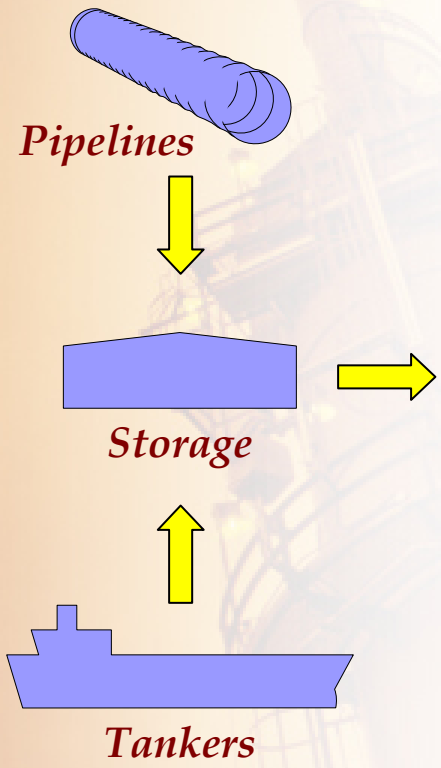


STATUS OF THE U.S. REFINING INDUSTRY

October 2005

REFINING – VITAL LINK IN THE OIL SUPPLY CHAIN

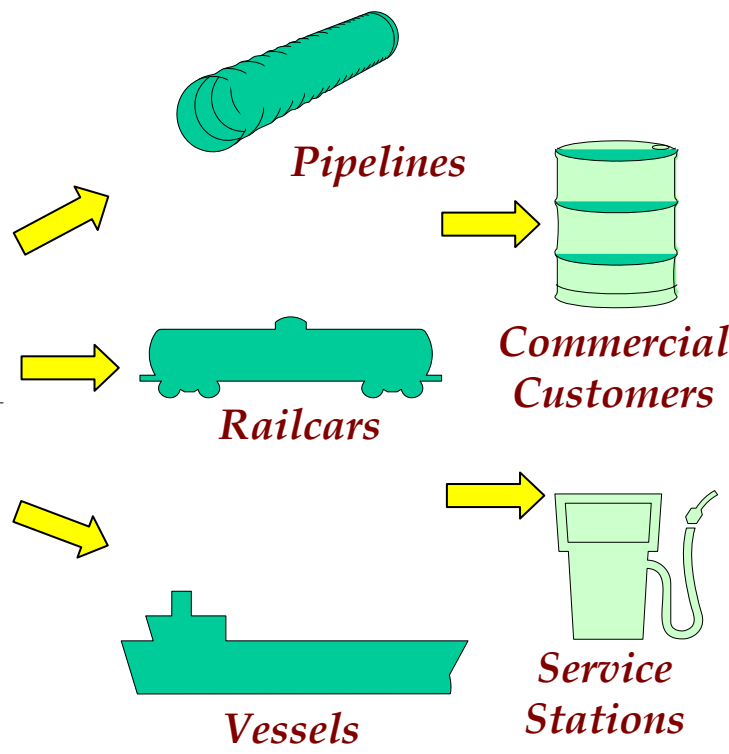
**Crude Oil
Supply & Logistics**



