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ENERGY MARKETS

Gasoline Price Trends

Statement of Jim Wells, Director
Natural Resources and Environment

GAO-05-1047T

September 21, 2005

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Gasoline Price Trends

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Highlights

Highlights of GAO-05-1047T, a report to Senate Committee on Commerce, Science and Transportation

Why GAO Did This Study

Soaring retail gasoline prices have garnered extensive media attention and generated considerable public anxiety in recent months, particularly in the aftermath of Hurricane Katrina. Prices in many areas hit by the hurricane saw retail gasoline prices increase to over $3.00 per gallon, and in one reported case to almost $6.00 per gallon, with some gasoline stations running out of gasoline entirely.

The availability of relatively inexpensive gasoline over past decades has helped foster economic growth and prosperity in the United States, so large price increases, especially if sustained over a long period, pose long-term challenges to the economy and consumers.

This testimony, as requested, addresses factors that that help explain how gasoline prices are determined and what key factors will likely influence trends in future gasoline prices.

www.gao.gov/cgi-bin/getrpt?GAO-05-1047T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Jim Wells, (202) 512-3841 or wellsj@gao.gov.

What GAO Found

Crude oil prices and gasoline prices are inherently linked, because crude oil is the primary raw material from which gasoline and other petroleum products are produced. In the past year, crude oil prices have risen significantly—from August 31, 2004 to August 31, 2005, the price of West Texas Intermediate crude oil, a benchmark for international oil prices, rose by almost $27 per barrel, an increase of almost 64 percent. Over about the same period, average retail prices for regular gasoline rose nationally from $1.87 to $2.61 per gallon, an increase of about 40 percent. Major upward and downward movements of crude oil prices are generally mirrored by movements in the same direction by gasoline prices. However, based on recent events, at least in the short term, this historical trend has not held, and retail prices have risen faster than crude oil prices.

While crude oil is a fundamental determinant of gasoline prices, a number of other factors also play a role in determining how gasoline prices vary across different locations and over time. For example, refinery capacity in the United States has, in recent years, not expanded at the same pace as demand for gasoline and other petroleum products. During the same period we have imported larger and larger volumes of gasoline from Europe, Canada, and other countries. Further, the American Petroleum Institute has recently reported that U.S. average refinery capacity utilization has increased to 92 percent. As a result, domestic refineries have little room to expand production in the event of a temporary supply shortfall.

Gasoline prices may also be affected by unexpected refinery outages or accidents that significantly disrupt the delivery of gasoline supply. Most recently, Hurricane Katrina hit the Gulf Coast, doing tremendous damage to homes, businesses, and physical infrastructure, including roads; electricity transmission lines; and oil producing, refining, and pipeline facilities. Because the Gulf Coast refining region is a net exporter of petroleum products to all other regions of the country, retail gasoline prices in many parts of the nation rose dramatically. Average retail gasoline prices increased 45 cents per gallon between August 29 and September 5. The average price for a gallon of regular gasoline on September 5 was $3.07, the highest nominal price ever.

Future gasoline prices will reflect the world supply and demand balance. Globally, if demand for oil and petroleum products continues to rise, supply will need to keep pace. The challenge is to boost supply and reduce demand. We need to choose wisely and we need to act soon.

Mr. Chairman and Members of the Committee:

I am pleased to participate in the Committee's hearing to discuss current gasoline prices and the factors that will likely influence trends in those prices. Soaring retail gasoline prices have garnered extensive media attention and generated considerable public anxiety in recent months, particularly in the aftermath of Hurricane Katrina. Prices in many areas hit by the hurricane saw retail gasoline prices increase to over $3.00 per gallon, and in one reported case to almost $6.00 per gallon, with some gasoline stations running out of gasoline entirely. In addition, retail gasoline prices have shot up in many areas of the country that were not directly affected by the hurricane. It was not uncommon to see pump prices rise not just daily, but multiple times in the same day. Overall, gasoline prices have been significantly higher this year than last, costing American consumers considerably. According to the Department of Energy's Energy Information Administration (EIA), nationally, each additional ten cents per gallon of gasoline adds about $14 billion to America's annual gasoline bill.

The availability of relatively inexpensive gasoline over past decades has helped foster economic growth and prosperity in the United States. However, large price increases, especially if sustained over a long period, pose long-term challenges to the economy and consumers. Importantly, some recent analyses suggest that gasoline prices may stay at today's relatively high level or even increase significantly in the future. In contrast, others suggest that prices may fall as oil companies invest in more crude oil producing capacity and as consumers respond to higher prices by adopting more energy-efficient practices. Regardless of what happens in the future, the impact of gasoline prices is felt in virtually every sector of the U.S. economy and when prices increase sharply, as they have in recent months, consumers feel it immediately and are reminded every time they fill up their tanks.

It is therefore essential to understand the market for gasoline. In this context, you asked us to discuss (1) how gasoline prices are determined and (2) what key factors will likely influence trends in future gasoline prices?

