PIRINC

You may be interested.

PIRINC has prepared the enclosed report, *Update on Ethanol*.

In the first four months of 2006, U.S. fuel ethanol production reached an annual rate of 4.5 billion gallons, far above the minimum required for 2006 under the Renewable Fuels Standard established by the Energy Policy Act of 2005 and 22% above year-earlier production. Despite rising production, ethanol prices continued to soar through late June, with infrastructure problems aggravating prices away from ethanol's Midwest heartland. In June, the New York Harbor spot price for ethanol before allowing for blender tax credits averaged nearly $4.50/gallon, up from an average of $2.74/gallon in May and more than triple its June 2005 average price of $1.36. Even allowing for the substantial easing of ethanol prices over the past few weeks, the recent trend in ethanol prices has far outpaced gasoline prices. Spot prices of gasoline, as measured by New York Harbor prices of unleaded 87 octane were more-or-less flat in May and June, averaging about $2.05/gallon when ethanol prices were reaching their peak. Overall U.S. average retail prices were also roughly stable, at about $2.95/gallon for May and June. So far in July, gasoline prices are up, propelled by higher crude costs while ethanol prices have eased, although they remain above spot gasoline prices. Until very recently, the more stable costs of the non-ethanol part of the gasoline gallon (about 90% of the gallon) were limiting the impact of the sharp escalation in ethanol costs.

While imports have filled some of the domestic supply shortfall, they have had to surmount the 51-cents/gallon import fee plus a 2.5% ad valorem tariff on most imports and a tight international market resulting from problems in Brazil, the world's key ethanol exporter. This report expands the discussion of ethanol issues to longer-term considerations that should be kept in mind as Congress weighs still further measures to promote (domestic) ethanol and other renewable fuels. While $70/barrel oil raises policy interest in alternatives and improves their economics, the recent new spikes in ethanol prices and the earlier gasoline price spikes associated MTBE phase-out problems should remind policy-makers of the need to avoid new self-inflicted wounds as they consider further actions to promote alternatives. In particular, as ethanol use expands, supply vulnerabilities increase as well. Any new measures should preserve maximum flexibility to manage such risks and should focus on more advanced technologies that promise far greater energy efficiencies and use of waste products rather than expanding an already high dependence on corn.

If you have any questions or comments, please contact Larry Goldstein or Ron Gold.

July 2006

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Update On Ethanol

Summary

In the first four months of 2006, reported U.S. fuel ethanol production reached an annual rate of 4.5 billion gallons, far above the minimum 4.0 billion gallons of renewable fuel required for 2006 under the Renewable Fuels Standard established by the Energy Policy Act of 2005 and 22% above year-earlier production. Despite rising production, ethanol prices continued to soar through late June, with infrastructure problems aggravating prices away from ethanol's Midwest heartland. In June, the New York Harbor spot price for ethanol before allowing for blender tax credits averaged nearly $4.50/gallon, up from an average of $2.74/gallon in May and more than triple its June 2005 average price of $1.36. Even allowing for the substantial easing of ethanol prices over the past few weeks, the recent trend in ethanol prices has far outpaced gasoline prices. Spot prices of gasoline, as measured by New York Harbor prices of unleaded 87 octane were more-or-less flat in May and June, averaging about $2.05/gallon when ethanol prices were reaching their peak. Overall U.S. average retail prices were also roughly stable, at about $2.95/gallon for May and June. So far in July, gasoline prices are up, propelled by higher crude costs while ethanol prices have eased, although they remain above spot gasoline prices. In effect, until very recently, the more stable costs of the non-ethanol part of the gasoline gallon (about 90% of the gallon) were limiting the impact of the sharp escalation in ethanol costs