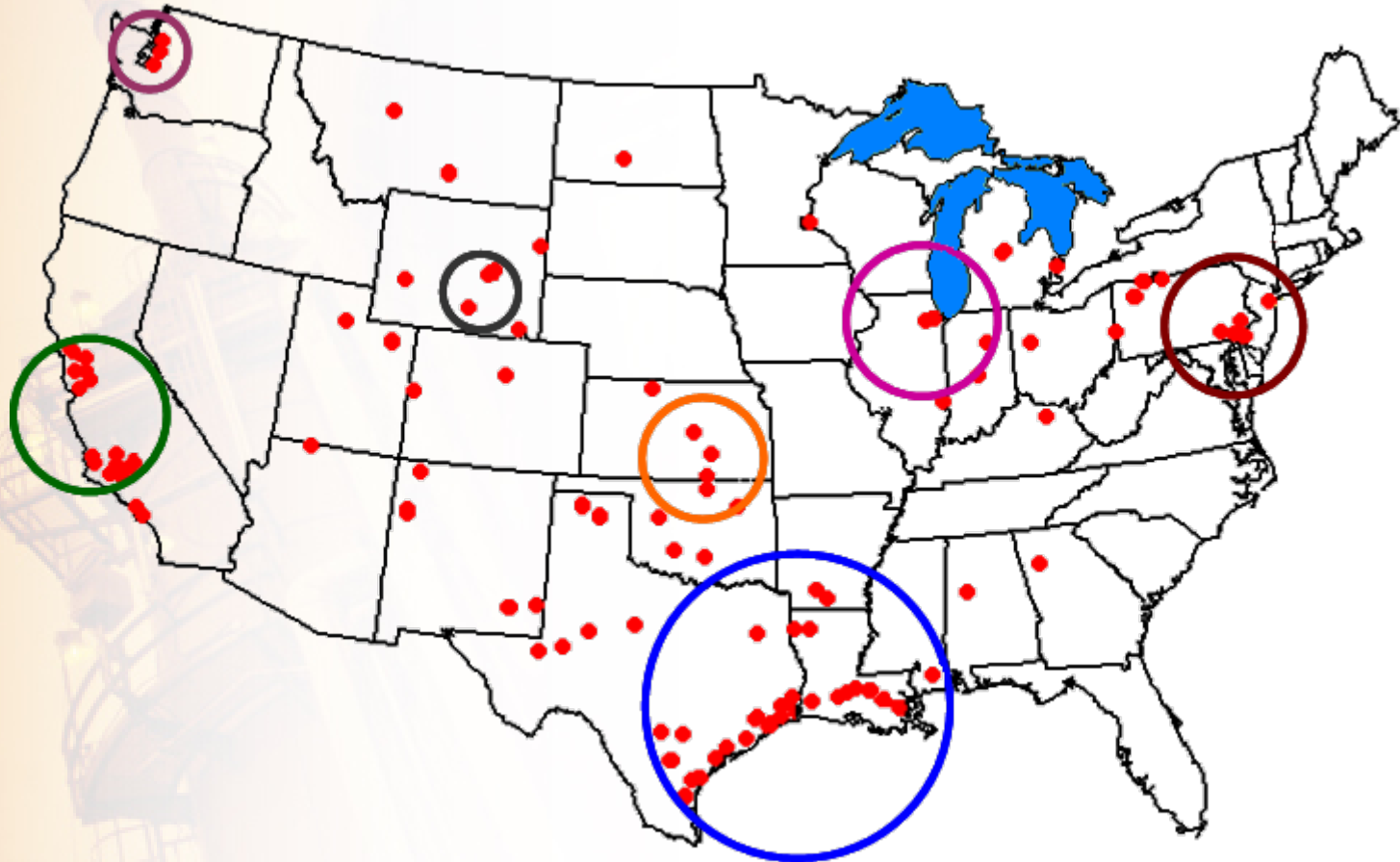
The Petroleum Refinery



**Products
Distribution & Marketing**



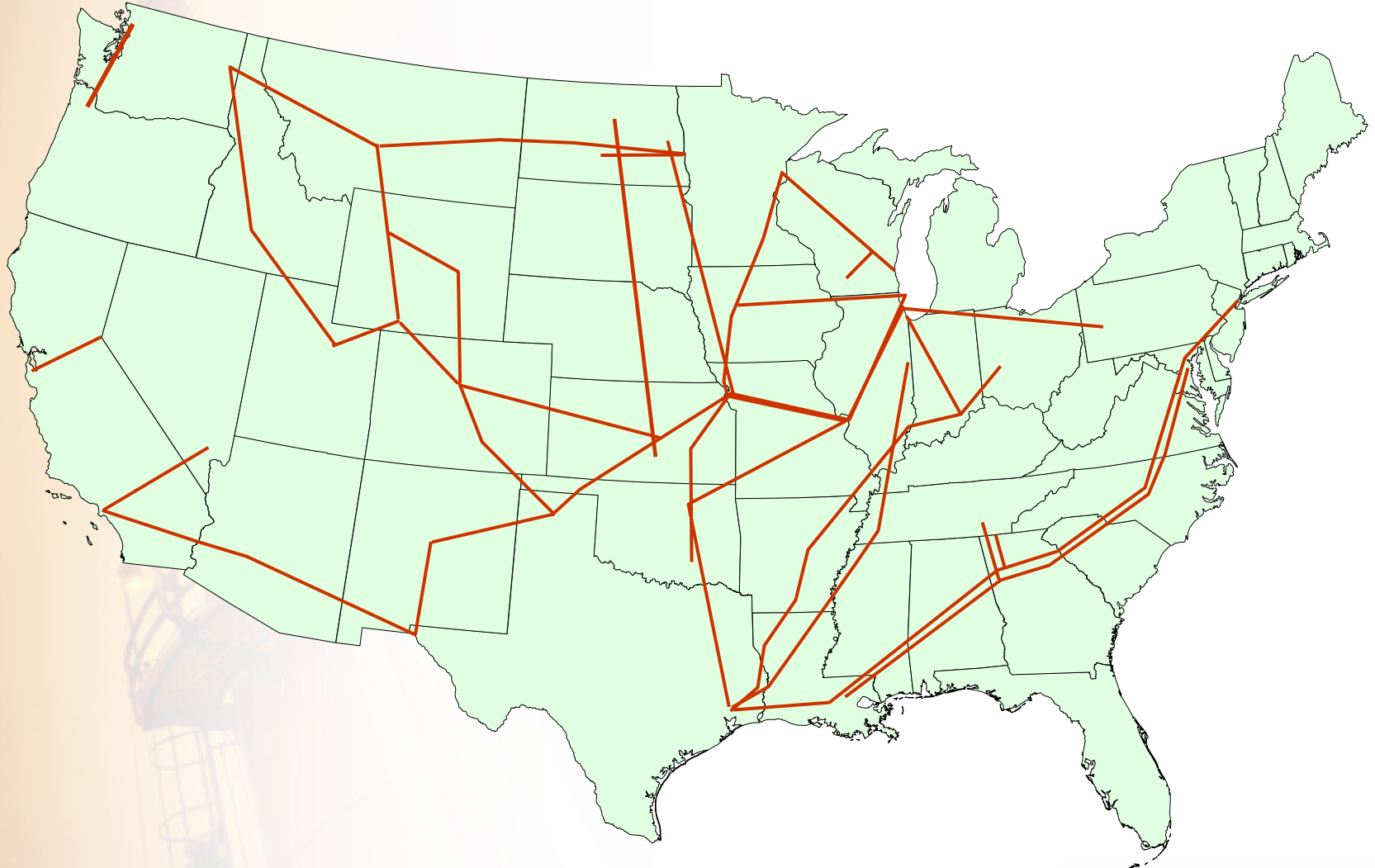
U.S. REFINING INFRASTRUCTURE



MAJOR CRUDE OIL PIPELINES