To respond to your questions, we relied heavily on the gasoline primer, "Motor Fuels: Understanding the Factors That Influence the Retail Price of

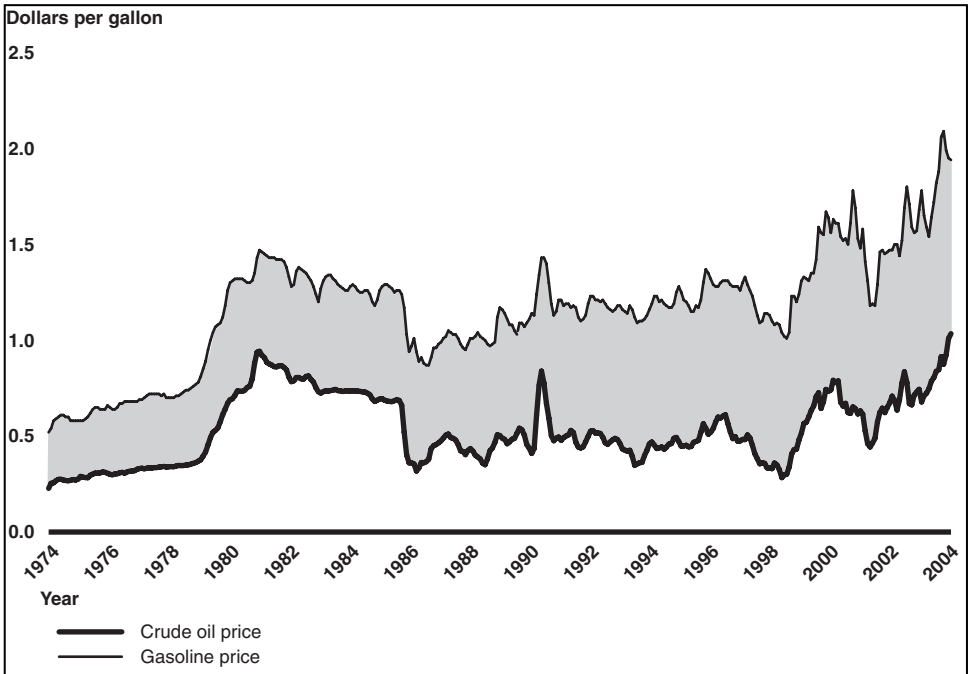
Gasoline,"[1] and 17 other GAO products on gasoline prices and other aspects of the petroleum products industry. (See Related GAO Products at the end of this testimony.) We also collected updated data from a number of sources that we deemed reliable. This work was performed in accordance with generally accepted government auditing standards.

In summary, our work has shown:

- Crude oil prices and gasoline prices are inherently linked, because crude oil is the primary raw material from which gasoline and other petroleum products are produced. In the past year, crude oil prices have risen significantly—from August 31, 2004 to August 31, 2005, the price of West Texas Intermediate crude oil, a benchmark for international oil prices, rose by almost $27 per barrel, an increase of almost 64 percent. Over about the same period, average retail prices for regular gasoline rose nationally from $1.87 to $2.61 per gallon, an increase of about 40 percent. Explanations for the large increase in crude oil and gasoline prices include the rapid growth in world demand for crude oil and petroleum products, particularly in China and the rest of Asia; instability in the Persian Gulf region (the source of a large proportion of the world's oil reserves); and actions by the Organization of Petroleum Exporting Countries (OPEC) to restrict the production of crude oil and thereby increase its price on the world market. Figure one illustrates the relationship between crude oil and gasoline prices over the past three decades. The figure shows that major upward and downward movements of crude oil prices are generally mirrored by movements in the same direction by gasoline prices. However, based on recent events, at least in the short term, this historical trend has not held, and retail prices have risen faster than crude oil prices.

1 GAO, *Motor Fuels: Understanding the Factors That Influence the Retail Price of Gasoline*, GAO-05-525SP (Washington, D.C.: May 2, 2005).

Figure 1: Gasoline and Crude Oil Prices—1974-2004 (Not adjusted for inflation)



Source: GAO analysis of Energy Information Administration, Department of Energy, Monthly Energy Review, Monthly Refiner Acquisition Cost of Crude Oil, Composite and and Bureau of Labor Statistics, Monthly Motor Gasoline Prices, U.S. City Averages, Regular Gasoline.

- While the price and availability of crude oil is a fundamental determinant of gasoline prices, a number of other factors also play a role in determining how gasoline prices vary across different locations and over time. For example, refinery capacity in the United States has not expanded at the same pace as demand for gasoline and other petroleum products in recent years. During the same period the United States has imported larger and larger volumes of gasoline from Europe, Canada, and other countries. The American Petroleum Institute has recently reported that U.S. average refinery capacity utilization has increased to 92 percent. As a result, domestic refineries have little room to expand production in the event of a temporary supply shortfall. Further, the fact that imported gasoline comes from farther away than domestically produced gasoline means that when supply disruptions occur in the United States, it might take longer to get replacement gasoline than if we had excess refining capacity in the United States, and this could cause gasoline prices to rise and stay high until these new supplies can reach the market.

