BIOFUELS OVERVIEW

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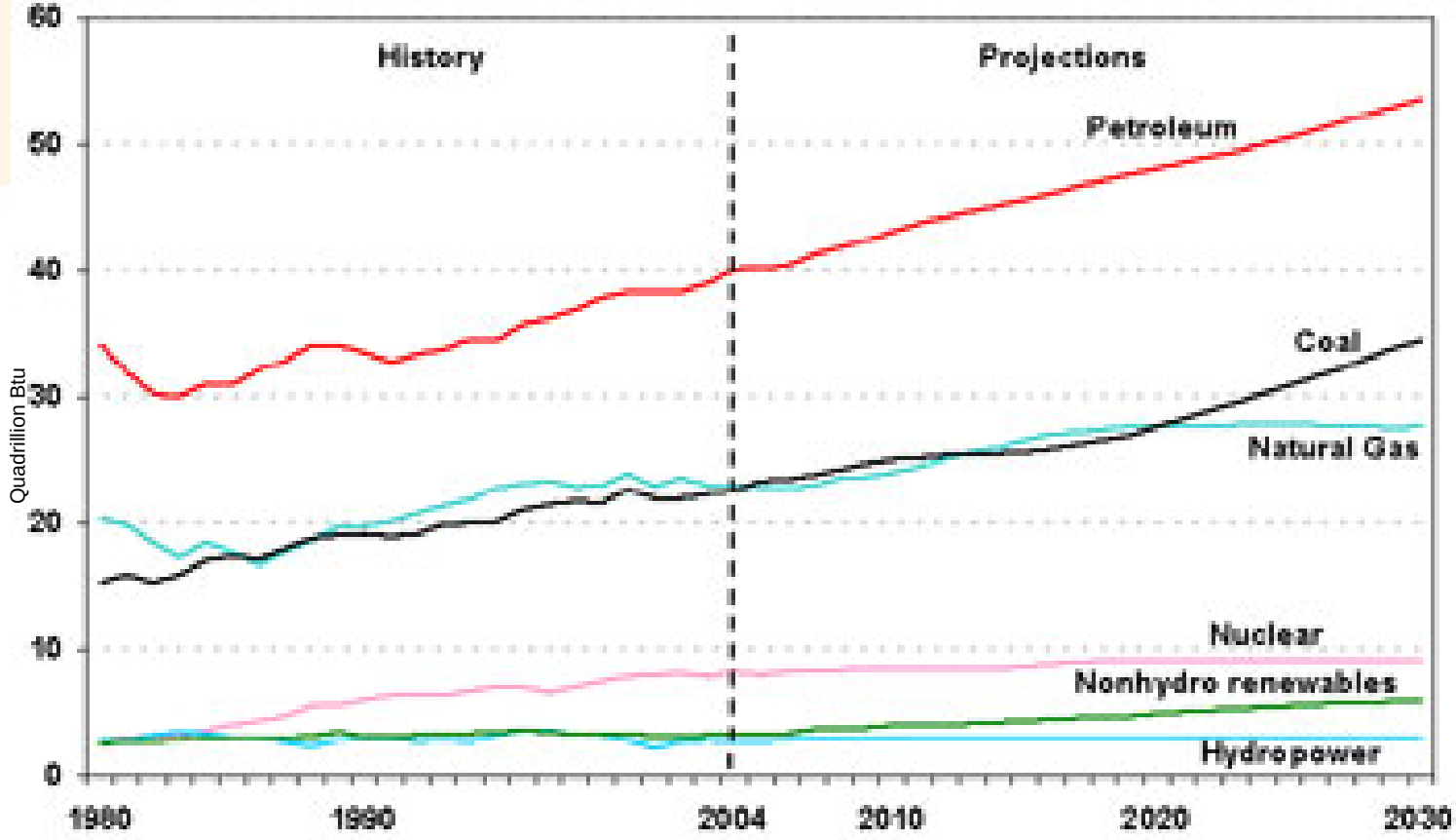
API

