PETROLEUM RESOURCE ASSESSMENT - 2007

INTRODUCTION

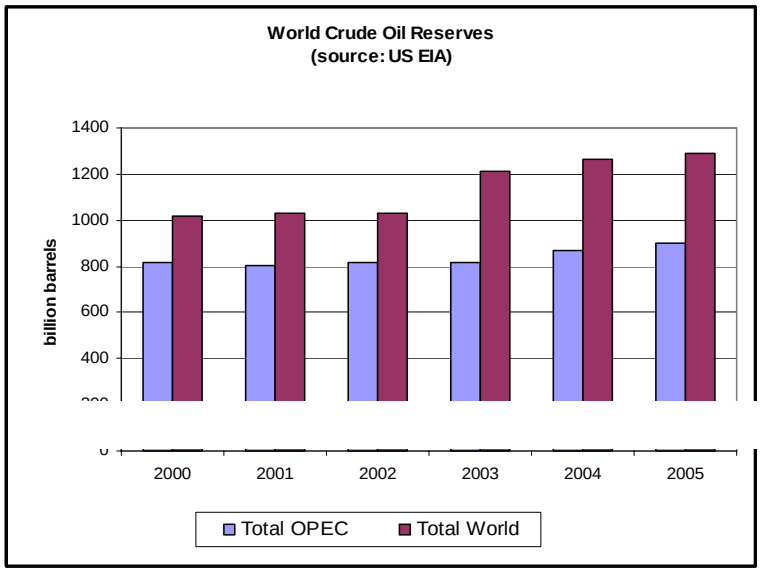
New York State is a major consumer of petroleum fuels such as motor gasoline, home heating oil, diesel fuel, propane, and residual oil. The State is the fourth largest petroleum fuel market in the U.S., exceeded only by Texas, California, and Florida. In 2004[1], total statewide expenditures on all petroleum fuels by all economic sectors equaled $21.2 billion. The transportation sector accounted for $16.4 billion, or 77% of the total. To meet this demand, numerous multi-national, national, and independent energy companies supply refined petroleum products to the State through an extensive distribution system. The Port of New York, with large petroleum storage terminals located on both the New York and New Jersey sides of the harbor, is an important component of this system. These deep water terminals receive a steady flow of refined petroleum products and crude oil into the New York area from domestic and foreign sources. New York State also receives petroleum products from several pipeline systems that connect terminals located throughout the State to the major refining centers located along the Gulf and East Coasts. Additionally, crude oil is used by refineries located in the mid-Atlantic region to produce refined products for the Northeastern U.S. Once refined fuels arrive at these facilities or are produced at the regional refineries, they are distributed by barge and truck transport to smaller coastal and inland terminals for further redistribution to customers.

PETROLEUM SUPPLY OVERVIEW

Crude Oil Reserves

Geographic location is as important a consideration as the quantity and quality of crude oil. The amount of proven world crude oil reserves varies annually depending on the rate of consumption and the addition of new discoveries and improved extraction techniques. In recent years, world crude oil reserves have remained relatively stable as new discoveries have effectively offset depletion of existing reserves. Between 2000 and 2005, estimated worldwide reserves increased from approximately 1.0 to 1.3 trillion barrels, shown in Figure 1, as significant reserve additions were recorded in Iran, Libya, Nigeria, and Russia.

Figure 1



[1] Most current data available as of Fall 2006.

While there are a number of important crude oil producing regions around the world, one of the most vital is the Middle East, home to many member nations of the Organization of Petroleum Exporting Countries (OPEC)[2]. OPEC crude oil reserves equaled approximately 900 billion barrels in 2005 and accounted for 70% of total world reserves. As a comparison, United States crude oil reserves in 2005 equaled about 21 billion barrels and accounted for 1.7 % of the worldwide total.

World Production Trends

In general, world crude oil production has increased steadily to meet growing world demand. This gradual trend is occasionally interrupted by periods of inventory draw down and short duration reductions in demand resulting from reduced economic activity. World crude oil production, as shown in Figure 2, increased from 60.6 million barrels per day (mmb/d) in 1990 to 73.5 mmb/d in 2005, an increase of 12.9 mmb/d or 21.3%.

Over the past 15 years, the percentage of world crude oil production attributed to OPEC member nations increased from 38.3% in 1990 to 42.4% in 2005. The 2005 OPEC percentage share of world supply is the highest rate since 1998 when the 43.0% level was reached. OPEC's all-time highest percentage share of 55.0% occurred in 1973.

Figure 3 presents the annual crude oil production volumes of several major producing countries between 1990 and 2005. The four countries, Venezuela, Russia, Saudi Arabia, and the United States, accounted for 35.8% of world production in 2005, down from 44.4% in 1990. The reduction in combined market share by these countries is primarily the result of the production decline in the United States and Russia, although since reaching a low

Figure 2

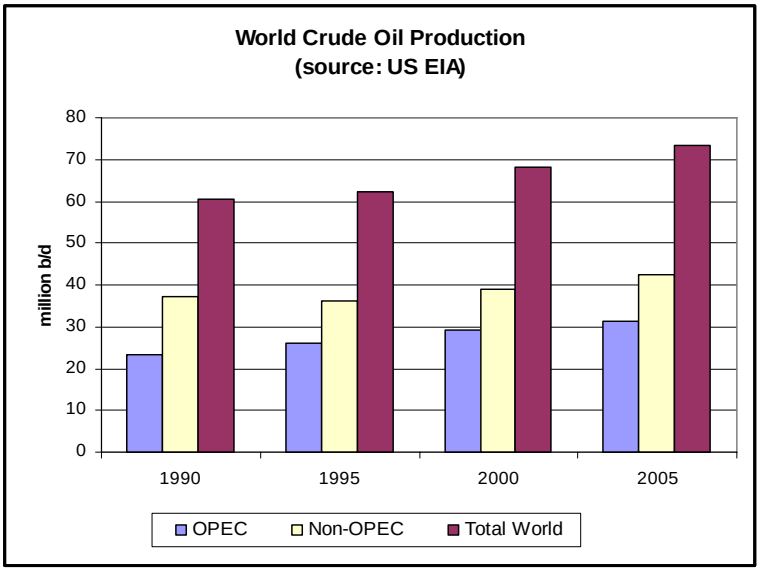
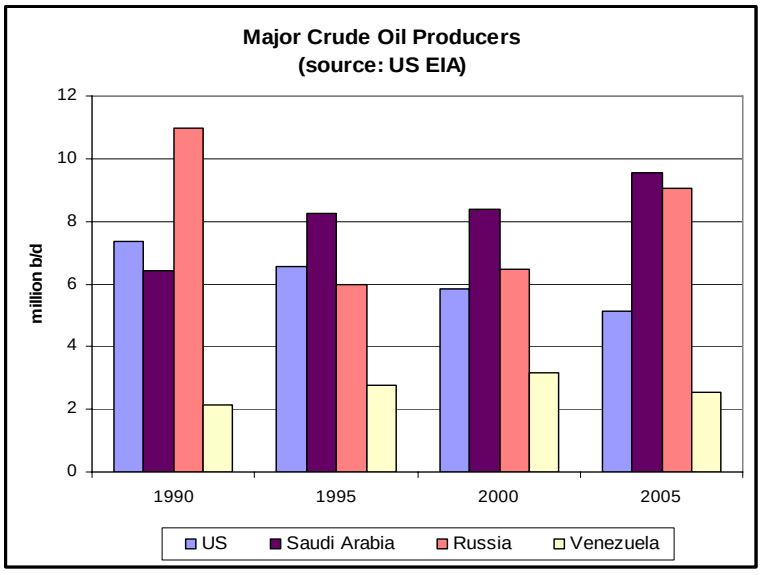


