EPRINC
formerly PIRINC

July 2007

You may be interested

EPRINC has produced the enclosed report, "***Where is the US Motor Fuels Market Headed?***"

Demand for motor fuels in the United States has steadily grown over the past fifteen years. Motor gasoline and diesel demand alone rose by over 3 million barrels/day (mmb/d), from a combined 8.6 mmb/d to 11.7 mmb/d between 1990 and 2006. With continued economic growth this demand is likely to increase over the next decade, though price rises of the past few years will temper the rate. Domestic capacity to refine petroleum into motor fuels, already strained by past increases in demand, is likely to expand modestly, although the amount of expansion is uncertain.

Policy makers have expressed concern over rising refiner margins, high gasoline prices, and growing dependence on petroleum imports. As a response, a raft of anti "price gouging" legislation as been introduced in both Houses of Congress, along with an assortment of new energy taxes.

The Administration has stated that the US is "addicted" to oil and has proposed programs aimed at cutting gasoline demand 20% over 10 years. In addition, rising concern about US carbon dioxide emissions has elicited proposals to limit these emissions, probably through use of a cap and trade program. Such measures would put a price on carbon and raise the price of all fossil fuels. Clearly, these policy and legislative initiatives offer far-reaching implications for refinery investment and energy policy generally.

This report examines the economic and policy factors that have played a large role in the in the US motor fuels market, and quantifies future outcomes based on a range of possible economic and policy conditions. These include aggressive pursuit of biofuels programs, increases in Corporate Average Fuel Economy (CAFE) standards, dieselization of US motor fuels, and the pricing of carbon emissions.

Our findings suggest there will be substantial effects on the gasoline market, but fairly small effects on the diesel market. The Administration's program to decrease gasoline demand 20% in 10 years is unlikely to reach that goal, but pursuit of biofuels and higher CAFE standards still could substantially reduce historic gasoline demand growth. Continued economic growth should stimulate diesel demand, though constraints on carbon may temper its rate of growth. Overall, demand for motor fuels is likely to grow, with much of that growth concentrated in the diesel market.

Ordinarily, this rising fuel demand would elicit additions to U.S. refining capacity. However, proposals to control refined product prices and other measures to intervene in open fuel markets, or to impose special taxes on refiners, are likely to discourage such investment. Further, efforts to mandate biofuels, as a substitute for petroleum based motor fuels, creates a new level of uncertainty in the downstream petroleum market.

Government policy is inherently unpredictable and mandates today may not be in place in the future. Some mandates are likely to have unintended consequences not yet fully understood. As a result, refiners face more rather than less risk in making decisions on how much capacity to add over the next ten years. We see a contradiction between the current market and recent policy proposals: Market forces imply a need for more domestic refining capacity, while legislative and policy initiatives discourage it.

Michael Canes, a consulting economist to EPRINC, provided the research and analysis for this report. If you have any questions, please contact Lucian Pugliaresi, Larry Kumins, or Larry Goldstein. Telephone 202 944 3339, 202 944 5082 (direct), Fax 202 944 9830. Please send any written inquiries to Ms. Yulan Guo at yulang@eprinc.org.

Recent publications covering a range of topical energy and petroleum issues can be found on our website

www.eprinc.org

EPRINC

ENERGY POLICY RESEARCH FOUNDATION, INC.
(formerly PIRINC)
1031 31ST STREET, NW
WASHINGTON, DC 20007

Where is the US Motor Fuels Market Headed?

Introduction

Over the past 15 years, motor fuel demand in the United States has headed steadily upwards. On average, gasoline demand has increased about 1.5% per year; on-road diesel demand has risen faster---up almost 4% annually. While this increase in demand largely has been the result of increased US prosperity, concerns have been expressed that the country is becoming too dependent on imported crude oil as well as imported refined products, notably gasoline. An additional concern is that the nation may be producing too much carbon dioxide.

In his 2006 State of the Union Address, for example, President Bush announced that the US has become "addicted" to petroleum.[1] He since has announced a goal of reducing annual US gasoline demand 20% in 10 years, through a combination of increased use of biofuels and higher light vehicle fuel economy standards. Also, while the US has not agreed to greenhouse gas limits under the Kyoto protocol, proposals proliferate in Congress to constrain US carbon emissions beginning in 2010, if not before.[2]

What effects on motor fuel demand might these various programs have? US population continues to increase. Incomes are rising. The US light vehicle fleet continues to expand. These forces inexorably push gasoline and diesel demand upwards. On the other hand, fuel prices have been rising. Technological means are at hand to increase vehicle fuel economy. The biofuels industry is booming. These and other factors could constrain the rise in petroleum motor fuel demand if not reverse it.

Finally, refiner profits in the first half of 2007 were high by historic standards but have fallen substantially in July 2007. Unscheduled shutdowns and ongoing required maintenance have caused short run motor fuel prices to rise substantially. In response, some in Congress and elsewhere have proposed anti "price gouging" legislation as well as special taxes on refiner profits.[3] These policy responses also bear on the willingness of firms to make large and long-term capital investments in new US refining capacity.

---

[1] In that speech, Bush stated that "America is addicted to oil, which is often imported from unstable parts of the world."

[2] For example, Senator Diane Feinstein (D-CA) has introduced a bill which would cap annual US greenhouse gases at 2006 levels beginning in 2010 and ratchet them downwards in subsequent years.