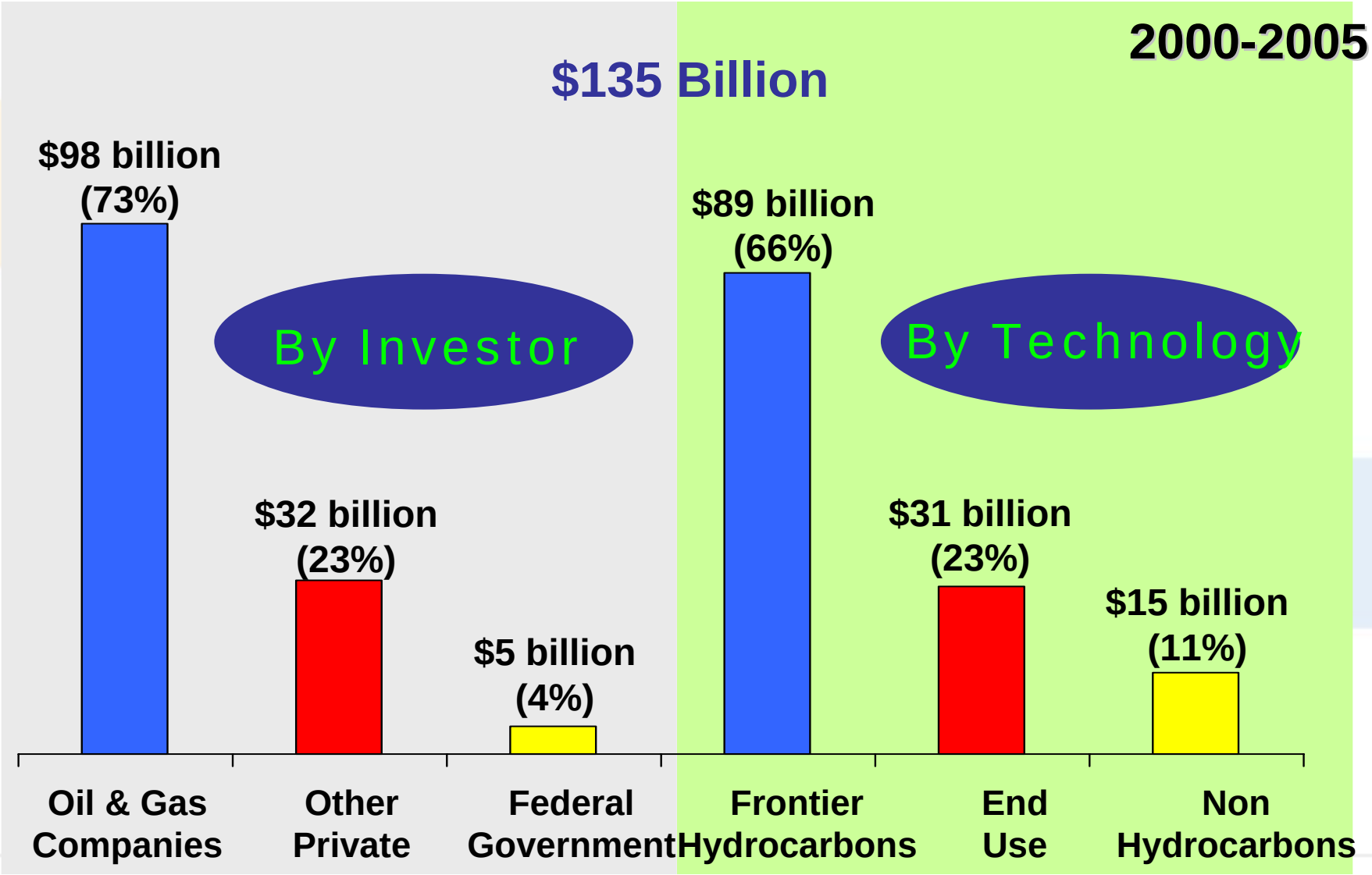
Future U.S. Energy Demand

- **The U.S. will consume 28 percent more oil and 19 percent more natural gas in 2030 than in 2005.**



