

# Atlantic Basin Refining Dynamics from U.S. Perspective

Joanne Shore  
John Hackworth

September 2010  
Platts 4th Annual European Refining  
Markets Conference



◆ This presentation focuses on the current refining situation in the Atlantic Basin, including some discussion on how we got here, and on drivers that will influence the next 5 years.

## Overview

### → Product demand growth

- Atlantic basin gasoline & middle distillate supply
  - Trade movements
  - Refinery production
- Prospects for refinery profitability



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◆ I will focus on three topics today that are critical to the petroleum product dynamics of the Atlantic Basin over the next several years.

◆ The first is product demand growth – something that has been affected both by the recession and legislation.

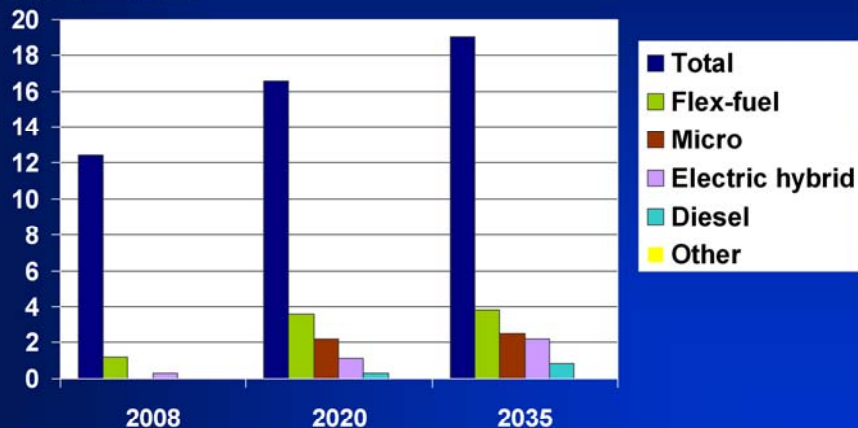
◆ Next I will cover the supply situation for gasoline and distillates in the Atlantic Basin, since Europe and the U.S. are closely entwined in these markets.

◆ Last, we will visit the outlook for those drivers affecting profitability – an area of large uncertainty.

## Long-Term Changes in U.S. Pushing Down on Transportation Petroleum Use

### U.S. Sales of LDVs by Fuel Type

Million Vehicles Sold



Source: EIA Annual Energy Outlook 2010

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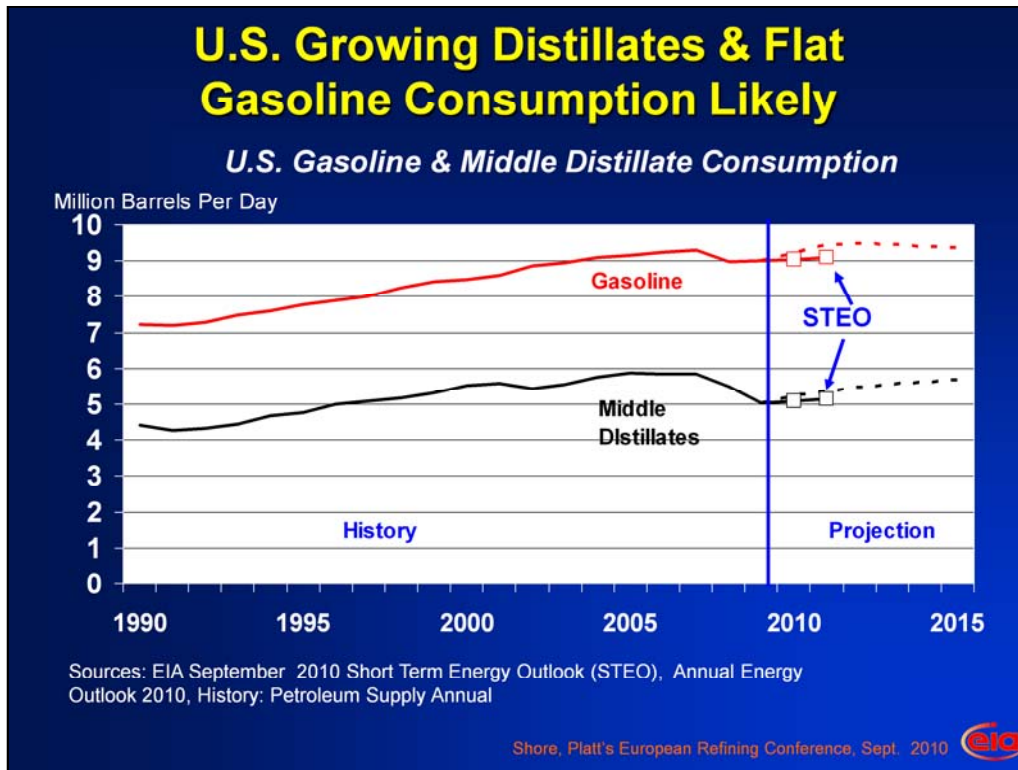
◆ I will begin today with a short discussion of important underlying long-term trends in U.S. demand that will not have much impact in the next year or two, but are influencing refiners' decisions today. In particular, although the U.S. is expected to depend on petroleum for many years to come, increasing petroleum prices and policies directed at emission reduction and national security will continue to discourage the use of petroleum.

◆ New CAFE and emissions standards boost vehicle fuel efficiency. Light trucks (pickups, SUVs, and vans) have claimed a rising share of U.S. light duty vehicle (LDV) sales since the 1970s, peaking at over 55 percent of new LDV sales in 2004 before dropping to just over 47 percent in 2009. Thus, despite technology improvements, average fuel economy for new LDVs ranged between 24 and 26 mpg from 1995 to 2006 after peaking at 26.2 mpg in 1987, then rose to 26.6 mpg in 2007 with higher fuel prices and introduction of tighter fuel economy standards.