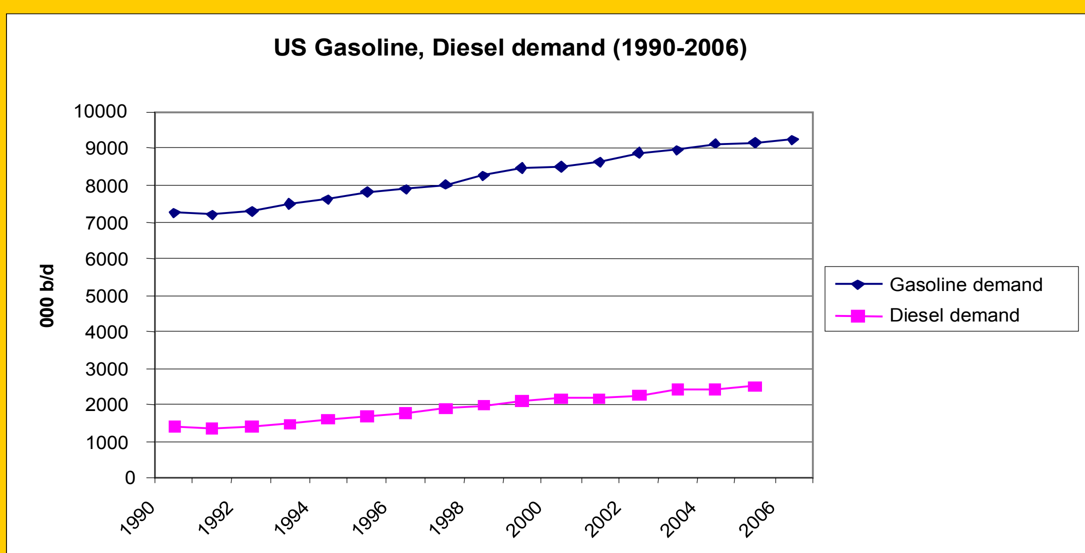
[3] For example, the "Petroleum Consumer Price Gouging Protection Act," sponsor by Senators Cantwell (D-WA) and Smith (R-OR) has been approved by the Senate Committee on Science, Commerce and Transportation. Numerous approaches to taxing "excess" oil profits have been proposed, among them taxes on profit increases over some base period, new excise taxes, taxes on inventory profits and others.

In this assessment, we examine the factors that influence US motor fuel demand to draw a picture of what is likely to happen over the next decade. A 10-year time span is chosen because beyond that the picture becomes less clear. Fuel prices, the state of technology and policy all might be very different from today so that projections beyond 10 years are highly uncertain. Still, a ten-year perspective can tell us a good deal about what the state of the world might look like by 2017.

BACKGROUND

Figure 1 below shows US gasoline and diesel demand from 1990 to 2006 (diesel demand through 2005). Gasoline demand grew at a 1.5% annual rate, rising from 7.2 million to 9.2 million barrels/day (mmb/d). Diesel demand rose virtually without slowing at a rate of 3.9% annually, increasing from 1.4 mmb/d to 2.5 mmb/d.

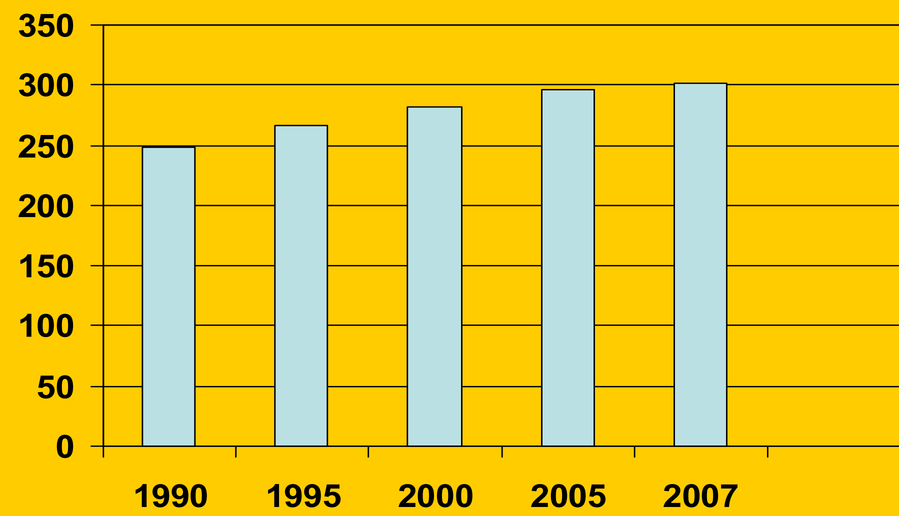
Figure 1: US gasoline & diesel demand - 1990-2006



Source: Energy Information Administration (EIA), Monthly Energy Review.

The principal factors affecting demand for motor fuels are national income - the combination of population and per capita GDP---and price. Figure 2 shows rising population during the 1990 to 2007 time period.