MAJOR PRODUCT PIPELINES

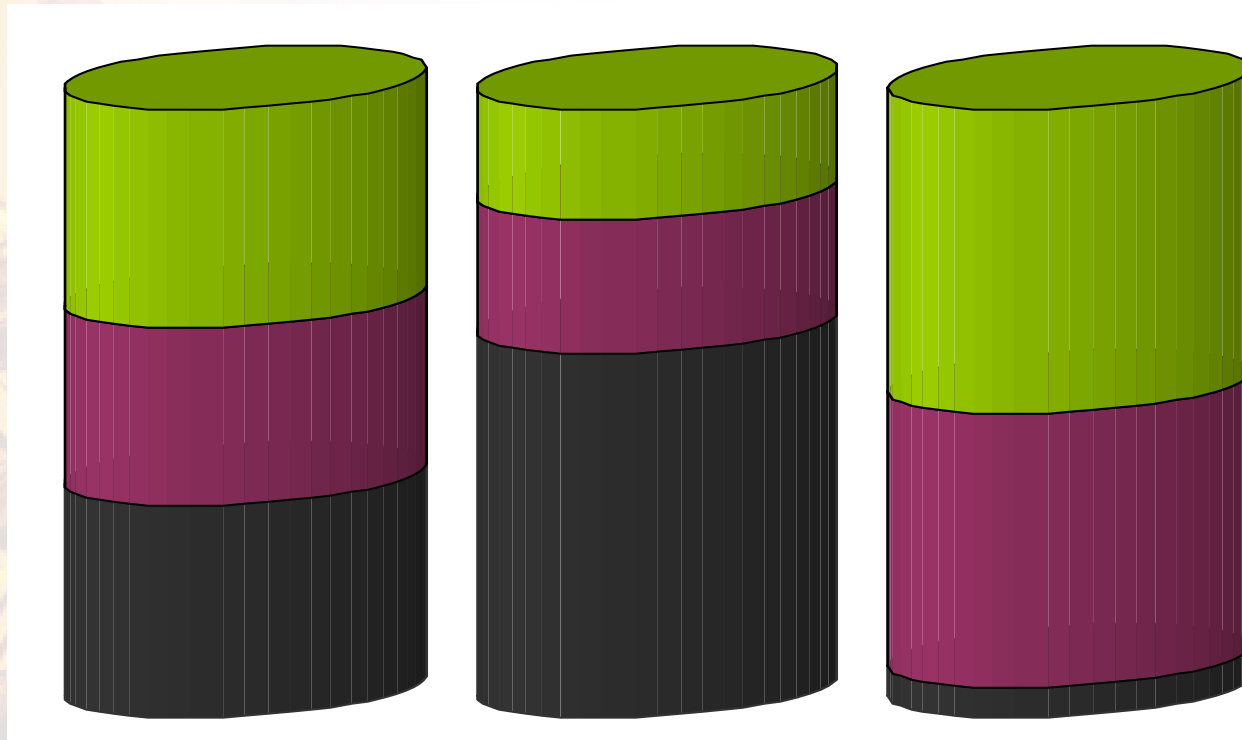


WHY WE NEED COMPLEX REFINERIES

West Texas Intermediate

Maya

U.S. Demand

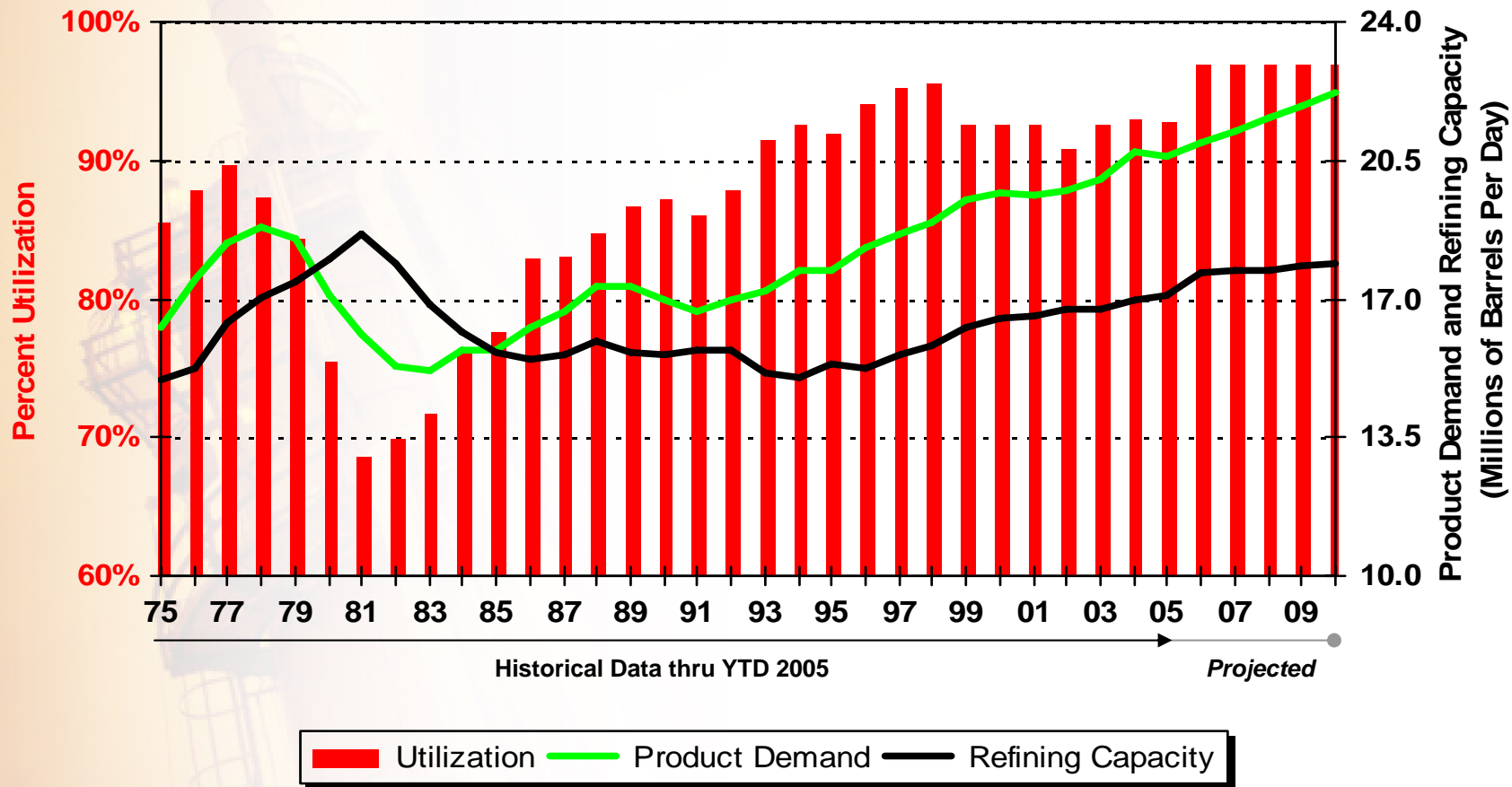


 Gasoline

 Mid Distillates
(Jet / Diesel)

