



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



# Challenges to Ethanol Blending in the Southeast

Agricultural Outlook Forum 2008  
Arlington Virginia  
February 22, 2008

**Daniel H. Moenter**  
*Manager, State Government Affairs*

**Marathon** 

# Marathon Oil Corporation



*Upstream*



*Downstream*



*Integrated Gas*



*Oil Sands Mining*

- ◆ In business since 1887
- ◆ Fourth-largest U.S.-based integrated oil company
- ◆ \$65 billion in revenues and other income in 2007
- ◆ Fifth-largest U.S. refiner

# Marathon Downstream Segment



- ◆ Fifth-largest U.S. refiner
- ◆ Largest pipeline carrier in volumes delivered
- ◆ Largest private inland liquids barge fleet
- ◆ Third-largest terminal system among R&M companies
- ◆ Major supplier to independent marketers in Midwest & Southeast
- ◆ Retail marketing system of ~6,000 outlets in 18 states

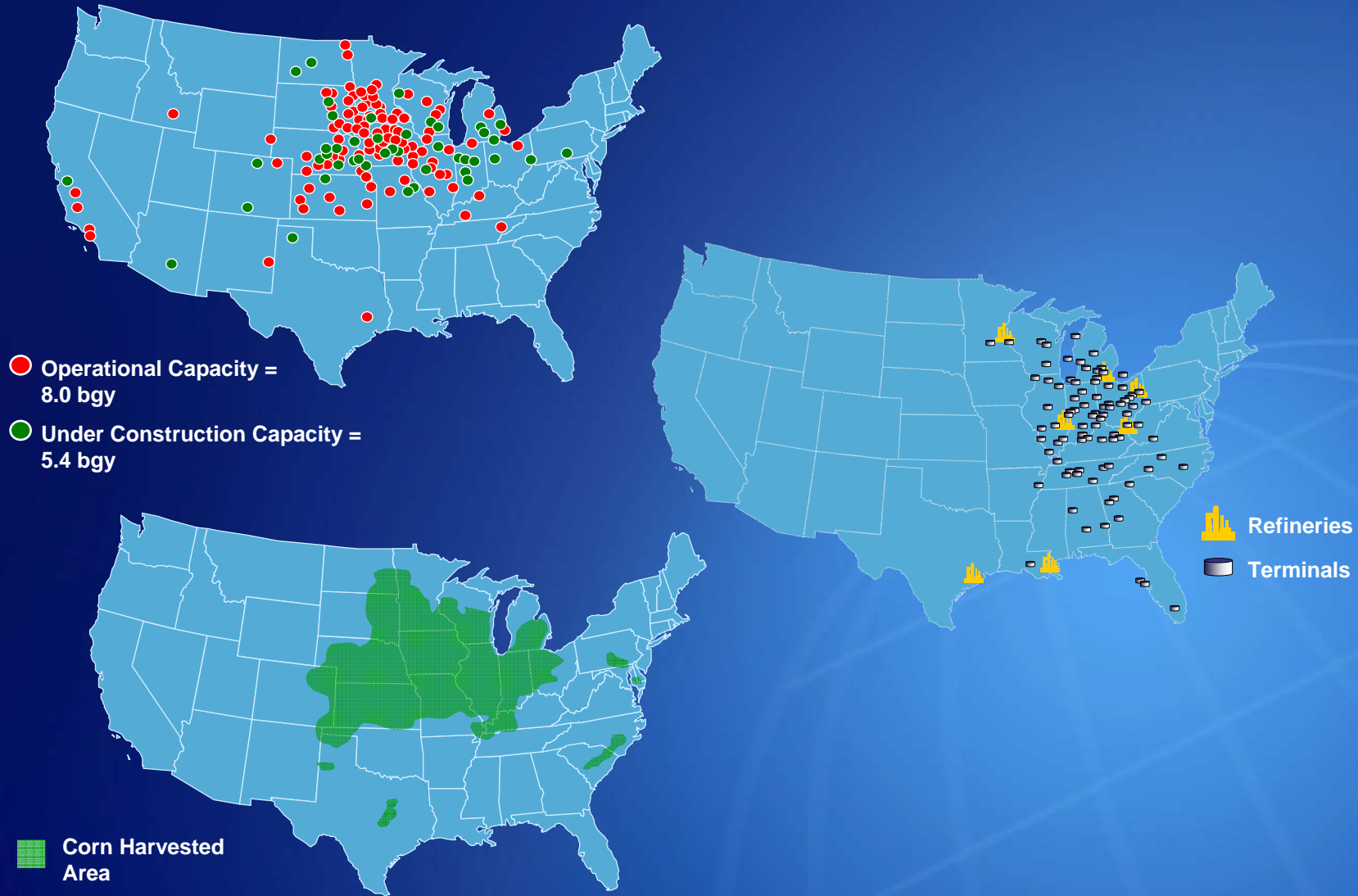




# Marathon's RM&T Operations



# Ethanol Plants, Corn Regions & MRO Operations



Source: Industry Sources and Company Information

# Marathon and Ethanol



- ◆ Nearly two decades of ethanol-blending experience