Many of the factors underpinning high gasoline prices were discussed in detail in a recent PIRINC report.[1]. That report focused on the widespread price implications of the rapid phase-out of MTBE from gasoline pool, including the accelerated call on ethanol supplies over and beyond the near term capabilities of the domestic ethanol producers to satisfy. While imports are filling some of the shortfall, they have had to surmount the 51-cents/gallon import fee plus a 2.5% ad valorem tariff in place on most imports and a tight international market resulting from problems in Brazil, the world's most important ethanol exporter. This report expands the discussion of ethanol issues to longer-term considerations that should be kept in mind as Congress weighs still further measures to promote (domestic) ethanol and other renewable fuels. While $70/barrel oil raises policy interest in alternatives and improves their economics, the recent new spikes in ethanol prices and the earlier gasoline price spikes associated MTBE phase-out problems should remind policy-makers of the need to avoid new self-inflicted wounds as they consider further actions to promote alternatives. In particular, as ethanol use expands, supply vulnerabilities increase as well. Any new measures should preserve maximum flexibility to manage such risks.

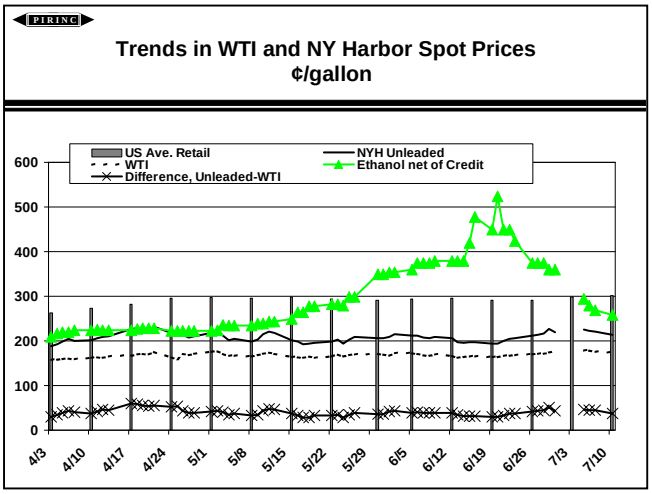
With lead times relatively short for new ethanol capability and numerous announcements of planned new capacity, it's clear that the current law target of 7.5 billion gallons of ethanol by 2012 will be met much earlier. There is great temptation to move the target forward and raise the 2012 figure to maintain the domestic market for producers. But such actions expand an already high dependence on corn-based ethanol and raise costs for taxpayers and consumers. At the very least, new measures should focus on promoting the more advanced technologies that

[1]See the report, **Rising Gasoline Prices: Made in the USA** released in May and available on the web at http://www.pirinc.org/publications.html

promise far greater energy efficiencies and use of waste products rather than competing further with food supplies.

Latest Price Trends

As consumers well know, gasoline prices have moved up after weeks of relative stability, but price movements are far more subdued than those for ethanol. Prices of the ethanol component of the gasoline pool, soared far above retail as well as spot gasoline prices over the Spring, although they have fallen back recently. This chart shows weekly U.S. average retail gasoline prices since the beginning of April as well as daily spot prices for New York Harbor unleaded (87 octane) gasoline and ethanol. The chart also shows spot crude prices as represented by WTI, all on a cents/gallon basis.



On a net of tax credit basis, spot New York Harbor ethanol prices in April were relatively close to spot gasoline prices with both well below U.S. average retail prices. In May and June, however, price trends for ethanol and gasoline diverged sharply. Retail and spot gasoline prices were roughly stable, with slight, erratic declines from peak levels earlier in the spring. Crude prices as well were more-or-less stable, with the differential between crude and gasoline prices narrowing slightly. New York Harbor ethanol on the other hand began moving well above spot gasoline prices in early May and by late May moved above retail prices. In June, ethanol prices surged higher, moving briefly above the $5 level late in the month. Part of the New York price surge reflected infrastructure problems in moving ethanol supplies from its Midwest heartland. In June, New York Harbor prices averaged 72 cents/gallon above Chicago prices, with the daily differentials exceeding $1/gallon in mid-month. In May, the price differential had been only 11 cents/gallon. Rough stability in gasoline prices at a time when the ethanol component was soaring indicated a moderation in costs of the rest of the gasoline gallon. Such moderation is consistent with recovering U.S. gasoline production, higher imports, and growing stocks.[2] However, over the past few weeks, escalating crude costs have put new upward pressure on gasoline prices at a time when ethanol prices have eased substantially.

