

U.S. Refining Capacity – Past, Present and Future Outlook

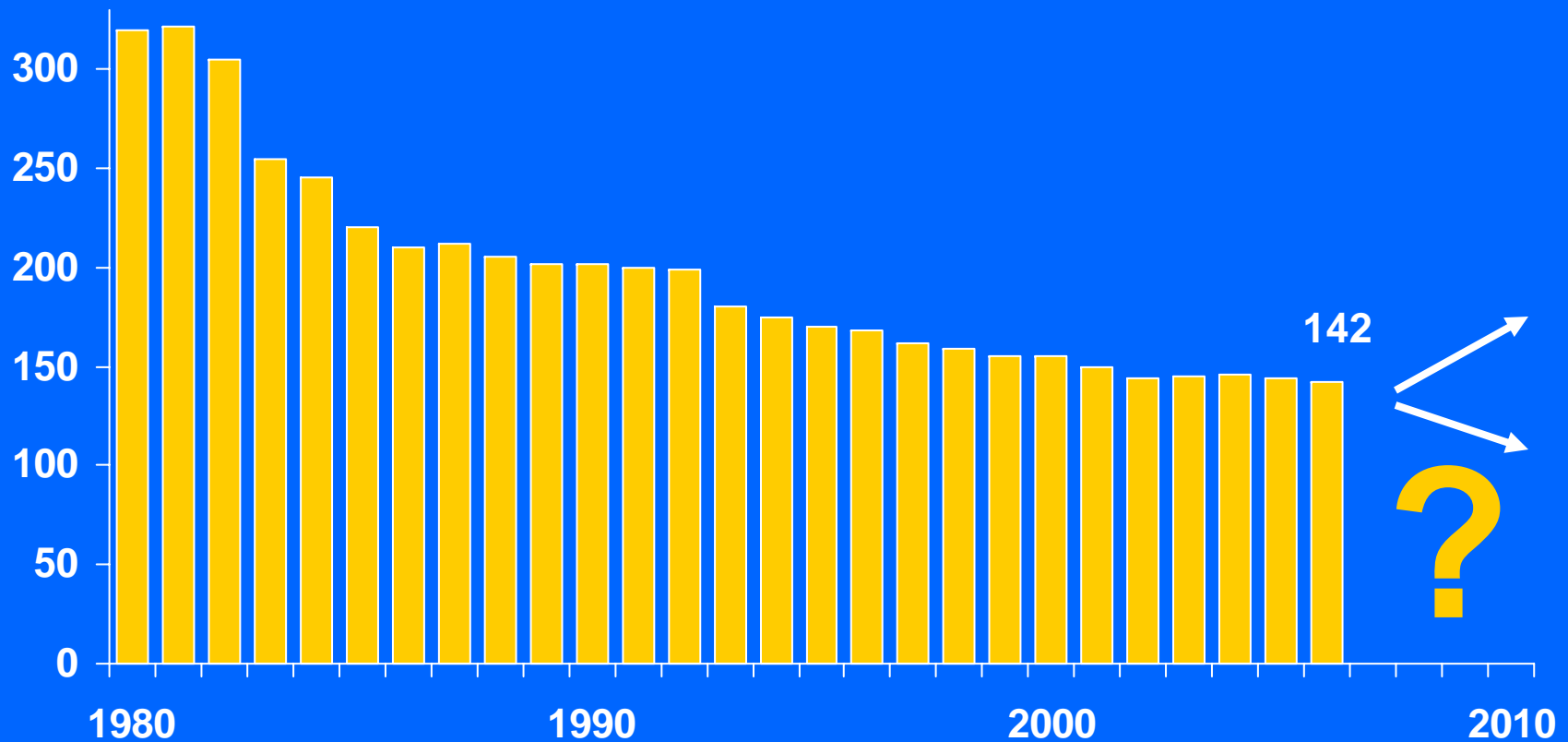
**Malcolm M. Turner, Chairman
Turner, Mason & Company**

**OPIS Supply
Summit 2006**

U.S. Refineries – How Many?

- The number of operable U.S. refineries has declined from 322 in 1981 to 142 currently (see Slide 3).
- It is often stated that no refineries have been built in the United States since the Garyville, Louisiana refinery (now owned by Marathon) in 1976. That is not exactly true.
 - Several “small refinery bias” refineries were built later.
 - Jack Stanley’s Good Hope refinery (now Valero’s St. Charles refinery) was substantially built during the 1990s.
- Will new refineries be built in the U.S.?
 - Arizona Clean Fuels Yuma refinery
 - Old military bases
 - Louisiana and Maine development initiatives
 - California/Washington

Operable U.S. Refineries



How Much Do Refineries Cost?

- It does not seem that long ago that \$1,000 per barrel per day of capacity was the “estimating figure”.
 - Prior to 1970, that was a typical new construction cost.
 - When Clark (Premcor) bought the 170,000 BPD Lima, Ohio refinery from BP in 1998, the purchase price was about \$1,000 per barrel per day.
- The largest refiner in the U.S. with 2.3 million barrels per day of capacity, Valero Energy, has its refining capacity booked at about \$5,400 per barrel per day. Former Chairman Bill Greehey frequently boasted of his ability to purchase refineries at 15-20% of replacement cost.

How Much Do Refineries Cost?

- Tesoro bought the California Bay Area Golden Eagle Refinery at about 37% of replacement cost, or \$5,500 per barrel per day of capacity in 2002. What was thought to be an extremely high price proved to be almost a steal from Valero (sale required by the FTC).
- On the other side, Valero bought Premcor and its four refineries in 2005 at an estimated 75% of replacement costs, or \$9,400 per barrel per day of capacity. Again, many believed this to be expensive, but it has not turned out that way.
- Recently, Harvest Energy Trust agreed to purchase Vitol's Come By Chance refinery for \$1.5 billion, equivalent to about 90% of replacement cost and about \$13,000 per barrel per day of capacity.