- Gasoline inventories maintained by refiners or marketers of gasoline can also have an impact on prices. As with trends in a number of other industries, the petroleum products industry has seen a general downward trend in the level of gasoline inventories in the United States. Lower levels of inventories may cause prices to be more volatile because when a supply disruption occurs, there are fewer stocks of readily available gasoline to draw from, putting upward pressure on prices. Regulatory factors also play a role. For example, in order to meet national air quality standards under the Clean Air Act, as amended, many states have adopted the use of special gasoline blends—so-called "Boutique Fuels." Many experts have concluded that the proliferation of these special gasoline blends has caused gasoline prices to rise and/or become more volatile, especially in regions such as California that use unique blends of gasoline, because the fuels have increased the complexity and costs associated with supplying gasoline to all the different markets. Finally, the structure of the gasoline market can play a role in determining prices. For example, we recently reported that some mergers of oil companies during the 1990s led to reduced competition among gasoline suppliers and may have been responsible for an increase in gasoline prices by as much as 2 cents per gallon on average, with boutique fuels increasing from between 1 to 7 cents per gallon.

- Gasoline prices may also be affected by unexpected refinery outages or accidents that significantly disrupt the delivery of gasoline supply. Most recently, Hurricane Katrina hit the Gulf Coast, doing tremendous damage to homes, businesses, and physical infrastructure, including roads; electricity transmission lines; and oil producing, refining, and pipeline facilities. The DOE reported on August 31, 2005 that as many as 2.3 million customers were without electricity in Louisiana, Mississippi, Alabama, Florida, and Georgia. The DOE further reported that 21 refineries in affected states were either shut down or operating at reduced capacity in the aftermath of the hurricane. This amounted to a reduction of over 10 percent of the nation's total refining capacity. Two petroleum product pipelines that serve the Midwest and East Coast from Gulf Coast refineries were also out. In addition, the Minerals Management Service in the Department of the Interior reported that as of September 1, 2005, over 90 percent of crude oil production in the Gulf of Mexico was out of operation. Because the Gulf Coast refining region is a net exporter of petroleum products to all other regions of the country, retail gasoline prices in many parts of the nation rose dramatically. Average retail gasoline prices increased 45 cents per gallon between August 29 and September 5. The average price for a gallon of regular gasoline on September 5 was $3.07, the highest nominal price ever. In addition, gasoline stations faced large increases in wholesale gasoline prices, and

some even reported running out of gasoline. The spot price for wholesale gasoline delivered to New York Harbor rose by about $0.78 per gallon between August 26 and August 30. Gasoline supply is recovering in the wake of the storm, however, and prices have begun to decrease. Between September 5 and September 12, average gasoline prices decreased 11 cents to $2.96 per gallon. Gasoline production increased dramatically over this time, rising by more than 400,000 barrels per day as most of the refineries shut down after the storm resumed production. Until production, refining, and pipeline facilities are fully operating at normal levels, prices are expected to continue to be higher in affected areas. Coming as this has on the heels of a period of high crude oil prices and a tight balance worldwide between petroleum demand and supply, the effects of the hurricane illustrate the volatility of gasoline prices given the vulnerability of the gasoline infrastructure to natural or other disruptions.

- Future gasoline prices will reflect the world supply and demand balance. If demand for oil and petroleum products continues to rise as it has in past years, then oil supply will have to expand significantly to keep up. The EIA projects that world demand for crude oil will rise by at least 25 percent by the year 2025. However, world surplus crude oil production capacity—the amount by which oil production can be increased in the short run without installing more drilling equipment or developing new oil fields—is currently very small. Moreover, many of the world's known and easily accessible crude oil deposits have already been developed and many of these are experiencing declining volumes as the fields become depleted. Other new sources may be more expensive to develop. For example, there are large stores of crude oil in tar sands and oil shale, or potentially beneath deep water in the ocean, but these sources are more costly to extract and process than many of the sources of oil that we have already tapped. If developing, extracting, and refining new sources of crude oil are more costly than extracting and refining oil from existing fields, crude oil and petroleum product prices likely will rise to make these activities economically feasible. If, on the other hand, technological innovations improve the ability to extract and process oil, this will increase the available future supply and may ease pressure on petroleum product prices.

- Although demand for crude oil is projected to increase, it could fall below current expectations if consumers choose more energy efficient products or otherwise conserve more energy. Such a reduction in demand could lead to lower-than-expected future prices. For example, in response to high gasoline prices in the United States, in the 1980s many consumers chose to switch to smaller or more fuel-efficient vehicles, which reduced demand for gasoline. Environmental issues could also have an impact on

world crude oil and petroleum product prices. For example, international efforts to reduce greenhouse emissions could cause reductions in demand for crude oil and petroleum products as more fuel-efficient processes are adopted or as cleaner sources of energy are developed. Additional factors that will likely influence future oil and gasoline prices include geopolitical issues, such as the stability of the Middle East; the valuation of the U.S. dollar in world currency markets; and the pace of development of alternative energy supplies, such as hydrogen fuel cell technology.

Background

In 2004, the United States consumed about 20.5 million barrels per day of crude oil accounting for roughly 25 percent of world oil production. A great deal of the crude oil consumed in this country goes into production of gasoline and, as a nation, we use about 45 percent of all gasoline produced in the world.[2] Products made from crude oil—petroleum products, including gasoline—have been instrumental in the development of our modern lifestyle. In particular, gasoline, diesel, and jet fuel have provided the nation with affordable fuel for automobiles, trucks, airplanes and other forms of public and goods transportation. Together, these fuels account for over 98 percent of the U.S. transportation sector's fuel consumption. In addition, petroleum products are used as raw materials in manufacturing and industry; for heating homes and businesses; and, in small amounts, for generating electric power. Gasoline use alone constitutes about 44 percent of our consumption of petroleum products in the United States, so when gasoline prices rise, as they have in recent months, the effects are felt throughout the country, increasing the costs of producing and delivering basic retail goods and making it more expensive to commute to work. It is often the case that prices of other petroleum products also increase at the same time and for the same reasons that gasoline prices rise. For example, today's high gasoline prices are mirrored by high jet fuel prices, creating financial pressure on airline companies, some of which are currently in the midst of economic difficulties. Gasoline prices vary a great deal over time. For example, in the period January 1, 1995 through August 29, 2005, the national average price for a gallon of regular grade gasoline has been as low as $1.10 and as high as $2.80 without adjusting for inflation.