Source: US DOE

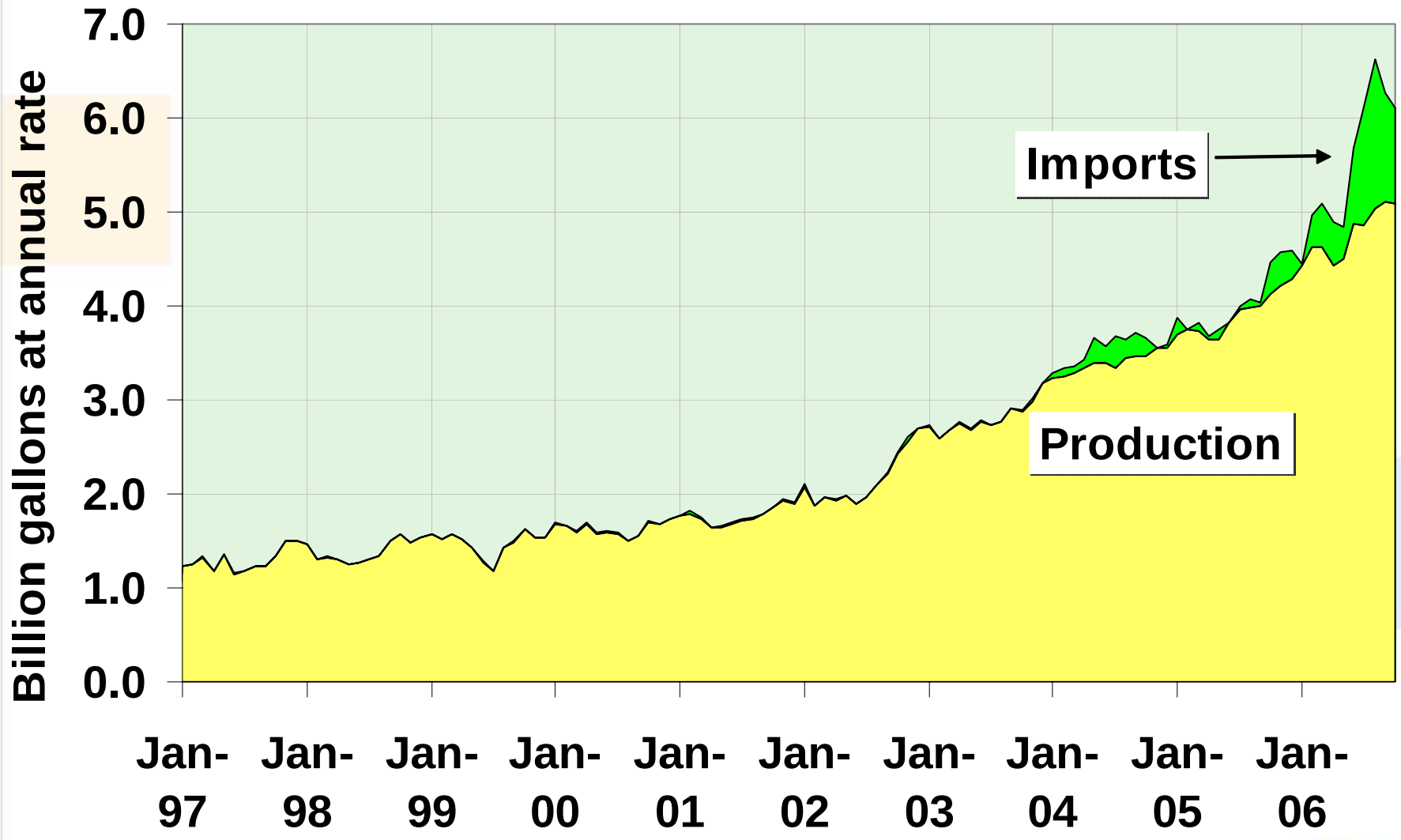
U.S. Firms Emerging Energy Investment



Biofuels Overview

- Our nation needs *ALL* sources of commercially viable energy, as well as a greater commitment to energy efficiency and energy conservation
- Almost 50% of all gasoline now produced in the U.S. includes ethanol
- Our companies have long been pioneers in developing alternatives and expanding our utilization of existing sources of energy