◆ The National Highway Transportation and Safety Administration (NHTSA) and EPA have proposed attribute-based CAFE and emissions standards for 2012 to 2016. In the EIA Reference case, the average fuel economy of new LDVs (including credits for alternative fueled vehicles (AFVs) and banked credits) rises from 29 mpg in 2011 to 34 mpg in 2016 and 35.6 mpg in 2020. The 2007 Energy Independence and Security Act (EISA) requires an average of 35 mpg in 2020.

◆ Changing technologies are expected to reduce consumption. In 2035, advanced drag reduction, which provides significant fuel economy improvements by reducing vehicle air resistance at higher speeds, is implemented in nearly 99 percent of new LDVs. With the adoption of light-weight materials that reduce vehicle mass, the average weight of new cars declines from 3,264 pounds in 2008 to 3,112 pounds in 2035, providing significant improvements in fuel economy. In addition, adoption of advanced transmission technologies, such as continuous variable and automated manual transmissions, grows from 5 percent of the LDV market in 2008 to 43 percent in 2035.

◆ And as this chart shows, with more stringent CAFE standards and higher fuel prices, unconventional vehicles (vehicles that use alternative fuels, electric motors and advanced electricity storage, advanced engine controls, or other new technologies) account for nearly 50 percent of new LDV sales in 2035 in the Reference case. Unconventional vehicle technologies play a significant role in meeting the new NHTSA CAFE standards for LDVs.



◆ In the short term, U.S. refiners are being impacted mainly by the recession and its impact on demand. The growing use of ethanol in gasoline also plays a role. The U.S. mandate for ethanol use is an increasing volume mandate. Thus, when consumption is flat or declining, the percent of ethanol suppliers are required to use increases, cutting into the need for petroleum-based gasoline.

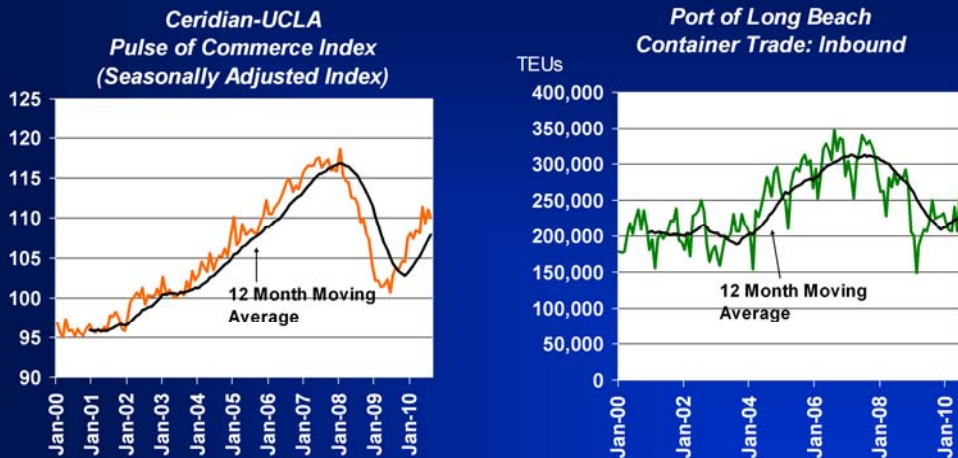
◆ Over 80 percent of U.S. finished petroleum product consumption is gasoline and middle distillates (where middle distillates are heating oil, diesel, kerosene and jet fuel).

◆ The recession affected both gasoline and middle distillate demand, but middle distillates were affected more. Light duty vehicles in the U.S. are mainly gasoline fueled, and personal travel is generally not as sensitive to economic changes as diesel-fueled heavy-duty trucking travel, which suffers when fewer goods are being produced, imported and moved.

◆ As we look ahead, our long-term forecast for gasoline at the end of last year (Annual Energy Outlook 2010), showed a brief come back before beginning to level out and fall a bit with increasing vehicle efficiency and slow economic recovery. Middle distillate use displayed an even slower recovery, not even returning to the 2007 level by 2015.

◆ Our more recent Short-Term Energy Outlook shows a slower near-term gasoline recovery, implying that short-term strength in the 2010 Annual Energy Outlook may be overstated. The Short-Term Outlook is still reflecting a slow middle distillate fuel recovery, but much uncertainty exists.

## U.S. Transport Indicators Show Upturns (Jan 2000 – Aug 2010)



◆ Various indicators are pointing towards economic recovery and more distillate fuel use.

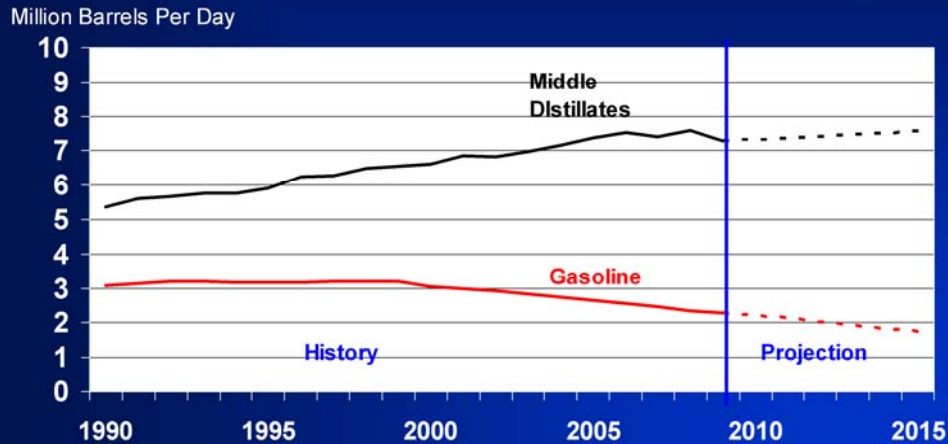
◆ A fairly new indicator, the Ceridian-UCLA Pulse of Commerce Index, represents truck fuel purchases. Even though there is some monthly wobble, the index trend is increasing and indicating recovery is still evident.