Figure 3



[2] Member nations include Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela. Ecuador withdrew in 1992 and Gabon withdrew in 1994.

point in 1996, production in Russia has steadily increased.

U.S. crude oil production fell from 7.4 mmb/d in 1990 to 5.1 mmb/d by 2005, a 31.1% decline. While U.S. production continues on a downward trend, production in Russia has increased in recent years from a low of 5.9 mmb/d in 1996 to 9.1 mmb/d in 2005, an increase of 54.2%. In Saudi Arabia production climbed from 6.4 mmb/d to 9.6 mmb/d between 1990 and 2005, a 50.0% increase. Again over the 15 year period, production in Venezuela rose from 2.1 mmb/d to 2.6 mmb/d, a gain of 23.8 percent.

Petroleum Price Review

A review of the refiner acquisition cost (RAC) of crude oil, the average price paid by U.S. refiners for all grades of crude oil processed at domestic refineries, in both nominal and constant year-2005 dollars, is presented in Figure 4. The nominal dollar line shows the average price paid by a U.S. refiner for a barrel of crude oil in that year. The constant year-2005 line indicates the price that a refiner would have paid in year-2005 dollars during each historic year. For example, in 1981, on a nominal basis, RAC prices reached a high of $35.24 per barrel (bbl) as the Iranian revolution disrupted the world petroleum markets. As high as this price seems, in terms of constant year-2005 dollars, the price of crude oil actually reached an estimated $75.60/bbl that year.

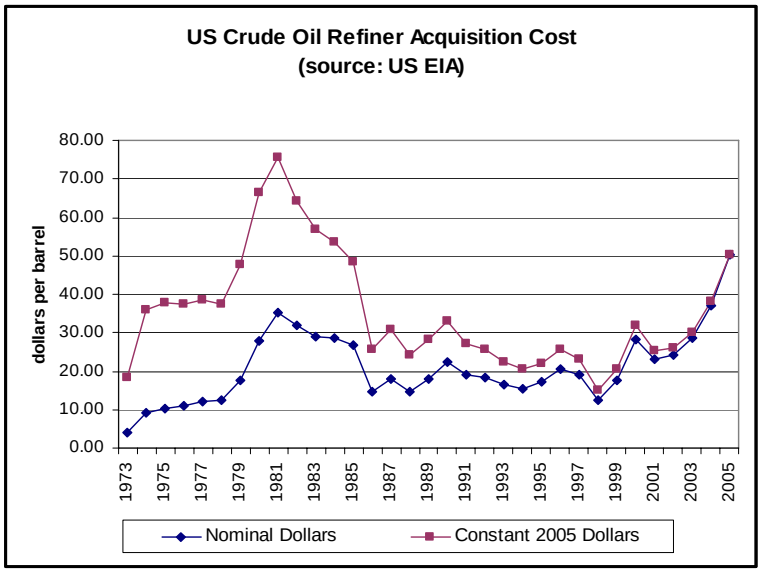
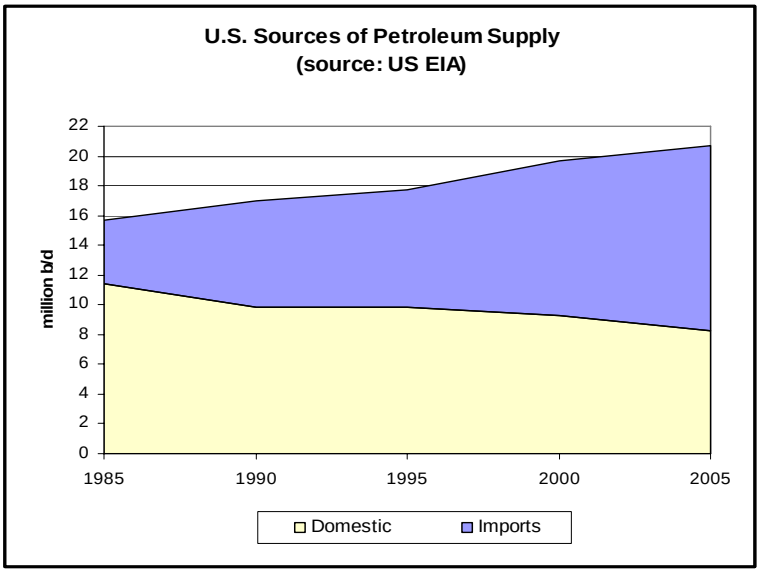


Figure 5



From the mid-1980s through the 1990s, nominal RAC prices generally remained within the $15/bbl to $25/bbl range. Even significant events such as the Persian Gulf War in 1990 only temporarily interrupted the relative stability of crude oil prices. However, beginning in 2003 and continuing into 2005, numerous global events such as rising tensions in the Middle East, a general strike in Venezuela, military action in Iraq, increased world demand, and hurricane damage in the US Gulf of Mexico in 2005, all contributed to forced RAC prices upward to the 2005

average of $50.23/bbl from a recent low of $12.52/bbl in 1998. This is an increase of $37.71/bbl or about 300%. The historic low price on the graph is the 1973 price of $4.15/bbl.

