Major Issues Affecting Biofuel Growth and Development in the U.S.

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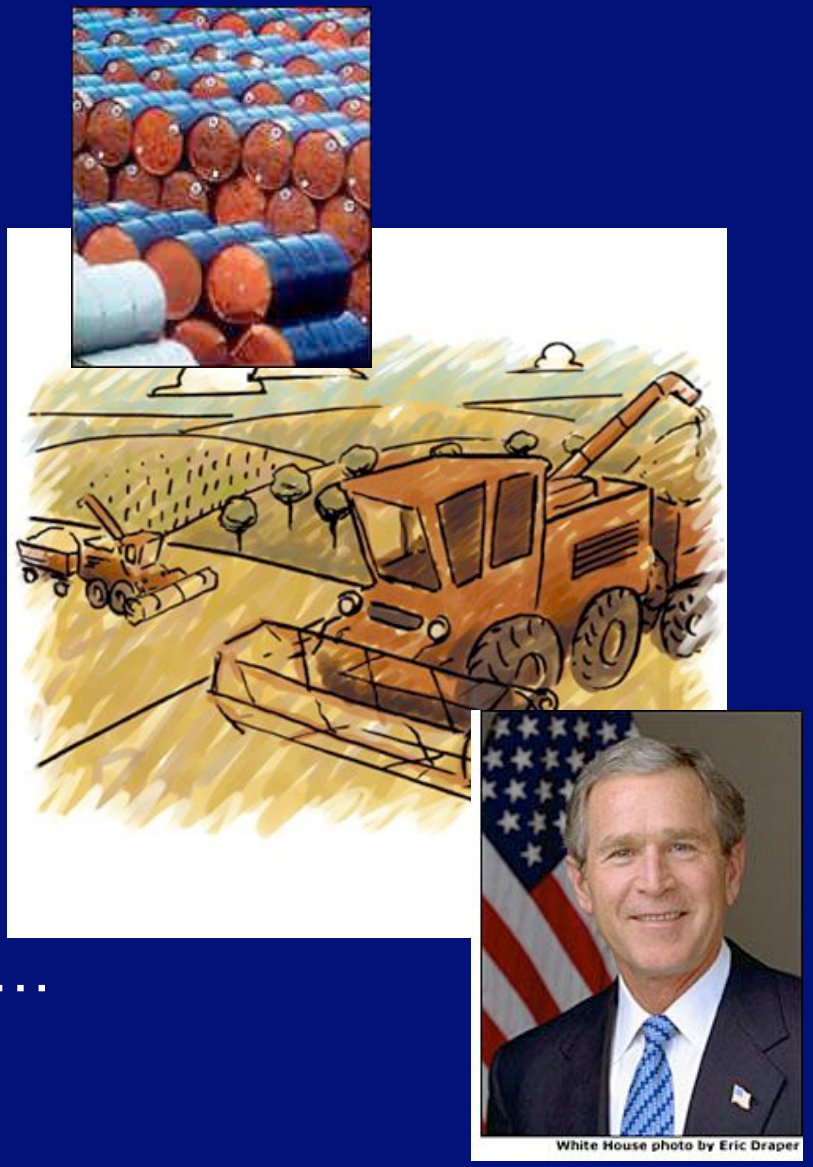
http://www.eia.doe.gov/oiaf/aeo/index.html

Energy Information Administration
Official Energy Statistics from the U.S. Government

Why Biofuels?

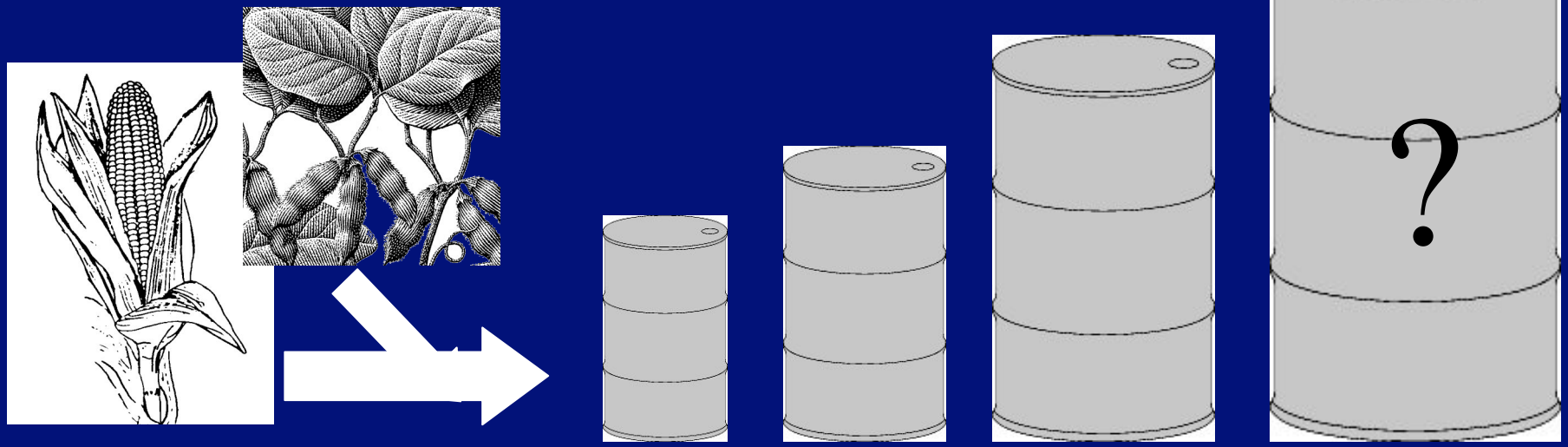
- High World Oil Prices
- Renewable/Environment
- Regulatory Incentive
- Energy Security
- Liquid Fuel
- Agriculture
- Because the President said so …