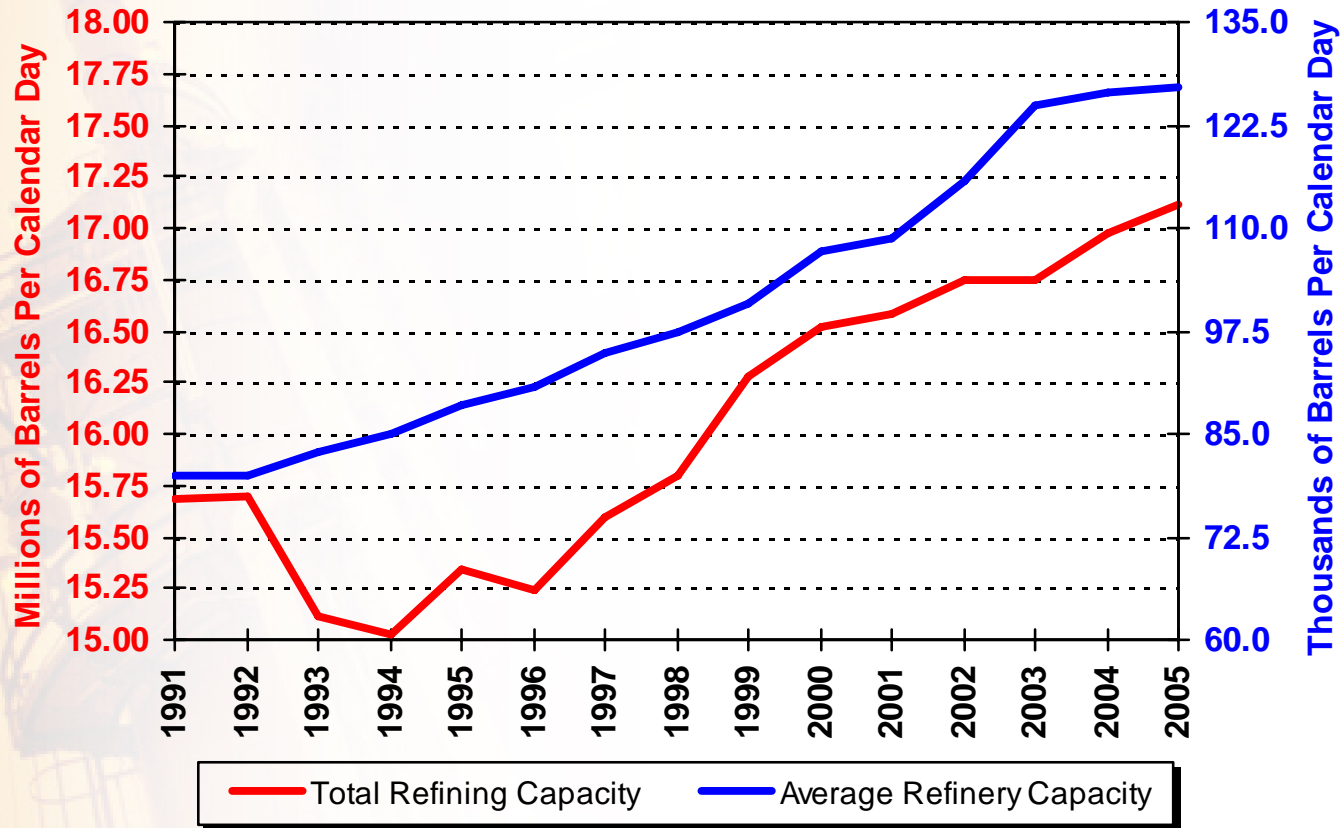
 Heavy Fuel Oils

THE SHORTFALL IN U.S. REFINING CAPACITY



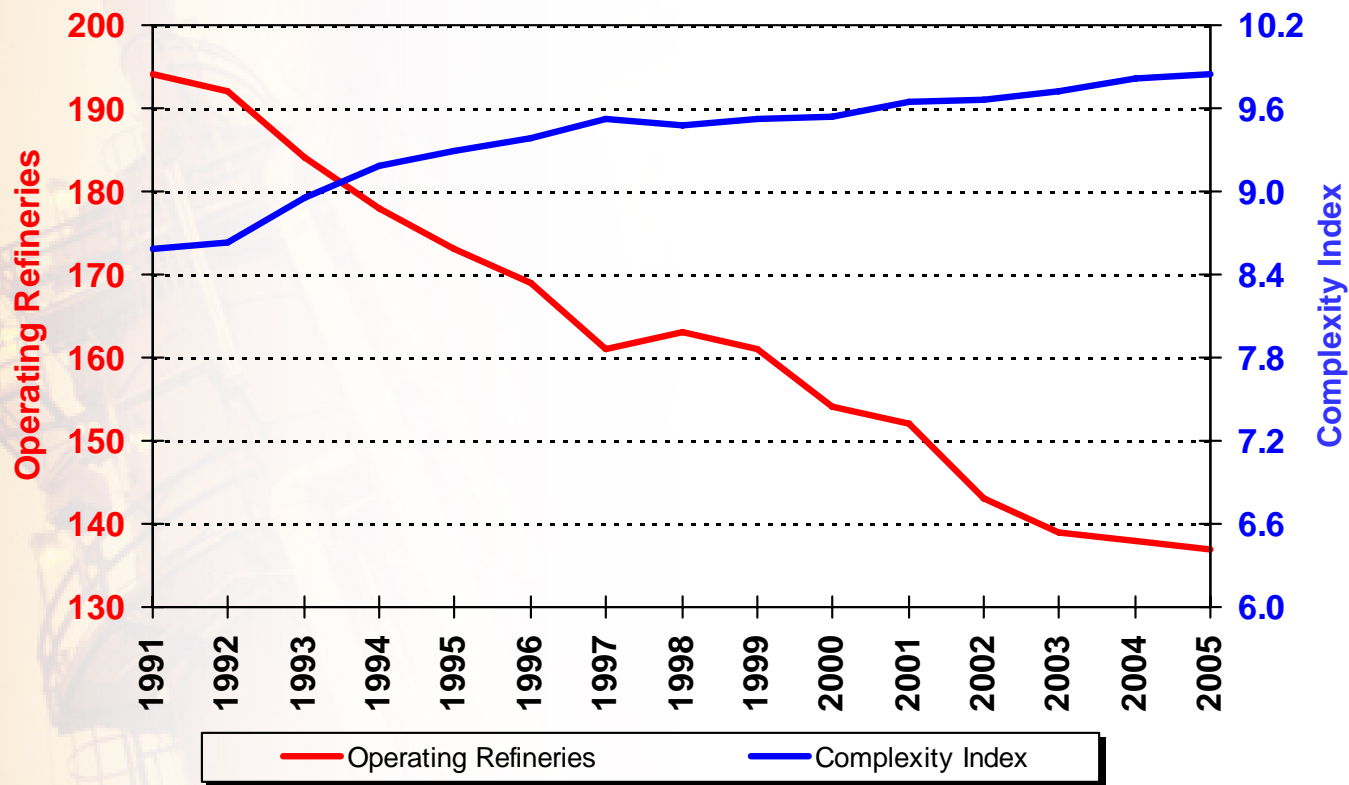
SOURCE: Energy Information Administration.

SLOW GROWTH AND LARGER REFINERIES



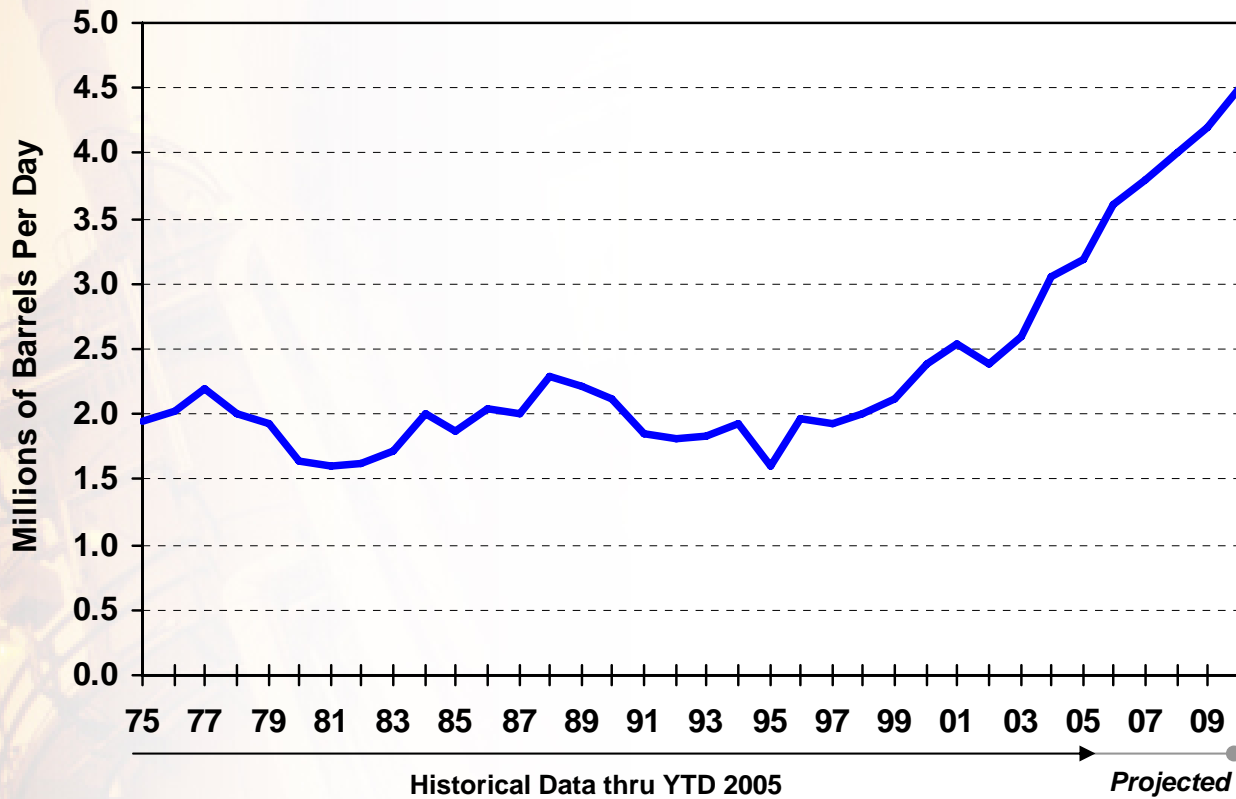
SOURCES: *Oil & Gas Journal* and Baker & O'Brien, Inc.