U. S. Petroleum Supply and Demand

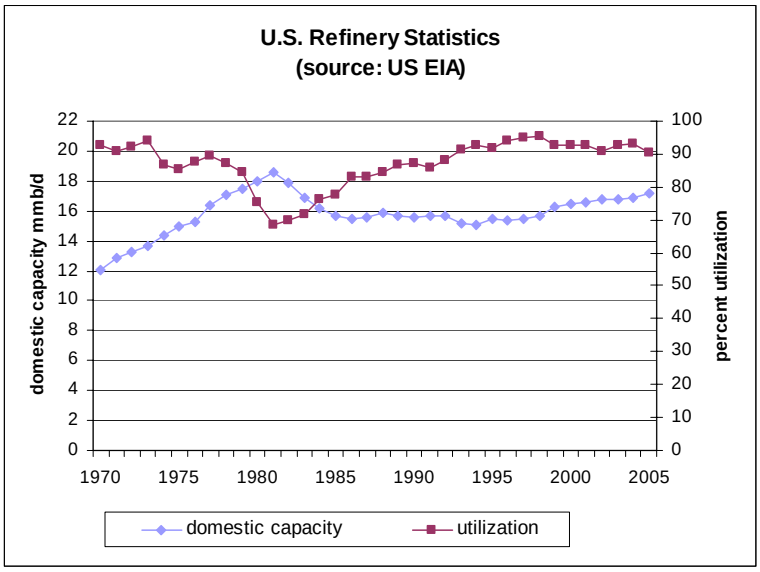
U.S. demand for petroleum products has grown steadily since 1985 as illustrated in Figure 5. During the 1985 to 2005 period, U.S. petroleum demand increased from 15.7 mmb/d to 20.7 mmb/d, a rise of 5.0 mmb/d or 31.8%. Conversely, over this same period, total domestic production declined from 11.4 mmb/d to 8.3 mmb/d, a decrease of 27.2%. Consequently, to meet the rise in domestic consumption as U.S. production was falling, net imports of crude oil and refined petroleum products rose from 4.3 mmb/d in 1985 to 12.4 mmb/d in 2005, a gain of 188.4%. On the percentage of total supply basis, imports of crude oil and refined products passed the 50% level for the first time in 1998 and equaled 51.6%. For the most recent year, 2005, U.S. dependency on imports equaled 59.8%. For comparison, the 1990 import share was 42.2% and in 1980 it was 37.3%.

OPEC's share of total U.S. petroleum product imports exceeded 50% for the first time in 1974 when the member countries supplied 55.7% of total imports. The percentage share moved steadily higher until 1977, when an all-time high of 72.3% of total imports were supplied by OPEC members. Beginning in 1978, the Arab oil embargo and sharply higher world crude oil prices pushed the OPEC share downward, reaching a low of 42.7% by 1985. From 1986 to 2001, OPEC's share of the U.S. market remained between 50 and 60%. More recently, since 2002 the share has fallen into the mid-40s percentage range and for the most recent year, 2005, equaled 44.6%.

Refining Industry Profile

The domestic refining industry has undergone significant changes over the past 35 years. During the 1970s and early 1980s, domestic refining capacity climbed from approximately 12 mmb/d to the historic peak of 18.6 mmb/d by 1981, a 55% gain. Correspondingly, the total number of refineries increased from 276 to 324 by 1981. This increase in refinery capacity occurred in response to rising domestic demand. However by 1978, petroleum demand had reached a peak of 18.8 mmb/d, and as a result of higher energy prices stimulating conservation initiatives, U.S. demand began to decline.

Figure 6



As domestic refining capacity rose, illustrated in Figure 6, the percentage utilization rate for domestic refineries began to fall from the 1973 peak of 93.9%. In effect, capacity additions were occurring at a faster rate than the growth in petroleum demand. This caused utilization rates to decline. The combination of rising capacity and falling demand pushed refinery utilization rates sharply downward until they reached a low of 68.6% in 1981. In response to these low utilization levels the domestic

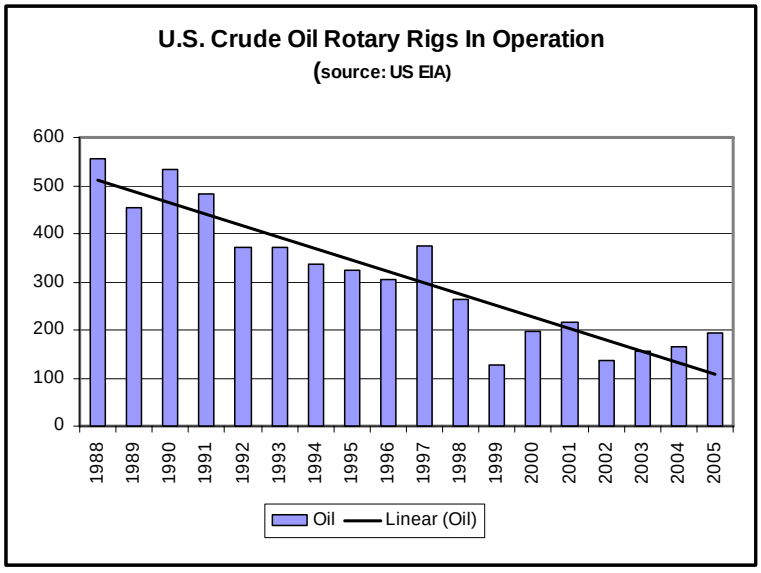
refining industry began to close smaller and less efficient refineries. Between 1981 and 2005, the number of domestic refineries fell from 324 to 148, a 54% decline, while the corresponding reduction in capacity from 18.6 mmb/d to 17.1 mmb/d was only a 8.1% decrease. While this consolidation effort has increased the utilization rate of the remaining refineries to above the 90% level since 1993, it has made the industry more susceptible to equipment breakdowns and outages as facilities have been required to operate closer to the maximum design capacity over longer durations. One result of this consolidation effort is that regions of the country once served by a number of different companies and facilities are now dependent on fewer refineries. When operational problems occur at one of the remaining facilities, a region may experience supply disruptions and price surges until adequate replacement volumes find their way to the affected markets.

Another aspect of consolidation is that many of the remaining refineries are geographically clustered together in a limited number of areas. During August and September 2005, Hurricanes Katrina and Rita made landfall in the Louisiana, Mississippi, and Texas Gulf Coast area. At the peak, the combined impact of these two hurricane events resulted in the closing of 16 refineries with combined capacity of almost 5 mmb/d, fully 30%, of total U.S. refining capacity. The net effect was a surge in prices and substantial concern of the ability of the remaining refineries and import sources to meet U.S. demand.

Since 1997 the total number of refineries has fallen even as domestic refining capacity has increased. While financial, environmental, and legal considerations make it difficult for new refineries to be built in the U.S., many facilities have added capacity as various existing processing units are upgraded or expanded. Refiners are also altering processing units to maximize the production of higher value "light products" such as gasoline, distillate, jet fuel, and liquefied petroleum gases at the expense of residual fuel which has seen its market share decline for many years.