Characteristics of Biofuels

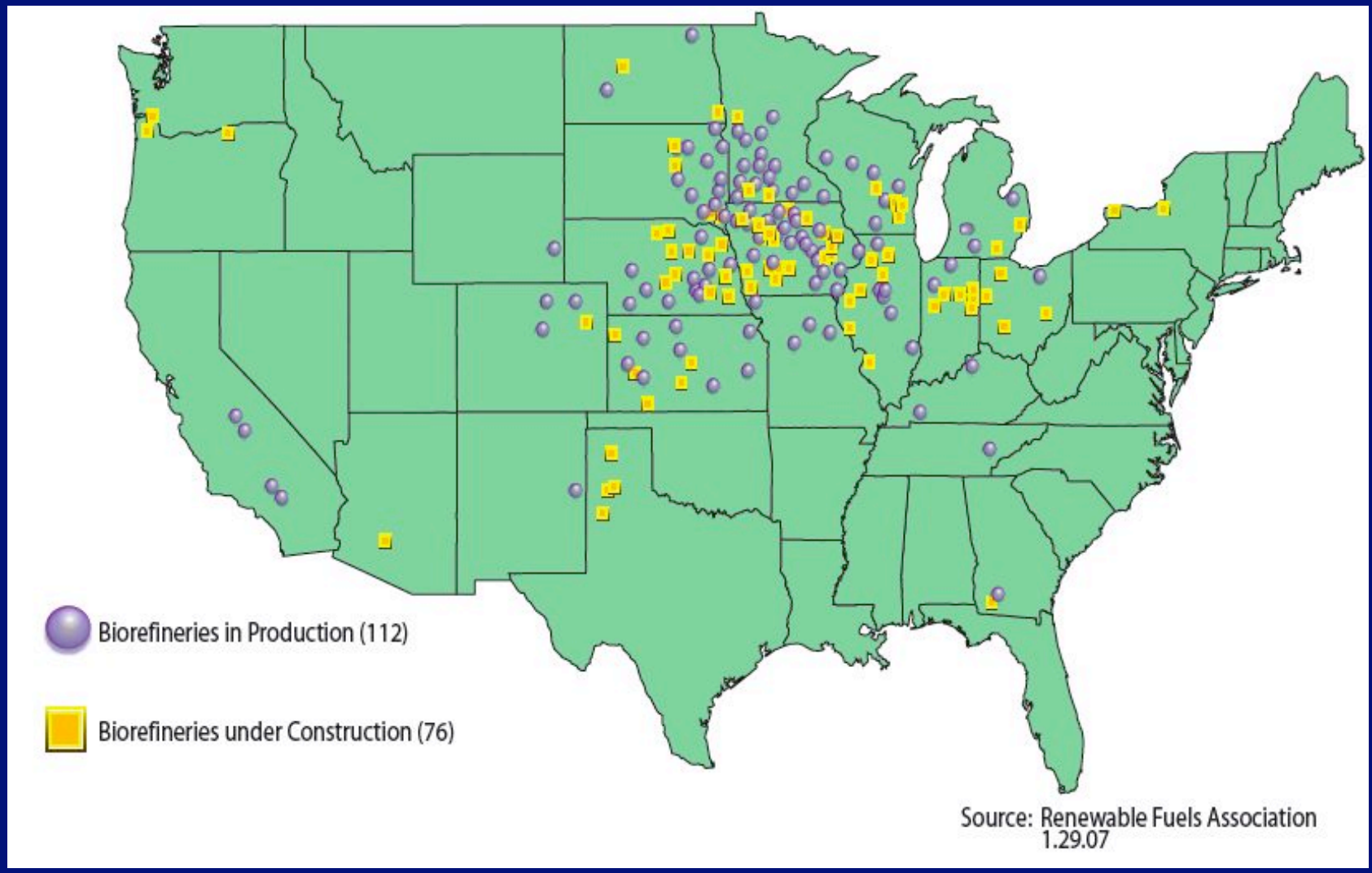
	Biodiesel	Ethanol	Cellulosic Ethanol
Feedstocks	Soybean Oil Canola Oil Waste Grease Animal Fats	Corn Sugar Cane Sugar Beets	Switchgrass Woody Biomass Biomass Residue
Common Blends	B2, B5, B20, B100	<E10, E20, E85	
2005 Production (MMgal)	91	3,900	Small
Production Technique	Transesterification	Dry Mills Wet Mills	Hydrolysis Gasification/F-T
ASTM Standard	D 6751	D 4806	