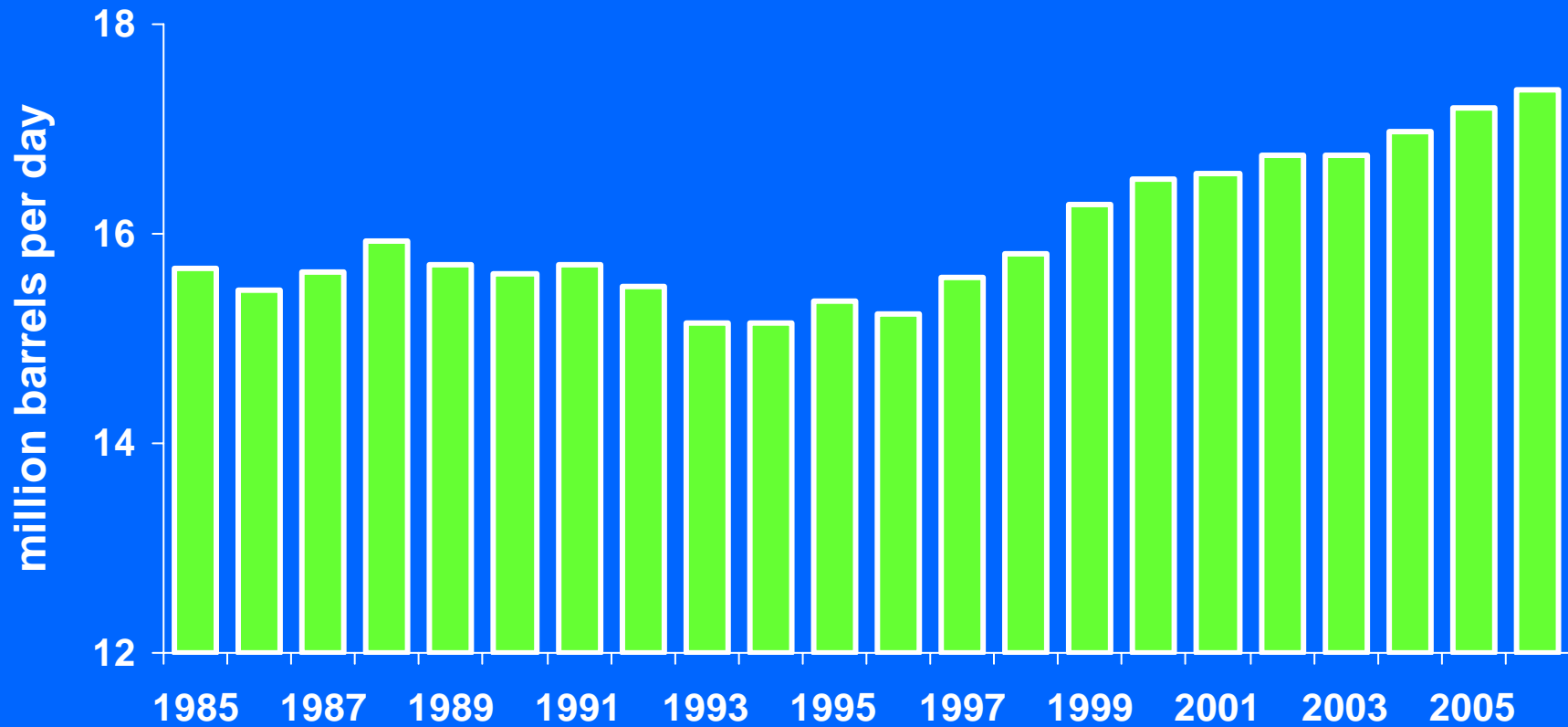
How Much Do Refineries Cost?

- The reigning high price refining deal in U.S. history is the Lyondell purchase of CITGO's minority interest in the 268 MBPD Houston refinery. This transaction is reported to be at an equivalent of \$5.4 billion, or \$19,000 per barrel per day of capacity and 135% of replacement cost.
- The most recent capital estimates announced by Arizona Clean Fuels Yuma equate to \$18,000 per barrel per day of capacity.
- TM&C studies point to the cost of competitive grass roots refineries in the U.S. to be in the \$15,000-20,000 per barrel per day of capacity range. That, of course, reflects 100% of today's replacement cost.

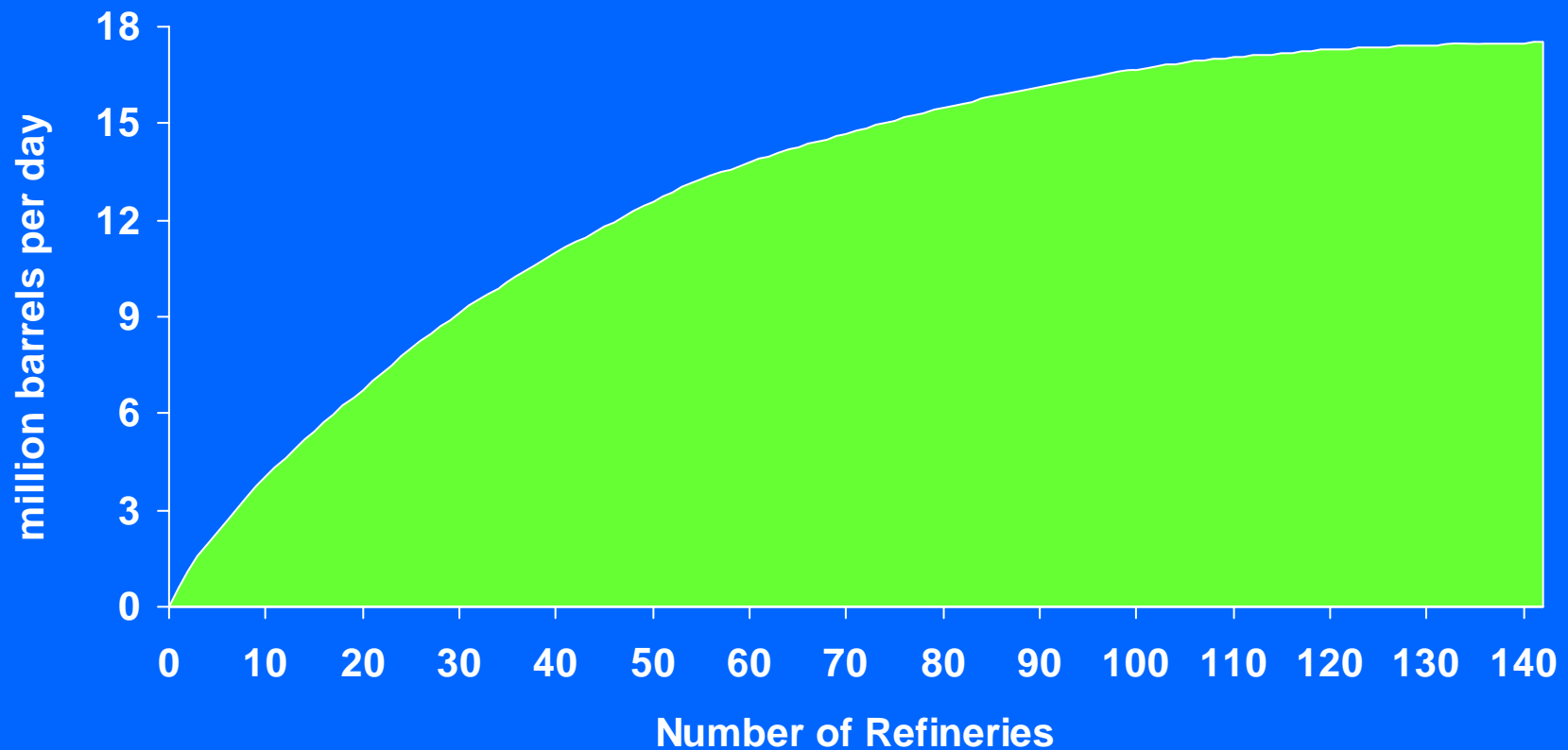
U.S. Refining Capacity – Past and Present

- With sharply declining numbers of refineries in the U.S., the total capacity hit a bottom of 15.1 million barrels per day (MMBPD) in 1993. Since then, steady growth has increased U.S. refining capacity to a current level of 17.4 MMBPD (see Slide 8).
- With the number of refineries in the U.S. reduced to 142, the average refinery capacity today stands above 120,000 BPD. This surprisingly high average figure reflects the impact of 21 large U.S. refineries with capacities in excess of 250,000 BPD (see Slide 9).