◆ Another indicator is the inbound container trade at California's Port of Long Beach. The ports of Long Beach and Los Angeles account for a significant amount (around 40 percent by one source) of U.S. inbound container movements. The container trade indicator reflects strength of the economy through increasing imports of container goods. This trade volume reflects the need for trucks to move the goods being imported as well as increasing need to move goods in an expanding economy. For January through August, loaded inbound container trade is up 12.8 percent over 2009, and outbound is up 11.3 percent.

◆ The debate about future economic activity continues, but we could see higher distillate demand sooner rather than later if the economy picks up a bit faster than what EIA assumed last year.

## OECD European Growing Distillates & Declining Gasoline Consumption

### OECD European Gasoline & Middle Distillate Consumption



Sources: IEA Monthly Oil Data Service Data Base August 2010, © OECD/IEA, 2010;  
Growth rates from IEA *Medium-Term Oil and Gas Markets 2010* © OECD/IEA, 2010.

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◆ OECD Europe's gasoline and middle distillate consumption look like U.S. consumption inverted. Middle distillate demand is higher than gasoline, reflecting Europe's policies to encourage diesel-fueled light-duty vehicles.

◆ The diesel-preference policies have resulted in declines in gasoline consumption, with increases in middle distillates.

◆ Like the U.S., OECD Europe saw the recession's large impact on middle distillate consumption. As recovery occurs, IEA is showing continued growth of middle distillates, spurred both by the pick up in heavy-duty trucking use, as well as continuing increases in the share of diesel-fueled vehicles in the light-duty fleet.

– This chart was derived from IEA historical data, then near-term projections were developed by applying IEA's mid-term forecast growth rates to that data.



## Overview

- Product demand growth

→ Atlantic basin gasoline & distillate supply

- Trade movements
- Refinery production

- Prospects for refinery profitability



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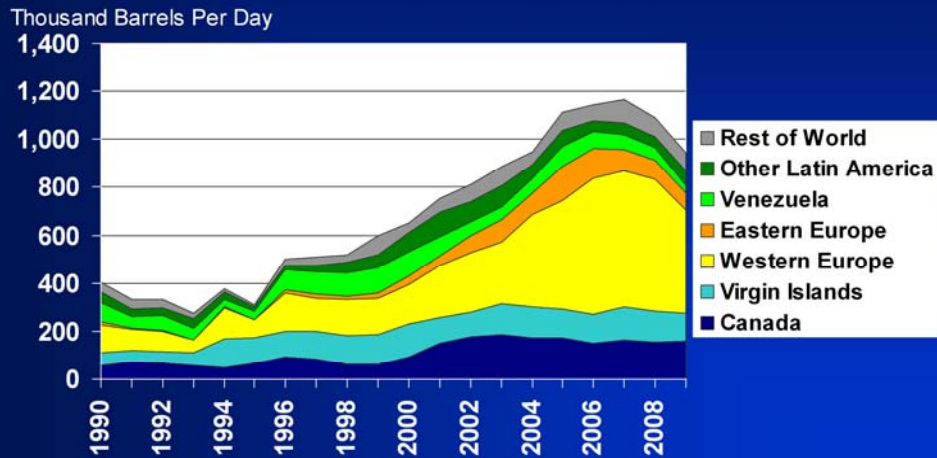


◆ In summary for demand, the combination of recession and changes in legislation have affected Atlantic Basin total demand for gasoline and distillate fuels. U.S. gasoline demand is affected by increases in light-duty vehicle efficiencies and by increased biofuel use, both of which diminish the need for petroleum-based gasoline. And Europe's policy to move light-duty transportation to more efficient diesel-fueled vehicles also reduces the need for petroleum based gasoline. Distillate, on the other hand, is expected to show more growth in both markets, adding to refiners' challenges as this product slate shifts.

◆ Next, the presentation moves to gasoline and middle distillate supply in the Atlantic Basin, beginning with changing trade movements, followed by refinery production needs.

## U.S. Gasoline Imports from Europe Grew, But Fell Recently with Demand

### Annual U.S. Total Gasoline Imports



◆ Gasoline imports to the United States declined 19 percent from their peak in 2007 to 2009.

◆ Nearby supplies from Canada and the Virgin Islands changed very little. The United States is the main market for the Atlantic Canadian and Virgin Island refineries.

◆ Europe and other areas accounted for most of the drop. With U.S. consumption falling 3 percent from 2007 through 2009, the sharper drop in imports cushioned the impact on U.S. refinery production.



## U.S. Gasoline Exports Increased 2009 & 2010

### U.S. Total Motor Gasoline Imports and Exports



Source: EIA Petroleum Supply Monthly

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◆ The U.S. is a net importer of gasoline. Most imports (86 percent in 2009) come into the East Coast, while most exports (83 percent in 2009) leave the U.S. from the Gulf Coast.