FEWER BUT MORE COMPLEX REFINERIES



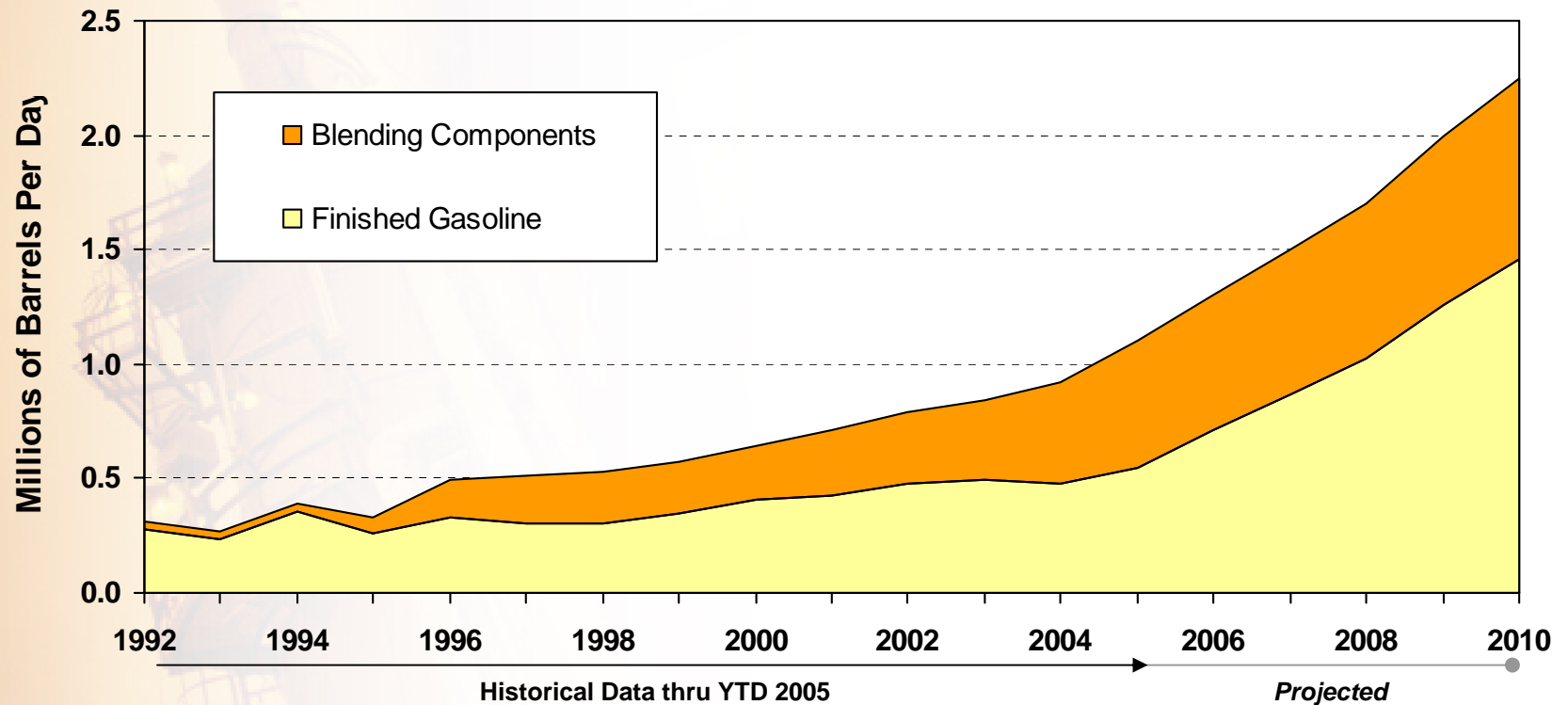
SOURCES: *Oil & Gas Journal* and Baker & O'Brien, Inc.

PRODUCT IMPORTS WILL CONTINUE TO RISE



SOURCES: Energy Information Administration and Baker & O'Brien, Inc.