U.S. Refining Capacity



U.S. Refining Capacity – Past and Present



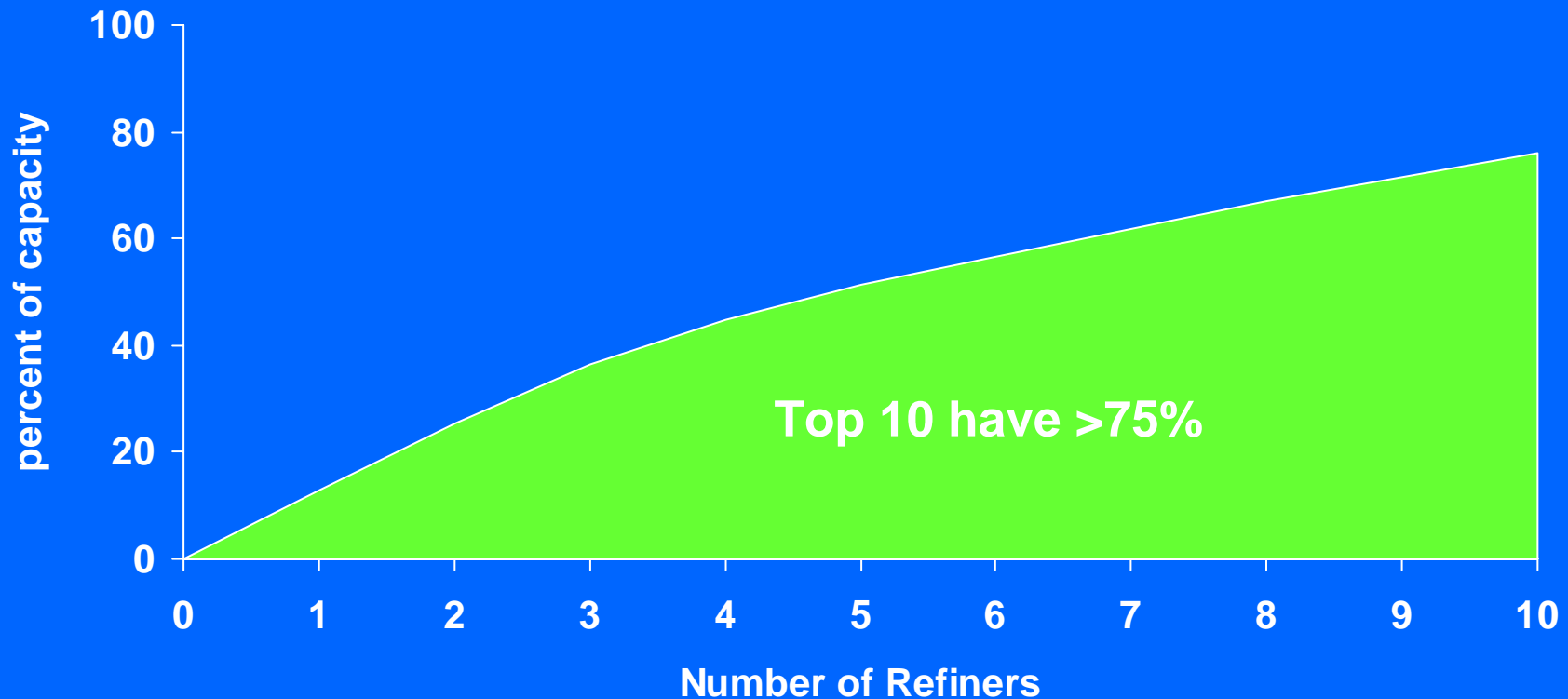
U.S. Refining Capacity – Past and Present

- Ownership of U.S. refining capacity has changed dramatically over the last ten years. Currently, the top ten U.S. refiners are as follows:

<u>Top 10 Refiners</u>	<u>Capacity (MBPD)</u>
Valero	2,257
ConocoPhillips	2,178
ExxonMobil	1,940
BP	1,475
Shell	1,143
Marathon	935
ChevronTexaco	909
Sunoco	880
PdVSA	828
Flint Hills	746
Total	13,291

U.S. Refining Capacity – Past and Present

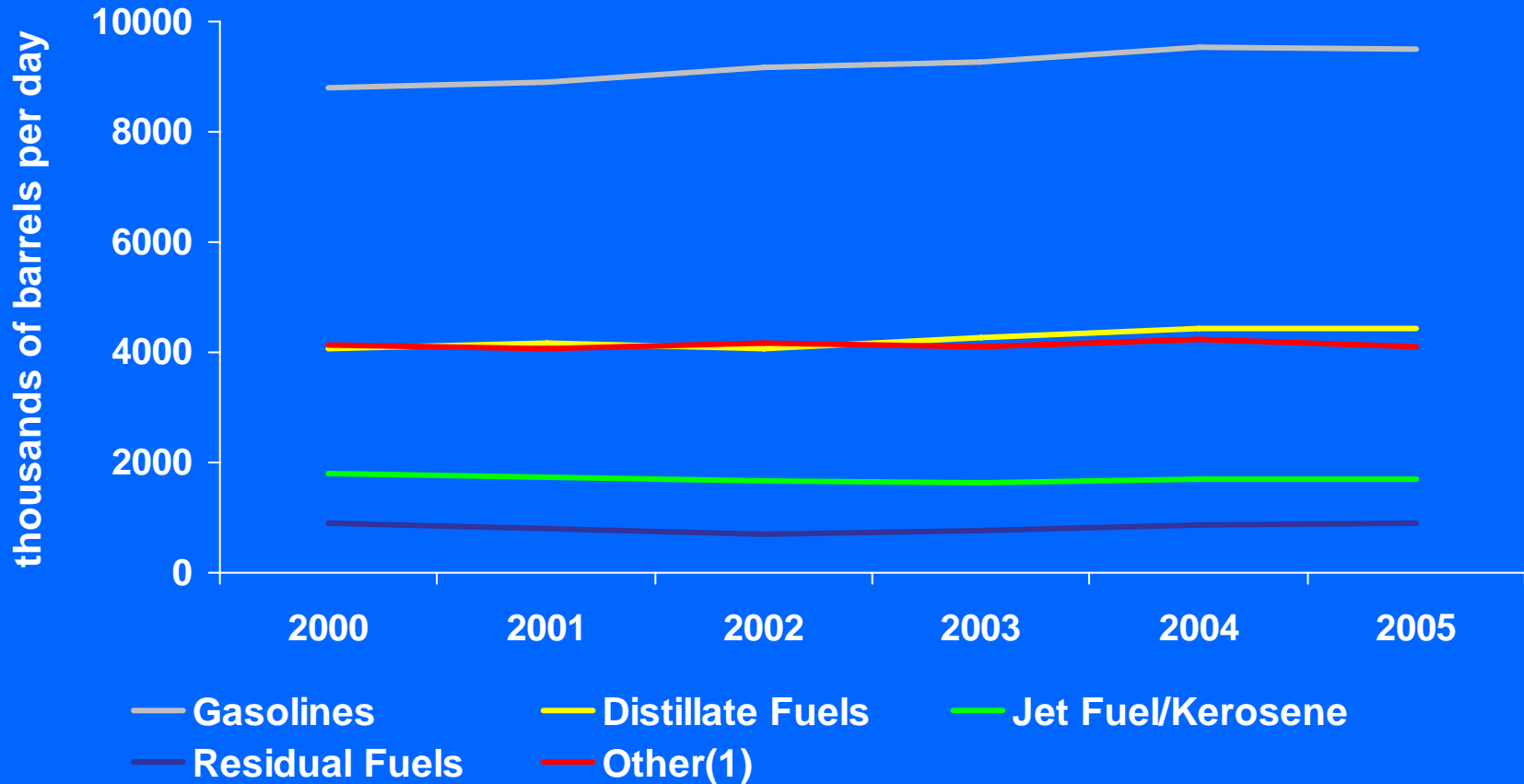
- Concentration of U.S. refining capacity is also increasing as the number of refiners and refineries diminishes.