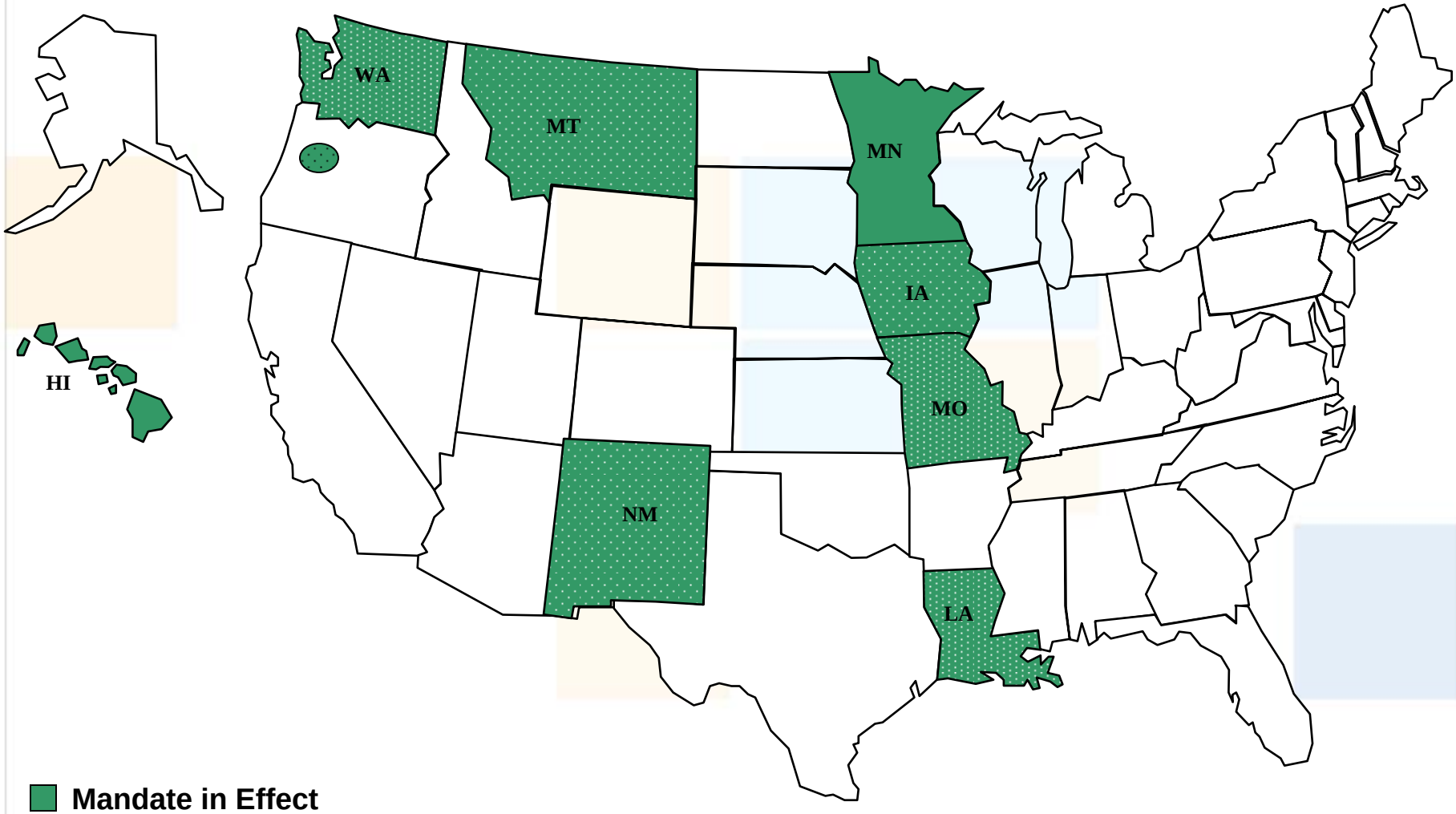
Ethanol Supply



Ethanol Overview

- Oil companies are the leading user of ethanol and a key player in increasing the use of ethanol
- Flexibility in the national renewable fuel standard (RFS) program will help ease ethanol and other biofuels integration soonest into the nation's gasoline pool
- Reliance on market forces is the best way to both deliver the greatest value to our customers and to ensure a long-term vibrant ethanol industry
- A patchwork of state-by-state ethanol mandates beyond the national RFS create additional boutique fuels that will likely interfere with the flexibility that Congress provided in the national RFS program

State Biofuels Mandates



Mandate in Effect

Mandate Passed but not yet in effect (includes Iowa Renewable Fuels Standard)

4/25/2007

Ethanol Challenges

- **Ethanol energy content is ~35% less than gasoline**
  - ✓Fewer miles per gallon
- **Ethanol generally cannot be transported via pipeline**
  - ✓Affinity for water requires segregation from gasoline during distribution
- **Higher vapor pressure**

Ethanol as a Fuel

- Ethanol has been used as an additive in gasoline in amounts up to 10% (E10) for some time
  - ✓ E10 can be used in the virtually all vehicles that operate on gasoline
- E85 is an alternative fuel that can only be used in specially designed "flexible-fuel" vehicles (FFVs)
  - ✓ Less than 3% of the current light-duty fleet are FFVs
  - ✓ Some auto makers have promised to produce more