[2]The large percentage of total world gasoline production consumed by the United States, in part, reflects the fact that diesel is a commonly used fuel for cars in Europe, while automobiles in the United States primarily run on gasoline. If all motor vehicle fuels were accounted for, the United States' share of these fuels would be smaller than its share of gasoline. However, we do not have the data to present this more comprehensive measure.

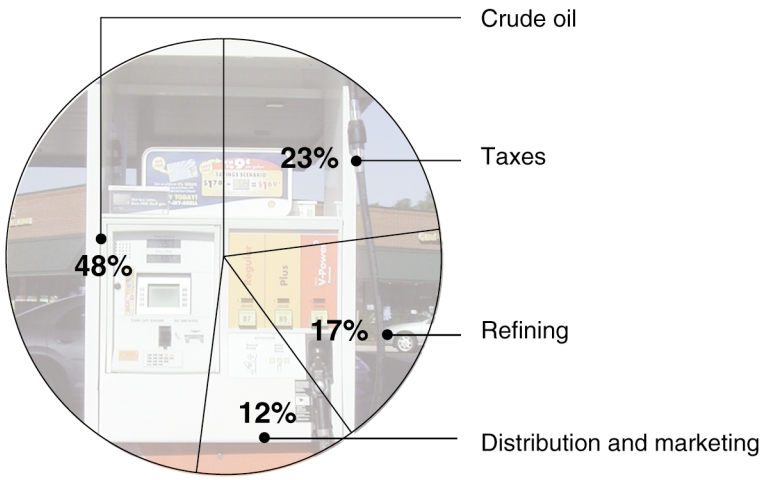
The future path of gasoline prices is difficult to predict, but it is clear that the use of petroleum products worldwide is going to increase for the near term and maybe beyond. Some analysts have predicted much higher crude oil prices—and as a result, higher prices for petroleum products—while others expect prices to moderate as producers respond to high prices by producing more crude oil and consumers respond by conserving more, and investing in more energy-efficient cars and other products. In either case, the price of gasoline will continue to be an important factor affecting the household budgets of individual Americans for the foreseeable future and therefore, it is important to understand how prices are determined so that consumers can make wise choices.

Gasoline Prices Are Determined by the Price of Crude Oil and a Number of Other Factors

Crude oil prices directly affect the price of gasoline, because crude oil is the primary raw material from which gasoline is produced. For example, according to our analysis of EIA data, in 2004 crude oil accounted for about 48 percent of the price of a gallon of gasoline on average in the United States. When crude oil prices rise, as they have over the past year, refiners find their cost of producing gasoline also rises, and in general, these higher costs are passed on to consumers in the form of higher gasoline prices at the pump. However, based on recent events, at least in the short term, this historical trend has not held, and retail prices have risen faster than crude oil prices. Figure 2 illustrates the importance of crude oil in the price of gasoline. The figure also shows that taxes, refining, and distribution and marketing also play important roles.[3]

[3]The latter two categories, refining and distribution and marketing, includes costs associated with these activities as well as profits. The figure is a snapshot of how much each component contributes to the price of a gallon of gasoline, and how the relative proportions attributable to each component vary over time as crude oil prices and other factors change.

Figure 2: Elements in the Price of a Gallon of Gasoline (Average for 2004)



Source: GAO analysis based on EIA data.

Because crude oil is the primary raw material used in the production of gasoline, understanding what determines gasoline prices requires examining how crude oil prices are set. Overall, the price of crude oil is determined by the balance between world demand and supply. A major cause of rising crude oil prices in recent months has been rapid growth in world demand, without a similar growth in available supplies. In particular, the economy of China has grown rapidly in recent years, leading to increases in their demand for crude oil. In contrast, oil production capacity has grown more slowly, leading to a reduction in surplus capacity—the amount of crude oil that is left in the ground, but could be extracted on short notice in the event of a supply shortfall. EIA has stated that the world's surplus crude oil production capacity has fallen to about one million barrels per day, or just over one percent of the world's current daily consumption, making the balance between world demand and supply of crude oil very tight. This tight balance between world crude oil demand and supply means that any significant supply disruptions will likely cause prices to rise. Such a disruption occurred in Nigeria in October 2004, when a workers' strike in Nigeria's oil sector forced world crude oil prices to record highs. (Nigeria is the world's seventh largest oil producer, supplying an average 2.5 million barrels per day in 2004.)