A Booming Biofuel Industry

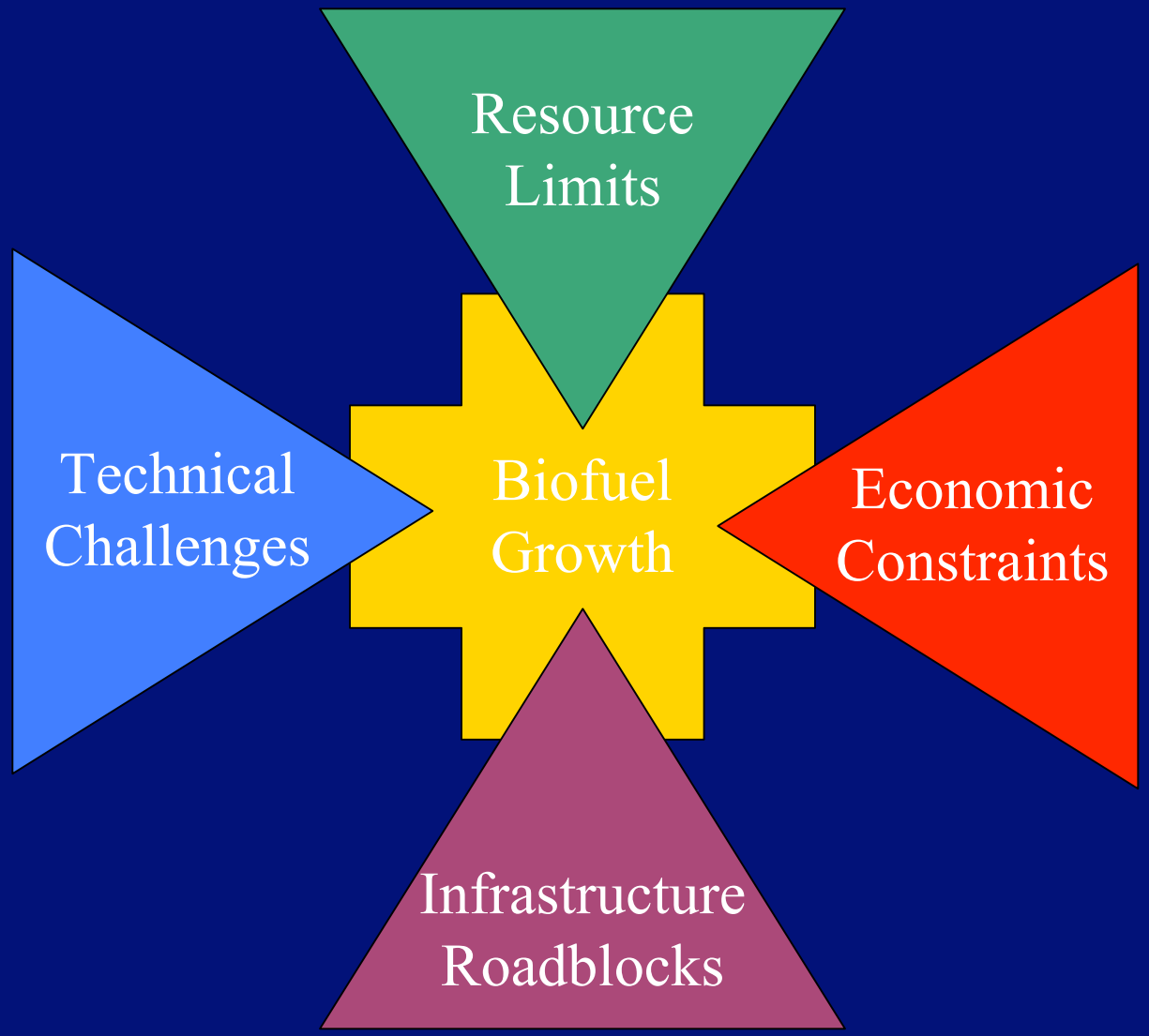


Year	Gasoline (billion gal)	Ethanol (billion gal)	% of Gasoline Pool
2000	128.7	1.63	1.27%
2001	129.3	1.77	1.37%
2002	132.8	2.13	1.60%
2003	134.1	2.80	2.09%
2004	137.0	3.40	2.48%
2005	136.9	3.90	2.85%

Locations of Ethanol Facilities

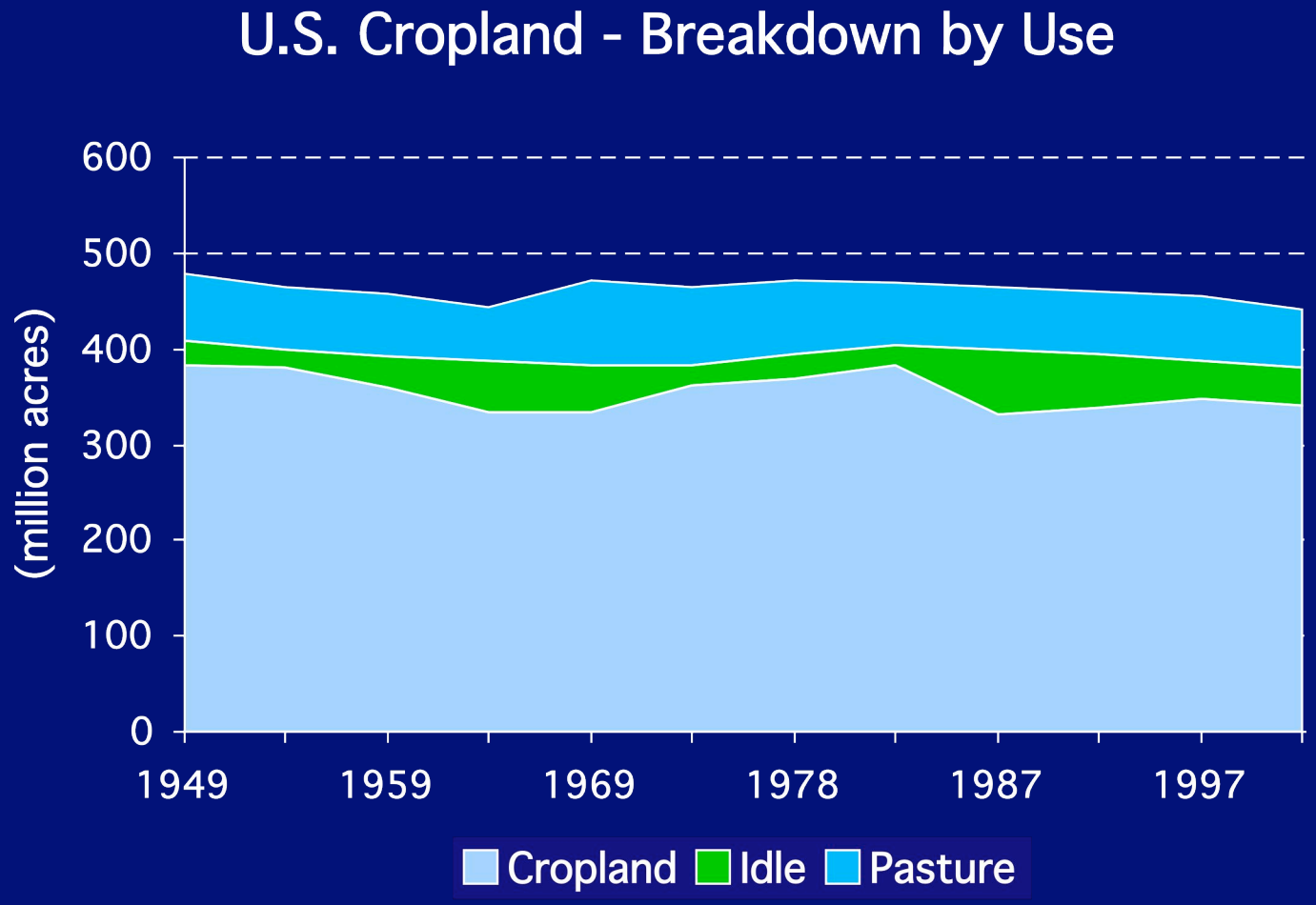


What are the Major Obstacles to Growth?