Figure 2: US Population in Millions



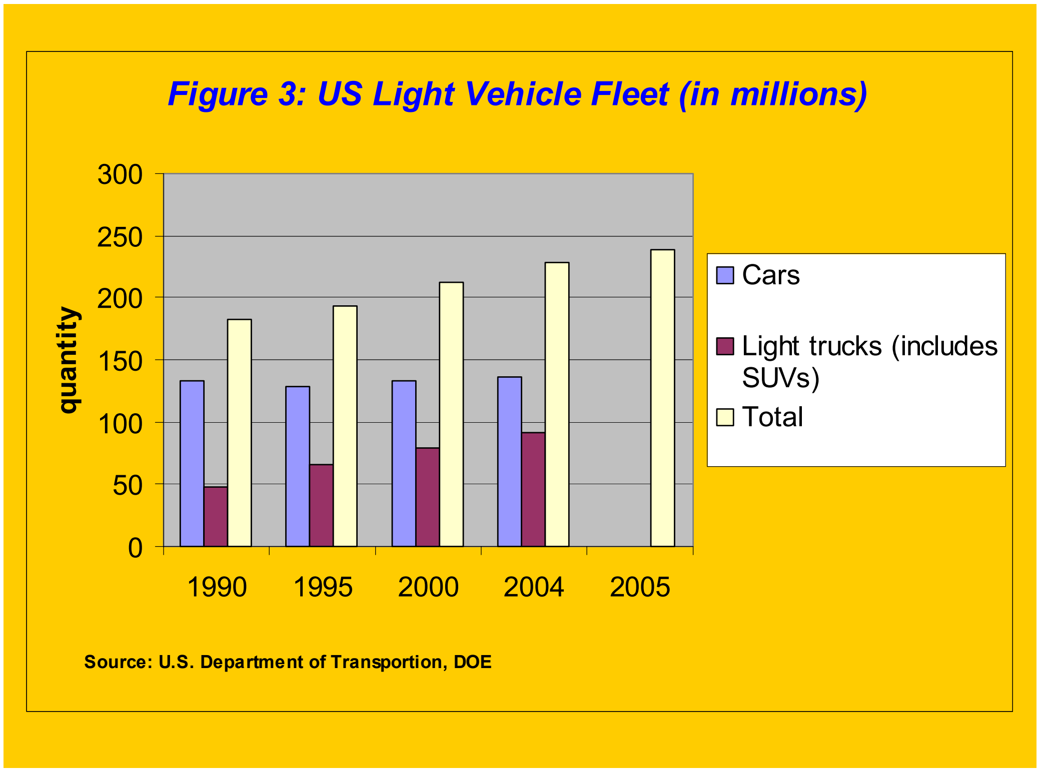
Source: US Bureau of the Census

Between 1990 and 2005, population increased by 19.2%, or 1.2%/yr. The Census Bureau projects US population will number 309 million by 2010 and 336 million by 2020. The projected rate of increase, below 1%/yr, is less than what occurred between 1990 and 2007; it appears conservative.

Per capita income also has been rising. In 1990 per capita US income was $19,500; by 2005 it was $34,600, an increase of over 77%. The GDP deflator increased by 33% over the same period, implying real income rose 44 percent.

Increasing population and real income lead to increased numbers of vehicles on the roads, as has been the case in the United States. Further, the composition of the fleet has been changing, from mostly passenger cars to a combination of cars, light trucks, and Sport Utility Vehicles (SUVs).

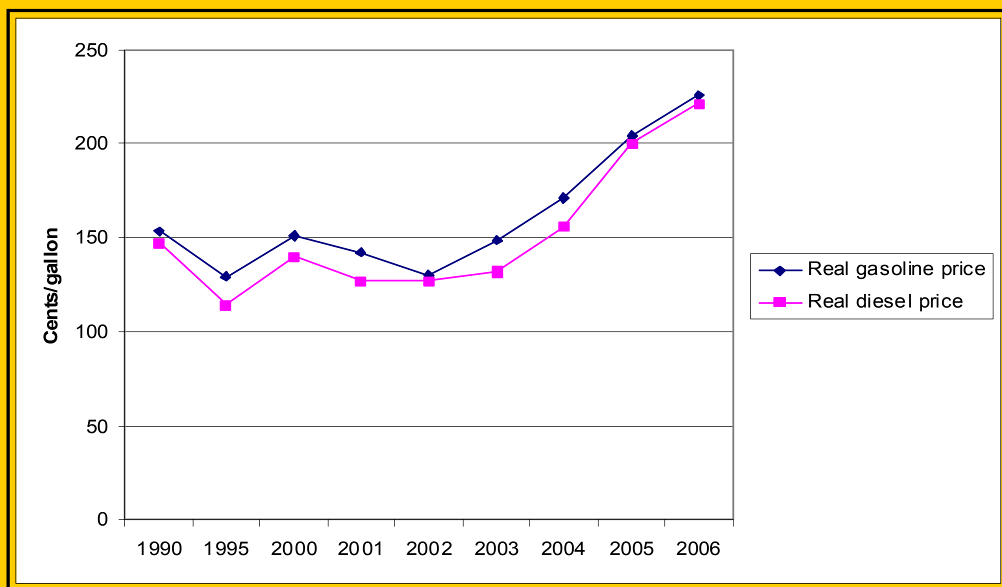
Figure 3 below shows the US light vehicle fleet between 1990 and 2005.



Between 1990 and 2004 the number of automobiles changed very little, but the numbers of light trucks and SUVs changed a great deal. In 1990 light trucks and SUVs comprised about a third of all light vehicles sold in the US. But since 2000, these categories have comprised between 50 and 55 percent of all new light vehicles sold. Thus, their numbers have been rising both absolutely and as a proportion of the vehicle fleet.