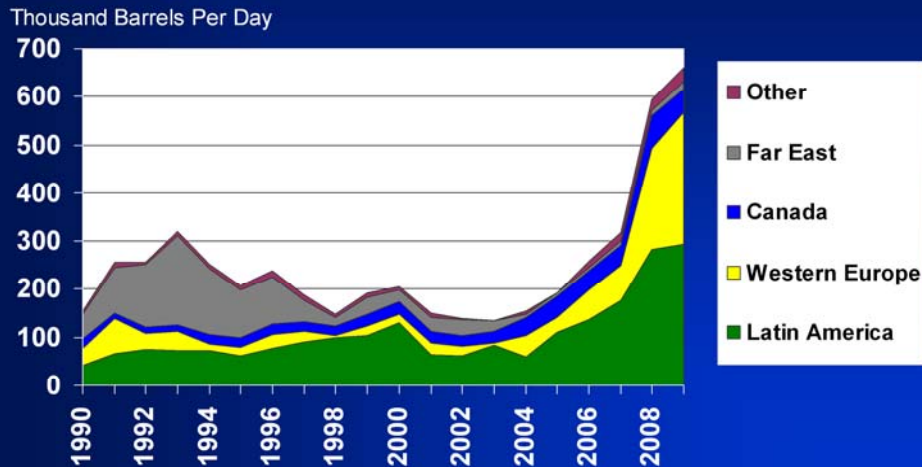
◆ In 2009 and 2010, gasoline exports rose, helping to reduce the need to cut refinery inputs.

– Most U.S. gasoline exports go to Mexico, which accounts for 60-70 percent of gasoline export volumes.

– Canada is the next biggest source at closer to 10 percent in the first half of 2010.

## Recent U.S. Distillate Export Opportunities To Europe and Latin America Surged

### Annual U.S. Middle Distillate Exports



Source: EIA Petroleum Supply Monthly

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◆ Until 2008, the United States was a net importer of distillate fuel, but with distillate margins rising in international markets, the U.S. became a net exporter in 2008, with net exports growing to over 300 thousand barrels per day.

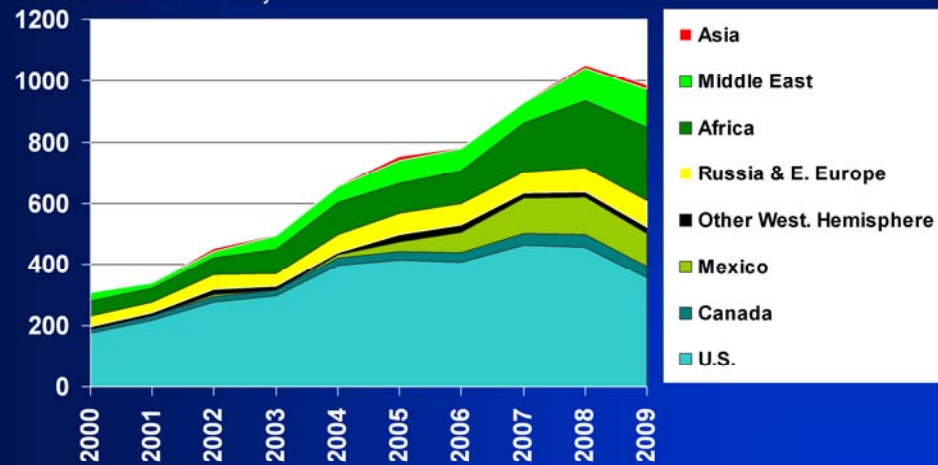
◆ With the recession, U.S. distillate demand in 2009 was 13.5 percent below 2007. While international distillate margins fell in 2009 versus the prior year, U.S. distillate exports increased by 60 thousand barrels over 2008 as refiners looked for product outlets.

◆ The combination of the decline in net gasoline imports and the increase in distillate exports has given U.S. refiners some relief in the face of falling product consumption. But even with the export opportunities, the fall in refinery utilization has been substantial.

## Western Europe's Gasoline Net Exports Grew to Mexico, Africa, Middle East

### Western Europe's Gasoline Net Exports

Thousand Barrels Per Day



Sources: IEA Monthly Oil Data Service Data Base August 2010, © OECD/IEA, 2010;

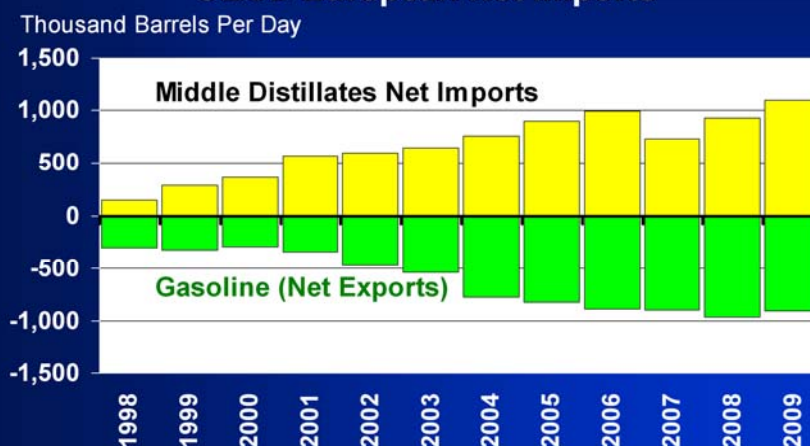
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◆ Europe has to export its surplus gasoline production, and when flows to the United States decreased recently, volumes increased to other destinations, mainly Africa and the Middle East.