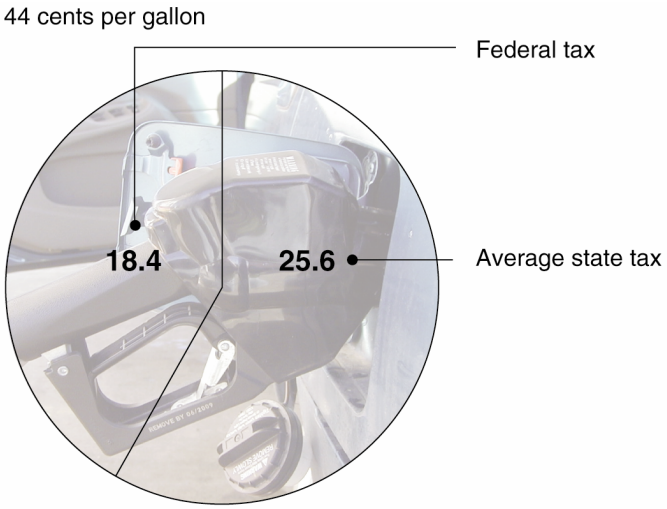
Another important factor affecting crude oil prices is the behavior of the Organization of Petroleum Exporting Countries (OPEC)—members of which include Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar,

Saudi Arabia, United Arab Emirates, and Venezuela. OPEC members produce almost 40 percent of the world's crude oil and control almost 70 percent of the world's proven oil reserves. In the recent past and on numerous other occasions, OPEC members have collectively agreed to restrict the production of crude oil in order to increase world prices.

Turning now to the price of gasoline seen at the pump, it is important to discuss the role of taxes. In the United States, on average, taxes accounted for 23 percent of what consumers paid for a gallon of gasoline in 2004, according to EIA's data. This percentage includes estimated federal and average state taxes totaling 44 cents per gallon (see figure 3).[4] Federal taxes accounted for 18.4 cents of this total, while state taxes averaged 25.6 cents per gallon, although taxes vary among states.

[4]EIA uses tax data from the American Petroleum Institute (API) for its tax analysis. According to API, these data include applicable state sales taxes, gross receipts taxes, and other applicable fees but largely exclude local taxes, which may average about 2 cents per gallon nationwide.

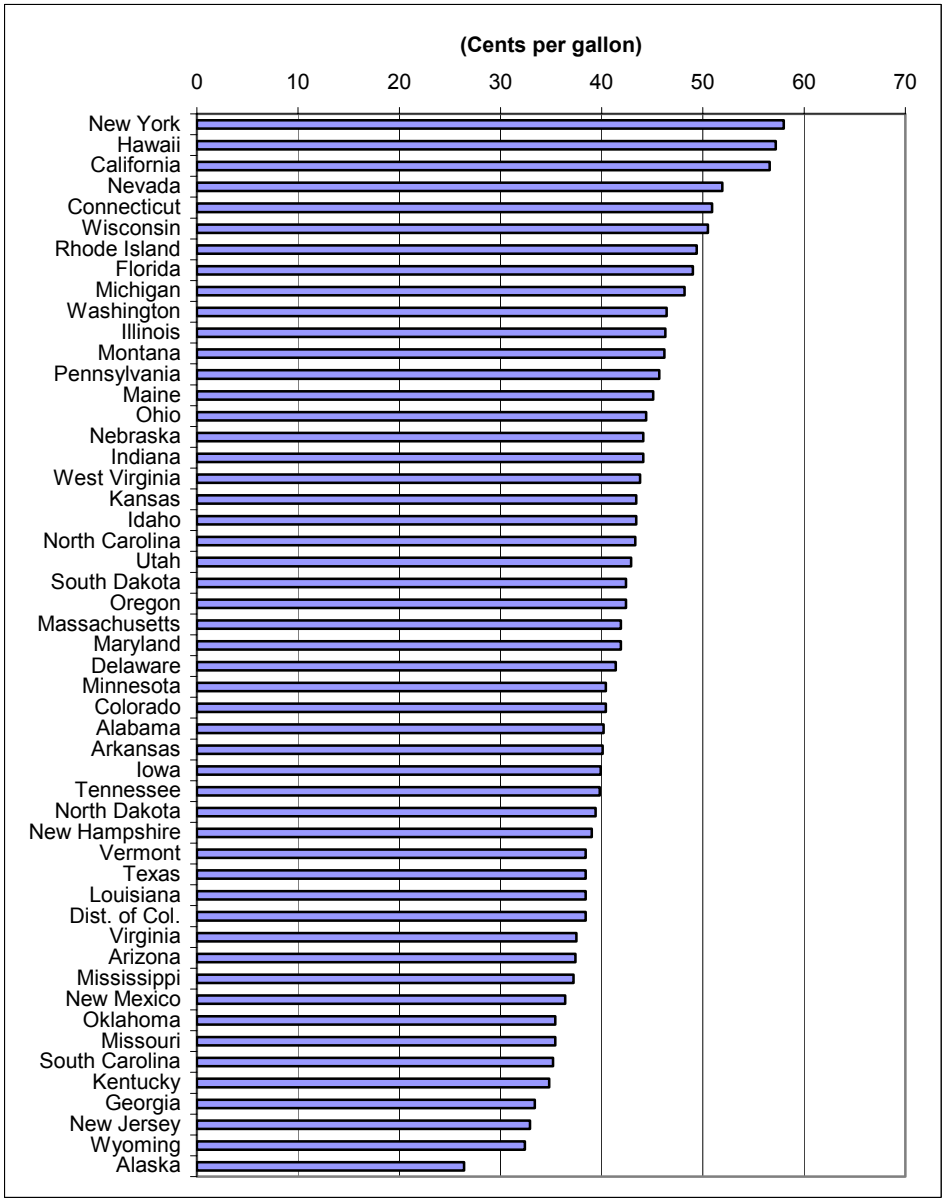
Figure 3: Estimated Federal and Average State Gasoline Taxes per Gallon (2004)



Source: GAO analysis based on API data.