Real (inflation adjusted) prices for gasoline and diesel over the same period are shown in Figure 4. From 1990 through 2002, real prices did not rise, but since then there has been an increase of about 50% in both fuels. Real prices have risen even further in 2007. These increases will have an effect on demand over time; in particular they will change the choices consumers make on the types of vehicles they decide to buy.

Figure 4: Real price of gasoline, diesel between 1990 and 2006 ($2000)



Sources: EIA Monthly Energy Review, CPI deflator

Projecting Forward

<u>Gasoline market</u>

A recent survey of gasoline demand studies performed since 1990 suggests that elasticity of demand with respect to price in the US is -.5 in the intermediate term and -.75 in the long term. Elasticities of demand with respect to income in the intermediate and long term are .65 and 1.0.[4] If long term demand is mainly a function of these two variables, the predicted demand increase between 1990 and 2005 is 28 percent. Actual demand over that period increased just less than 27 percent, indicating that these parameter estimates and the assumption that price and income largely explain long run gasoline demand, are close to the mark.

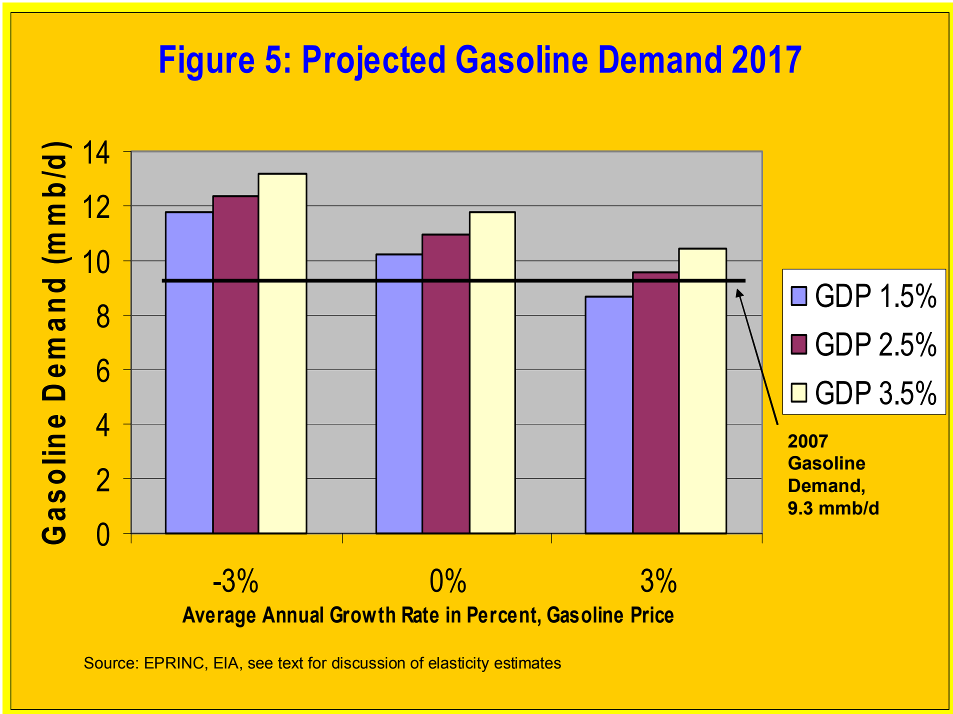
What about the next 10 years? This is too short a period for US light vehicle fleet to turn over completely.[5] It will take several additional years for a price increase in any given

---

[4] Dahl, Carol, "Energy Demand Elasticity Survey: A Primer and Progress Report," draft manuscript, April 2007.

[5] The median age of US passenger cars is 9 years. On average, American cars last almost 17 years.

year to substantially alter the vehicle stock. With this as a consideration, Figure 5 below reflects use of intermediate term elasticity to project demand growth under a variety of price and GDP growth assumptions.



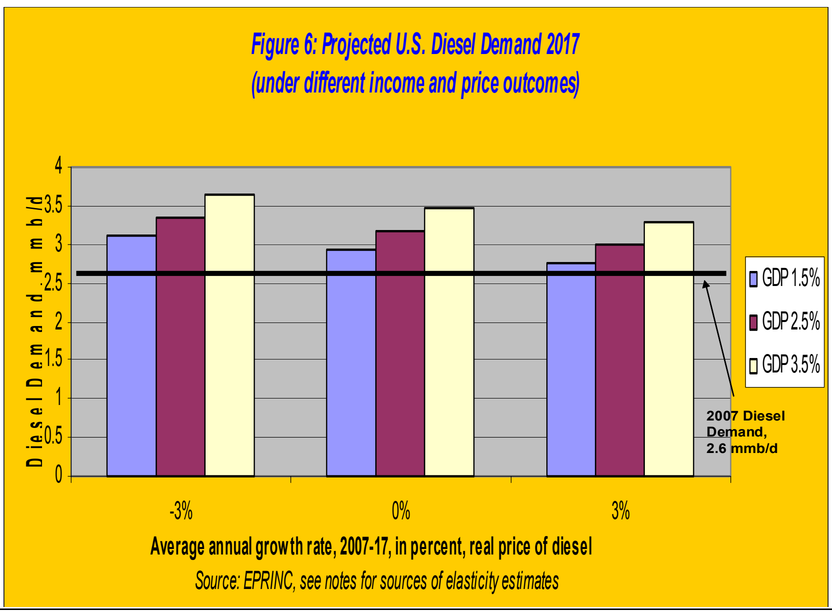
Growth in gasoline demand ranges from -7% to 42%, where the former represents consistently slow economic growth and steadily rising real prices at 3%/yr while the latter represents rapid economic growth coupled with steadily declining prices. The true range is probably narrower. Rapid economic growth coupled with steadily declining prices seems unlikely since the growth probably would push demand up and exert upwards pressure on prices. On the other hand, economic growth is likely to average more than 1.5%/yr, i.e., we expect consumers will continue to see sustained in real incomes consistent with recent history.