Exploration Industry Profile

Figure 7



The amount of exploratory and development drilling undertaken by industry is strongly dependent on the price of crude oil and access to attractive exploration targets. Data showing the number of rotary rigs operating in the U.S. involved with crude oil exploration since 1988 is presented in Figure 7. Since peaking at 554 rigs in 1988, the number of exploratory rigs operating in the U.S. has steadily declined. Comparing the trend line to annual data indicates that since 2003 higher priced crude oil may be helping to stimulate an increase in the number of exploration rigs operating in the U.S...

As important as the price of crude oil and land access are to drilling activity, the productivity of drilling operations is also critical. As the cost of operations and activities, such as data acquisition and processing, and the display and integration of seismic data with geologic data, continue to fall, the costs

of drilling becomes more affordable and efficient. Additional factors, such as powerful computers and the general increase in knowledge and experience, continues to exert downward pressure on drilling costs and helps stimulate exploration activities.

NEW YORK STATE OVERVIEW

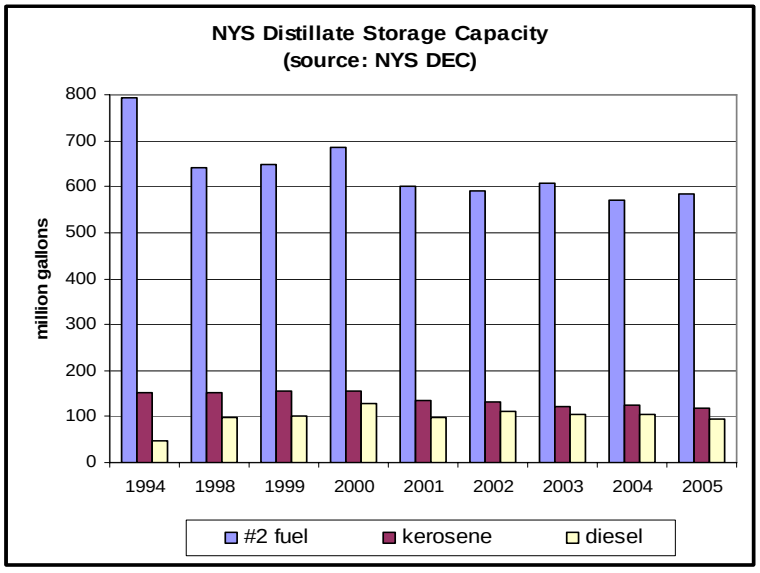
Infrastructure and Distribution Network

Meeting New York's future petroleum demands requires both an adequate supply of refined products and an efficient distribution network to move the various fuels from refining centers and terminals to end users statewide. However, the reliability and efficiency of the present petroleum distribution system is continually challenged by changing circumstances, such as stricter environmental requirements, land use issues, and the general aging of infrastructure.

The petroleum supply industry in New York has evolved over time in response to ever greater dependence on imported oil. As domestic sources of crude oil and refined products became less plentiful, the Port of New York developed into a ready entry point for petroleum products. As tanker shipments of petroleum products from foreign and distant Gulf Coast refineries increased, many terminal companies established large supply operations along the New York and New Jersey sides of the Port. Today, these primary oil storage facilities act as vital mechanisms to redirecting bulk deliveries of imported and domestic refined products to end users across New York and throughout the Northeast.

A diverse distribution network has developed over the years to transport petroleum products into and throughout New York State. Several pipeline systems connect New York consumers to the major refining centers located along the Gulf and East Coasts. Waterways, consisting of coastal channels, rivers, and canals, allow barges and coastal tankers to move supplies of refined products to end users statewide. These water routes also provide an alternative means for shipping fuels from domestic refineries located outside New York. Highway transport vehicles deliver supplies from New Jersey, Pennsylvania, and Canada across the southern and northern regions of the state. Rail shipments are not as common as other modes of transportation and generally are confined to interstate movements of bulk quantities of fuel. Refined products often are placed in interim locations, such as major regional terminal centers, for later truck or barge distribution to retail outlets and end users.

Figure 8



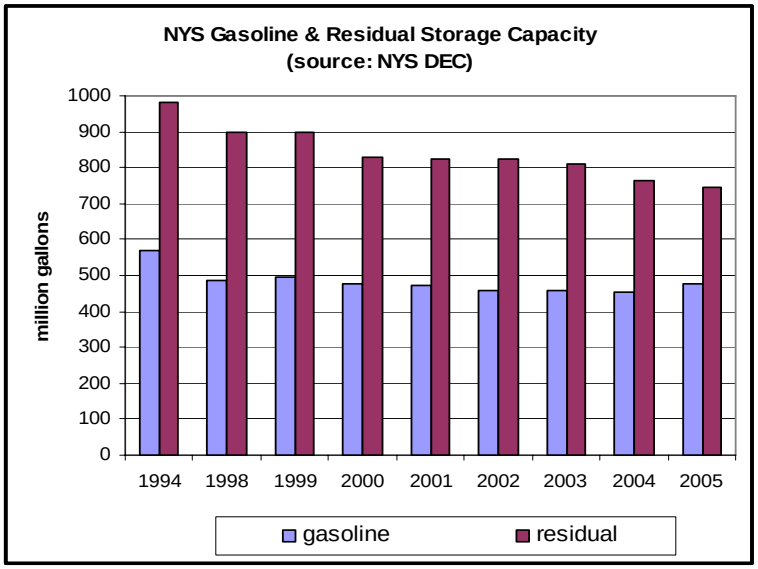
Statewide Storage Capacity

In recent years, petroleum product distribution companies throughout the state have expressed concern over the long-term decline in the number of storage terminals and associated storage capacity. They note that this reduction has increased the risk of impairing the operational flexibility needed to satisfy consumer oil demand. Petroleum storage terminal facilities face many of the same environmental, land use, and economic pressures that affect the refining sector. Operators note the high costs associated with meeting more stringent environmental regulations, increased insurance costs, greater carrying costs associated with holding petroleum products, and the lack of market incentives to build new facilities as impediments to adding storage capacity in the state.

Statewide distillate fuel storage capacity, which includes volumes of #2 home heating oil, kerosene, and diesel fuel, is shown in Figure 8. Operational storage capacity of home heating oil has declined from 794 million gallons in 1994 to 583 million gallons by 2005, a reduction of 211 million gallons or 26.6%. However, over the same period, statewide demand for this fuel by the residential, commercial, industrial, and electricity generation sectors has increased 20.3%.[3] This indicates that while terminal capacity is being used more efficiently to meet normal everyday demand, there is less capacity to meet atypical demand surges associated with colder than normal temperatures. This creates marketplace supply uncertainty and contributes to greater short-term price volatility. In effect, consumers have become more dependent on the ability of the petroleum transport industry (tugboats, barges, pipelines, and tankers) to resupply the remaining terminals during peak demand periods.