Despite the ongoing rise in domestic ethanol production, the U.S. was forced to look abroad for additional supply, which meant first, prices had to rise to surmount the 51 cent/gallon tariff currently imposed on ethanol imports beyond a limited amount of duty-free imports permitted

[2] As of mid-June, gasoline stocks were up about 6% or 13 MMB from mid-April aided by a 10% increase in finished gasoline production over the same period and a high level of imports. Nonetheless, although the gaps have narrowed, stocks and production levels are still below year-earlier levels.

from Caribbean sources. However, U.S. ethanol prices have risen by far more than the tariff---a result of the U.S. entering what has turned out to be at least temporarily a tight international market, in large part due to developments in the world's most important ethanol supplier, Brazil.

Brazil Ethanol Production

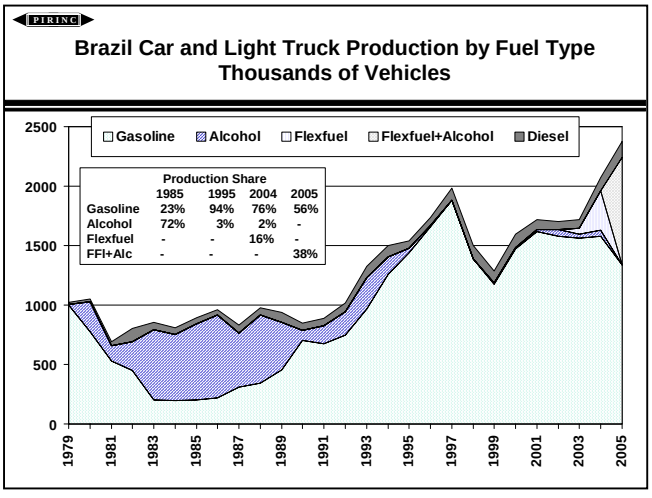
As the table shows, Brazil in 2004/05 produced nearly 4 billion gallons of ethanol. Exports in 2005 amounted to nearly 700 million gallons, about 17% of 2004/05 production.[3] Although most production is used at home, exports had been growing sharply, rising from 200 million gallons in 2003 and 60 million in 2000 (about 2% of domestic production in that year), a much faster pace than growth in production. But this year is different. The latest export statistics for January-May 2006 show a 17% decline in ethanol export volumes, just when the U.S. need for additional imports is most acute. It is not clear from the available statistics to what extent the fall-off in exports reflects poor sugar harvests as opposed to strong increases in local requirements. But reported production for 2004/05 was well above the average level for the 1994/95-2004/05 period and close to the highest level reported. Production has been on occasion much lower, with the lowest level for the period, 2.8 billion gallons reported for 2000/01.[4]

Selected Brazil Ethanol Statistics

Million Gallons	
Production 2004/5	**3,998**
Exports 2005	**693**
% Change in Exports	
Jan-May 06 vs. 05	**-17%**
Recent Production History	
Ave. 1994/95-2004/05	**3,517**
High 1997/98	**4,069**
Low 2000/01	**2,775**

Trends in Brazil's Car and Light Truck Production by Fuel

For the U.S., adverse supply developments in Brazil limited the relief available to U.S. consumers from ethanol imports and propped up prices at the gasoline pump. But supply developments over the longer term have also had a significant influence within Brazil that are worth studying as U.S. policy-makers consider expanding the market for ethanol (and other biofuels) well beyond levels mandated under current law. The influence of domestic supply developments within Brazil is best illustrated by its impact on the country's motor vehicles industry. The next chart



[3] Statistics as published by the Brazil Ministry of Agriculture.

[4] As would be expected, average FOB realizations from ethanol exports have been rising. In 2004, realizations averaged 78 cents/gallon, in 2005, $1.11. For May 2006, realizations averaged $1.46.

summarizes annual trends in Brazil's car and light truck production beginning in 1980 by designated engine fuel.[5] In the late 1970s, the Brazilian government adopted its "Proalcool" program to substitute sugar-based ethanol for petroleum by encouraging production of dedicated ethanol vehicles as well as increased blending of ethanol into conventional gasoline.