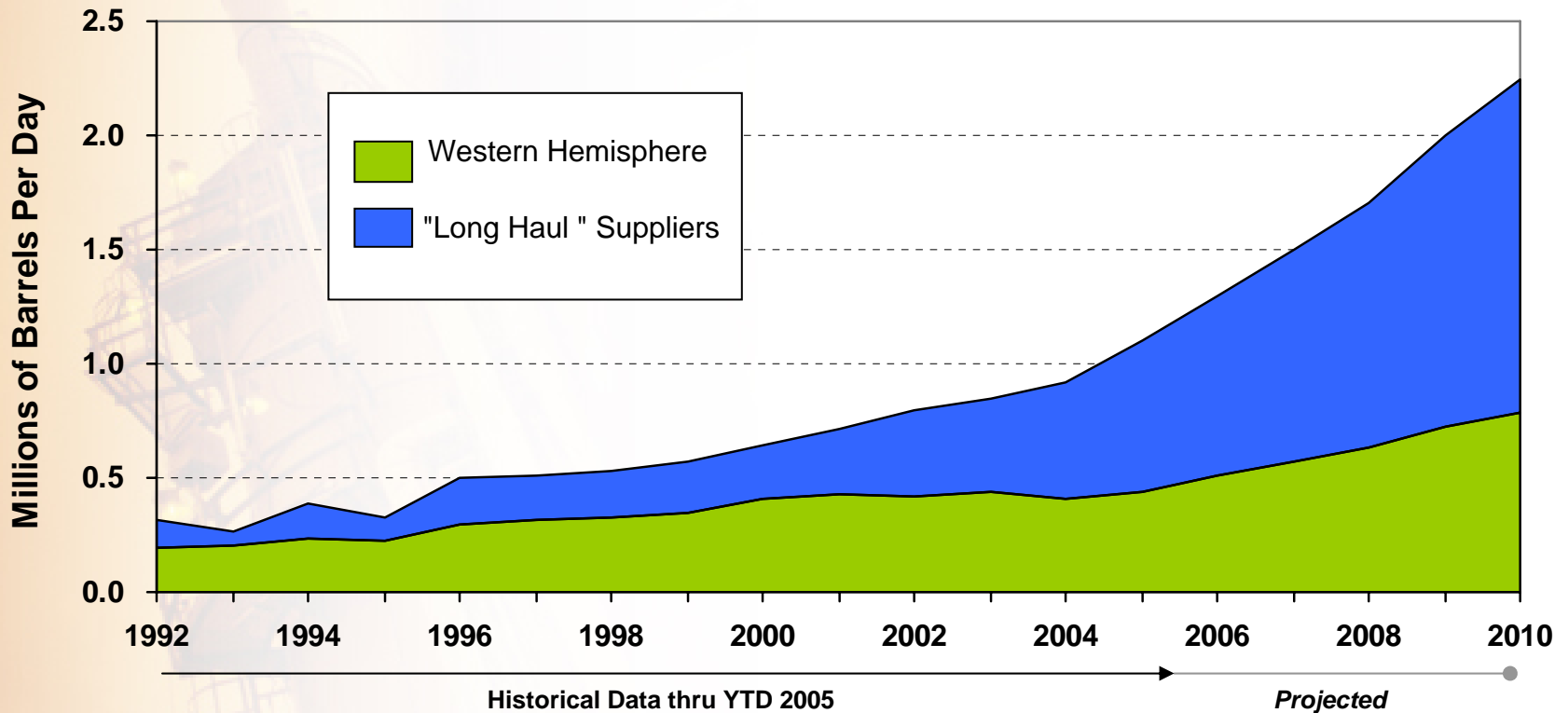
ACCELERATED INCREASE IN GASOLINE IMPORTS



SOURCE: Energy Information Administration and Baker & O'Brien Estimates.

BAKER & O'BRIEN
INCORPORATED

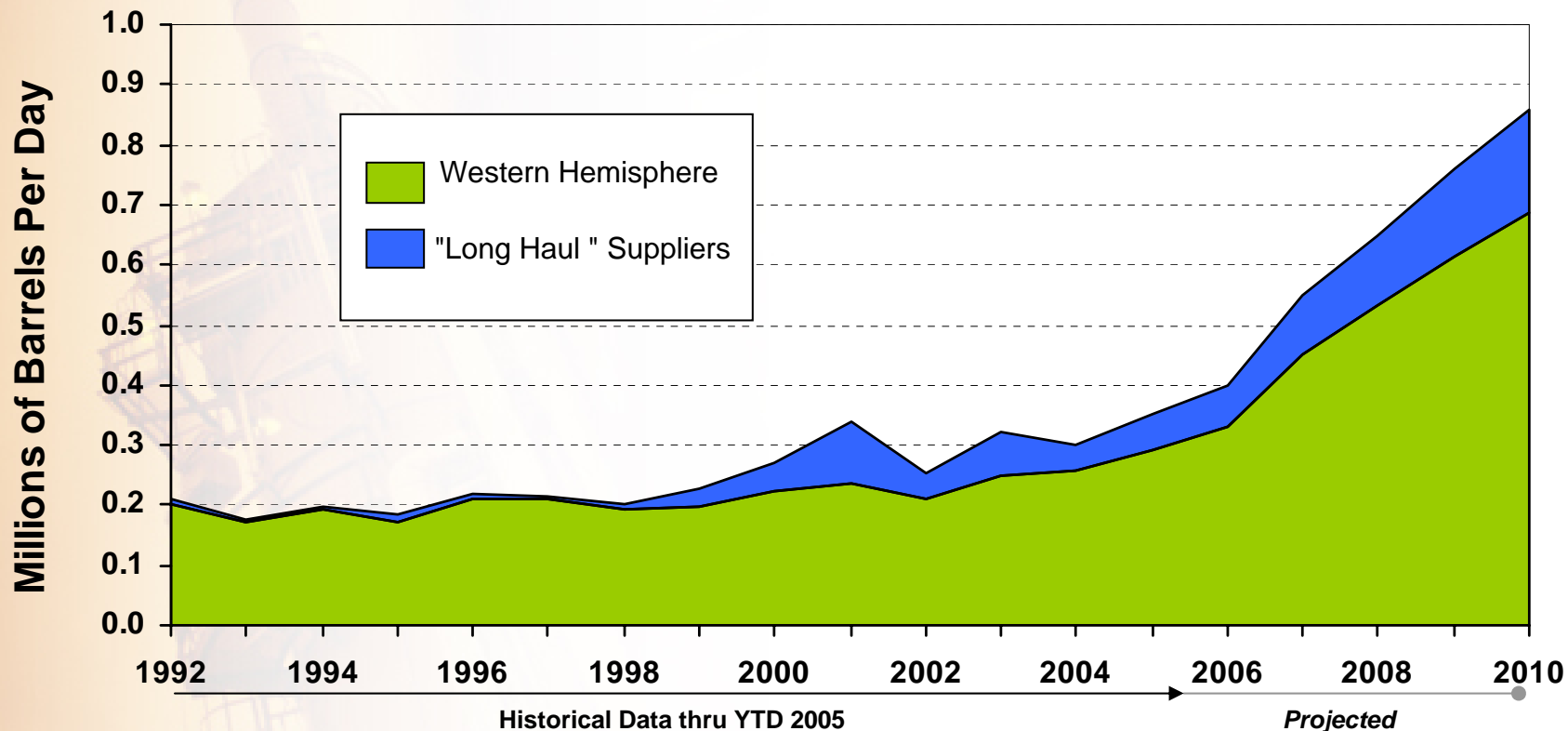
MORE GASOLINE IMPORTS FROM "LONG HAUL" SUPPLIERS



SOURCE: Energy Information Administration and Baker & O'Brien Estimates.

BAKER & O'BRIEN
INCORPORATED

MORE LIMITED "LONG HAUL" DIESEL SUPPLIERS



SOURCE: Energy Information Administration and Baker & O'Brien Estimates.