Kerosene is an important fuel used to meet heating needs and as a blending agent to prevent cold temperature gelling in both diesel fuel and home heating oil. This fuel is also used as a secondary backup fuel by many dual fueled electricity generating facilities that use natural gas as their primary fuel. Statewide storage capacity of this fuel has fallen from 151 million gallons in 1994 to 118 million gallons in 2005, a decrease of 21.9%

Figure 9



Storage capacity of diesel fuel increased steadily from 49 million gallons in 1994 to 127 million gallons by 2000, a gain of 78 million gallons or 159%. However, a significant decline in capacity occurred in 2001 as the total statewide volume decreased to 99 million gallons, a fall of 28 million gallons, or 22%. Since 2001 capacity has remained relatively steady, and in 2005 equaled 95 million gallons, 25.2% less than the 2000 peak.

Statewide motor gasoline and residual fuel storage capacities, presented in Figure 9, indicate the same declining capacity trend discussed for distillate

[3] NYSERDA Patterns and Trends 2004, Table 2-2a.

fuels. Between 1994 and 2005, gasoline capacity fell from 571 million gallons to 477 million gallons, a drop 94 million gallons or 16.5%. Again, while capacity decreased, demand for gasoline over the 1994 to 2004 period increased from 5.4 billion gallons to 5.8 billion gallons, a gain of 7.4%.[4] Similarly, the capacity of residual fuel, a fuel used by the electricity generation sector and in large industrial, commercial, and residential boilers, saw capacity decline from 981 million gallons in 1994 to 745 million gallons in 2005, a reduction of 236 million gallons, or 24.1%.

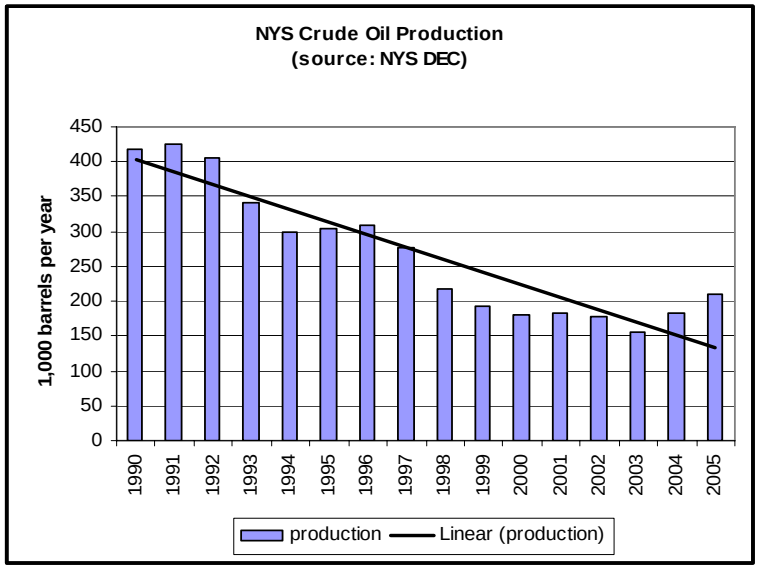
EXPLORATION ACTIVITIES

Historic Industry

New York's first commercial oil well began production in 1865, and statewide production peaked in 1882 at 6.8 million barrels per year. This initial oil boom was short-lived, and by 1893 production was down to one million barrels per year. New York's second oil boom occurred with the invention of water flooding, the first enhanced oil recovery technique. This technique led to a second peak of 5.4 million barrels in 1943. Since then, statewide oil production has steadily declined. The last major oil discovery occurred in 1981 when the "Bass Island Trend" was discovered in Chautauqua County. This geographic formation proved to hold a significant amount of oil and has produced over 1.5 million barrels of oil and significant volumes of natural gas.

Current Production Trends

Figure 10



According to the U.S. Energy Information Administration (EIA), New York ranked 28th out of 31 oil producing states in 2004. New York's oil production comes from two distinct regions: 1) the historic areas of Allegany, Cattaraugus, and Steuben counties, and 2) from the Bass Island Trend in Chautauqua County. As shown in Figure 10, oil production in 2005 totaled 211,000 barrels, less than 0.1% of annual statewide demand. While the 2005 production total is 50.5% less than the 1991 peak of 426,000 barrels, it is 34.4% greater than the 2003 low of 157,000 barrels. Sharply higher crude oil prices in recent years have stimulated exploration activities in the state.

[4] NYSERDA Patterns and Trends 2004, Table 2-2a.

Crude Oil Production Outlook

Recent crude oil price increases have stimulated new interest in New York's historic oil fields. As indicated by the production graph, the long decline of the state's crude production reversed in 2004 and continued higher in 2005. During 2005, permits for new oil wells totalled 199. This is compared with just 17 completions in 2002.

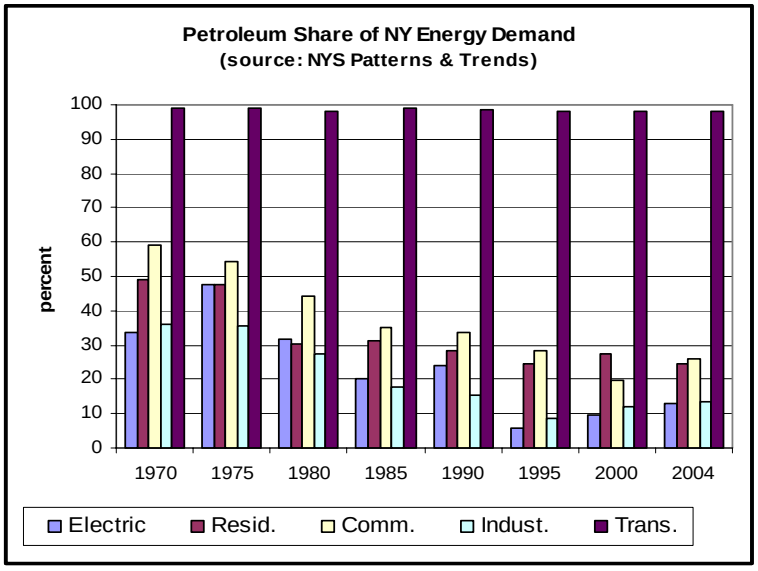
Even after 140 years of production, the remaining resource base is substantial. In an extensive geological study of New York's resource base completed in the 1980s, original oil-in-place was estimated at 1.118 billion barrels.[5] Cumulative production through 2004 totaled approximately 245 million barrels. This represents an estimated recovery rate of approximately 22%. Primary production usually can recover a maximum of 30%, with another 15% possible from enhanced oil recovery methods. Using a 45% maximum recovery factor, total New York production from primary and enhanced methods may total 600 million barrels with 355 million barrels yet to be recovered.