## OECD Europe: Imbalance Between Refining and Demand Met with Imports/Exports

### OECD European Net Imports



Sources: IEA Monthly Oil Data Service Data Base August 2010, © OECD/IEA, 2010;

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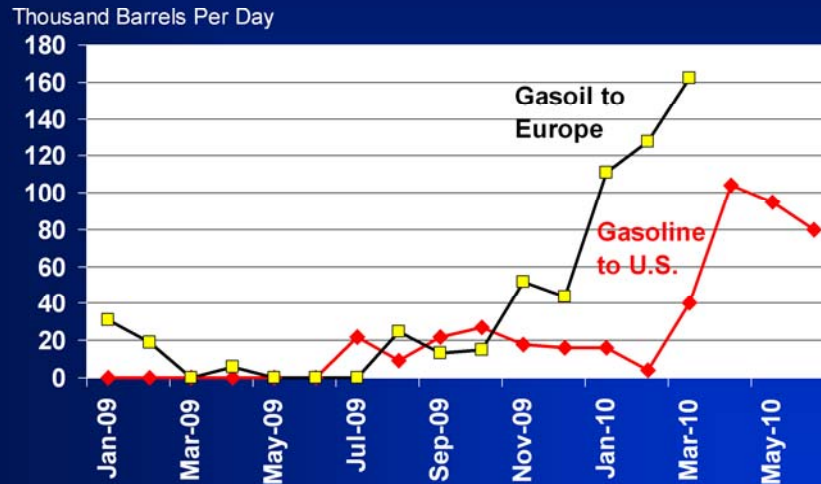
◆ The shift to light-duty diesel-fueled vehicles in Europe may have slowed a bit in recent years. As reported by the European Automobile Manufacturers' Association ([www.ACEA.be](http://www.ACEA.be)), the shares of new diesel-fueled passenger car registrations have declined from their peak in 2007 of 53.3 percent to 45.9 percent in 2009. But the fleet is still well below that share, so new sales continue to increase the share of diesel-fueled vehicles in the European fleet. As a result, the gasoline and distillate demand and refinery production disparity continues.

◆ Since 1995, distillate refinery yield has risen 6.5 percent on crude oil charge, and gasoline yield has declined about 3 percent, but that has not been sufficient to deal with the shift in fuel demand.

◆ The imbalance picture is not likely to change much between now and 2015, as refinery distillate production capacity increases will not keep up with the demand shift. As a result, Europe will continue to be left with the need to increase distillate imports and gasoline exports.

## Jamnagar Adding Competition to Atlantic Basin

### Refined Products from India to U.S. & Europe



Sources: Gasoil to Europe: IEA Monthly Oil Data Service Data Base August 2010, © OECD/IEA, 2010; Gasoline to U.S.: EIA Petroleum Supply Monthly

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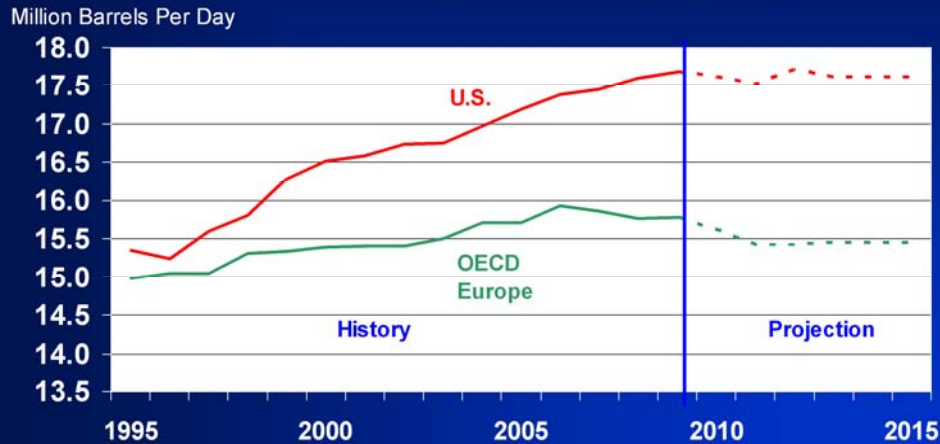
◆ Product trade patterns reflect increasing competition in the Atlantic Basin. Reliance Industries started up its second large refinery at Jamnagar, India in January 2009, bringing total capacity at that location to 1.24 million barrels per day. The capacity was designed for product export markets, and in early 2010 was reported to be operating at over 100 percent of design capacity.

◆ As can be seen from this chart, gasoil exports to Europe and gasoline exports to the United States from India have risen dramatically, with Jamnagar playing a major role. The cost structures of this capacity make this product source competitive in Atlantic Basin markets.

◆ Capacity plans for additional refinery export capacity in the Middle East have been reduced substantially because of the recession, but Reliance has demonstrated that refineries East of Suez can impact the Atlantic Basin.

## Likely See More Capacity Decline in Europe than in U.S.

### U.S. & OECD European Refining Capacity



Sources: History EIA Petroleum Supply Monthly, IEA Monthly Oil Data Service Data Base August 2010, © OECD/IEA, 2010; Forecast :Trade Press, Company Web Sites, Estimation

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◆ As we move to refinery production in this presentation, three factors are considered that play into production volumes and utilization in the U.S. and European refinery systems: Demand growth; product trade movement changes; and refinery capacity expansion and closures.

◆ Both the U.S. and Europe have already seen refinery closures, and more are likely to occur in the next few years. But there are still expansion projects underway.

◆ As the chart shows, we don't think significant net reduction in capacity is likely. Plants can still be sold, albeit at dramatically reduced per-barrel prices than seen several years ago. And margins, while not good, also came back a bit in the second quarter of 2010, giving rise to hope that the market for refining could improve.