By 1985, dedicated alcohol vehicles accounted for 72% of all cars and light trucks produced, with gasoline powered vehicles accounting for 23%, down from 98% in 1979. The remaining vehicles produced in both years were diesel powered. However, in the late 1980s, alcohol supply problems in the face of greatly expanded demand, and a concurrent easing of oil prices, led to a dramatic change in consumer preferences and in the vehicle market. By 1995, the market share of alcohol vehicles was down to 3%, or 41 thousand out of total production that year of over 1.5 million cars and light trucks. The market for dedicated alcohol vehicles never recovered. In 2004, the last year in which separate statistics were published, despite rising oil prices they accounted for only 2% of the market. However, in 2003, Brazil began producing flexfuel vehicles, capable of burning both ethanol and gasoline. In that year, flexfuel vehicles accounted for 3% of total car and light truck production, with its share rising to 16% in 2004. In 2005, the statistical reported a combined alcohol and flexfuel share of production of 38%. For the first 5 months of 2006 (not shown on the chart) the share of this combined category reached 52% of production versus a gasoline vehicle share of 43%.

The rapid growth of flexfuel (but not dedicated alcohol) vehicle production suggests consumers see value in having a choice of fuels given current high oil prices but have no interest in locking themselves into a vehicle dedicated to a fuel with demonstrated supply issues.

U.S. Policy Implications

The more the U.S. expands the role of ethanol, the greater the potential impact from supply variability, especially under the current high tariff regime that expands the scope for domestic price surges. The Brazilian experience also suggests that policies that encourage consumers to lock in directly to ethanol could expose them to significant supply risks. In this regard, there were no reported dedicated ethanol (E85) vehicles made available in the U.S. in 2004, which given Brazilian history, appears to be the right number.

There were on the other hand nearly 675 thousand non-dedicated E85 vehicles made available, all light duty vehicles, and of which two-thirds were SUVs. Non-dedicated E85 vehicles accounted for almost 90% of all alternative fuel vehicles (including hybrids) made available in 2004. These vehicles, which have tended to run almost exclusively on gasoline, have been attractive to vehicle manufacturers because of special advantages granted to such vehicles for meeting CAFÉ requirements.[6] Now, however, with historically expensive oil such dual-fueled

[5] Vehicle sales data are from the country's National Association of Automotive Vehicle Manufacturers (ANFAVEA).

[6] Current law allows CAFÉ mpg for such a vehicle to be calculated as the average of mpg with gasoline and mpg from E85 divided by 0.15. The result is that, for example, an SUV with a gasoline mpg of 20 mpg and an E85 mpg of 15 mpg is counted as achieving 60 mpg (0.5*20+0.5*15/0.15). For model years 1993 to 2004, the increase in the

vehicles could have an option value for consumers, although a low one right now given the current extreme prices for ethanol. There is currently an attempt to open E85 fueling facilities across the country. Drivers of conventional gasoline powered vehicles should be aware that manufacturers could void vehicle warrantees if E85 is used.[7]

Among the energy policy proposals under consideration by Congress is still higher mandated volumes for renewable fuels (at this time overwhelmingly corn-based ethanol) than those enacted into law last year and proposals to require availability of E85 at service stations nationwide. Regarding still higher mandates, the growing vulnerability to supply fluctuations as domestic demand increases has already been noted. Vulnerability is also greater the more protection is given to domestic supply sources, currently through the high tariff on most imports. If the U.S. enters the international market only at times of significant domestic supply shortfalls, international players will have limited interest in investing in capability to meet an uncertain market. As such, when the U.S. does look abroad, it is likely to pay more and get less---as is currently the case. Congress would do better to reserve any new incentives for more advanced production technologies that are more energy efficient, use waste products, and effectively diversify supply sources away from overwhelming reliance on corn.