As crude oil prices have rebounded, there has been new interest in improving the recovery rate from domestic oil fields. Through the Stripper Well Consortium, a program funded by the U.S. Department of Energy and NYSERDA, Pennsylvania State University and East Resources are examining the use of a nitrogen/carbon dioxide mixture injection for enhanced oil recovery in the Chipmonk Field in Cattaraugus County, New York. If the laboratory work proves successful, the project may move on to field demonstration.

The University at Buffalo, with support from NYSERDA, is developing a geological model of sand deposition to help identify bypassed crude oil pay zones. This study will help operators identify new primary production zones and hopefully increase New York's production volumes.

Due to the improved business conditions, there is renewed interest in applying new technologies, such as enhanced oil recovery and horizontal drilling, to New York's oil fields. Should the current high price trend hold, it is possible production may continue to trend upward for the foreseeable future.

Figure 11



Petroleum Share of New York Sector Demand

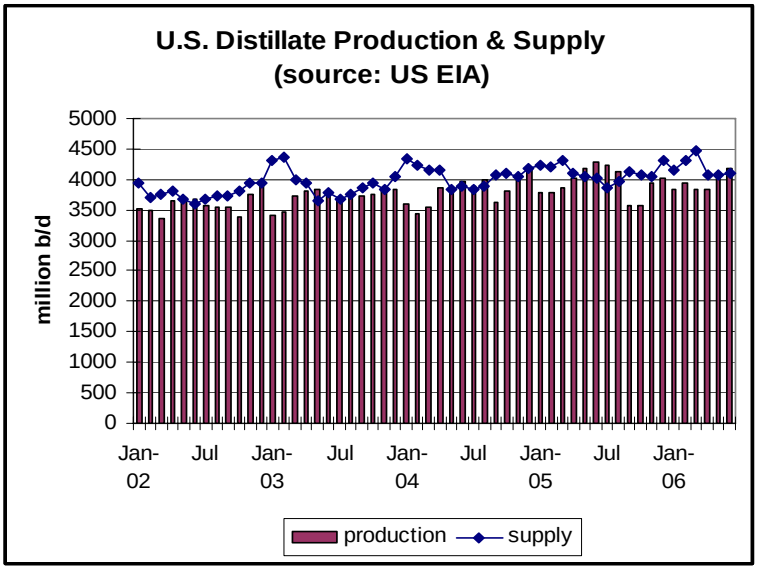
Petroleum fuels are vital to New York's economy and remain the single largest source of energy consumed in the state, as shown in Figure 11. As

[5] Reed, C. ed., 1989. *New York State Oil and Gas Drilling and Production 1988.* New York State Department of Environmental Conservation - Division of Mineral Resources, p. 59.

of 2004, petroleum fuels accounted for approximately 44.7% of New York's total energy demand. This is well below the 65.4% record high recorded in 1973. While the total petroleum share of energy demand has been steadily falling, a review of each economic sector shows that there has been an increase in the electric and industrial sectors since 1995 and since 2000 in the commercial sector.

On a historical basis the electric sector has posted the sharpest decline, falling from about 48% in 1975 to 13% in 2004. Beginning in the early 1990s, the electricity sector steadily turned to natural gas to satisfy the state's increased electricity demand. Even with the trend to natural gas powered facilities, petroleum products, such as residual fuel, continue to supply a number of large baseline generating units. Additionally, distillate fuels, such as diesel, kerosene, and home heating oil, fuel electricity generation peaking units and providing backup fuel capability at some generation facilities during periods when natural gas supply is unavailable or at a price disadvantage. Finally, in the transportation sector, petroleum fuels such as gasoline and diesel fuel, account for over 98% of energy supplies.

Figure 12



In the residential sector demand for all petroleum fuels, including home heating oil, kerosene, and propane fuel, declined as higher prices in the 1970s and early 1980s encouraged homeowners to convert to natural gas, increase home insulation, lower thermostats, and purchase high efficiency furnaces. Similar end-user sentiment in both the commercial and industrial sectors acted to reduce petroleum's share of total energy supply. A limited amount of dual-fuel capability exists in large apartment buildings in the residential sector and in both the commercial and industrial sectors. Dual-fuel equipment allows end-users the option to switch between natural gas and distillate or residual fuels when the price for one fuel makes it an economic advantage to do so. As a result, if a sufficient amount of fuel switching occurs, petroleum use may increase from year to year. This occurred in both the residential and industrial sectors between 1995 and 2004.

REFINED PRODUCT REVIEW

Distillate Supply and Demand

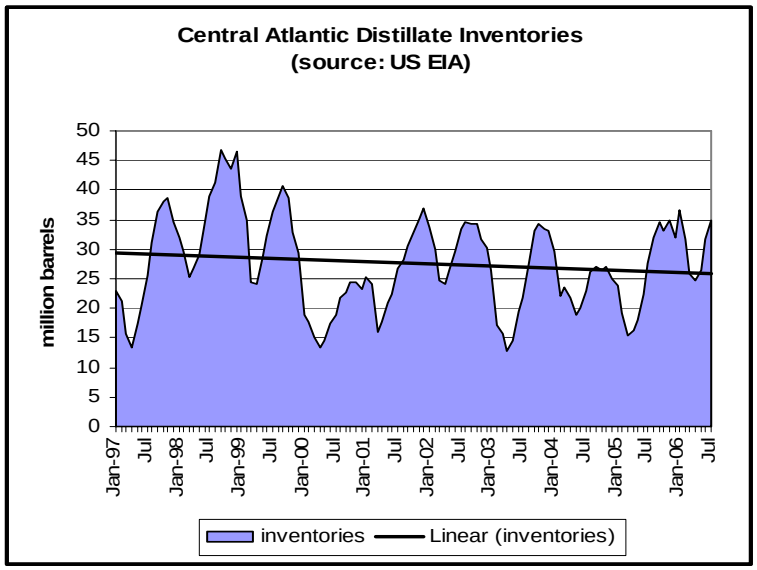
Monthly total U.S. distillate fuel production and supply is presented in Figure 12. In this analysis supply is used as a surrogate measure for demand. As the graph illustrates, there are months during the winter period when demand outstrips the production capacity of domestic refineries. It is during these periods that inventories and product imports become critical to meet consumer needs. A review of historic data indicates that the spread between domestic production and demand has widened in recent years. During

the October 1997 through March 1998 winter period, the demand over production spread averaged 153,000 b/d. By the October 2002 through March 2003 winter season the spread had increased to 445,000 b/d, a gain of 292,000 b/d, or 193%. For the most recent winter season, October 2005 to March 2006, one of the warmest winters in many years, the spread equaled 371,000 b/d.