◆ It appears that prospects for reducing capacity in Europe may be somewhat more likely than in the United States. This chart shows a drop of over 300 thousand barrels per day from 2009 to 2015 in Europe. In the U.S., the large Motiva refinery expansion of 325 thousand barrels per day at Port Arthur, Texas, weighs heavily in this assessment, keeping the U.S. close to capacity seen in 2009.



## Recent U.S. Capacity Changes

Company	Refinery	Date of Change	Capacity Change (KB/D)
Flying J / Alon	Big West, Bakersfield, CA	Idled in Jan 2009; restart 2010 -2011	-66
Valero/ PBF Energy	Delaware City, DE	Idled in Nov 2009 restart in mid-2011	-182; until restart
Sunoco	Eagle Point, NJ	Oct 6, 2009	-145
Holly	Tulsa, OK (Integration)	2011/12	-35
Western	Gallup & Bloomfield, NM (Integration)	Nov 9, 2009	-17
Marathon	Garyville, LA	January, 2010	180
Western	Yorktown, VA	August 2010	-70

Sources: Company web sites and trade press.

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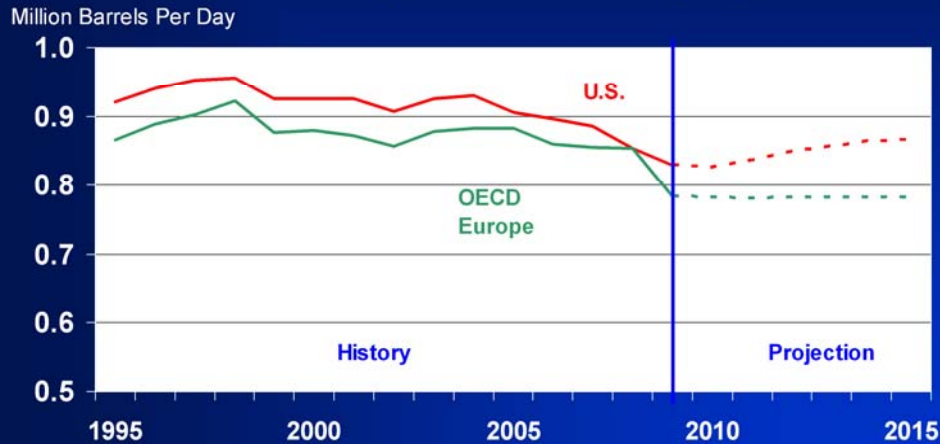
◆ The U.S. has seen a number of closures recently, as shown in this table, which highlights 515 thousand barrels per day of capacity offline now or soon to come. That is countered by the recent startup of Marathon's Garyville, Louisiana expansion, which added 180 thousand barrels per day of highly efficient production.

◆ Some refiners want to sell facilities. Conoco Phillips has indicated an interest in selling, and Murphy Oil wants to sell all of its refineries – both of its U.S. refineries and its UK facility. Valero recently sold its Delaware City refinery to PBF Energy, and has indicated an interest in selling its Paulsboro facility. Other refiners are undoubtedly also looking at sales potential. If refineries cannot be sold, companies look more strongly at closures. How this will play out is difficult to answer.

◆ Most of the refinery distillation capacity expansions that had been planned for the 2013 to 2015 period have been dropped or put in the indefinite category.

## U.S. Utilization May Improve Slightly, But Atlantic Basin Likely Will Remain Low

### U.S. & OECD European Distillation Capacity Utilization



Sources: History EIA Petroleum Supply Monthly, IEA Monthly Oil Data Service Data Base August 2010, © OECD/IEA, 2010; Forecast :Trade Press, Company Web Sites, Estimation

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◆ In neither the United State nor OECD Europe do we see significant recovery in utilization over the next few years.

◆ The United States improves slightly because of a potential shift in imports and exports that allows refiners to run at higher rates than demand implies. The United States has been able to reduce imports of gasoline and increase exports of distillate fuel, which has had and is expected to continue to have an attractive margin in world markets.

◆ Europe has to import diesel fuel and export gasoline due to its mismatch between refinery output and consumption product mix.

## U.S. Middle Distillate Production Potential

- Historically, U.S. has seen a steadily increasing distillate yield, but in summer 2008, middle distillate yield jumped 3.4 percentage points over prior summer
- EIA analysis indicates future potential middle distillate yield increases:
  - Short term: increases of 3 to 5 percentage points over a base of 35 percent (no or small investments)
  - Long term: Increases of 4 to 8 percentage points (with planned hydrocracking additions)

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◆ With future U.S. product mix being projected to shift to more distillate relative to gasoline, the question arises as to how much U.S. refineries can move that direction before significant investments are needed.

◆ Annual middle distillate yields at U.S. refineries have steadily risen from 31.9 percent in 1995 to 35.4 percent in 2007. The summer of 2008 was unusual in the United States. Typically gasoline margins exceed distillate margins during the summer months, but the reverse occurred in 2008. Middle distillate yields during the summer jumped 3.4 percent over summer of 2007.

◆ EIA did an analysis of the potential for U.S. refinery middle distillate yield increases. The study looked at reported refinery production, consulted with refiners and process experts, and used refinery modeling.

– The results show the U.S. refineries have the ability to increase annual average distillate yields on crude and unfinished oil inputs 3 to 5 percentage points with no or small investments for distillation improvements

– When planned hydrocracking increases are taken into consideration (e.g., Motiva's expansion), the increase could be in the 4 to 8 percentage point range.