U.S. Petroleum Products Supply/Demand

- In spite of forecasts and efforts by opponents of the petroleum industry and capitalism generally, the demand for petroleum products continues to grow in the U.S. (see Slide 13).
- For the 15-year period 1990-2005, demand for motor gasolines in the U.S. increased over 26%. For this same period, demand for jet fuels grew over 37%, and for distillate fuels demand grew more than 36%.
- Most analysts and economists were shocked at the minor impact on demands of U.S. petroleum products resulting from the sharp price increases that developed during the last two years. U.S. consumers seem to have adjusted remarkably.
- With the falling prices observed during the past few months, we certainly expect continued growth in U.S. demand for petroleum fuels products.

U.S. Petroleum Products Demand (Actual)



(1) Includes LPGs, petrochemical feedstocks, lubricants/waxes, petroleum coke, asphalt, refinery gas and other miscellaneous products.

Source: TM&C "The Outlook", mid-year 2006.

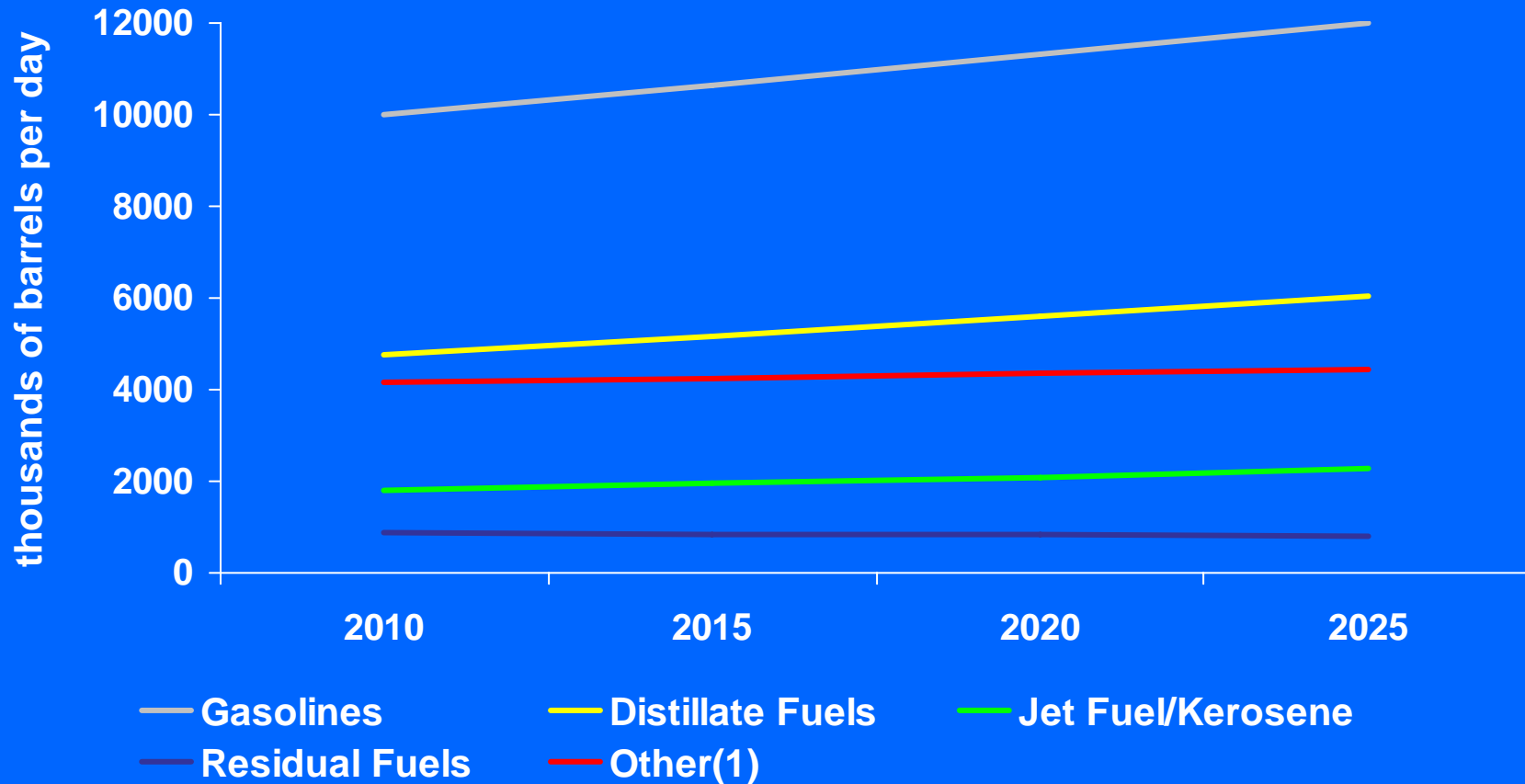
Supply/Demand (cont.)

- The outcry for production of fuels from non-crude oil sources is broad but mostly noise. There is “Biodiesel”, “BioWillie” and even “Biobutanol”. Much effort is in place to create fuels from anything other than petroleum sources. Will it amount to anything?
- According to the National Biodiesel Board, there are 86 plants in the U.S. producing biodiesel. Production in 2006 will amount to only about 16,000 BPD, a tiny fraction of U.S. distillate demand. At least three-quarters of existing plants have capacity of less than 650 BPD. Over the next two years, however, new facilities will be built to more than double U.S. production capacity.