State Ethanol Blending Issues

- Several states (mainly in Southeast) have gasoline specifications making ethanol blending with conventional gasoline problematic
- In those states ethanol can only be blended with a customized blendstock (BOB), causing boutique fuel concerns
- API has been encouraging states to adopt language in the NIST 130 Handbook
- Meeting increased Federal RFS levels could become difficult without changes to state regulations

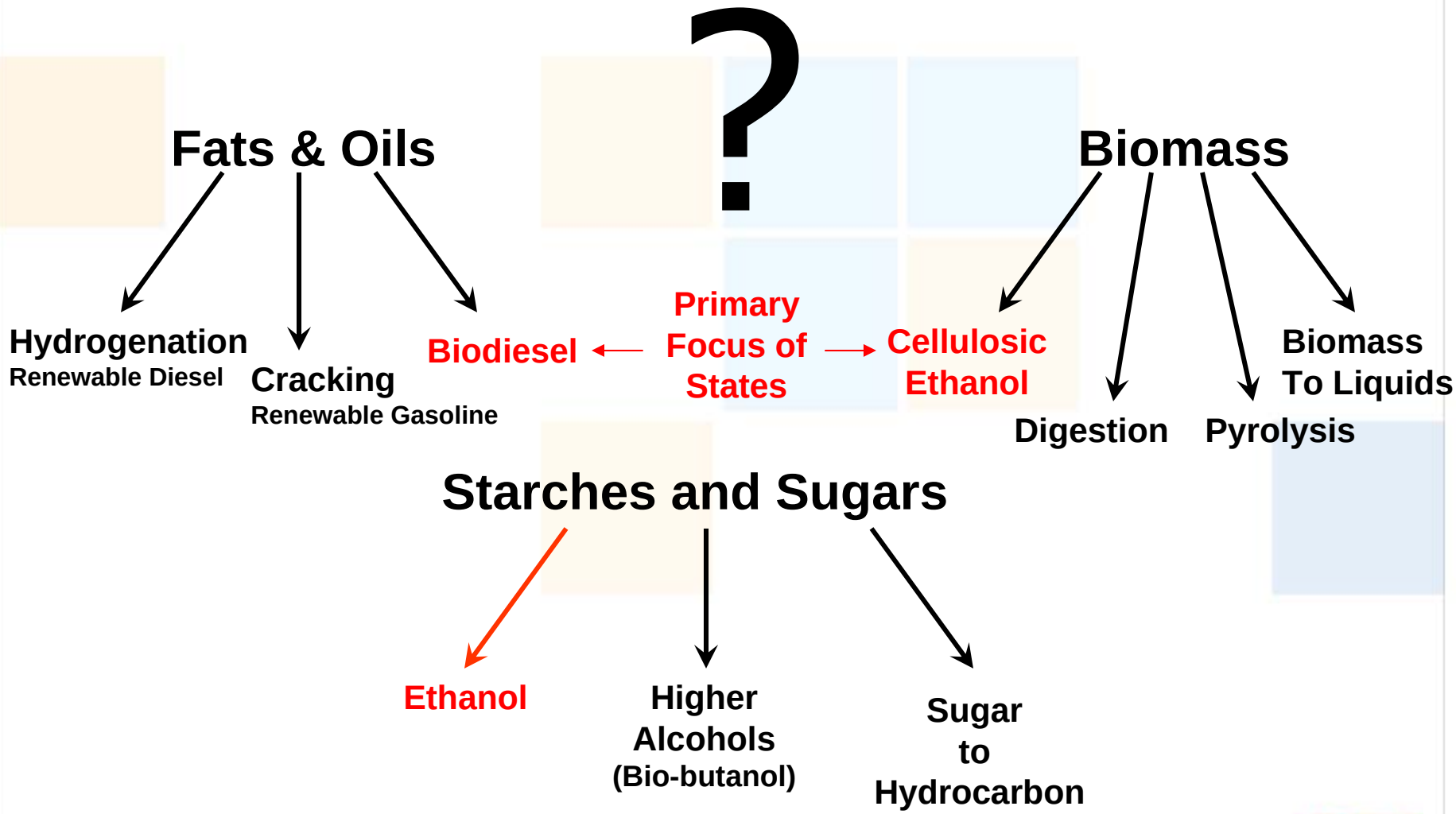
Ethanol Blends Above 10%

- Significantly higher mandates would require more ethanol than can be used as an E10 blend
- Moving beyond E10 will require a breakthrough in cellulosic ethanol technology
- However, there are many unanswered questions on emissions, and vehicle and engine compatibility with higher blends (E10 to E20+)
- Testing currently being conducted by:
  - ✓ University of Minnesota/ RFA
  - ✓ DOE
  - ✓ CRC
  - ✓ Small engine manufacturers