◆ Given the current slowly increasing distillate consumption outlook, the potential yield increases will enable U.S. refiners to increase distillate exports when the economics are attractive. It appears that U.S. refiners' export volumes will be market bound between now and 2015, rather than bound by their ability to produce more distillate.

## Overview:

- Product demand growth
- Atlantic basin gasoline & distillate supply
  - Trade movements
  - Refinery production

➔ **Prospects for refinery profitability**



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◆ The scene we have painted for refinery profitability is heavily influenced by weak demand, extra refining capacity lingering in the U.S. and Europe, and increasing competition from India now and perhaps from others later.

## Profitability: Margins and Light-Heavy Price Differentials

- The brief Golden Age of refining ended with the recession
- Refinery light-product margins and the light-heavy crude price differences drive profitability
- Margins will be affected by surplus capacity in the Atlantic Basin and competition from the the Middle East and Asia
- Light-heavy price differentials, also slow to recover, impact the complex refinery margins

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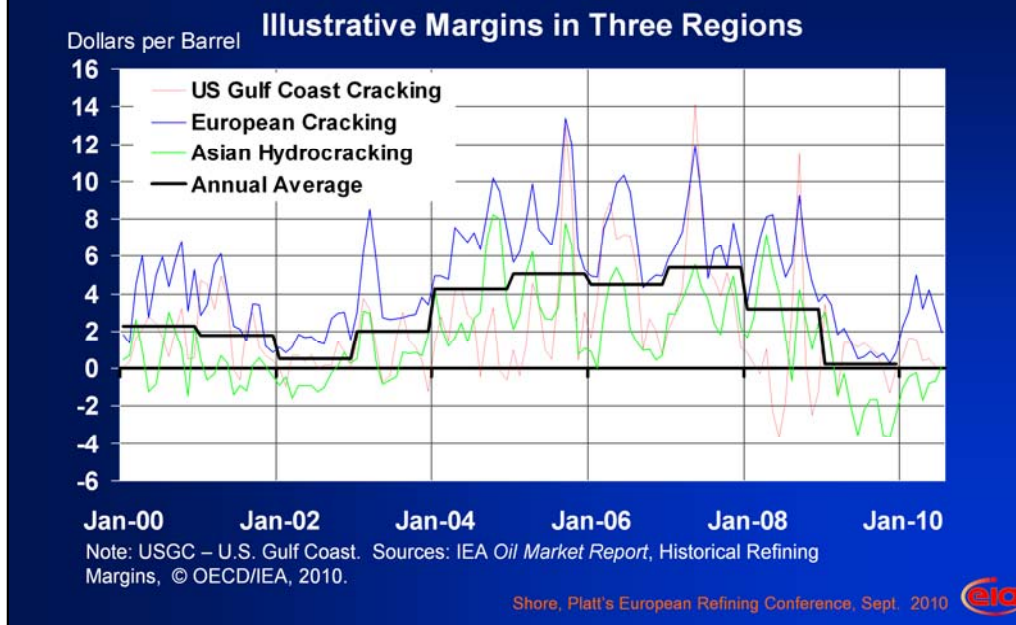
◆ We had some years of good margins after the turn of the century, but the recession brought a halt to the “Golden Age” of refining.

◆ Profitability is mainly determined by light product margins and by light-heavy crude price differences that impact complex refiners.

◆ The current surplus capacity in the Atlantic Basin along with strong trade competition weighs margins down.

◆ And the light-heavy price difference indicates how well complex refiners will do relative to simpler refineries.

## Margins Recovering Slightly from 2009 Collapse



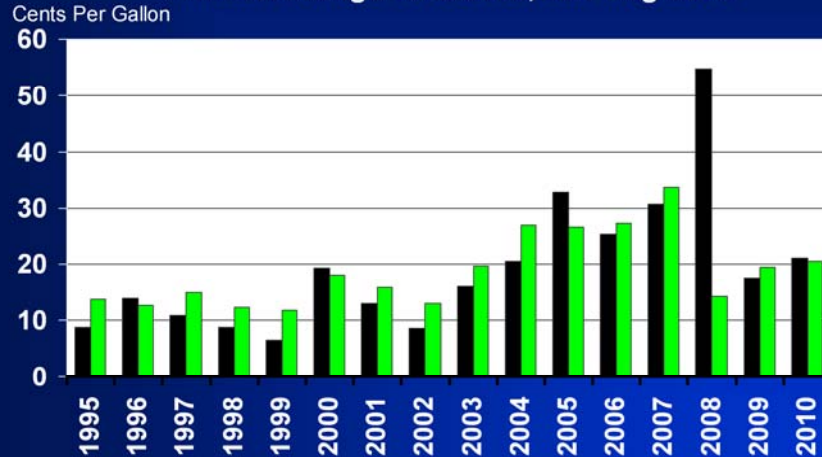
◆ This slide shows estimated refinery margins for different parts of the world. In general, it illustrates that the strong refining margins seen from 2004 into 2008 collapsed with falling economies in all markets. While margins were very low in 2009, they have begun to pick up in 2010.

◆ The next several slides will look at the contribution to margins from gasoline and distillate fuels, the two fuel types that comprise the largest product contribution to margins, and will explore the impact of feedstock costs on different refiners. In particular, after the crude price drop mid-2008 through 2009, light-heavy crude price differentials did not move up as might have been expected with subsequent increases in crude oil prices in 2010, meaning more complex refiners have not been able to see the margin premiums they experienced 2004 into 2008.