Resource Limitations

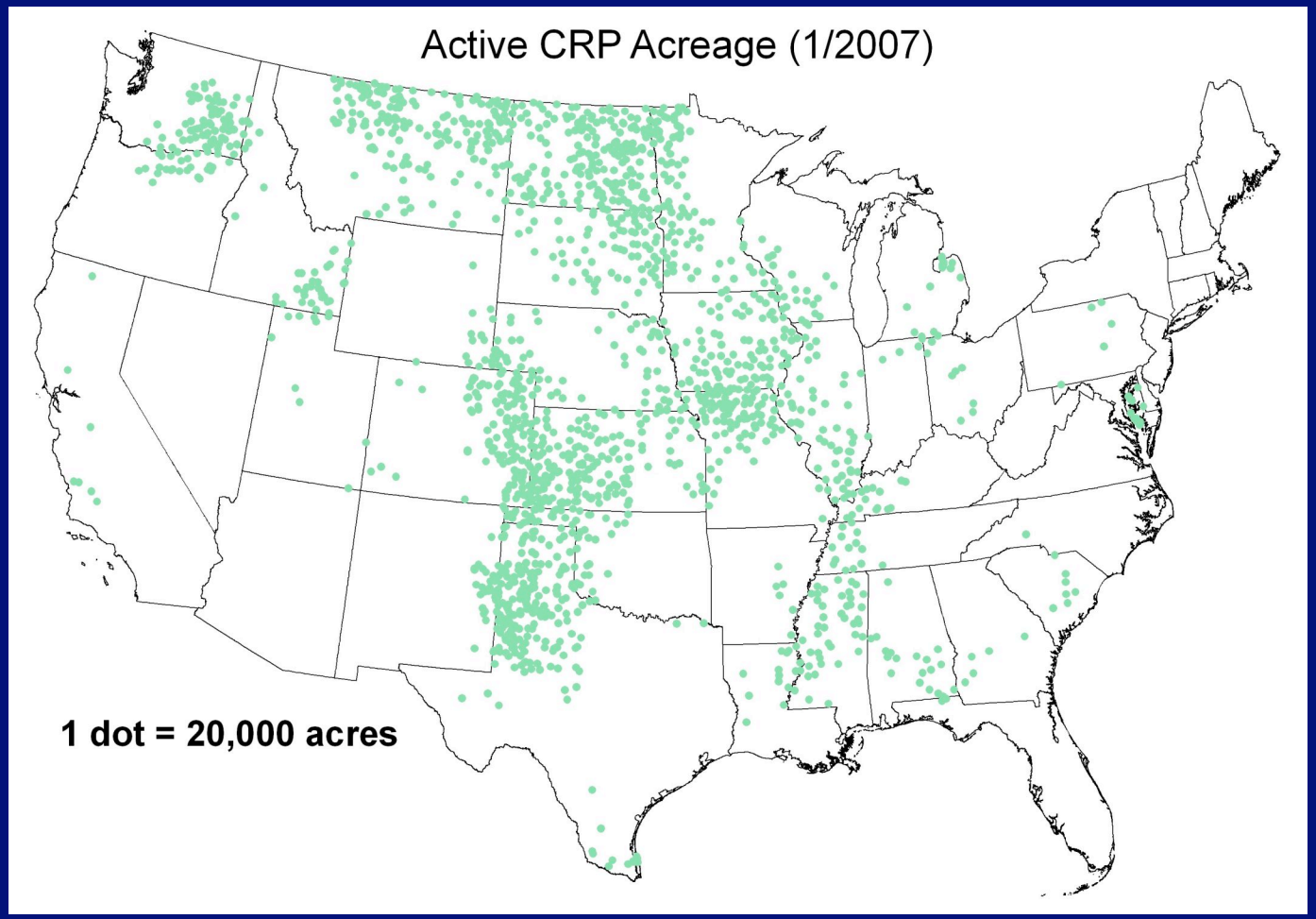
The amount of arable land in the United States is limited, no new land has been added, and existing land is under pressure to produce more than ever before.