IMPACT OF PRODUCT IMPORTS ON PRICES

- **Gasoline product imports will increasingly come from across the Atlantic (and eventually Asia & Middle East) instead of from Western Hemisphere sources**
- **Distillate imports will need to come increasingly from Western Hemisphere sources**
- **“Long-haul” imports are becoming “base” requirements to satisfy growing demand**
- **Previously a seasonal occurrence--now year round**
- **Higher transportation costs for “Long Haul” marginal gasoline imports will continue to be reflected in higher U.S. product prices**
- **Increased Western Hemisphere diesel supplies may be limited**

THE GROSS REFINING MARGIN (GRM)

“The revenues of refined products over some period,
less
the costs of all feedstocks over the same period,
divided by
the number of barrels of *crude oil* (or feedstock) processed.”

$$\text{GRM} = \frac{\text{Revenues minus Feed Costs}}{\text{Crude Processed}}$$

NOT ALL REFINERIES ARE CREATED EQUAL

➤ Simple - “Topping” or “Hydroskimming”

- ❖ Have the lowest margins; close to breakeven
- ❖ Often small, “niche” players
- ❖ Must accept what is naturally in the crude oil

➤ Cracking

- ❖ Some ability to “convert” heavy fuels to lighter oils
- ❖ Supply the “marginal” barrel and live off base margins

➤ Coking

- ❖ Can convert virtually all the barrel to light oils
- ❖ Enjoy the highest upgrading margins; highly flexible

TYPES OF REFINERIES AND THE GRM

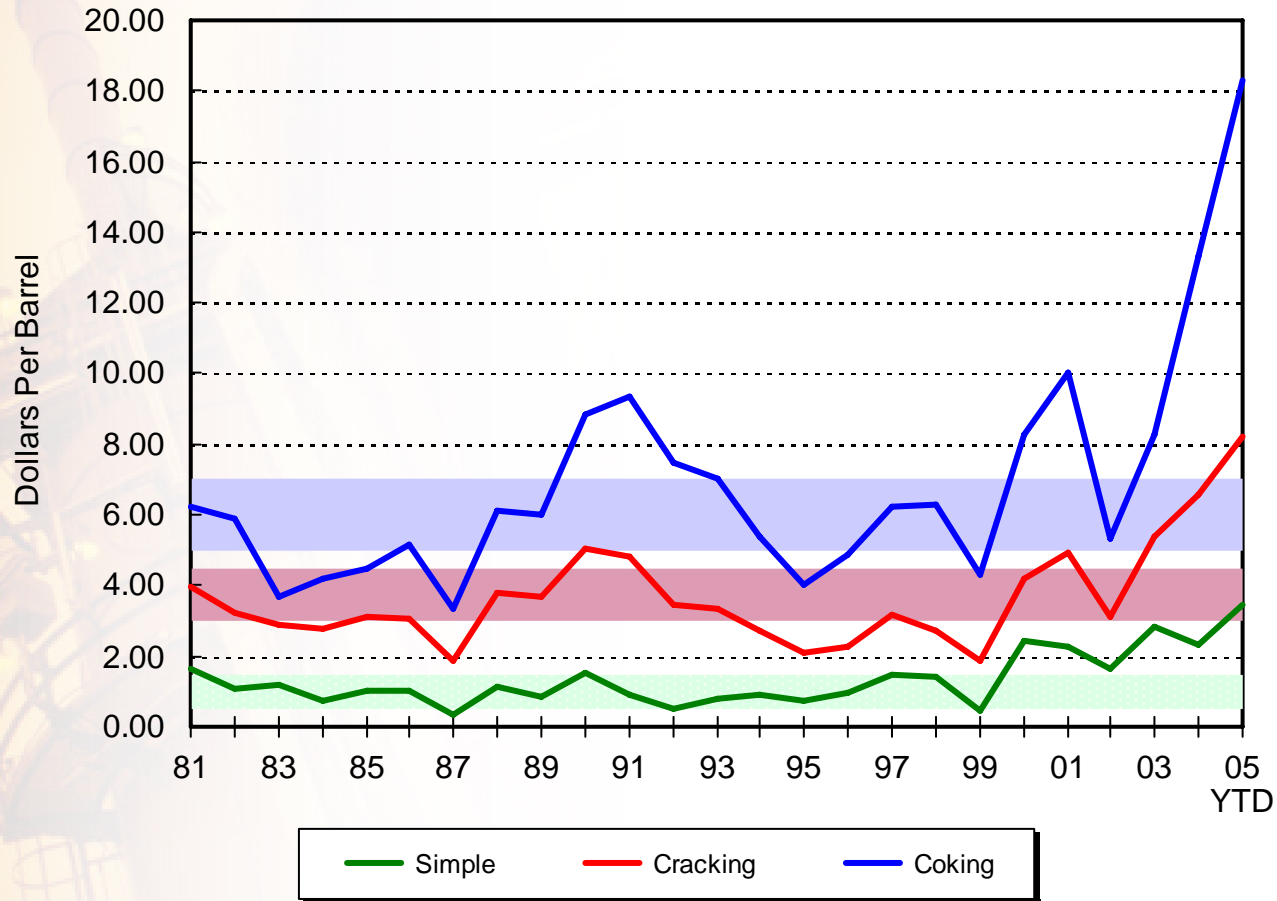
Type	% of U.S. Capacity	Number of Refineries	Average Size (B/D)	Historical Range for GRM (\$/Barrel)	Typical Cash Costs (\$/Barrel)	Typical Net Refining Margin (\$/Barrel)
Simple	5.6	27	35,233	0.50 to 1.50	0.50 to 1.00	(0.50) to 1.00
Cracking	28.7	53	92,552	3.00 to 4.50	2.00 to 3.00	0.00 to 2.50
Coking	65.7	57	196,939	5.00 to 7.00+	3.00 to 4.50	0.50 to 4.00+

NOTE:

\$1.00 per barrel equals approximately \$35 million per year for a typical 100,000 barrels per day refinery. GRM and costs are for U.S. Gulf Coast refineries.

SOURCES: *Oil and Gas Journal* and Baker & O'Brien, Inc.

HISTORICAL GRM FOR GULF COAST REFINING TYPES



SOURCE: Baker & O'Brien, Inc.

ANALYSIS OF GROSS REFINING MARGINS

- **Base Refining Margins**
 - ❖ **The U.S. Gulf Coast**
 - ❖ **The Marginal Barrel**
 - ❖ **Cracking Refineries**

- **Upgrading Margins**
 - ❖ **Base Margins “Plus”**
 - ❖ **Heavy Sour Crudes**
 - ❖ **Coking Refineries**

ISSUES AFFECTING BASE REFINING MARGINS

- **Total Product Demand and Growth**
- **Refinery Capacity Utilization**
- **Product Imports / Availability**
- **Product Quality Changes**
- **Crude Oil Quality and Availability**

ISSUES AFFECTING UPGRADING REFINING MARGINS

- **Product Demand Mix**
- **Residual Fuel Oil Supply / Demand**
- **Refinery Upgrading Additions**
- **Environmental Regulations / Gasoline and ULSD**
- **Crude Oil Quality and Availability**
- **The Light / Heavy “Spread”**

TODAY'S CRUDE OIL TRENDS

- **World Supply / Demand is “Tight”. Bulk of Reserves are Heavy.**
- **Incremental Demand Met by Increasing Proportion of Heavy Crude, which Many Refineries have Difficulty Processing in Large Volumes.**
- **Major Sources: Middle East, Venezuela, Mexico, Canada**
- **New Light Crude Discoveries (e.g., West Africa) Can Postpone these Developments, but Not Reverse them.**
- **New Heavy Crude Production Puts Pressure on Heavy Crude Price.**