- ◆ One of the Nation's largest blenders of ethanol; largest in the Midwest
  - Blended over 600 million gallons of ethanol in 2007
- ◆ Extensive investment in terminal blending facilities
  - Midwest refineries supply lower-cost sub-octane gasoline to blend with high-octane ethanol
  - Major ethanol infrastructure project underway to bring ethanol blending to all Marathon markets by mid-2008
- ◆ Equity interest in two 110mm gal/yr ethanol manufacturing plants operated by The Andersons



# Overview



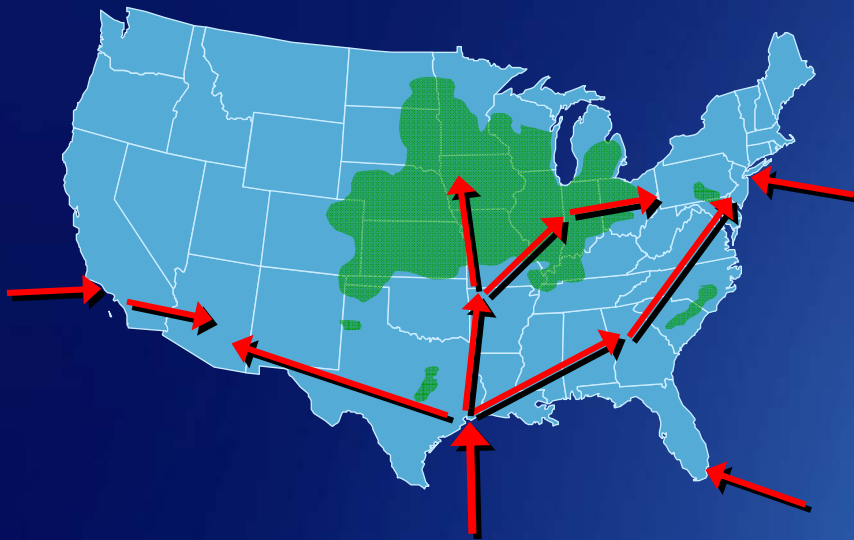
- ◆ Refiners / importers will be challenged to meet vastly expanded Renewable Fuels Standard (RFS)
- ◆ Rapidly expanding domestic ethanol production (driven largely by RFS) is outpacing demand growth
  - Traditional markets nearing saturation
  - Expansion must come in discretionary markets
- ◆ Southeast is a logical, largely untapped market for ethanol blending
- ◆ Two significant factors have impeded ethanol's expansion in the Southeast:
  - Insufficient transportation and distribution infrastructure
  - Restrictive state fuel regulations



