

# DuPont and Biofuels

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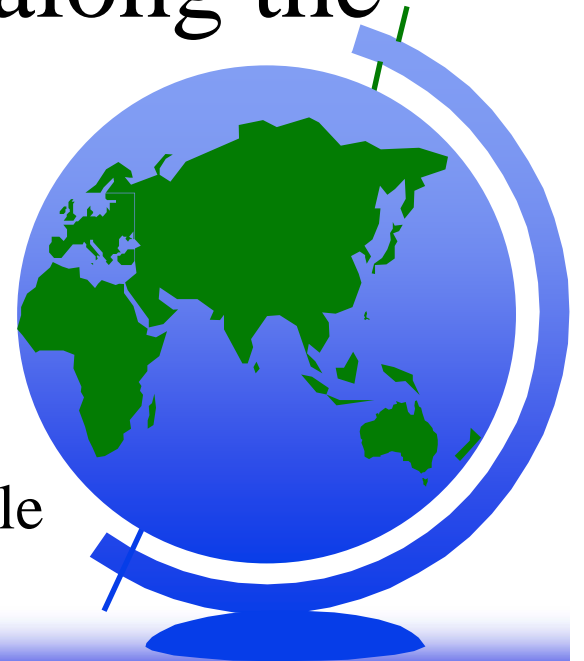
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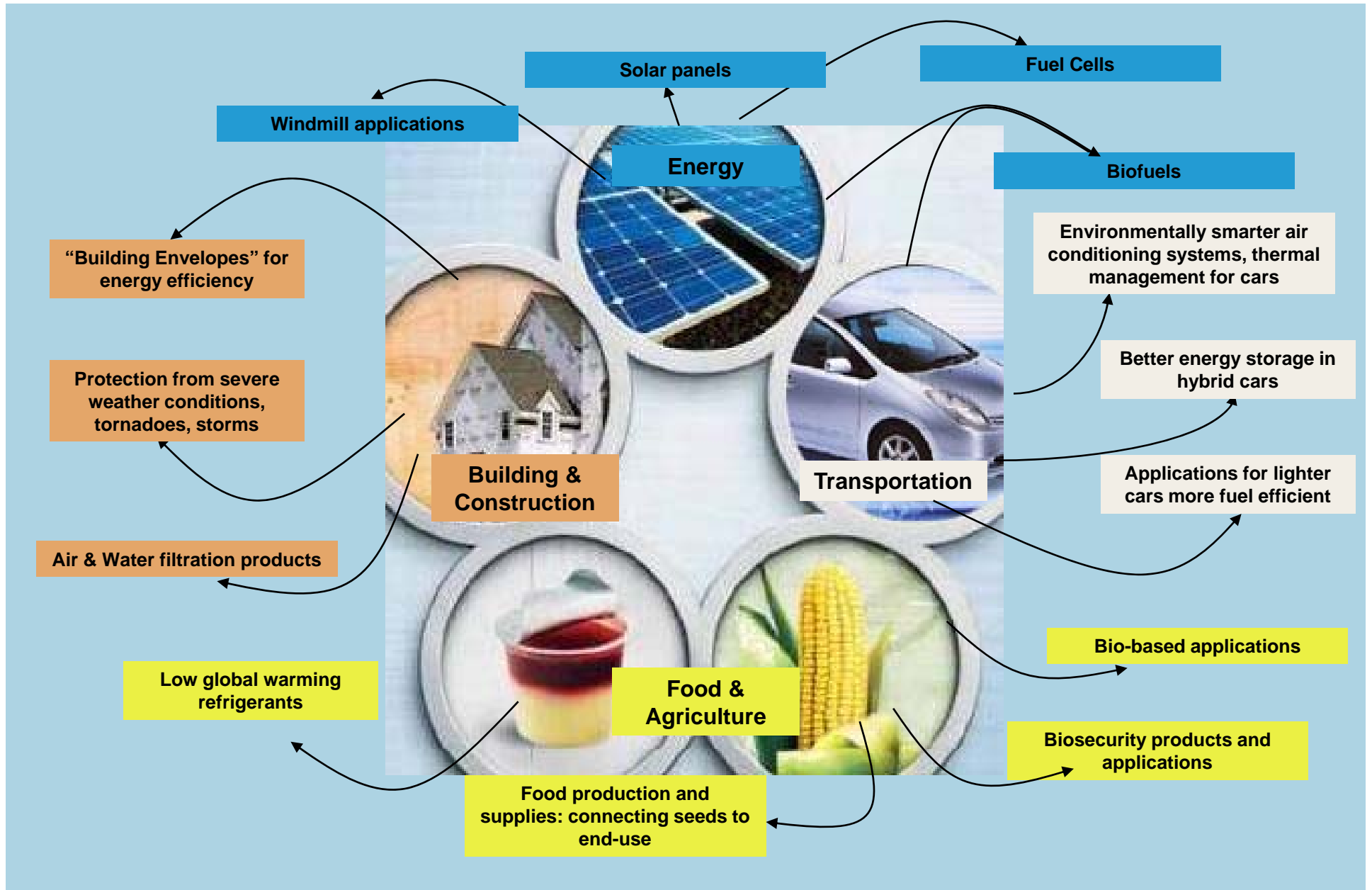
# DuPont Mission: Sustainable Growth

➡ Increasing shareholder and societal value while reducing the environmental footprint\* along the value chains in which we operate.

\* DuPont defines footprint as all injuries, illnesses, incidents, waste, emissions, use of water and depletable forms of raw materials and energy.