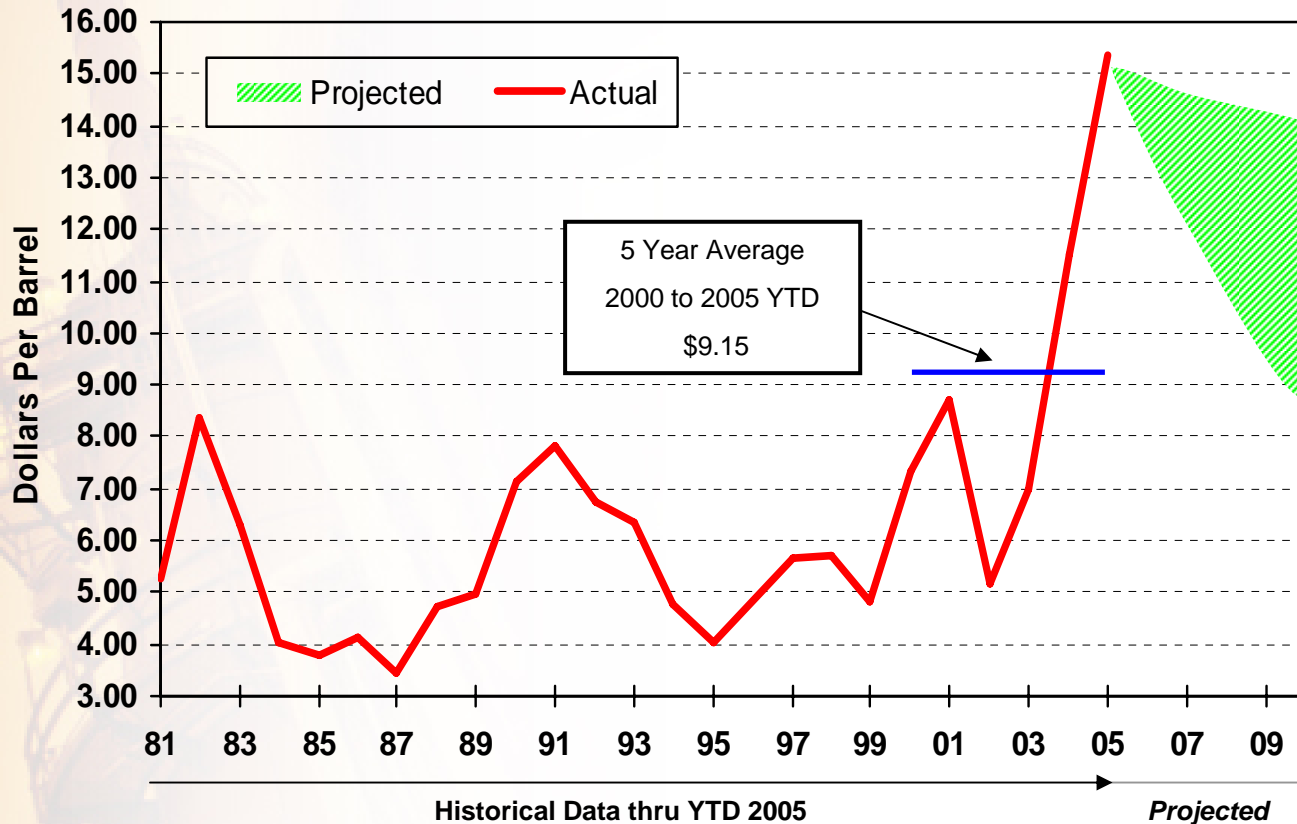
REFINING CAPACITY / UPGRADING

- **Latest of New Coking Capacity Additions are Complete.**
- **Light / Heavy Crude Differentials are Superlative. Coking Capacity is Fully Utilized.**
- **Continued Pressure on Heavy Crude Oil Price and Upward Pressure on Light Crude Price (China, et. al.).**
- **Capital Spending being Directed to Fuel Quality Improvements, Not Refinery Capacity Expansion.**

LIGHT / HEAVY CRUDE PRICE DIFFERENTIALS

- **Historical Cyclicity Based on Imbalances in Resid Conversion and Crude Supply / Demand.**
- **Cycles Can be Irregular and Timing Difficult to Predict.**
- **Fundamentals Indicate Future Differentials Should be Higher--and Remain Higher--than Historical Averages.**
- **Light / Heavy Product Differentials Follow Similar Trends.**

WTI / MAYA DIFFERENTIAL



NOTE: Maya formula: f.o.b. Mexico; WTI spot: Cushing.

SOURCES: *Platt's Oilgram* and Baker & O'Brien, Inc.

ENVIRONMENTAL ISSUES / SULFUR REGULATIONS

- **More Stringent Sulfur Specifications Increase Relative Cost of Refining Heavy Sour Crudes. These Costs Need to be Recovered.**
- **Penetration of Unleaded Gasoline and ULSD in Developing Countries Increases Relative Demand for Light Crudes.**
- **Accelerated Use of Cleaner Fuels Such as Natural Gas; Reduced Demand for Residual Fuel Oil.**
- **Result: *Pressure on Heavy Crude Prices.***

OUTLOOK FOR BASE REFINING MARGINS

	<i>Trends</i>	<u><i>Impact on Base Margins</i></u>		
		<i>Positive</i>	<i>Neutral</i>	<i>Negative</i>
Factors				
Product Demand Growth	Moderate to Strong	✓		
Capacity Utilization	High and Stable	✓		
Product Imports / Availability	Rising / Potentially Limited	✓		
Product Quality Changes	More Stringent	✓		
Crude Oil Availability	Tight		✓	

OUTLOOK FOR UPGRADING REFINING MARGINS

	<i>Trends</i>	<i>Impact on Upgrading Margins</i>		
		<i>Positive</i>	<i>Neutral</i>	<i>Negative</i>
Factors				
Product Demand Mix	More Light Products	✓		
Residual Fuel Oil Supply / Demand	Resid Demand Declining	✓		
Refining Upgrading Additions	Limited	✓		
Environmental Regulations	More Stringent	✓		
Crude Oil Quality Available	More Heavy	✓		
Light / Heavy Spread	Strong	✓		

BARRIERS TO NEW DOMESTIC REFINERIES

- **Environmental Concerns**
 - ❖ “NIMBY”
 - ❖ Time and Cost – Will it get approved?
- **Long Lead Time – 5 Years Minimum**
- **Economies of Scale – Must be Big (>100 MBD)**
- **Capital Intensity - \$12-15K / BD**
- **Can I get a long term crude oil supply?**
- **Competition from lower-cost foreign refiners**
- **“I’ve seen the movie already -- it ends badly”**