# Distribution Patterns – Gasoline vs Ethanol



## Gasoline



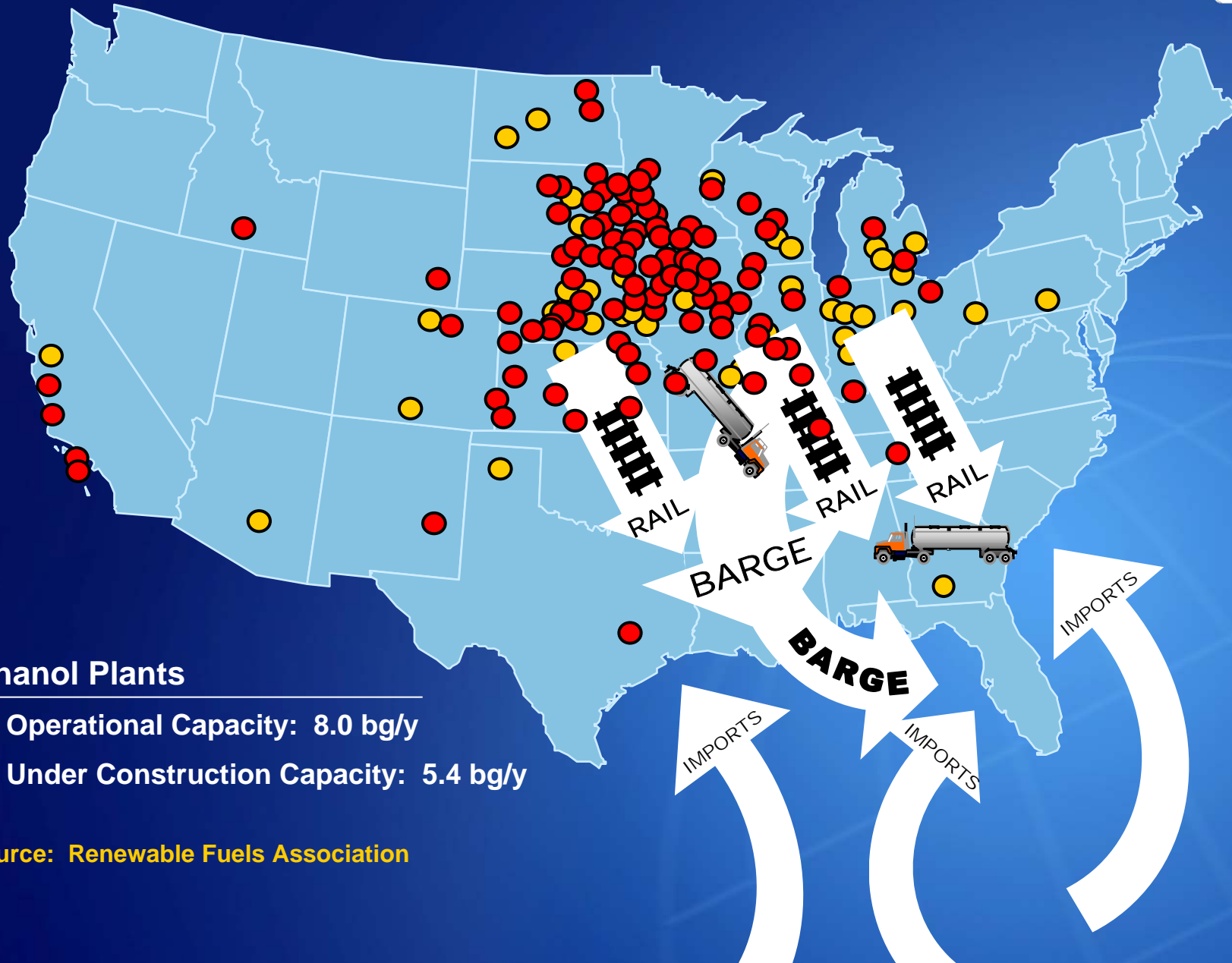
## Ethanol



## Ethanol Pipelines

- **Unlikely to use existing products pipelines due to:**
  - Ethanol's affinity for water, corrosivity, acts as solvent
- **Pipelines for ethanol more commercially challenged than technically challenged**
  - 110mm g/y ethanol plant equates to only 7,200 b/d