Differences in gasoline taxes across states help explain why gasoline prices vary from place to place in the United States. In addition to federal taxes that apply across the board, states and, in some cases, local jurisdictions also impose taxes and other fees on gasoline that add to the price. Figure 4 shows total state and federal gasoline taxes for each of the 50 states and the District of Columbia, as of November 2004. New York, Hawaii, and California have the highest total gasoline taxes, while Alaska, Wyoming, and New Jersey have the lowest. While differences in taxes affect the price of gasoline, there is no consistent relationship between high taxes and high prices. For example, on March 7, 2005, gasoline cost $1.91 per gallon in North Carolina and $1.98 per gallon in Alaska, even though the taxes paid in North Carolina were almost 17 cents per gallon higher.

Figure 4: Motor Gasoline Taxes as of November 2004



Source: GAO Analysis of API data.

Note: According to API, these tax data include applicable state sales taxes, gross receipts taxes, and other applicable fees but largely exclude local taxes, which may average about 2 cents per gallon nationwide.

In addition to the cost of crude oil, taxes, refining, and distribution and marketing costs, gasoline prices are influenced by a variety of other factors. These include refining capacity constraints, low inventories, unexpected refinery or pipeline outages, environmental and other regulations, and mergers and market power in the oil industry.

First, domestic refining capacity has not kept pace with growing demand for gasoline. As demand has grown faster than domestic refining capacity, the United States has imported larger and larger volumes of gasoline and other petroleum products from refiners in Europe, Canada, and other countries. EIA officials told us that, in general, this increase in imports has reflected the availability of gasoline from foreign sources at lower cost than could be achieved by building and operating additional refining capacity in the United States. However, the American Petroleum Institute (API) has recently reported that capacity utilization has been high in the U.S. refinery sector. Refining capacity has typically averaged over 90 percent, and has recently increased to 92 percent—much higher than the rate in many other industries that API reports as more typically operating at around 80 percent of capacity. As a result, domestic refineries have little room to expand production in the event of a temporary supply shortfall. Furthermore, the fact that imported gasoline comes from farther away than domestically produced gasoline means that when supply disruptions occur in the United States, it might take longer to get replacement gasoline than if we had excess refining capacity in the United States, and this could cause gasoline prices to rise and stay high until these new supplies can reach the market.

Second, the level of gasoline inventories can also play an important role in determining gasoline prices over time because inventories represent the most accessible and available source of supply in the event of a production shortfall or increase in demand. Similar to trends in other industries, the level of gasoline inventories has been falling for a number of years. In part, this reflects a trend in business to more closely balance production with demand in order to reduce the cost of holding large reserves. However, reduced inventories may contribute to increased price volatility, because when unexpected supply disruptions or increases in demand occur, there are lower stocks of readily available gasoline upon which to draw. This puts upward pressure on gasoline prices until new supplies can be refined and delivered domestically, or imported from abroad.

Third, gasoline prices may be affected by unexpected refinery outages or accidents that significantly disrupt the delivery of gasoline supply. Most

recently, Hurricane Katrina hit the Gulf Coast, doing tremendous damage to homes, businesses, and physical infrastructure, including roads; electricity transmission lines; and oil producing, refining, and pipeline facilities. The DOE reported on August 31, 2005 that as many as 2.3 million customers were without electricity in Louisiana, Mississippi, Alabama, Florida, and Georgia. The DOE further reported that 21 refineries in affected states were either shut down or operating at reduced capacity in the aftermath of the hurricane. The refining capacity of the shutdown refineries alone is equivalent to over 10 percent of the nation's total refining capacity. Two petroleum product pipelines that serve the Midwest and East Coast from Gulf Coast refineries were also out. The Minerals Management Service of the Department of the Interior reported that as of September 1, 2005, over 90 percent of crude oil production in the Gulf of Mexico was out of operation. Because the Gulf Coast refining region is a net exporter of petroleum products to all other regions of the country, retail gasoline prices in many parts of the nation have risen dramatically, with news reports that many locations have seen prices over $3.00 per gallon, and in one reported case to almost $6.00 per gallon. In addition, many gasoline stations have reported running out of stocks and have faced large increases in wholesale gasoline prices—the spot price for wholesale gasoline delivered to New York Harbor rose by about $0.78 per gallon between August 26 and August 30. Until production, refining, and pipeline facilities are back up and running at normal levels, prices are expected to continue to be higher in affected areas. Coming as this has on the heels of a period of high crude oil prices and a tight balance worldwide between petroleum demand and supply, the effects of the hurricane illustrate the volatility of gasoline prices given the vulnerability of the gasoline infrastructure to natural or other disruptions. Such disruptions also have the potential to adversely affect the economy. For example, in 2004, the International Energy Agency reported that a $10 increase in the world price of crude oil would lead to at least a one half percent reduction in world GDP – equivalent to $255 billion – in the year following the price increase. The effects on individual countries would vary depending on whether or not they are net oil importers and on the level of energy intensity of their economies.