A medium case might be moderate (2.5%/yr) economic growth with no change in real prices over the decade. That would imply an 18 percent overall increase in gasoline demand. However, the projection probably is high for two reasons. Consumers still are adjusting to the real price increases of the past few years, and real prices have continued to rise so far in 2007. Accounting for likely consumer adjustments to recent price increases in motor fuels, growth of 10-15% over the next decade under the mid-case assumptions is more likely.

How do the projections compare with EIA projections of gasoline demand? In its annual energy outlook, the Department of Energy projects declining real gasoline prices followed by increases. It also projects 2.9%/yr annual economic growth, between our 2.5%/yr and 3.5%/yr growth cases. Using our parameter estimates, these assumptions would yield projected growth of around 22% over the next 10 years, though past price increases likely would reduce this to 15-20%. However, in its Annual Energy Outlook, DOE projects growth of only around 1.2%/yr or 13% for the decade. This is within the range of our mid-case estimate.

Diesel market

Estimates of the impact of price and income on diesel demand have been made for the entire OECD, not just the United States.[6] They suggest a higher long run income elasticity of demand than for gasoline, around 1.15, and a lower long run price elasticity, around -.3. Using these parameter estimates to predict the growth in diesel demand between 1990 and 2005, we get 71%, not much different from actual growth of 78% over the period. Projecting forward using intermediate term elasticity, we obtain the results shown in Figure 6 below.



In all of the cases, diesel demand rises, although the rise might not be as great as shown because diesel consumers are still adjusting to past price increases. Under mid-case assumptions, this might reduce growth to around 15-20 percent. Nevertheless, the clear implication is that so long as US GDP continues to rise, the on-road diesel market is likely to remain strong.

[6]See Dahl, Carol, "Oil and Oil Product Demand," for the *Encyclopedia of Hydrocarbons*, Published by the Instituto Della Encyclopedia Italiana Treccani.

Technology and Policy Options to Reduce Future Motor Fuel Demand

Biofuels

President Bush's plan to reduce US gasoline demand 20 percent by 2017 is based on two approaches:

- *an aggressive effort to substitute biofuels for gasoline (15% reduction);*
- *a 4%/yr increase in the fuel economy of new light vehicles sold in the US (5% reduction).*

If the market otherwise would have grown by 13% as projected by EIA, from 140 billion gallons per year (the equivalent of 9.1 mmb/d in 2006) to 158 billion gallons (10.4 mmb/d in 2017), biofuels would replace 24 billion gallons and rising fuel economy standards would conserve another 8 billion.

How realistic is this? Most of the biofuel contribution would have to come from ethanol. Biodiesel will reduce diesel demand somewhat, but US biodiesel production is projected to increase to only 650 million gallons by 2015.[7] If diesel demand grows 15-20% between now and then, this would be only a little over 1% of the total market.

Ethanol is presently made almost exclusively from corn, and that is not likely to change dramatically over the next 10 years.[8] In 2006, 23% of US corn production of somewhat less than 10 billion bushels was devoted to the fuels market, yielding about 5.3 billion gallons. More acreage will be devoted to corn in 2007 and higher yields per acre may be possible. Processing capacity exists or is under construction to produce as much as 12 billion gallons of ethanol by 2009. However, this could consume one-third of the US corn crop, with consequent effects on food markets. Further, because ethanol has only 67% of the Btu content per gallon as gasoline, this is only 8 billion gallons in gallons of equivalent gasoline after adjusting for ethanol's lower Btu value. That is but one third the 2017 goal.

[7] Biodiesel Board, "Biodiesel Backgrounder," www.biodiesel.org

[8] In the long term, ethanol from cellulose may make an important contribution to supply. DOE has offered $385 million in grants to build plants capable of supplying ethanol from cellulosic sources. However, at least three technical hurdles must be overcome at production scale. The cellulosic portion of the feedstock must be isolated, the cellulose must be enzymatically degraded into sugars, and those sugars need to be fermented to turn them into ethanol. Different cellulosic sources require somewhat different processes, complicating the challenges further. DOE's National Renewable Energy Laboratory has set a goal of cutting the cost of cellulosic ethanol by 50% over 5 years, which would make it competitive in the marketplace. However, the steps to doing so are likely to take longer than that and it appears unlikely that this technology will produce large quantities of fuel within 10 years.