E85 Overview

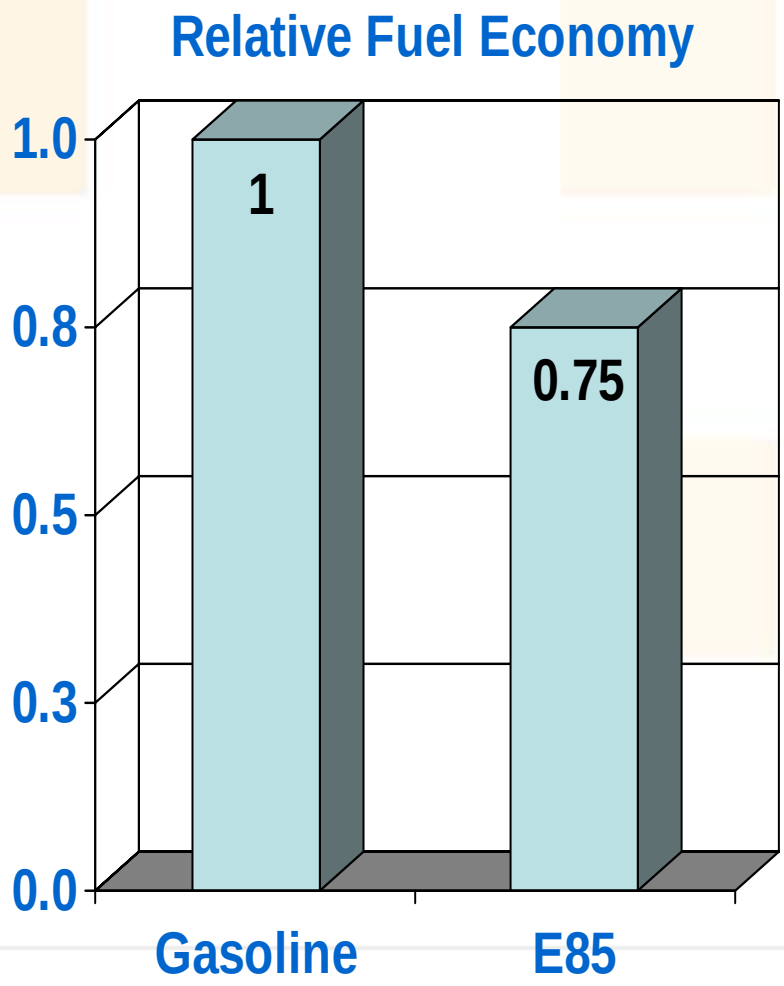
- Products offered for sale must meet consumers expectations. Care should be taken not to over-promise on E85's capabilities by not recognizing cost tradeoffs, poorer fuel economy, and shorter range
- Ethanol has a role as a transportation energy source but its role is limited until significant technology breakthroughs yields economic production of ethanol from cellulosic biomass
  - Timing of technological breakthroughs is unknown
  - No assurance that technologies will emerge
- Government policies should not pick winners and losers