Fourth, regulatory steps to reduce air pollution have also influenced gasoline markets and consequently have increased gasoline prices. For example, since the 1990 amendments to the Clean Air Act, the use of various blends of cleaner-burning gasoline—so-called "boutique fuels—has grown as states have adopted the use of such fuels to meet national air quality standards. The use of these special blends has provided environmental and health benefits by reducing emissions of a number of

pollutants. However, the proliferation of these special gasoline blends has also put stress on the gasoline supply infrastructure and has led to increased price volatility because areas that use special blends cannot as easily find suitable replacement gasoline in the event of a local supply disruption.[5]

Finally, we recently reported that industry mergers increased market concentration and in some cases caused higher wholesale gasoline prices in the United States from the mid-1990s through 2000.[6] Overall, the report found that the mergers led to price increases averaging about 2 cents per gallon on average. For conventional gasoline, the predominant type used in the country, the change in the wholesale price, due to specific mergers, ranged from a decrease of about 1 cent per gallon—due to efficiency gains associated with the merger—to an increase of about 5 cents per gallon—attributed to increased market power after the merger. For special blends of gasoline, wholesale prices increased by from between 1 and 7 cents per gallon, depending on location.

Future Oil and Gasoline Prices Will Reflect Supply/Demand Balance, but Technological Change and Conservation Will Also Play a Role

Looking into the future, daunting challenges lie ahead in finding, developing, and providing sufficient quantities of oil to meet projected global demand. For example, according to EIA, world oil demand is expected to grow to nearly 103 million barrels per day in 2025 under low growth assumptions, and may reach as high as 142 million barrels per day in 2025 —increases of between 25 and 71 percent from the 2004 consumption level of 83 million barrels per day. Looking further ahead, the rapid pace of economic growth in China and India, two of the world's most populous and fastest growing countries, may lead to a rapid increase in their demand for crude oil and petroleum products. While current consumption of oil by China and India is far below that of the United States, it is projected to grow at a far more rapid rate. Specifically, EIA's medium-growth projections estimate that oil consumption for China and

[5] For more details see GAO, *Gasoline Markets: Special Gasoline Blends Reduce Emissions and Improve Air Quality, but Complicate Supply and Contribute to Higher Prices*, GAO-05-421 (Washington, D.C.: *June 17, 2005*).

[6] GAO, *Energy Markets: Effects of Mergers and Market Concentration in the U.S. Petroleum Industry*, GAO-04-96 (Washington, D.C.: *May* 17, *2004).*

India will each grow by about 4 percent annually through 2025, while consumption in the United States is projected to grow at an annual rate of 1.5 percent over the same period.

To meet the rising demand for gasoline and other petroleum products, new oil deposits will likely be developed and new production facilities built. Currently, many of the world's known and easily accessible crude oil deposits have already been developed, and many of these are experiencing declining volumes as fields become depleted. For example, the existing oil fields in California and Alaska have long since reached their peak production, necessitating an increasing volume of imported crude oil to West Coast refineries. Developing new oil deposits may be more costly than in the past, which could put upward pressure on crude oil prices and the prices of petroleum products derived from it. For example, some large potential new sources, such as oil shales, tar sands, and deep-water oil wells, require different and more costly extraction methods than are typically needed to extract oil from existing fields. In addition, the remaining oil in the ground may be heavier and more difficult to refine, necessitating investment in additional refinery processes to make gasoline and other petroleum products out of this oil. If developing, extracting, and refining new sources of crude oil are more costly than extracting and refining oil from existing fields, crude oil and petroleum product prices likely will rise to make these activities economically feasible.

On the other hand, technological advances in oil exploration, extraction, and refining could mitigate future price increases. In the past, advances in seismic technology significantly improved the ability of oil exploration companies to map oil deposits, while improvements in drilling technology have enabled oil companies to drill in multiple directions from a single platform. Together, these advances have enabled companies to identify and extract oil more efficiently, essentially increasing the supply of oil. Further, refining advances over the years have also enabled U.S. refiners to increase the yield of gasoline from a given barrel of oil—while the total volume of petroleum products has remained relatively constant, refiners have been able to get a greater proportion of the more valuable components, such as gasoline, out of each barrel, thereby increasing the supply of these components. Similar technological improvements in the future that lower costs or increase supply of crude oil or refined products would likely lead to lower prices for such commodities.

Innovations that reduce the costs of alternative sources of energy could also reduce the demand for crude oil and petroleum products, and thereby

ease price pressures. For example, hydrogen is the simplest element and most plentiful gas in the universe and when used in fuel cells produce almost no pollution. In addition, hydrogen fuel cell cars are expected to be roughly three times more fuel-efficient than cars powered by typical internal combustion engines. Currently, enormous technical problems stand in the way of converting America's fleet of automobiles from gasoline to hydrogen, including how to produce, store, and distribute the flammable gas safely and efficiently, and how to build hydrogen cars that people can afford and will want to buy. However, there are federal and state initiatives under way as well as many private efforts to solve these technical problems, and if they can be solved in an economical way in the future, the implications for gasoline use could be profound.