## Distillate Played a Bigger Role in Profitability in Recent Years

*U.S Spot Heating Oil and Gasoline Minus Crude Price  
Annual Average 1995-2009, Jan-Aug 2010*



Source: Average spot prices, Reuters New York Harbor No. 2 heating oil and conventional gasoline minus Brent spot crude oil prices

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◆ Consider the product price contribution to margins, where the focus is on gasoline and distillate fuel oils. Gasoline and middle distillate fuels make up the majority of the refiners' product barrel and the majority of product contribution to profitability.

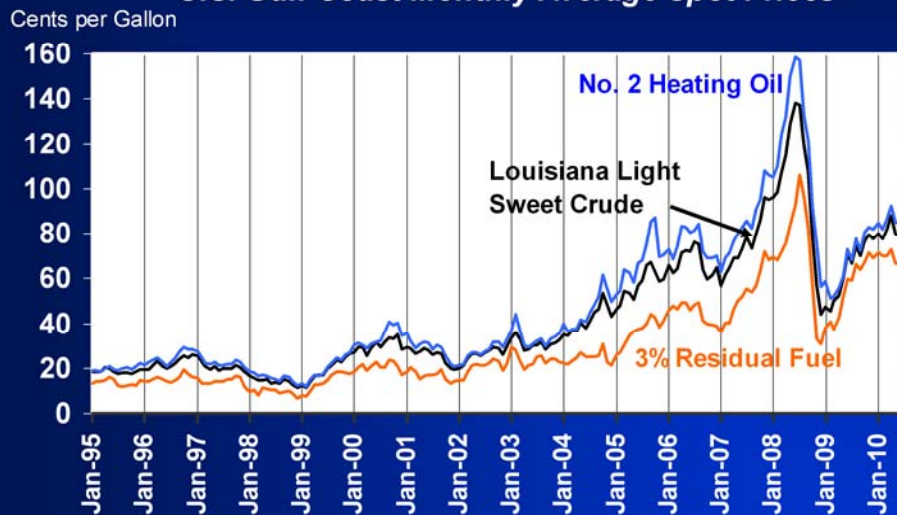
◆ Until recent years, gasoline usually had higher prices and thus higher spreads over crude oil through most of the year, except when cold winter weather drove up distillate prices for short periods.

◆ However, distillate drove the profits in 2008 with distillate markets tightening significantly worldwide due to extra electricity needs to a large extent. Gasoline and distillate fuels are closer in price again, with distillate showing extra strength over gasoline in Europe.

◆ In the future, the outlook for distillate demand relative to gasoline should continue to show a larger contribution from distillate to the bottom line than had been the case historically. However, the margins of 2008 may not be reached again.

## Residual Fuel Strength 2009-10 Impacted Light-Heavy Differentials

### U.S. Gulf Coast Monthly Average Spot Prices



Source: Average spot prices, Bloomberg No. 2 heating oil, 3% sulfur residual fuel oil, and Louisiana Light Sweet crude oil.

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◆ Light-heavy crude prices are correlated with light-heavy product prices.

◆ Typically, residual fuel does not move up or down as much as crude oil price, as it competes in various boiler fuel markets that don't change much with crude oil price. This was the case as crude oil prices rose in 2004 to their peak in 2008, but the situation changed in 2009.

◆ In 2009, as crude oil prices began to rise again, residual fuel prices moved with the petroleum markets, keeping light-heavy price differentials depressed. Trade press has indicated bunker fuel strength and use of residual fuel for electricity in Asia and the Middle East have contributed to this unusual strength. Residual fuel prices have weakened a bit on a relative basis recently as demand from areas like China and Pakistan have fallen.

◆ But what about the long term? Sulfur restrictions on bunker fuel may reduce residual fuel demand, while squeezing the distillate markets. In the United States, natural gas continues to be well supplied and we have seen natural gas prices fall well below residual fuel. The uncertainty in residual fuel markets East of Suez adds a large degree of uncertainty to the light-heavy price differences.

## Summary

- **Supply and demand balance**
  - Recession deep and long on both sides of Atlantic putting drag on product demand
  - Distillate demand should fare better than gasoline
  - Capacity closures may barely offset additions in U.S.
- **More competitive product trade in Atlantic Basin**
  - Europe's demand/capacity imbalance continues
  - U.S. shows a reduced need for gasoline imports and may remain net exporter of distillates for some time
  - India's Jamnagar export refinery is major new player
- **Prospect for profitability**
  - Both the supply/demand balance and increasing trade competition point to slow recovery in product margins to 2015
  - Complex refinery margins hurt by narrow light-heavy price differentials – driven recently by strong residual fuel market. When and how much that may change is unclear.

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◆ The increasing demand for distillate fuels with softening gasoline requirements should continue to encourage some refiners to increase distillate yields. The U.S. can still increase distillate yields with operating changes and small investments such as those to improve distillation tower efficiencies or expand hydrotreating capacity. Europe may be faced with a continuing declining market for its gasoline, and planned hydrocracking investments will not be sufficient to prevent further growth in gasoline exports.

◆ Europe's imbalance between its demand slate and capacity will continue for some time. Excess gasoline production in Europe will need to find markets beyond the U.S., where gasoline demand is weakening. U.S. refiners may continue to find more opportunities to produce distillate for export. And in the meantime, Jamnagar is demonstrating how well new large export refineries can compete in the distillate and gasoline markets of the Atlantic Basin.

◆ Margins are not likely to improve rapidly as a result of weak demand and increasing competition. The light-heavy price differentials may again expand, albeit not into levels seen during crude oil high prices of 2008. Increased oil sands production will help to widen the spread, as will a weaker residual fuel market than we currently are seeing.

# Questions?

[www.eia.doe.gov](http://www.eia.doe.gov)

[joanne.shore@eia.gov](mailto:joanne.shore@eia.gov)

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