Distillate Inventory Trends

Inventory volumes are important components of the distillate fuel supply system and at the regional level act as critical buffers to meeting demand during the winter months. Monthly distillate fuel quantities for the Central Atlantic Region of the U.S. are presented in Figure 13. Regional analysis is important because New York's fuel needs, as well as those of neighboring states, are met from terminals located both within and outside the state. Correspondingly, some fuel inventories held at terminals in the New York Harbor area and northward along the Hudson River, supply neighboring New England and other Central Atlantic states.

Figure 13



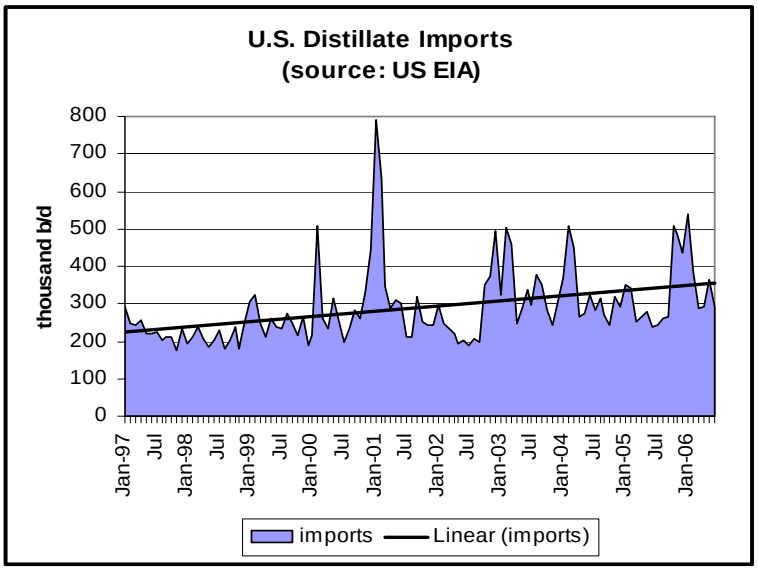
The trend line shown in Figure 13 clearly illustrates the downward trend for inventory volumes. While the trend line takes into account volumes for each month of the year, including the low demand summer months, it is also easily seen that winter month volumes are in steady decline. Between the summer 1998 peak of 46.9 million barrels (mmbbls) and fall 2004 quantity of 26.5 mmbbls, inventory pre-winter season peaks declined 17.4 mmbbls, a 43.5% decrease. For the 2005/2006 season, pre-winter season stocks equaled 34.8 mmbbls, significantly higher than recent years.

The general downward pattern of lower inventories reflects the industry's movement to "just-in-time" inventory resupply. "Just-in-time" inventory practices reflect the desire of petroleum terminal operators and distributors to lower costs. The industry now relies on the petroleum supply chain to deliver fuel to satisfy market requirements more promptly. While this management practice reduces inventory carrying costs, it exposes the petroleum distribution chain to a greater level of potential volatility and vulnerability should supply disruptions occur anywhere, or for any reason, along the distribution chain.

Northeast Home Heating Oil Reserve

As a result of the distillate fuel shortfalls that occurred during the 1999-2000 winter season, the U.S. Department of Energy (U.S. DOE) established the Northeast Home Heating Oil Reserve in the summer of 2000. This reserve consists of two million barrels of government-owned heating oil. The reserve is intended to provide insurance against lower than normal inventories, supply shortfalls, and delivery interruptions. In the initial year of operation, reserves of 500,000 barrels each were held at the Motiva Enterprises Terminal and Magellan Midstream Partners L.P. Terminals, both in New Haven, Connecticut, and one million barrels were held at the Hess Terminal in Woodbridge, New Jersey. In the summer of 2001, U.S. DOE approved the relocation of 250,000 barrels of the Reserve from New Haven to Providence, Rhode Island. This third location enhances the distribution capabilities by increasing truck and marine loading options. States covered by the reserve are New York, Connecticut, Maine, New Hampshire, Rhode Island, Vermont, Massachusetts, Pennsylvania, and New Jersey.

Figure 14



Distillate Imports

In response to ever lower inventory levels and relatively steady domestic production trends, the petroleum industry has increased imports of distillate fuel to meet the surge in demand that occurs during peak winter periods. Monthly total U.S. distillate fuel imports and a trend line are shown in Figure 14. The graph illustrates that as inventory volumes declined over the years the petroleum industry satisfied demand with increasingly larger quantities of imports. For example, in February 1999, the industry imported a high of 322,000 barrels per day (b/d), 85,000 b/d or 36% more than the previous year. By February 2000, the total had climbed to 510,000 b/d, 188,000 b/d or 58% above the 1999 level. In 2001, the petroleum industry imported record volumes for two consecutive months, 789,000 b/d and 635,000 b/d, respectively for January and February. Finally, as recently as January 2006, during a relatively warm winter, imports equaled 541,000 b/d.

With import volumes of this magnitude there is concern whether or not the distribution system, including barges and tankers, can satisfy the future requirements of the region during severe weather conditions. Also, potentially significant increases in demand for distillate products, used as backup fuel for natural gas by the electricity generation sector, add to the concern. Lower storage tank capacities and quantity of fuel stored increase the potential that supply disruptions caused by winter storms or heavy ice conditions could adversely affect New York end users in all economic sectors.

New York Distillate Fuel Focus

New York State is a major user of distillate fuel,[6] accounting for 6.1% of total U.S. distillate fuel demand in 2004. The three distillate fuels are utilized in each of the economic sectors of the State and represent approximately 28%[7] of total petroleum fuel used in New York in 2004. The transportation and residential sectors account for the greatest percent share of consumption of distillate fuel in the state in 2004, 39.0% and 35.3%, respectively. Home heating oil use in the residential sector is particularly important in New York State with an estimated 2.3 million households (representing nearly one-third of the housing stock) using home heating oil and kerosene to heat. New York uses more home heating oil than any other state in the nation, accounting for approximately 21% of the nation's total demand.