# Ethanol Movement to Southeast



## Ethanol Plants

- Operational Capacity: 8.0 bg/y
- Under Construction Capacity: 5.4 bg/y

Source: Renewable Fuels Association

# Southeast Ethanol Logistics



## ◆ Rail Logistics

- Terminals typically not configured to receive rail cars (Atlanta the exception)
- Initially, new markets will need to rely on manifest railcars and rail-to-truck transfer locations
- Blenders lack railcars to move ethanol to market; producers will be called on to arrange shipments to market
- Rail / truck schedules are critical for reliable supply
- Supply chain complexity: producer / rail / transfer / truck
- Rail logistics to new markets will be challenged to keep up with ethanol production growth

# Southeast Ethanol Logistics



## ♦ Marine Logistics

- Florida is large market and well positioned to receive waterborne supply from the Caribbean or Mississippi River
- Mississippi River deliveries require transfer facilities between inland tow barges and ocean-going vessels
- Marine terminals have limited available tankage to accommodate full vessels of ethanol
- Supply chain complexity: Mississippi barge transfers and two porting vessels
- Marine logistics to new markets will be challenged to keep up with ethanol production growth



# Southeast Ethanol Logistics



## ◆ Terminal / Blender Preparations

- Southeast states are discretionary (non-mandated) blend markets
- MLP terminals typically do not invest until guaranteed throughput commitments are in place
- To assure quality control of fuels marketed under their company brand, major oil companies generally have not permitted ethanol blending downstream of the terminal
- Timing of investments will vary throughout the system; investments will lag ethanol production growth

# Ethanol Terminaling Issues



- ◆ Ethanol storage
  - Build new or convert existing tanks
- ◆ Ethanol offloading capability
  - Barge, rail, truck
- ◆ Pumps and piping
- ◆ Loading rack modifications
  - Meters
  - Computer-controlled blenders
- ◆ Permits
- ◆ Cost: \$300k - \$2.5 million +



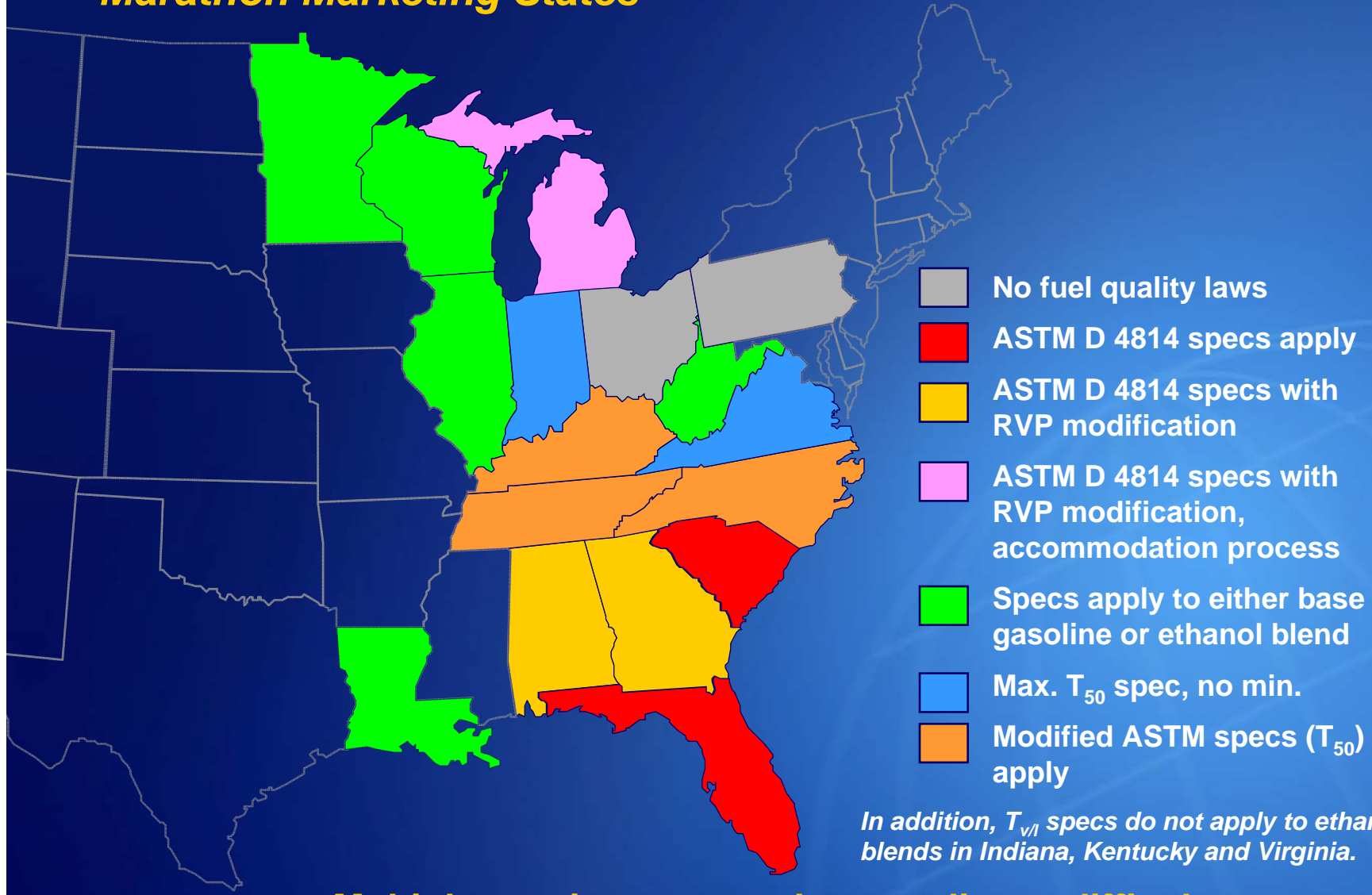
# State Distillation / Volatility Specs Impacted by Blending Ethanol