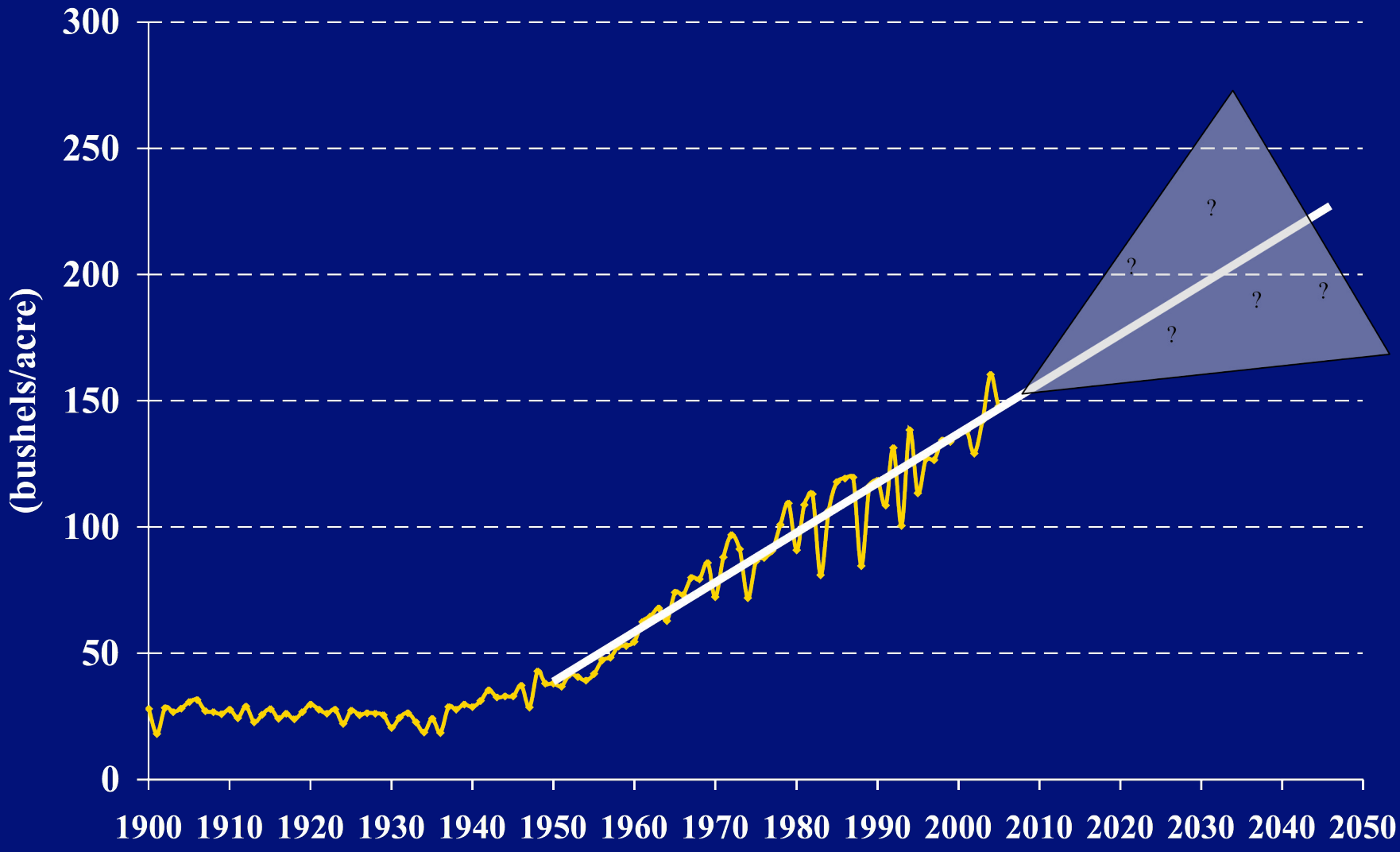
Overcoming Resource Limitations

- Find More Land - convert CRP, forestlands, and pastureland to cropland (for cellulosic)
- Use Existing Land More Efficiently
  - Boost Corn/Soybean Yields
  - Engineer corn/soybeans to have more starch/oil
- Change the Resource Limits
  - Cellulosic Ethanol
  - Use "2nd-Generation" feedstocks: perennials, agricultural residue, forest biomass, dedicated oilseed crops, etc.

The Conservation Reserve Program



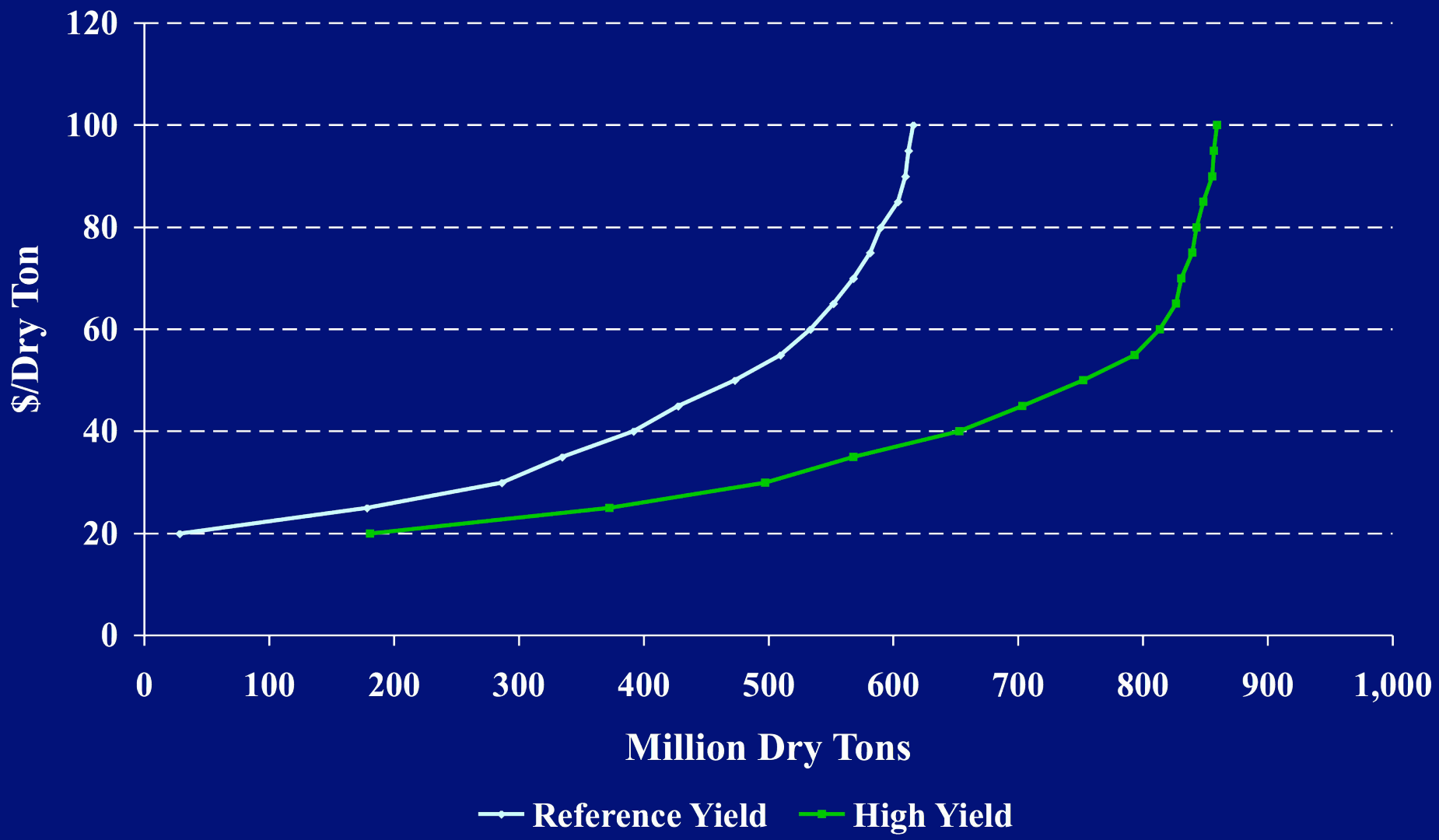
Boosting Yields of Corn/Soybeans



The Promise of Cellulosic Ethanol

- Dedicated Energy Feedstocks
  - Limited Interaction with Food/Feed Markets
  - More Environmentally Friendly
  - Potentially much cheaper
- Resources are Larger
  - Derived from Waste Streams
  - Grown in less favorable conditions/on marginal land
- Liquid Fuel
- Long-term Growth Potential

