymatic hydrolysis



Fermentation to ethanol



## State of Tennessee

- In 2006, Governor Bredesen formed the Alternative Fuels Working Group as a first step in developing an alternative fuels strategy for Tennessee
- In 2007, the Governor and the General Assembly set aside more than \$72 million to position Tennessee to be a national leader in the production of biomass ethanol and related research
- July 2008, provided \$40 million in funding to build a pilot biomass ethanol plant in the FY 2007-2008 budget in partnership with DuPont Danisco

# DuPont Danisco Cellulosic Ethanol

## Commercial scale by 2012

### Phase I

- Optimize integrated solution for corn inputs
- Site and begin construction of TN pilot plant 2009
- Build global partnership network for development & commercialization

### Phase II

- Start up pilot
- Optimize 2<sup>nd</sup> feedstock
- Deliver final technology package for corn cellulosic ethanol

### Phase III

- Site & break ground for commercial plant by 2012

# DuPont Solutions

Deliver Innovations that Transform the Market

## Downstream



### Refinery & Pipeline

Compatibility  
With  
Existing Gas Refinery  
Infrastructure

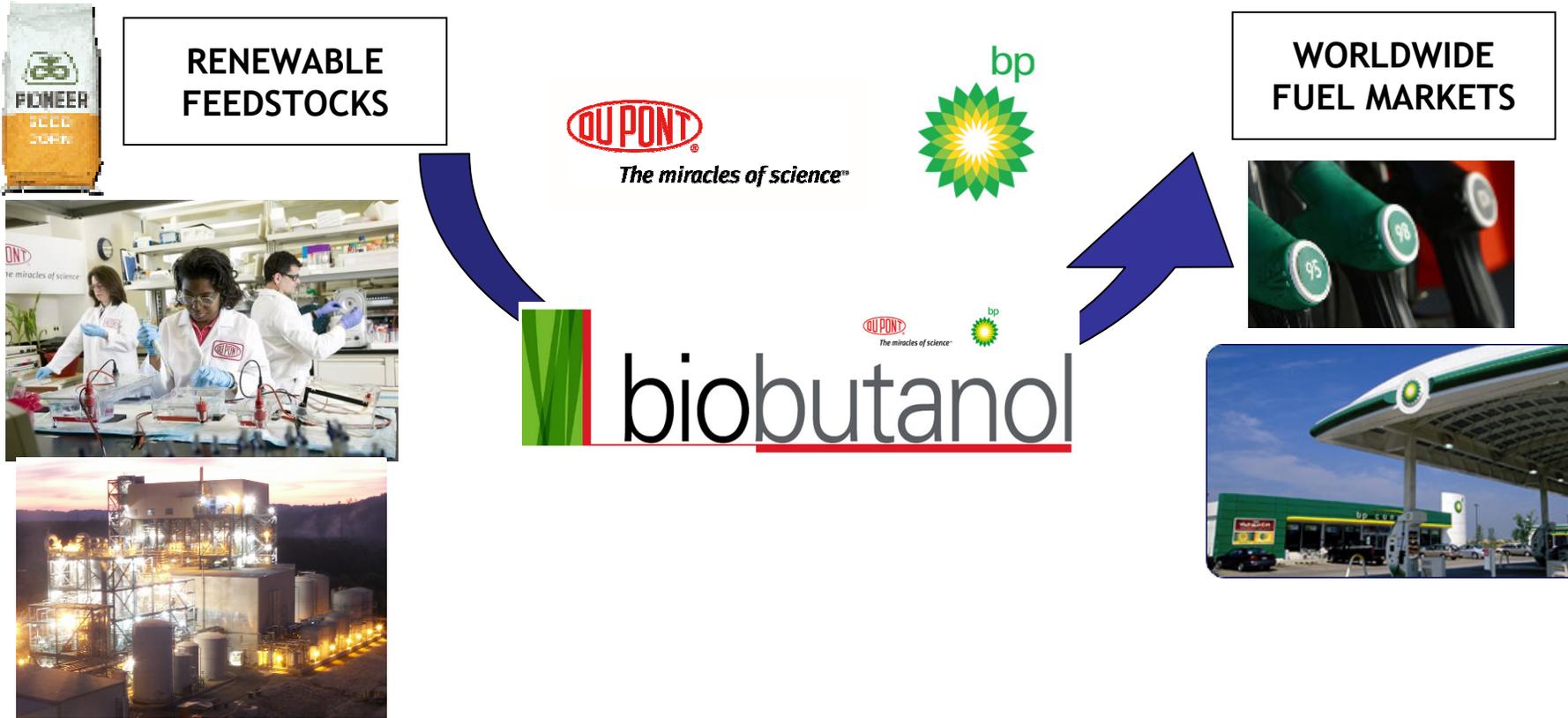


### Retail & Consumer

Uncompromised  
Fuel Performance

*An advanced biofuel - biobutanol*

# Biobutanol the Advanced Biofuel



BP & DuPont announced June 2006

# Biobutanol: Advanced Biofuel



**BIOFUEL PRODUCTION**

- SAME AGRICULTURAL FEEDSTOCKS
- EXISTING ASSETS RETROFITTABLE
- SUPPORTS AGRICULTURAL DEVELOPMENT



**REFINERY**



**PIPELINE**



**TERMINAL**

- LIMITED WATER ABSORPTION
- FUNGIBLE FUEL
- PIPELINE FEASIBLE
- EXISTING INFRASTRUCTURE

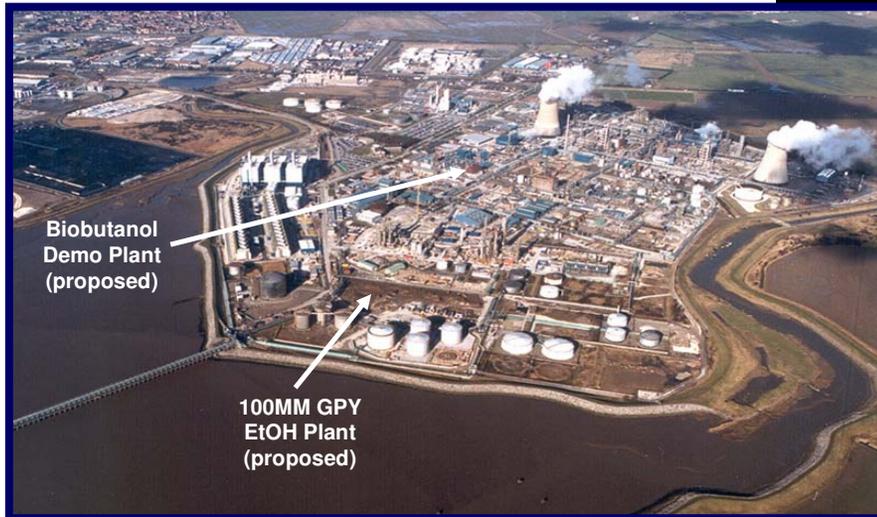
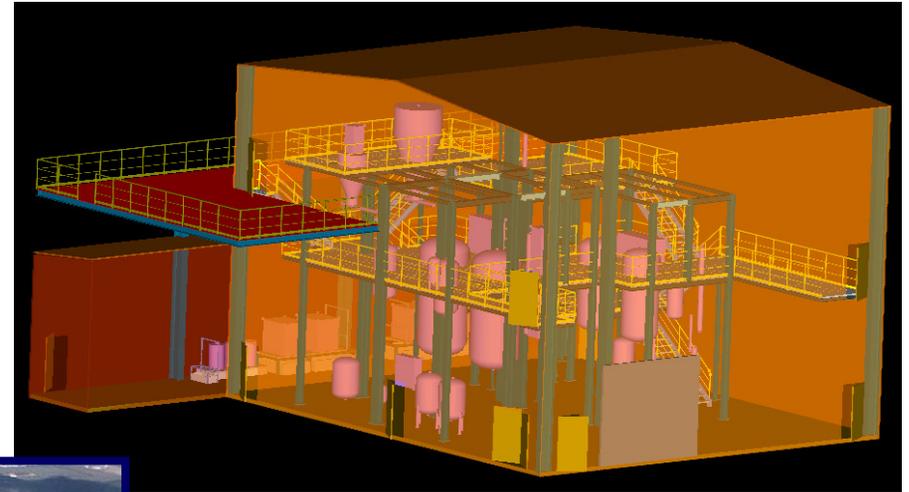


**RETAIL / AUTO INDUSTRY / CONSUMER**

- BETTER FUEL CONSUMPTION
- HIGHER BLEND LEVELS WITHOUT VEHICLE MODIFICATION

# Biobutanol Commercial Demonstration

- Biobutanol demonstration plant sited on existing BP site at Kingston upon Hull in UK
- Pilot plant completion in 2009
- Commercial plant [site TBD] completion in 2012



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# Summary

## DuPont Delivers Innovations that Transform the Market

### Upstream



Feedstock

Cellulosic Ethanol

### Downstream



Refinery & Pipeline



Retail & Consumer

Biobutanol



Thank you!