Presumably, land that is now used for other crops could be replanted with corn to provide feedstock to the fuel market. That would reduce pressure on the corn market but would raise prices of other agricultural commodities. Also, some land now held in reserve might be released for purposes of upping aggregate corn production. But some of that land is unsuitable for corn and yield on other such acreage is likely to be low. Production devoted to the fuels market could yield 15 billion gallons by 2017, but even this would replace only 10 billion gallons of gasoline.[9] It seems clear that US corn-based ethanol cannot replace 24 billion gallons of gasoline by 2017.

Another option is to relax import barriers to ethanol in order to induce greater supplies from around the world. However, to date domestic producers have successfully opposed such relaxation and in any case such a program would merely replace one form of imported fuel with another. In all likelihood, US produced ethanol will slow growth in demand for gasoline but not prevent it. Even if that growth is no greater than DOE projects and 15 billion gallons of ethanol are supplied by 2017 (equal to about 650,000 b/d of gasoline), ethanol will replace only a little more than half the projected growth amount (10 billion of 18 billion gallons).

Tightened CAFE standards

A number of studies have examined prospects for raising the average fuel economy of US vehicles. For example, the National Academy of Sciences in 2002 and Energy and Environmental Analysis, Inc. in 2006 identified technologies already in commercial use that could be employed to increase fuel economy throughout the fleet. These include rolling resistance reduction, improved lube oils, weight reduction, engine friction reduction, and alternator improvements among other technologies. An analysis conducted at Oak Ridge National Laboratory finds that at gasoline prices between $2 and $3 per gallon, increased light vehicle fuel economy of 30 to 50 percent will more than pay for itself.[10]

Other vehicle technologies also may contribute to increased fuel economy over the next 5-10 years. These include Homogeneous Charge Compression Ignition and hybrid electric vehicles, including plug-in hybrids with advanced batteries. But, the contributions of these technologies likely will be limited over this time period.

Proposals have been made to raise US Corporate Average Fuel Economy (CAFE) standards as a means to increase light vehicle fuel efficiency. For example, Senators Richard Lugar (R-IN) and Barack Obama (D-IL) have introduced the "National Fuel Initiative," which would mesh light trucks with autos and increase the overall CAFE

---

[9] DOE's Office of the Biomass Program projects 2017 ranges for corn-based and cellulosic ethanol of 12.5-15 billion and 2-5 billion gallons per year (bpy), respectively. Combined, this is 14.5-20 bgy. The lower end of this range, mainly from corn ethanol, seems more likely.

[10] David L. Greene, "The President's State of the Union Fuel Economy Plan: How I know it will work," Presentation at 11th Annual Washington Energy Policy Conference, April 20, 2007.

standard by 4%/yr. For purposes of analysis, we initially assume that from 2008 through 2017, average annual mpg among the US light vehicle fleet will increase by that number.

Each year, new vehicles comprise around 7% of the vehicle fleet. The scrappage rate is only about 4.5%; the vehicle fleet is expanding. To begin with, we assume that 7% of the fleet turns over every year, with no net gain.

At present, light vehicles average 21 mpg.[11] Thus, in 2008 the 7% of new vehicles would average 1.04 x 21 or 21.8 mpg. The 2009 new vehicles would average 22.7 mpg and so on. Since new light vehicles make up only 7% of the fleet, the average increase in mpg from the first year increment is only .07 x .04 = .0028 or .28%. In the second year, the percentage gain would be from a slight higher mpg base. By the 10th year, new vehicles would average 21 x 1.0410 raised to the 10th power or about 31.1 mpg.

Under these assumptions, the 2017 fleet would consist of 10 years of vehicles averaging 26.2 mpg (assumed to be 70% of the fleet) and another 3 years worth averaging 21 (30%). Fleet average fuel economy would be 24.6 mpg, a gain of 17%. A vehicle traveling 13,000 miles per year, the average in the US, would consume 528 gallons of gasoline rather than 619, a savings of 15%. This arithmetic suggests that growth in gasoline demand would be significantly affected.

However, the actual gain in fuel economy between 2008 and 2017 from increasing CAFE standards by 4%/yr is likely to be considerably less. For one thing, the 2008 and 2009 models already are past the design stage, so that a new program probably would not be implemented until the 2010 model year at the earliest. This would reduce the average mpg of new vehicles sold between 2008 and 2017 to 24.3, and the overall fleet average to 23.3.[12]

Automakers receive credit towards CAFE goals by marketing flexible fuel vehicles, vehicles able to use alternative fuels such as ethanol or methanol as well as gasoline. The credit allows each manufacturer to increase the calculated CAFE value of its fleet by up to .9 mpg. However, almost all of today's flexible fuel vehicles are run on gasoline so that their production has little effect on demand. If 0.9 is deducted from 24.3, new vehicles would average 23.4 mpg and the fleet average would be 22.7 mpg. A vehicle traveling 13,000 miles would consume 573 gallons rather than 619, a fuel economy gain of about 7.4%. Daily demand for gasoline would be reduced by about 775,000 b/d.