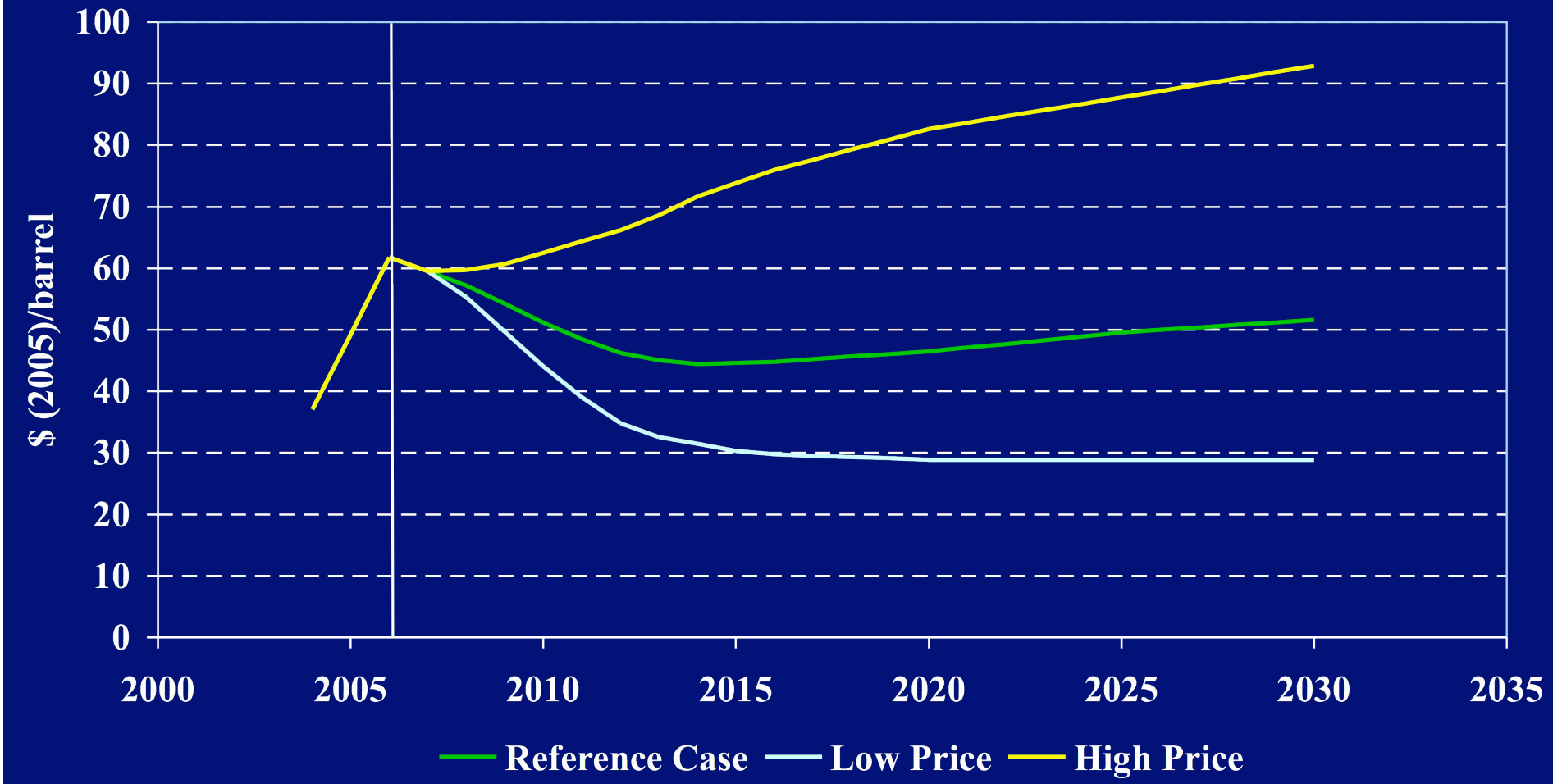
Cellulosic Biomass Supplies (Excludes Corn Grain)