Too Early to Pick Winners/Losers



E85 - Ethanol up to 85% in Gasoline

FFV – Flexible Fuel Vehicle can use gasoline or E85



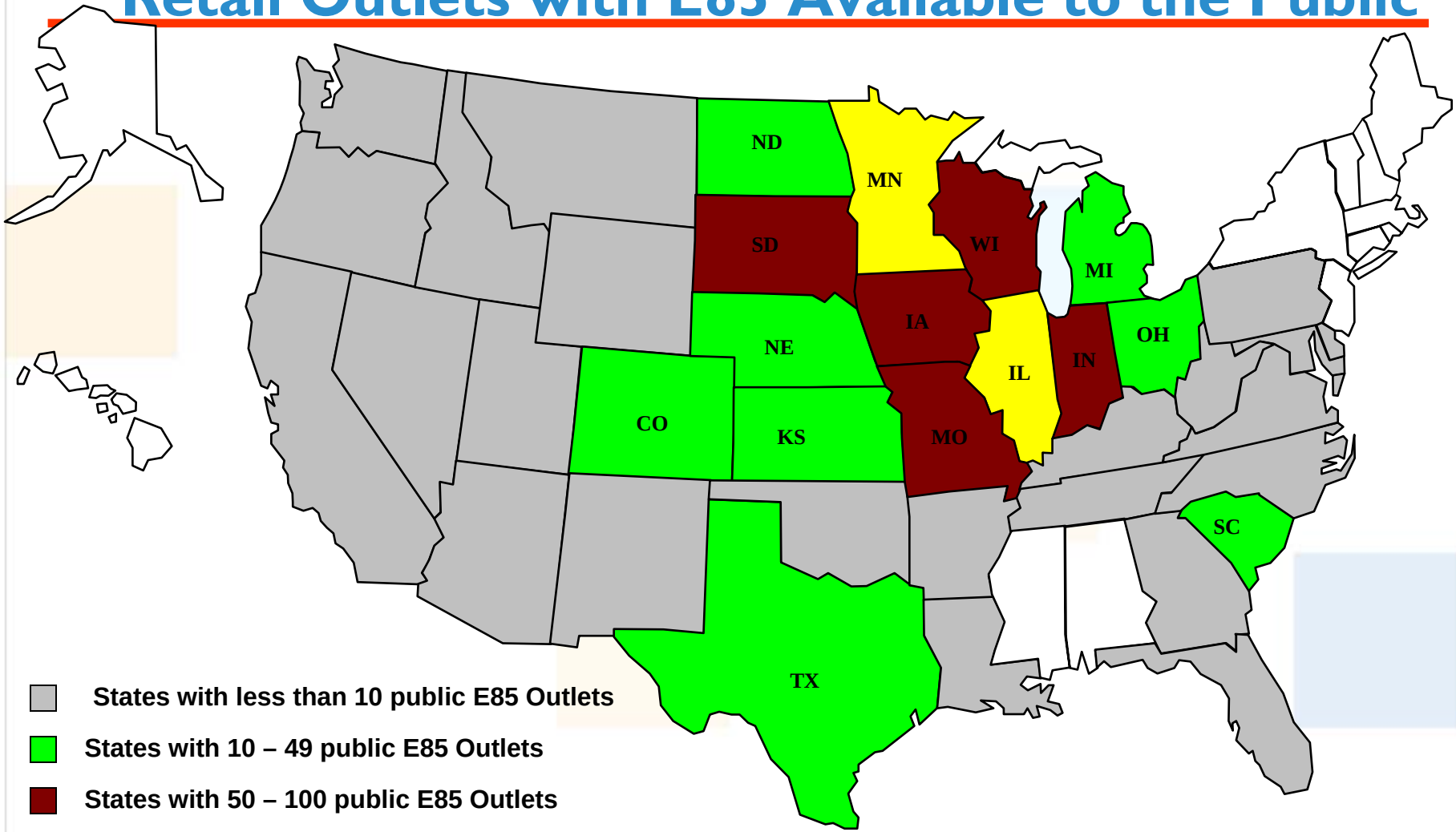
- Only ~3% of today's vehicles are specially designed FFV's to use E85, others will be damaged if misfueled
- By EPA measurements, FFV's using E85 get about 25 to 30% less mpg than gasoline
- Costs to equip a retail outlet with E85 can range from $20k to $200k
- E85 specifications and equipment are still developing

E85 Fueling Stations*

- The number of E85 fueling stations has nearly doubled since 2005
- According to DOE, there are **1229** E85 fueling stations currently in operation
  - ✓ **1106** public access
  - ✓ **123** government or private fleet only
- **446** public access stations are in just 2 states
  - ✓ Minnesota – **300**
  - ✓ Illinois – **146**
- **15** states now have 10 or more public access stations
  - ✓ CO, IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SC, SD, TX and WI

* As of September 6, 2007

Retail Outlets with E85 Available to the Public



- States with less than 10 public E85 Outlets
- States with 10 – 49 public E85 Outlets
- States with 50 – 100 public E85 Outlets
- States with over 100 public E85 Outlets
- States with No public E85 Outlets

Source: US DoE, 09/06/2007