The mandate regime as enacted last year does have two important features that ease potential problems. First, the rules allow for trading of credits, which, other things equal, allow for ethanol to flow to its most economic locations. Second, the rules do not specify how ethanol is used, i.e., blended into gasoline or sold as E85. When ethanol is blended into gasoline, if ethanol supplies are tight, the amount blended could be adjusted (if waivers as allowed for in the law under certain conditions are granted) to maintain overall gasoline supplies. Using less ethanol in the gasoline would mean using more petroleum blendstock to maintain volume. With E85, the way to adjust to an ethanol supply shortfall is to produce less E85 or, if volumes are to be maintained, pull ethanol out of the gasoline pool raising oil requirements to compensate in any case.

As ethanol supply volumes increase over the coming years and prices come down, consumers would see increasing value in vehicles with an alternative fuel option and would have greater interest in buying the alternative fuel. There are proposals to hurry this process along by requiring availability of E85 across the country. But there are good reasons not to rush. First, E85 is more vulnerable to ethanol supply problems than the overall gasoline pool with its blending flexibility and second, there are costs involved in requiring physical volumes to move where they would otherwise not economically go.

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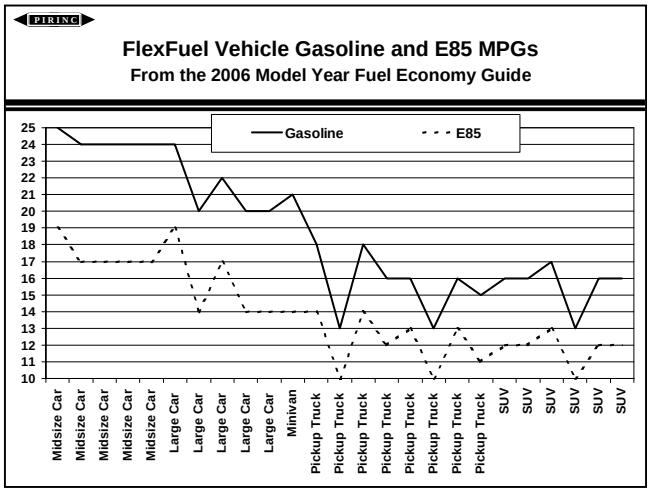
overall CAFÉ fleet average attributable to dual-fueled vehicles was limited to 1.2 mpg. The limit has been reduced to 0.9 mpg for model years 2005 to 2008.

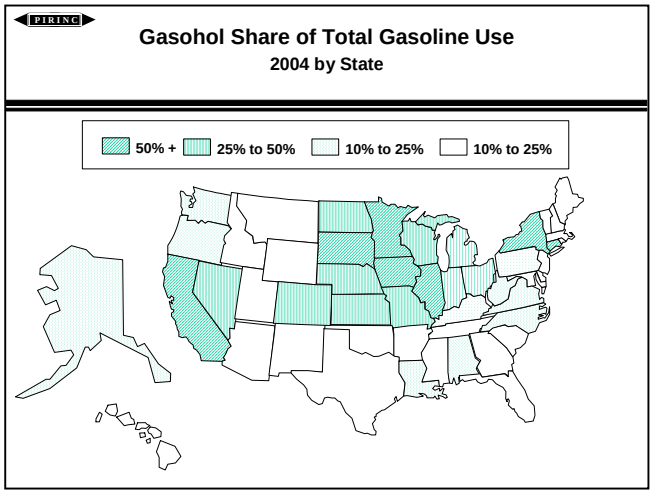
[7] Flexfuel vehicles have been modified to allow for the otherwise corrosive effects of high concentrations of alcohol on conventional gasoline vehicles--- the use of stainless steel as opposed to coated sheet steel for fuel tanks, modifications to fuel pumps and fuel lines, etc. Drivers of unmodified conventional gasoline-powered vehicles should not use E85 to avoid damage to their vehicles.