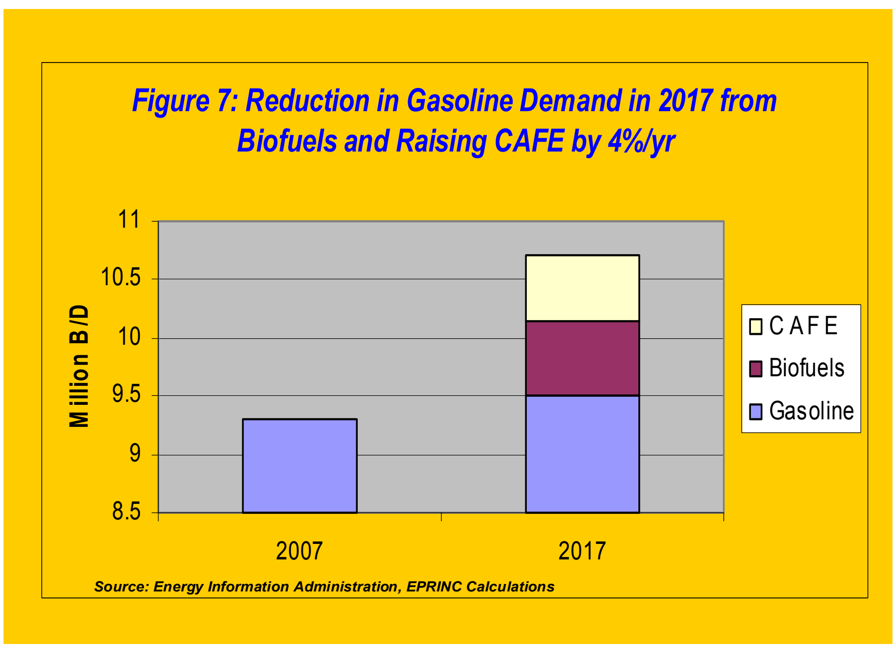
Other factors would reduce the impact of increased CAFE standards further. Better gas mileage means a lower cost of travel, which will induce people to drive more. This so-

[11] US EPA. "Light Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2006." July 2006.
[12] Of course, if CAFE standards continue to increase past 2017, the effects would continue to grow.

called "rebound effect" is estimated to be around 20 percent. The average gain in fuel economy in new vehicles is effectively reduced by .5 mpg, to 22.9 mpg.

In reality, the light vehicle fleet likely will continue to expand by a few million vehicles per year. If this occurs mainly through old vehicles lasting longer---in contrast to extra new vehicles being sold---then new vehicles will comprise less than 70% of the total in 2017, closer to 60%. In that case, raising CAFE standards by 4%/yr for new light vehicles between 2010 and 2017 would result in fleet average fuel economy of about 22.1 mpg and a reduction in daily demand for gasoline of about 550,000 b/d.

If a biofuels program yielding 15 billion gallons in 2017 is combined with a program to increase CAFE 4%/yr for the light vehicle fleet, gasoline demand would be affected as shown in Figure 7 below. Assuming base case growth of 15% between 2007 and 2017, from 9.3 mb/d to 10.7 mb/d, biofuels would reduce demand by 650,000 b/d and CAFE standards by another 550,000 b/d. The two together would reduce demand by around 1.2 mb/d, to about 9.5 mb/d. President Bush's goal of a 20% reduction in gasoline demand would be only partly met, but the combined programs nevertheless would have a significant effect on gasoline demand.



Dieselization

Another means to reduce US motor fuel consumption would be a massive transformation of the light duty vehicle fleet from gasoline to diesel. Fewer gallons would be needed to propel vehicles because diesel has about 14% more Btu's per gallon and because it combusts more efficiently than gasoline. The two effects combined result in a vehicle of given size and weight going about 30% further on a gallon of diesel than on a gallon of gasoline. Thus, for given aggregate vehicle miles traveled, about 23% fewer gallons would be needed. [13]

To help achieve greenhouse gas reduction goals, European nations have encouraged such a vehicle transformation through differential taxation of diesel and gasoline. The policy appears to be working. Despite diesel vehicles being more expensive (approximately $3000 more for a comparable light vehicle), 50% of new cars sold in Europe in 2005 were fueled by diesel.

The present situation favors the United States in one important respect. European refineries are producing more gasoline than is being consumed there and are exporting about 800,000 b/d to the world market. At the same time, the US is importing more than 1 mmb/d of gasoline and gasoline components from world refining centers. Gasoline prices in the US would be higher were European refineries not over-producing relative to EU demand. To some extent, in Europe gasoline has now become an unwanted by-product of rising throughput to meet diesel demand.

A new policy to encourage diesel use in the United States would require US refineries to substantially change their makeup. At present, the product mix is heavily oriented towards gasoline, which makes up over 50% of production. Only a little over 20% is diesel. A large-scale switch from gasoline to diesel would render past capital investments in catalytic cracking less valuable and would require large new investments in hydro treating and hydro cracking. In the short run, such a policy would put pressure on the diesel market. In the longer run, increased US diesel production capacity would relieve that pressure, but several years time would be required and cost recovery would be necessary. US policy makers are indicating a preference for biofuels and fuel economy measures as the core strategy to reduce motor fuel consumption. Although diesel fuel offers considerable potential for fuel savings, it appears unlikely that this alternative will be given serious consideration at this time.

Carbon Tax

Increased motor fuels taxes sometimes are discussed by policy analysts, but rarely by policy makers, who would have to deal with voters' wrath over a widely unpopular measure. Such taxes would likely slow economic growth as well as reduce the efficiency of distribution of goods. Further, these imposts would be unpopular with motorists, whose real incomes would be cut and their mobility curbed. Other unresolved questions

[13] The net reduction in petroleum use would be less, however, because more oil is required to make diesel fuel than gasoline. Adjustment for this factor would reduce the net fuel efficiency advantage of diesel over gasoline by about 20%.

include what would be done with potentially large revenues, and how these monies would be recycled within the economy.