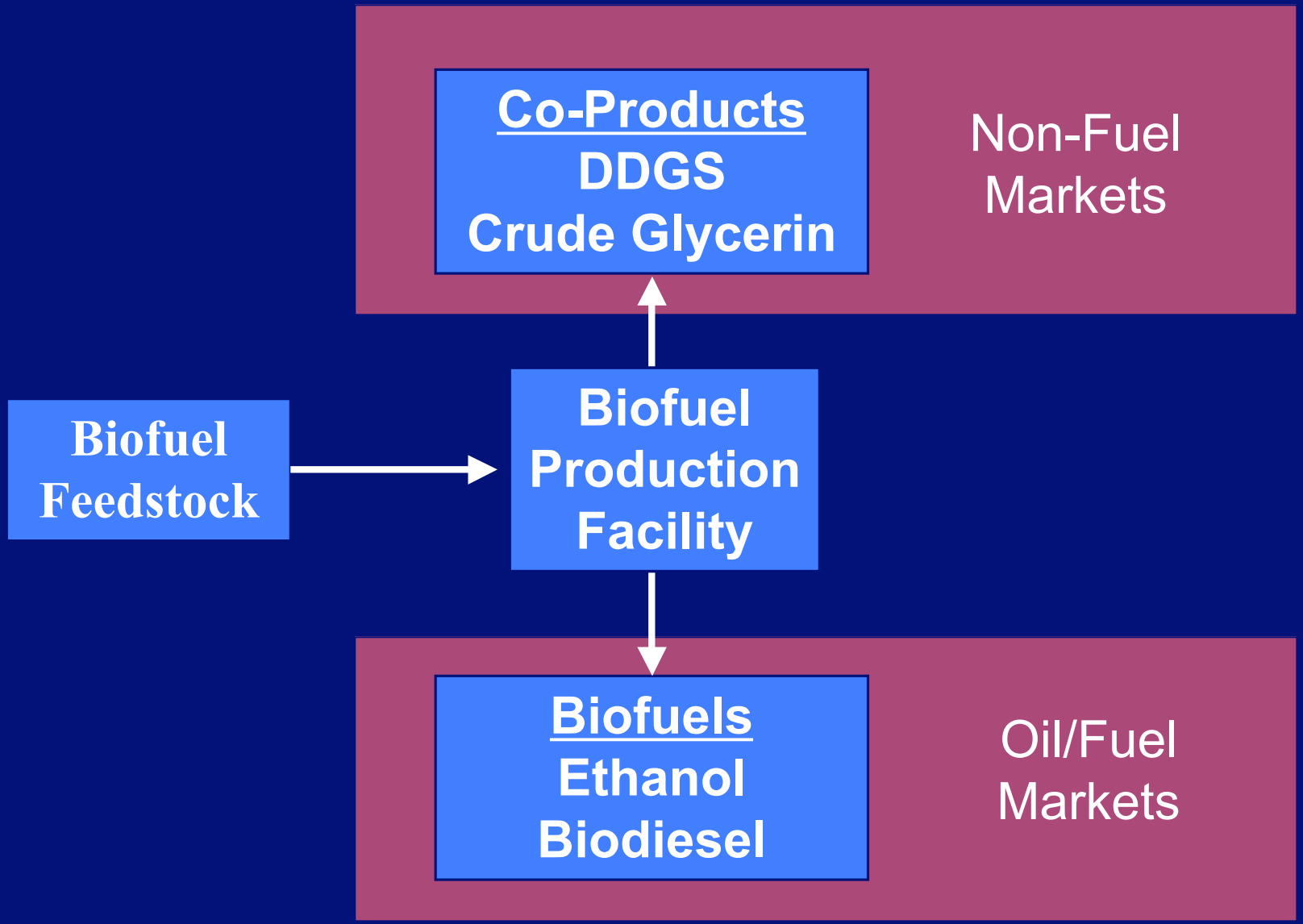
Economic Constraints

- World Oil Price
- Feedstock Price/Co-Product Values
  - 57% of ethanol production cost is the feedstock
  - 70-78% of biodiesel production cost is the feedstock
  - High Value Co-Products essential to lower costs
- Saturation of Co-Product Markets
  - Large supply of DDGS, crude glycerin can depress prices
- Federal Tax Incentives
- Blended Biofuels vs. Dedicated Biofuels

Imported Crude Oil Prices (Annual Energy Outlook 2007)



The Importance of Co-Products



Regulatory Incentives

- EPAct 2005 - Renewable Fuel Standard
  - 7.5 billion gallons by 2012, 250 million from cellulosic
- Biofuel Tax Credits
  - $0.51/gal for ethanol - expire/reauthorize in 2010
  - $1.00/gal for biodiesel from virgin oil feedstocks
  - $0.50/gal for biodiesel from recycled/waste feedstocks
  - Biodiesel tax credit - expire/reauthorize in 2008
- Import Tariff on Ethanol - $0.54/gal extended to 2009
- State Incentives?

Blended vs. Dedicated Biofuels

Short-term demand for biofuels is primarily for blends. Long-term demand required for sustained industry growth must come from high-percentage, dedicated biofuels.