Supply/Demand (cont.)

- On the demand side, there continues to be noise about reducing consumption, especially for automobiles. There are many who expect large impacts from hybrid vehicles and even fuel cell energy sources. With no reasonable payouts for such purchases or sensible economics in sight, I remain in the “skeptics corner”.
- Growth in demands for petroleum products are very likely to continue, in the opinion of most analysts. TM&C recently fore-cast (see Slide 16) the following annual growth rates for the period 2010-2025: motor gasolines 1.2-1.3%; distillate fuels 1.6-1.7%; jet fuel 1.5%; and other products 0.4%.
- Other analysts and cautious petroleum executives expect gasoline demand growth to dampen because of improved technology and changing motorist/consumer purchasing patterns (hybrids, crossovers, etc.). We have seen motor gasoline growth rates forecast at as low as 0.5-0.6% per year.

U.S. Petroleum Products Demand (Forecast)



(1) Includes LPGs, petrochemical feedstocks, lubricants/waxes, petroleum coke, asphalt, refinery gas and other miscellaneous products.

Source: TM&C "The Outlook", mid-year 2006.

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Supply/Demand (cont.)

- To understand the substantial change in the financial health of U.S. refiners and the increased value of refineries, a closer look at the sources of supplies for U.S. petroleum products is helpful.
- For the many years that the U.S. was capable of supplying its own demands for petroleum products from domestic refineries (including those nearby offshore facilities that are part of our traditional supply, such as Irving Oil and Vitol in Canada and the Caribbean refiners), consumers enjoyed the competitive benefits of low incremental refining costs of surplus capacity serving as a dominating force on price setting.

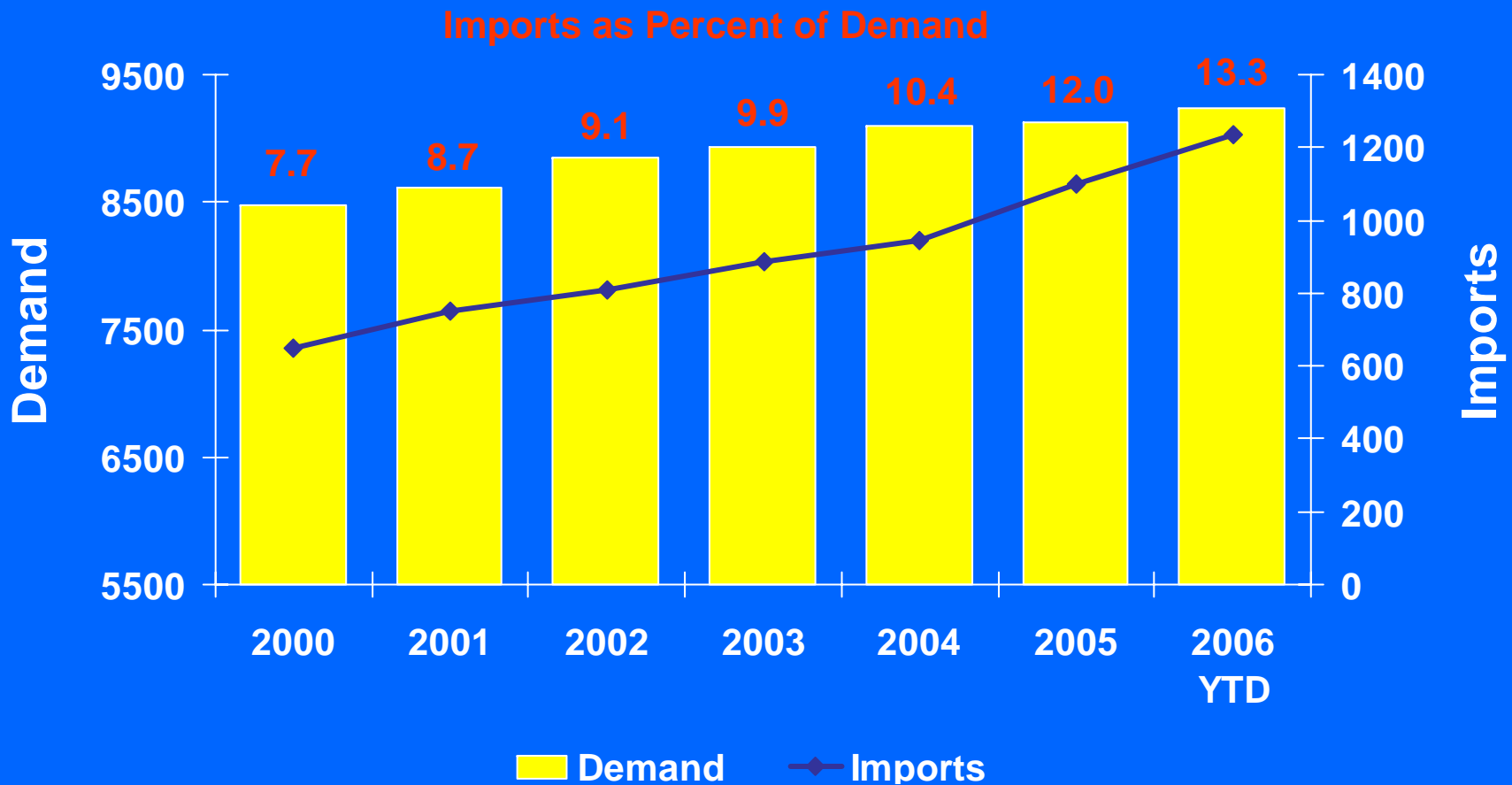
Supply/Demand (cont.)

- When U.S. refiners lost the ability to meet growing demands, they likewise lost the ability to be the incremental source of supply and thus the dominant price setter.
- With subpar margins and unattractive profits, capital investment was not available for refinery expansion projects or new refineries. John Auers, Vice President of TM&C and key author of our firm's August study "The Outlook", was recently quoted: "The lack of significant investment in grass roots refineries for over three decades and sustained economic growth in recent years, especially in Asia and North America, have combined to create a worldwide shortage of refining capacity."