# Solutions to Serve the Marketplace



# DuPont Biofuels

- ❏ Biology will help reduce global reliance on fossil fuels
- ❏ DuPont solutions -- sustainable, renewable and matched to real-world needs
  - Integrate modern biological tools into world-renowned chemistry and engineering capabilities
  - Renewably-sourced chemicals and fuels



# Three-Part Biofuels Strategy

- ➡ Improve existing ethanol production via differentiated agriculture seed products and crop protection chemicals
- ➡ Develop, supply next generation biofuels with improved performance
- ➡ Develop, supply new technologies to allow conversion of cellulose to ethanol



# Improving Ethanol Yield - Seed Technology and Crop Protection

☞ Pioneer Hi-Bred customized crop genetic solutions

- 170 Pioneer brand ethanol hybrids
- Improving corn grain composition → increased ethanol yield, more valuable food and feed co-products
- Improve supply-chain efficiencies to better-link farmers, ethanol producers.

☞ DuPont Crop Protection protecting yields of biofuel crops

- Corn, sugar cane, sugar beets, switchgrass



# DuPont-BP Biobutanol

- ➡ Biobutanol formulations deliver good fuel characteristics
  - Energy density
  - Controlled volatility
  - Sufficient octane
  - Low levels of impurities



# Biobutanol Performance

## Benefits

- ➡ Energy content closer to gasoline
- ➡ Opportunities to add more biofuels to gasoline
- ➡ Can easily be used in existing distribution infrastructure
  - Gasoline blended with butanol less susceptible to separation than ethanol/gasoline blends
- ➡ Compatible with current vehicle and engine technologies





# Other Biobutanol Benefits

## ☞ Environmental benefits

- GHG benefits at least as good as ethanol
- Low vapor pressure → lower VOC emissions

## ☞ Synergy w Ethanol

- Existing ethanol capacity can be retrofitted to butanol production
- Same agricultural feedstocks as ethanol
- Reduced vapor pressure enhances co-blending w gasoline/ethanol blends



# Are Food, Feed, Fiber and Fuel Competing Uses of Ag Commodities?

- ❏ Some suggest that agriculture cannot supply all of these needs, and that governments should make choices between them.
- ❏ A long history of agricultural yields and productivity in North America indicate otherwise.



# The Power of Agricultural Productivity

**+13%**

The growth in world **population** over the last 10 years

**+36%**

The growth in global **income** over the last 10 years

**+21%**

The growth in **meat** consumption (Beef +14%, Pork +11%, Chicken +45%) over the last decade

**+34%**

The growth in world **corn** consumption over the last decade

**+52%**

The growth in world **soybean** consumption over the last decade

**+6%**

The growth in world **crop area** harvested over the last decade

# Agriculture Can Provide Food, Feed, Fiber and Fuel in Abundance

☞ Either/or is a false debate.

- Policies should focus on greater agricultural productivity, especially in the developing world.
- Expanded agricultural production will expand health, stability and economic opportunity in the developing world, and help green the US economy.



# DuPont–Danisco

## Cellulosic Ethanol

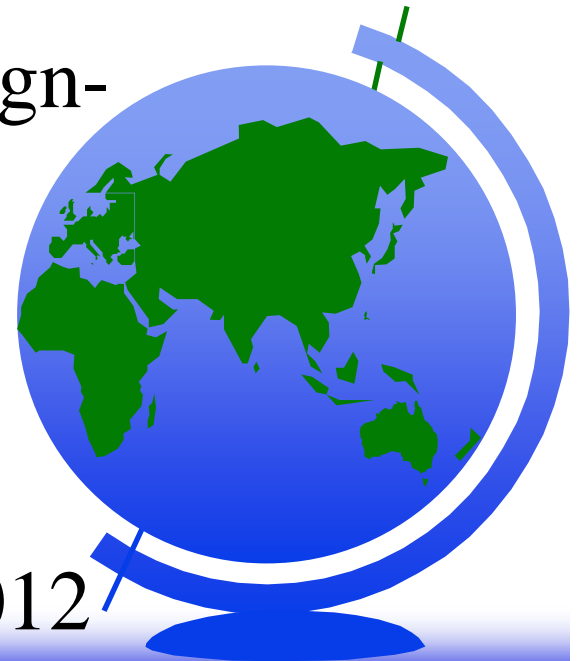
- ➡ \$140 million – DuPont and Genencor division of Danisco
- ➡ Commercialize leading technology package for non-food based, cellulosic ethanol production
- ➡ License technology package directly to ethanol producers
- ➡ Establish regional cellulosic ethanol affiliates



# DuPont–Danisco

## Cellulosic Technology

- ➡ Technology package can be used as “bolt-on” to existing ethanol plant
  - Expanding capacity to accept cellulosic feedstocks
- ➡ Technology package can be design-basis for stand-alone cellulosic ethanol facility
- ➡ Operational this year
  - Corn cobs and switch grass
- ➡ Commercial-scale production 2012



# Cellulosic Biofuels/Biomaterials

## Reduce Oil Demand and Price

- ➡ DuPont Danisco Cellulosic Ethanol will produce from corn stover at pilot scale 2009, commercial scale by 2012.
- ➡ Ethanol from corn stover expands productivity of existing acreage and biorefineries by 1/3.
- ➡ Iowa State estimates biofuels reduce US gasoline prices \$.25-.40/gallon.
- ➡ Biomaterials like DuPont Sorona and Cerenol further reduce oil demand.



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