2005 Biofuel Production (billion gallons)	
Biodiesel	Ethanol
0.091	3.904

Potential Blend Market (billion gallons)	
E10	13.7
B2	0.86
B5	2.16
B20	8.64

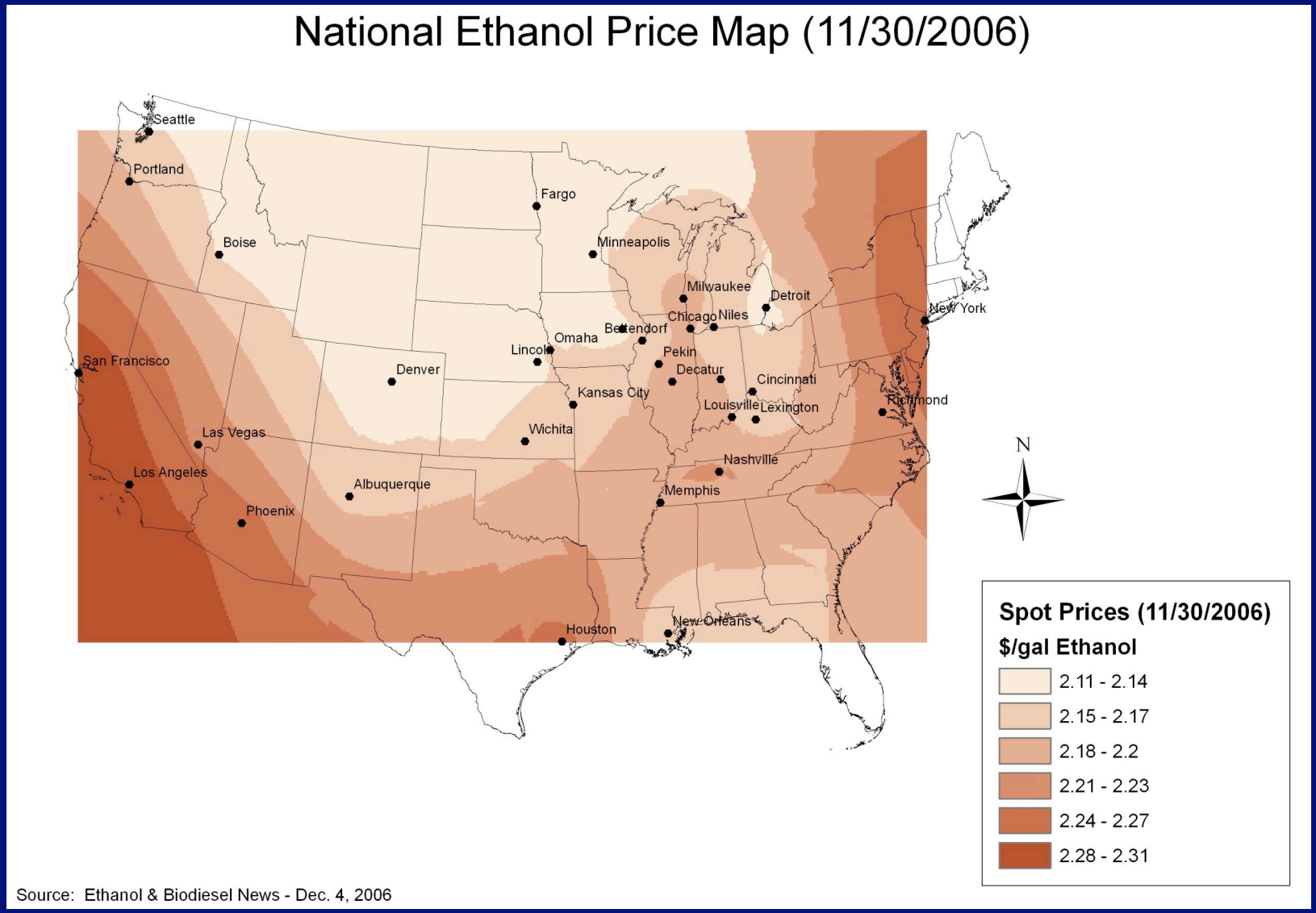
Infrastructure Roadblocks

- "Pumps, Pipelines and People"
  - Pumps - limited # of high-blend biofuel pumps
  - Pipelines - high transportation costs to end-markets
  - Low consumer awareness, limited # of FFV's

Limited Biofuel Pump Availability

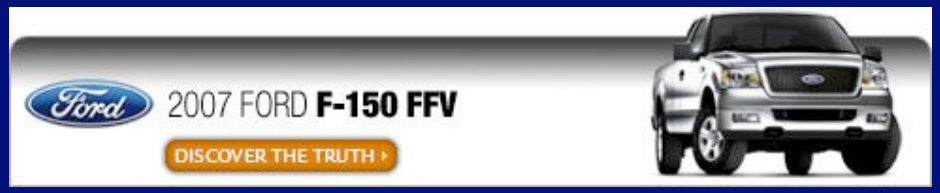
Fuel	# of Stations	% of Total
All Fuels	~169,000	100%
Biofuels (Total)	2,125	1.25%
E85	1,157	0.7%
Biodiesel	968	0.5%

Transporting Biofuels to Market



Source: Ethanol & Biodiesel News - Dec. 4, 2006

Limited Numbers of FFV's

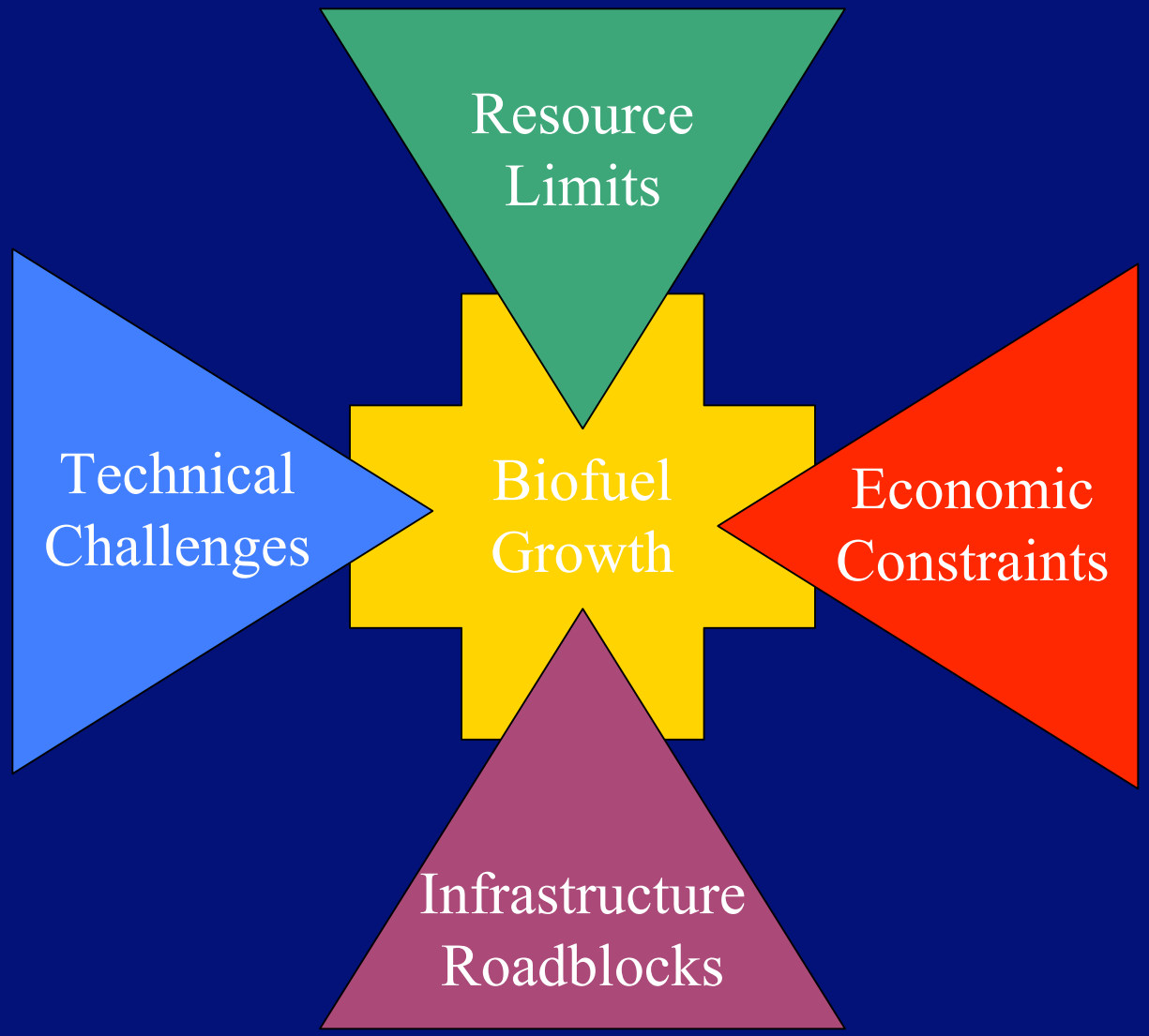


Technical Challenges

- Cellulosic Ethanol Capital Costs/Production Technology
- Retrofitting Pumps, Fuel Systems, Fuel Distributors
- Maintaining Fuel Quality
- After-market Biofuel Kits - emissions certification
- New Engine Designs - Biofuel Only?
- Energy Content and Fuel Volume

Energy Content and Fuel Volume

Conclusion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Biofuel Growth
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Thank you

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