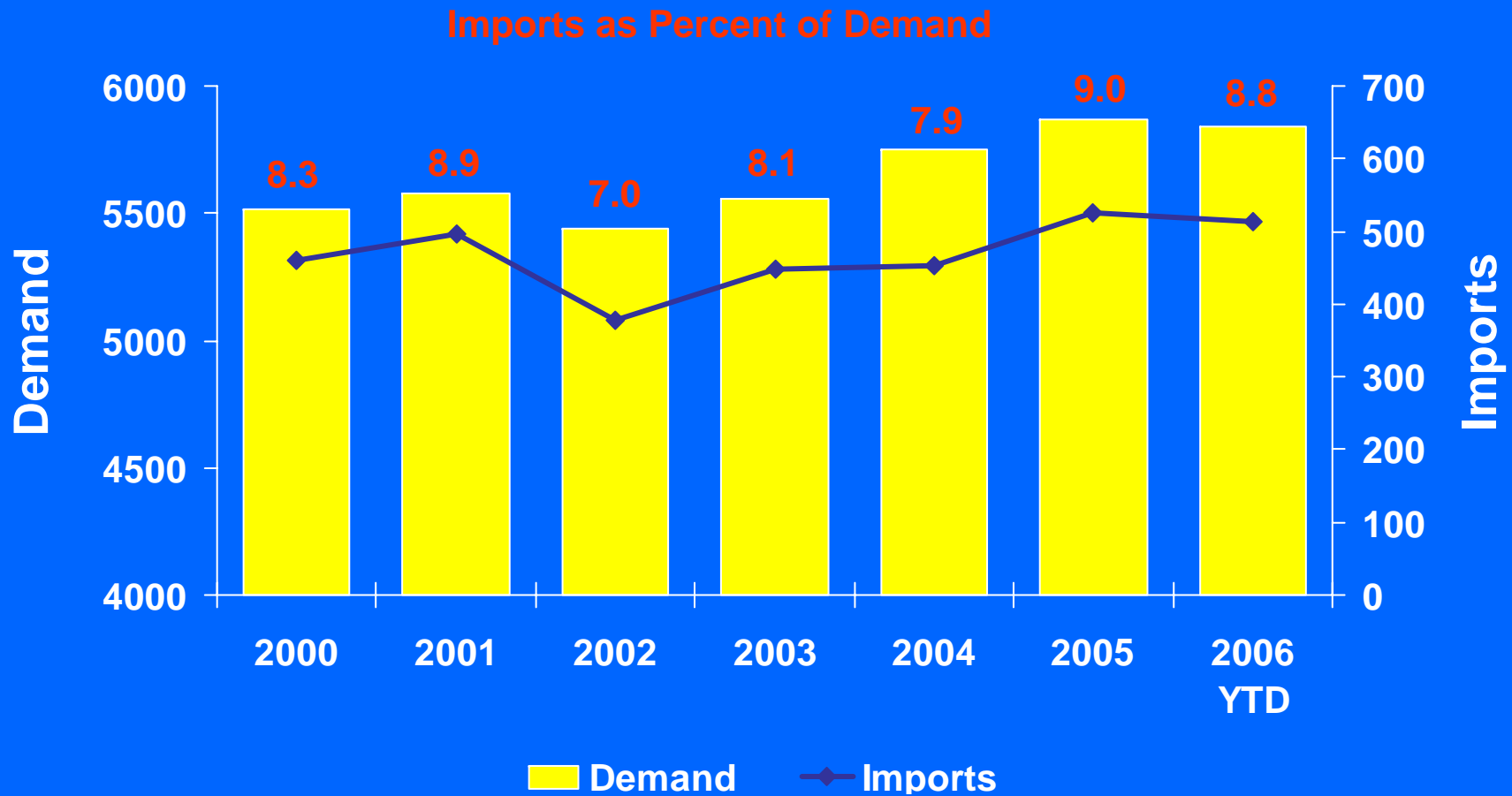
Supply/Demand (cont.)

- Looking at U.S. gasoline demand and imports, we may see that the trends are dramatic. In 1985, imports were only 450 MBPD, which comprised 6.6% of total U.S. gasoline demand, and none of that was from long-haul sources. In 2006, about 1,200 MBPD of U.S. gasoline demand was supplied by imports (see Slide 20), and most of it was long-haul.
- With distillate imports above 500 MBPD and almost 9% of U.S. demand, we have come to depend more on sources where competition from other purchasers is stiffening (see Slide 21).
- Most product imports come into PADD I, the U.S. East Coast. Here imports have risen to over 30% of demand. More importantly, this is the price setting area for most of the U.S., with the home of the NYMEX in New York City (see Slide 22).

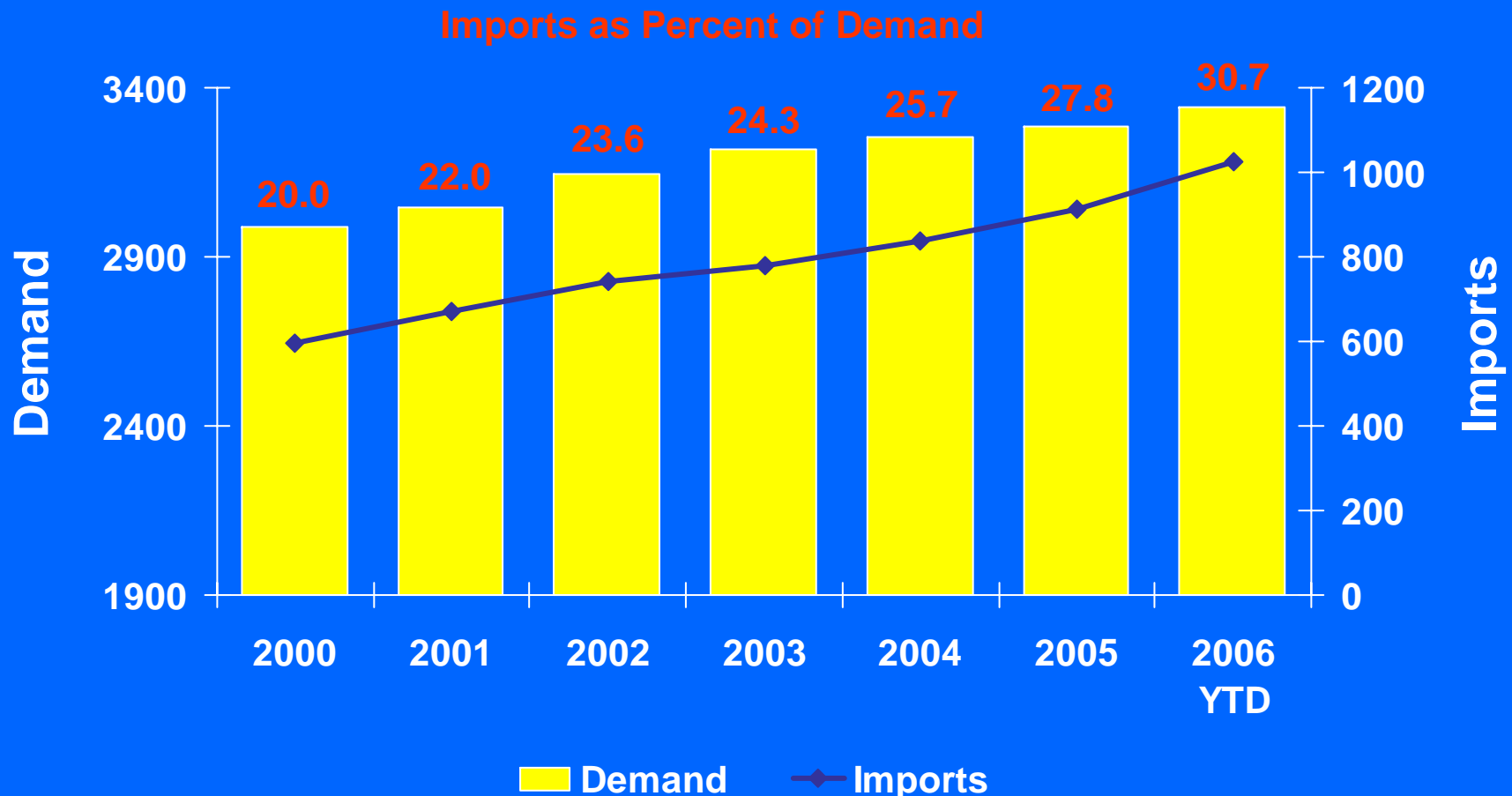
U.S. Gasoline Demand and Imports (MBPD)