Greater conservation or improved fuel efficiency could also reduce future demand for crude oil and petroleum products, thereby leading to lower prices. The amount of oil and petroleum products we will consume in the future is, ultimately, a matter of choice. Reducing our consumption of gasoline by driving smaller, more fuel-efficient cars—as occurred in the 1980s in response to high gasoline prices—would reduce future demand for gasoline and put downward pressure on prices. For example, the National Academies of Science recently reported that if fuel-efficiency standards for cars and light trucks had been raised by an additional 15 percent in 2000, gasoline consumption in the year 2015 would be 10 billion gallons lower than it is expected to be under current standards. The Congress established fuel economy standards for passenger cars and light trucks in 1975 with the passage of the Energy Policy and Conservation Act. While these standards have led to increased fuel efficiency for cars and light trucks, in recent years, the switch to light trucks has eroded gains in the overall fuel efficiency of the fleet of American passenger vehicles. Future reductions in demand for gasoline could be achieved if either fuel efficiency standards for cars and light trucks are increased, or if consumers switch to driving smaller or more fuel-efficient cars.

The effect of future environmental regulations and international initiatives on oil and petroleum products prices is uncertain. On one hand, regulations that increase the cost or otherwise limit the building of refining and storage capacity may put pressure on prices in some localities. For example, the California Energy Commission told us the lack of storage capacity for imported crude oil and petroleum products may be a severe problem in the future, potentially leading to supply disruptions and price volatility. Alternatively, international efforts to reduce the generation of greenhouse gas emissions could cause reductions in the demand for crude oil and petroleum products through the development

and use of more fuel-efficient processes and as cleaner, lower-emissions fuels are developed and used.

Moreover, geopolitical factors will likely continue to have an impact on the price of crude oil and petroleum product in the future. Because crude oil is a global commodity, the price we pay for it can be affected by any events that may affect world demand or supply. For example, Venezuela—which produces around 2.6 million barrels of crude oil per day, and which supplies about 12 percent of total U.S. oil imports—is currently experiencing considerable social, economic, and political difficulties that have, in the past, impacted oil production. Finally, instability in the Middle East, and particularly the Persian Gulf, has in the past, caused major disruptions in oil supplies, such as occurred toward the end of the first Gulf War, when Kuwaiti oil wells were destroyed by Iraq.

Finally, the value of the U.S. dollar on open currency markets could also affect future crude oil prices. For example, because crude oil is typically denominated in U.S. dollars, the payments that oil-producing countries receive for their oil are also denominated in U.S. dollars. As a result, a weak U.S. dollar decreases the value of the oil sold at a given price. Some analysts have recently reported in the popular press that this devaluation can influence long-term prices in two ways. First, oil-producing countries may wish to increase prices for their crude oil in order to maintain their purchasing power in the face of a weakening U.S. dollar. Secondly, because the dollars that these countries have accumulated, which they use, in part, to finance additional oil exploration and extraction, are worth less, the costs they pay to purchase technology and equipment from other countries whose currencies have gained relative to the dollar will increase. Such higher costs may deter further expansion of oil production, leading to even higher oil prices.[7]

Conclusions

In closing, the wide-ranging effects of Hurricane Katrina on gasoline prices nationwide are a stark illustration of the interconnectedness of our petroleum markets and reveal the vulnerability of these markets to disruptions, natural or otherwise. Current U.S. energy supplies remain highly dependent on fossil energy sources that are costly, largely

[7]Higher oil prices, because they increase the U.S. trade deficit, may also contribute to the further devaluation of the dollar. Hence, analysts have called this process a vicious cycle in which a weak dollar drives up oil prices, which then feeds back into the trade deficit causing the dollar to weaken further.

imported, and potentially harmful to the environment. No matter what the price of petroleum is, alternative energy options seem always to remain uneconomic. Striking a balance between efforts to boost petroleum supply, provide incentives for developing of alternative energy sources, develop policies and technologies focused on improving the fuel efficiency of petroleum burning vehicles, and promote overall energy conservation, presents challenges as well as opportunities. Clearly, all providers and consumers of energy need to get serious about conserving energy. The challenge is to boost supply and reduce demand. We need to choose wisely and we need to act soon. How we choose to meet the challenges and seize the opportunities will help determine our quality of life and economic prosperity in the future.

We are currently studying the determinants of gasoline prices in particular, and the petroleum industry more generally, including an evaluation of world oil reserves; an assessment of the security of maritime facilities for handling and transporting petroleum, natural gas, and petroleum products; an analysis of the viability of the Strategic Petroleum Reserve; and an assessment of the impacts of a potential disruption of Venezuelan oil imports. With this body of work, we hope to continue to provide Congress and the American people the information needed to make informed decisions about energy that will have far-reaching effects on our economy and our way of life.

Mr. Chairman, this completes my prepared statement. I would be happy to respond to any questions you or the other Members of the Committee may have at this time.

GAO Contacts and Staff Acknowledgments

Contact points for our Offices of Congressional Relations and Pulic Affaris may be found on the last page of this statement. For further information about this testimony, please contact Jim Wells at (202) 512-3841 (or at wellsj@gao.gov). Individuals who made key contributions to this statement include Godwin Agbara, Byron Galloway, Dan Haas, Michelle Munn, Melissa Arzaga Roye, and Frank Rusco.

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