On an economic basis, E85 should be significantly less expensive than gasoline at the pump to be economically attractive to consumers choosing between the two. This is because thanks to a much lower energy density for ethanol, dual fuel vehicles using E85 get significantly less miles per gallon than when using gasoline. A gallon of ethanol contains 76 thousand Btu while a gallon of gasoline contains about 115 thousand Btu. The next chart shows fuel economy figures for model year 2006 flexfuel cars and light trucks as published in the Department of Energy's 2006 Fuel Economy Guide. Of the 25 vehicles listed as flexfuel, 17 are light trucks (8 pickup trucks, 6 SUVs and 1 minivan) while 10 are cars evenly divided between large and midsize. Overall, the same vehicles running on E85 achieved about 25% fewer miles per gallon than when they ran on gasoline.

In effect, without a significant price difference in favor of E85, the consumer has no economic incentive to buy that fuel, although there could still be some value in having a vehicle with the option to use it. With ongoing high oil prices, there is ample room for ethanol prices to come down substantially as domestic supplies expand while still preserving other policy objectives of supporting the country's agricultural interests. Current Federal and selected state incentives also hold down E85 prices to consumers but of course at the expense of taxpayers. As of end-June, the Department of Energy reports a total of 676 service stations in 37 states plus the District of Colombia. As would be expected, the numbers are concentrated in the Midwest, with the highest number, 205, in Minnesota followed by Illinois with 106. Although the numbers are very small they have been growing rapidly. A Department of Energy report released in early 2002 estimated the nationwide total at that time at about 50.

Geography of Ethanol Use



Part of the gasoline price increases seen this year reflected logistics costs of moving greatly expanded volumes of ethanol from their production sources concentrated in the Midwest to distant locations, particularly near the coasts, in a relatively short timeframe. These areas presumably would have easier access to imports but both the high tariff and a tight international market limited immediate supply possibilities. However, certain large coastal states had moved earlier to ethanol, helping to contain

immediate strains on distribution systems.

As a proxy for ethanol use, the next chart shows a map of the U.S. coded by share of gasohol in total gasoline use within each state in 2004, the latest year for which FHWA data are available. In 7 states, gasohol accounted for at least 50% of total gasoline use and 25% to 50% in a further 9 states. Most of the states with high gasohol shares were, as expected, in the Midwest, close to domestic production sources. But California, the nation's largest gasoline market, on the west coast, and New York and Connecticut on the east coast were in the 50% plus group. The three states had previously enacted MTBE bans that took effect in 2004. The states are major markets for reformulated gasoline and therefore needed at a minimum to replace MTBE used to meet the Federal reformulated gasoline oxygenate requirement with ethanol.[8]

An additional 10 states had gasohol shares between 10% and 25%, mainly on the coasts. This still left certain significant MTBE-based reformulated gasoline areas with minimal gasohol use in 2004, in particular Texas, and other northeast and mid-Atlantic states such as Massachusetts, Maryland, New Jersey and the nation's capital.

Concluding Comments

Current law already guarantees an expanding market for ethanol, even before proposals to raise mandated volumes still further. As use grows, there is a need to consider how to manage the supply security issues associated with this fuel. While the underlying factors contributing to supply risk are very different from those associated with oil, the Brazilian experience demonstrates they are nonetheless significant.

At the very least, additional measures to promote ethanol should not aggravate supply risks by reducing flexibility in how the overall mandates are met. The U.S. should also reconsider its policy toward imports. While favoring domestic production is a political given, the current approach makes the U.S. an erratic, potentially disruptive customer for international markets and therefore likely to find less supply at higher prices when needed most. As noted above, reserving any new incentives for more advanced technologies that don't rely on corn would, by diversifying supply sources help contain supply risks.

In terms of overall costs, the mandate approach by itself guarantees markets for renewable fuels with direct costs paid by consumers. Mandates call into question the need for ongoing, let alone still further, tax credits or other subsidies at taxpayer expense, especially for well-developed supply options such as corn-based ethanol. The rush of investors into ethanol production suggests the current combination of high prices, mandates, and tax credits are more than enough. The case is stronger for support of more prospective, advanced renewable supply possibilities, in line with public encouragement of new and emerging technologies in other areas.

[8] California alone accounts for about 35% of nationwide reformulated gasoline use while New York and Connecticut account for about 10%.