U.S. Distillate Demand and Imports (MBPD)



PADD I Gasoline Demand and Imports (MBPD)



Supply/Demand (cont.)

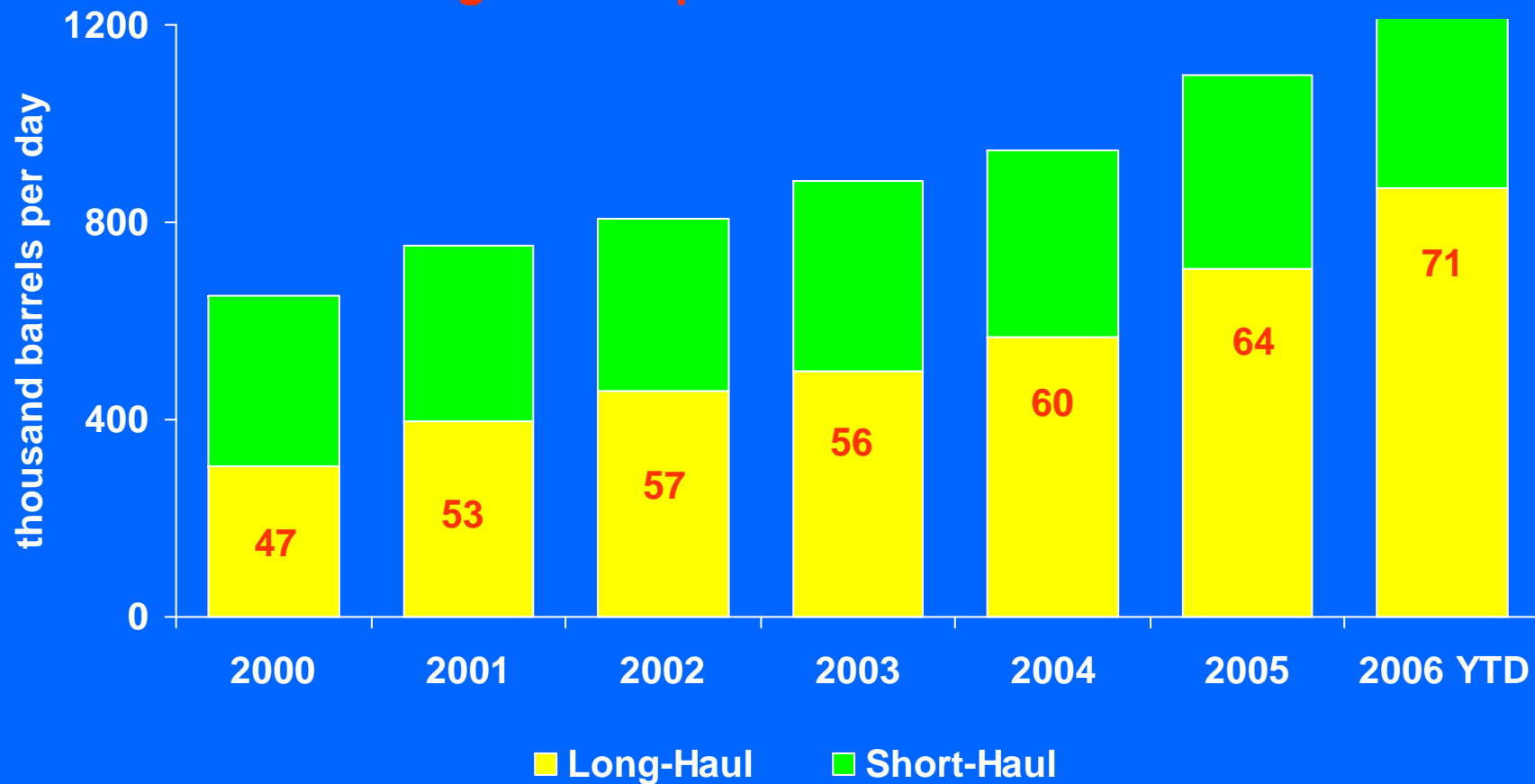
- With the U.S. markets becoming more dependent each year on long-haul imports, the costs are increasing relatively, and the price setting mechanism has proved to be especially beneficial for U.S. refiners. Long-haul imports have risen from less than half in 2000 to about 71% of total imports in 2006 (see Slide 25).
- For two growth scenarios, we have estimated the impact on long haul imports in 2015 (see Slide 26). Based on the TM&C growth outlook for gasoline, long haul imports will increase and the new Middle East refinery sources will come into play. For the more pessimistic growth outlook, plentiful gasoline import sources should be available from European refiners.

Supply/Demand (cont.)

- Long-haul imports are defined as production from refiners not located in Canada or the Caribbean. Major sources are European countries such as Netherlands, United Kingdom and France, and surprisingly Russia (see Slide 27).
- Large refining projects announced in the Middle East, especially Saudi Arabia, indicate that these long-haul sources expect to become incremental suppliers of imported products for the U.S. markets.

U.S. Gasoline Imports by Source Category

Long-Haul Imports as Percent of Total



Projected U.S. Gasoline Imports by Source Category (MBPD)

	<u>Est. 2006</u>	<u>TM&C Outlook 2015</u>	<u>Low Growth 2015</u>
Total Demand	9,240	10,281 ⁽¹⁾	9,751 ⁽²⁾
Refining Production	7,761	8,500 ⁽³⁾	8,500 ⁽³⁾
Less Exports	(150)	(150)	(150)
MTBE	93	0	0
Ethanol	303	489 ⁽⁴⁾	489 ⁽⁴⁾
Imports – Short Haul	364	364 ⁽⁵⁾	364 ⁽⁵⁾
Imports – Long Haul	869	1,078 ⁽⁶⁾	548 ⁽⁶⁾

- (1) “The Outlook”, mid-year 2006.
- (2) Annual growth at 0.6%.
- (3) TM&C estimate.
- (4) 2012 federally mandated volume.
- (5) Assumed to be constant.
- (6) Calculated by difference.