- ◆ Vapor pressure: Pressure exerted by the vapor of a liquid when in equilibrium with the liquid
  - Reid vapor pressure (**RVP**): Standard test method to determine the vapor pressure of a liquid at 100°F
- ◆ Mid-point ( $T_{50}$ ): Distillation temperature of a liquid when 50 vol% has been evaporated
- ◆ Vapor-liquid ratio temperature ( $T_{v/l}$ ): Temperature at which the ratio of the volume of vapor formed at atmospheric pressure to the volume of liquid equals 20

# Gasoline / Ethanol-Blend Regulations

Marathon Marketing States



*In addition,  $T_{v/l}$  specs do not apply to ethanol blends in Indiana, Kentucky and Virginia.*

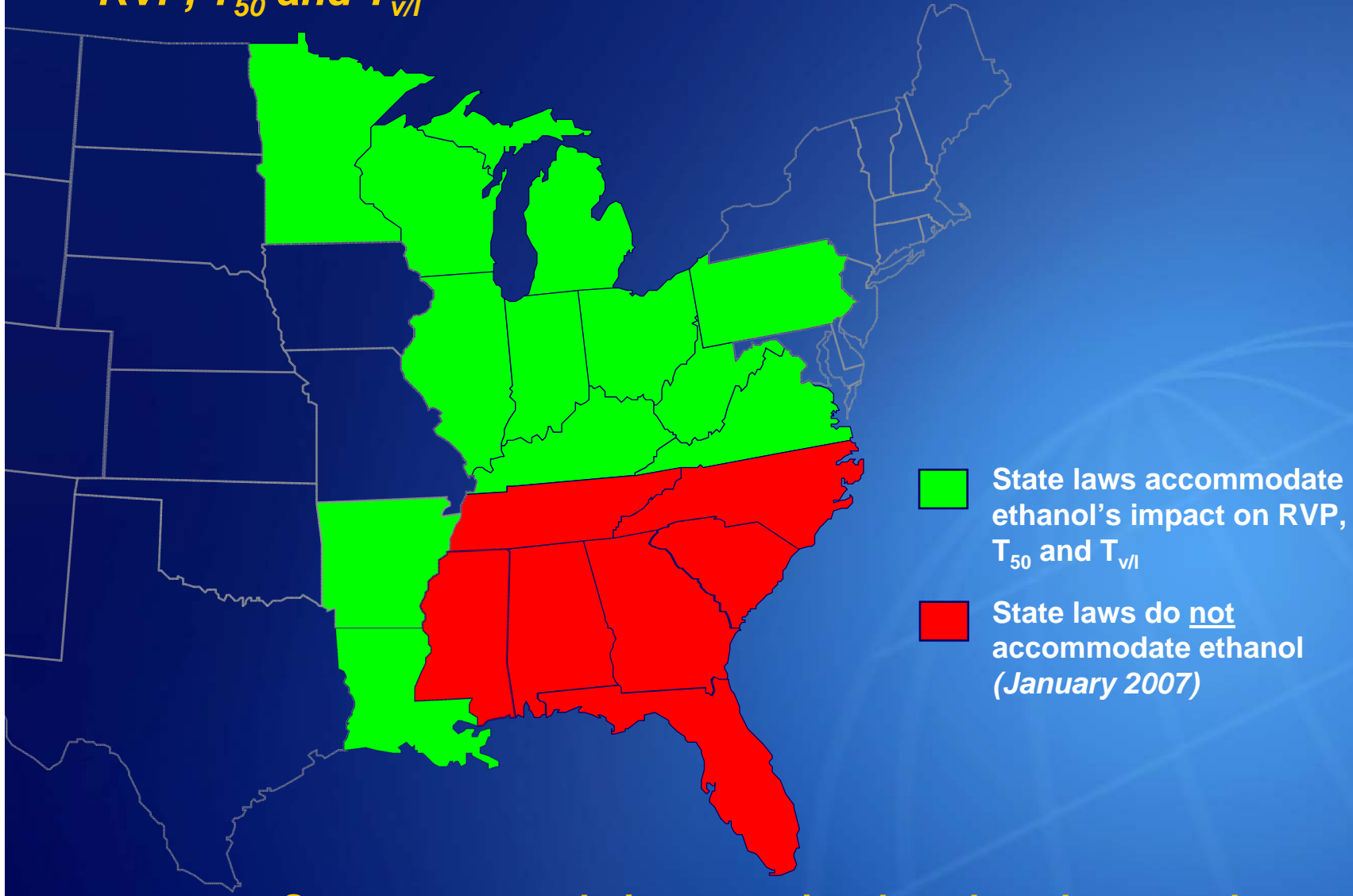
**Multiple requirements make compliance difficult.**



# The Dilemma of Volatility Regulations



*RVP,  $T_{50}$  and  $T_{v/l}$*



*Some state regulations stymie ethanol market growth.*

# Ethanol in the Southeast



- ◆ **Ethanol won't be widely marketed in the Southeast until state gasoline regulations are revised to accommodate ethanol blends**
  - To penetrate new markets, refiners must be able to blend ethanol with fungible, conventional gasoline
  - Most publicly-held companies are unwilling to risk regulatory non-compliance
  - If base gasoline must be “tailored” for ethanol:
    - Gasoline yield is reduced and manufacturing costs increase, reducing the incentive to blend
    - New “boutique fuel” created ... with associated supply risks
    - Most terminals lack tankage to add a new slate of fuels
  - All Midwest states permit ethanol blending with ASTM-compliant gasoline. Consumer acceptance of ethanol blends (E-10) is widespread.

# What Petroleum Suppliers Seek



- ◆ The ability to blend up to 10 vol% ethanol with fungible, ASTM-compliant conventional gasoline without fear of potential regulatory non-compliance
  - Base gasoline or blended fuel must meet ASTM specifications (D 4814)
  - **Note:** A regulatory-compliance issue, not a fuel-performance issue

## What Petroleum Suppliers Seek to Avoid

- ◆ Additional “boutique fuels” ... and associated supply risks

# Conclusions



- ◆ Substantial ethanol demand growth needed to meet 2008 RFS requirement
- ◆ Southeast is logical candidate for ethanol market expansion
- ◆ Infrastructure investment lags ethanol production-capacity growth
- ◆ For ethanol to penetrate SE markets, state fuel regulations must permit blending with ASTM-compliant fungible gasoline
  - Extensive Midwest blending history demonstrates that vehicle performance will not be compromised
- ◆ Motorists stand to benefit from increased fuel supplies, price competition