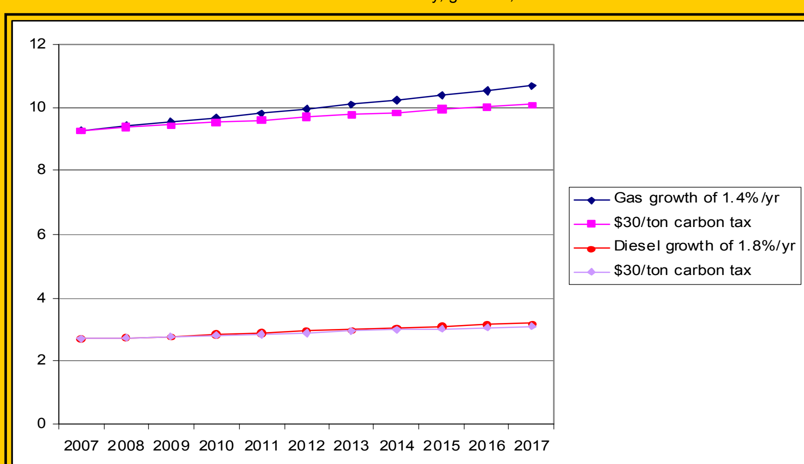
Although higher motor fuels taxes are unlikely in the near future, constraints on aggregate US carbon emissions are being aggressively advocated. A quantitative limitation on carbon emissions coupled with an allowance trading system is most often discussed. Such a limitation would have many of the properties of a tax on carbon, though it would not be entirely equivalent. Without knowing the specifics of what might be done it is difficult to precisely predict the future price of prospective carbon allowances, but there is experience within the EU of carbon allowance trading and the price ranges that emerge.

For analytic purposes, we assume an allowance price of $30 per ton of CO_2, which roughly equates to $.30/gallon of motor fuels. Further, assume the price is set in 2008 and remains constant in real terms through 2017. A base price of $2.60 per gallon for both fuels is also assumed. We assume too that gasoline demand would rise 1.4%/yr or 15% over 10 years if there were no carbon constraint; diesel demand would rise 1.8%/yr or 20% over 10 years; and that elasticity of demand increase in even increments towards intermediate term values of -.5 for gasoline and -.2 for diesel (for example, elasticity of demand for gasoline is assumed -.05 in 2008, -.1 in the 2009, etc.).

Figure 8 below indicates the impact of the carbon constraint on motor fuel demand.

Figure 8: Impact on motor fuel demand of an allowance price of $30/ton of CO2

Millions of barrels of day, gasoline, diesel



Source: EPRINC Calculations, see text for discussion

By 2017 gasoline demand is calculated to be 600,000 b/d below what it otherwise would have been. But it still is more than 725,000 b/d above 2007 demand. Diesel demand in 2017 grows by over 400,000 b/d; it is only about 70,000 b/d below what it otherwise would have been. Together, the $30/ton implicit tax on carbon reduces demand for motor fuels by about 670,000 b/d in 2017.

Conclusions

Economic growth, fuel prices, and policy choices will determine the rate of growth of gasoline and diesel markets over the next decade. Diesel demand is mostly sensitive to economic growth. As a result, the diesel market will remain strong if the economy continues to do well. Growth of 15-20% in motor fuels over the next decade would be slower than the recent past, but continued adjustment to past price increases and a somewhat lower economic growth rate plausibly will push future growth into that range. Biofuels and carbon policies would constrain diesel demand growth further, perhaps to the lower end of the range.

The gasoline market also will grow with the economy but is more sensitive to price and is still adjusting to past price increases. Base case growth of 15-20% over the next 10 years is plausible. However, biofuels, CAFE policies, and changes in the vehicle mix together could reduce gasoline demand by up to 1.2 million b/d. Alternatively, constraints on carbon emissions plus biofuels substitution could reduce overall motor fuels demand by as much as 1.3 million b/d. In that case the gasoline market would grow by only around 200,000 b/d over the 10-year period while diesel would grow 400,000 b/d.

This is the context in which the US refining industry must make investment plans. Given reasonable assumptions about US economic growth over the next several years, the market for motor fuels appears poised to grow, albeit more slowly than in the recent past. Investment in new diesel and gasoline processing capacity appears necessary and consumers will benefit if additions to refining capacity keep pace with demand.

However, from a refiner perspective, policy uncertainties abound. The industry faces immediate prospects of anti-price gouging and punitive tax legislation. Investors also cannot be certain how CAFE requirements will be implemented nor the extent to which policy will compel use of biofuels beyond the 15 billion gallons expected from corn ethanol. There also are supply risks facing ethanol output, as changes in feedstock prices, weather, and distribution costs could curtail output in that market. In addition, cellulosic ethanol may not be available in large quantities within the next 10 years, but mandated biofuels targets could be established on the belief that it will be. These various uncertainties cloud prospects for investment in US motor fuel producing capacity from petroleum. The outcome could be a situation in which market forces imply a need for expansion of domestic refining capacity while policy discourages it.