U.S. Gasoline Imports by Country of Origin

June 2006

	<u>MBPD</u>		<u>MBPD</u>
<u>Short Haul</u>		<u>Long Haul (cont.)</u>	
Canada	132	Italy	30
U.S. Virgin Islands	125	Portugal	29
Venezuela	77	Finland	21
Other Caribbean	<u>23</u>	Sweden	20
Subtotal	357	Germany	19
		Saudi Arabia	18
<u>Long Haul</u>		Latvia	17
Netherlands	179	Nigeria	14
United Kingdom	170	Norway	11
France	59	Other Long Haul	<u>81</u>
Russia	55	Subtotal	863
Spain	54		
Belgium	49	Total Imports	1,220
Estonia	37		

Worldwide Increases in Refining Capacity

- In its study released in August, TM&C notes that “the expansion in worldwide refining capacity needed to sustain even moderate economic growth is quite significant, and in our judgment, exceeds current engineering, procurement and construction capacity to effectively manage and complete major projects within traditional time and cost parameters.”
- Significant new worldwide refining investment, currently estimated to be as much as \$300 billion or more during the next 20 years, will be required to meet growing product demand and higher quality product specifications and to process heavier crude oil slates.
- Worldwide expansion will have to be dramatic to meet demand. By 2012 another 10.4 MMBPD of new capacity is expected to come on line, based on announced projects (see Slide 29). Of this total, the U.S. will add only net capacity of about 1.7 MMBPD.

Worldwide Refining Outlook

(MMBPD)

Capacity Expansions

U.S.	1.7
Asia	4.0
Latin America	1.2
Mideast	2.4
Others	<u>1.1</u>
Total by 2012	10.4

Product Supply Increases

Gasoline	4.1
Distillates	4.2
Resid	0.4
Others	<u>1.7</u>
Total by 2012	10.4

Source: TM&C "The Outlook", mid-year 2006.

U.S. Refining Capacity – Future Outlook

- **TM&C expects most additional new capacity in the U.S. to be concentrated on the Gulf Coast, although some will be in the Midwest. Collectively, these regions may add an additional 1.5 MMBPD of capacity with negligible additions in the East Coast and Rocky Mountain regions. West Coast additions will be nominal (see Slide 31).**
- **TM&C studies also forecast conversion capacity increases and octane unit capacity increases through 2012 as shown in Slides 32 and 33.**

U.S. Refining Capacity Increases through 2012

	<u>Crude Capacity (MBPD)</u>		
	<u>Heavy/Sour</u>	<u>Light/Sweet</u>	<u>Total</u>
PADD I	30	(30)	0
PADD II	675	(84)	591
PADD III	1,060	(107)	953
PADD IV	63	(35)	28
PADD V	<u>140</u>	<u>(31)</u>	<u>109</u>
Total U.S.	1,968	(287)	1,681

U.S. Conversion Capacity Increases through 2012

(MMBPD)

	<u>Coking</u>	<u>FCCU</u>	<u>Hydrocracking</u>
PADD I	14	20	0
PADD II	184	52	174
PADD III	270	50	228
PADD IV	20	12	0
PADD V	<u>45</u>	<u>50</u>	<u>0</u>
Total U.S.	533	184	402

U.S. Octane Unit Capacity Increases through 2012

(MMBPD)

	<u>Reforming</u>	<u>Alkylation</u>	<u>C5/C6 Isomerization</u>
PADD I	0	0	0
PADD II	120	6	5
PADD III	30	0	0
PADD IV	0	3	0
PADD V	<u>0</u>	<u>17</u>	<u>0</u>
Total U.S.	150	26	5

Capacity – Future Outlook (cont.)

- **TM&C notes that virtually every U.S. refiner has expansion projects under study for its currently owned plants, and several are continuing to look at acquisitions. The high prices, both for buying refiners and building capacity, are significant deterrents. The extraordinary EPC circumstance worldwide has undoubtedly caused many aspirants to cancel or scale back plans.**
- **Earlier this month, Valero announced its plans to consider a major expansion of its St. Charles refinery in Louisiana. With a boost to 380,000 BPD if implemented, Valero would be following the pattern of its up-the-river neighbor Marathon at Garyville by adding crude, coking, hydrocracking and hydrogen capacity. The result would be a very competitive Gulf Coast refinery.**

Capacity – Future Outlook (cont.)

- Subsequent to completion of TM&C's August report, "The Outlook", Irving Oil announced its intention to consider seriously the construction of a second refinery with a capacity of 300,000 BPD. This facility could dramatically impact East Coast markets where Irving already supplies more than 100,000 BPD of reformulated gasoline meeting tough U.S. specifications. It also is capable of making ULSD and is currently a formidable source of supply.
- Proposed expansions of the Come By Chance refinery and the announced Newfoundland and Labrador Refining Corporation 300,000 BPD new refinery are both competitors with the Irving project. Such additions to the East Coast supply sources would undoubtedly reduce dependence on long-haul petroleum products sources from Europe and the Middle East.

Capacity – Future Outlook (cont.)

- It has been suggested that some skilled and well financed refiners might enjoy speculative announcements concerning new capacity simply to deter the entry of newcomers and even fellow competitors. TM&C of course has no evidence of such activities, but such ideas make for interesting conversation.
- On the bright side from the perspective of U.S. refiners, all of these new supplies will be relatively high cost. That is, they will require returns on capital based on new grass roots investments. These are classic 100% of replacement cost facilities.

Capacity – Future Outlook (cont.)

- Existing U.S. refiners, with lower capital cost from current capacity or even newly built facilities, will enjoy competitive advantages. This circumstance is one of TM&C's primary bases for a continued outlook for relatively prosperous financial times for the U.S. refining industry.
- In the final analysis, TM&C believes that U.S. refiners will not be able to “build” their way out of their new-found prosperity for perhaps a decade. On the other side of the supply/demand equation, products demand outlooks could indeed change dramatically during that time period.

Capacity – Future Outlook (cont.)

- TM&C does believe that U.S. refiners will see consistent transition in feedstock supplies, with Canadian syncrude becoming a significant factor all the way into the Gulf Coast. We are actively involved in and well aware of several pipeline, refining and upgrading projects that will bring about shifts in crude oil supplies. Canadian WCS and similar grades will gain some markets from Venezuela and perhaps Mexico.
- An observation that we put forth is that while U.S. refiners have heretofore been forced to make significant capital expenditures in order to avail themselves to optimum priced crude oil from worldwide sources, the Canadian syncrude alternative will bring changes to that scenario.
- We expect large upgrader projects to manufacture Canadian syncrudes that are tailor-made to fit U.S. refiners' existing process configurations and allow them to avoid what otherwise might be prohibitively expensive capital projects.