Figure 15

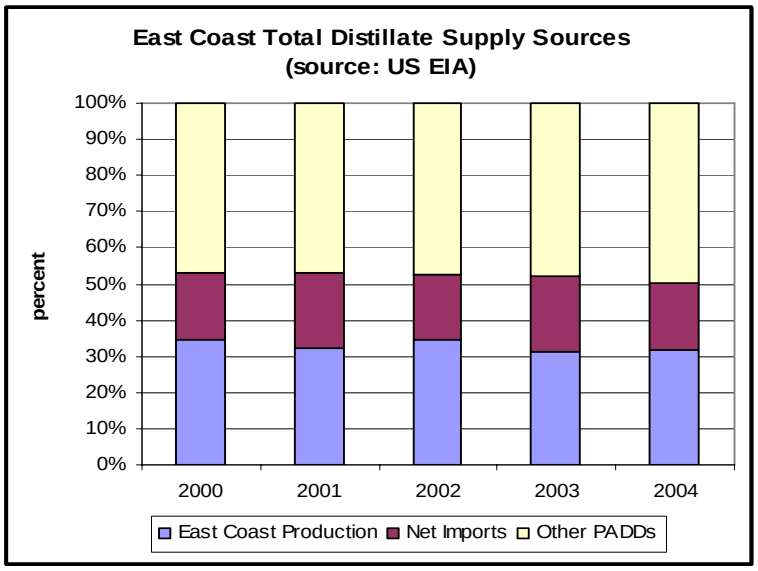
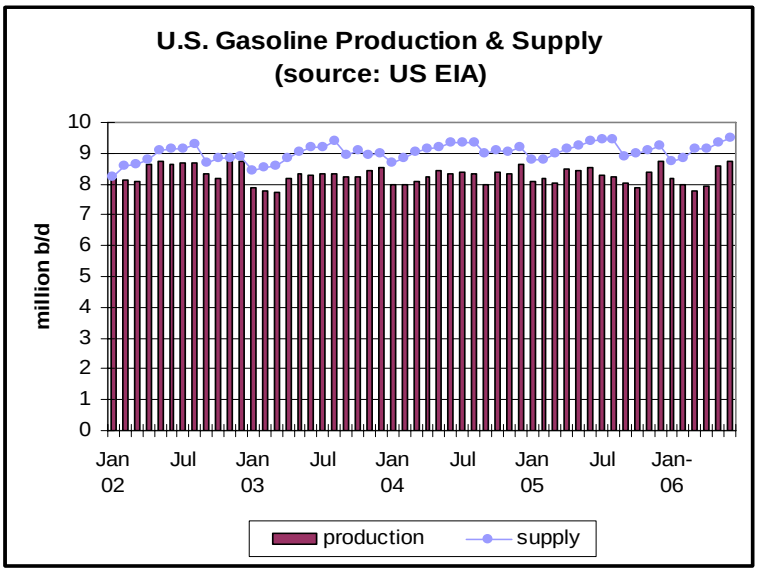


Figure 16

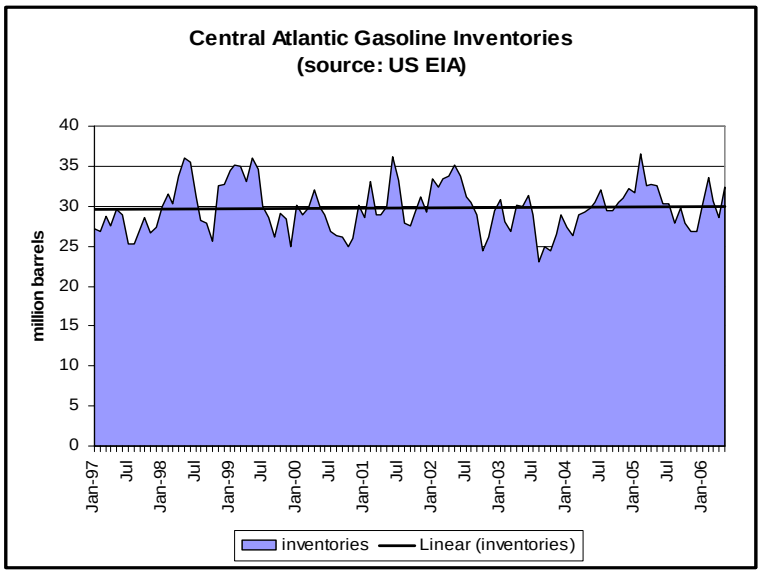


New York State specific sources of supply data are not possible to calculate, however the US Energy Information Administration (EIA) does calculate East Coast PADD 1[8] level refined product source data. As shown in Figure 15, in 2004 East Coast states received approximately 32% of their distillate supplies from refineries located within PADD 1, almost 50% from other US areas, and about 19% from direct foreign imports. These percentages have held relatively steady over the past five years. In 2004, NYS accounted for 16.8% of PADD 1 distillate consumption.

[6] Distillate fuel is defined as home heating oil, kerosene, and diesel fuel.
[7] NYSERDA, *Patterns and Trends 2004*. Distillate fuel does not include jet fuel.
[8] Petroleum Administration for Defense Districts are geographic aggregations of the 50 States and District of Columbia. PADD 1 includes 17 states from Maine to Florida, including New York.

Gasoline Supply and Demand

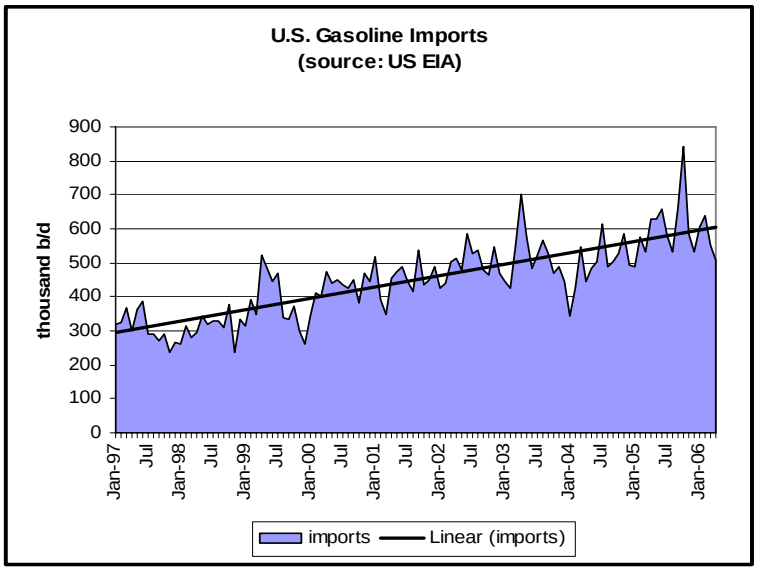
Figure 17



Monthly total U.S. gasoline production and supply data beginning in January 2002 are presented in Figure 16. Once again, supply is used as a surrogate measure for demand. The clear pattern that emerges from the data is that the U.S. is becoming more dependent on imported gasoline to meet the increasing volume of every day demand. This is particularly true during the summer months and again highlights the importance of maintaining adequate inventories. On an annual basis the data indicate that from 2002 to 2005 the difference between domestic production and demand increased from 370,000 b/d to 840,000 b/d, an increase of 470,000 b/d or about 127%. The growing dependency on imported gasoline to meet demand is not a new trend. In 1997, the difference between domestic demand and supply was 147,000 b/d, significantly lower than the 2005 quantity.

Gasoline Inventory Trends

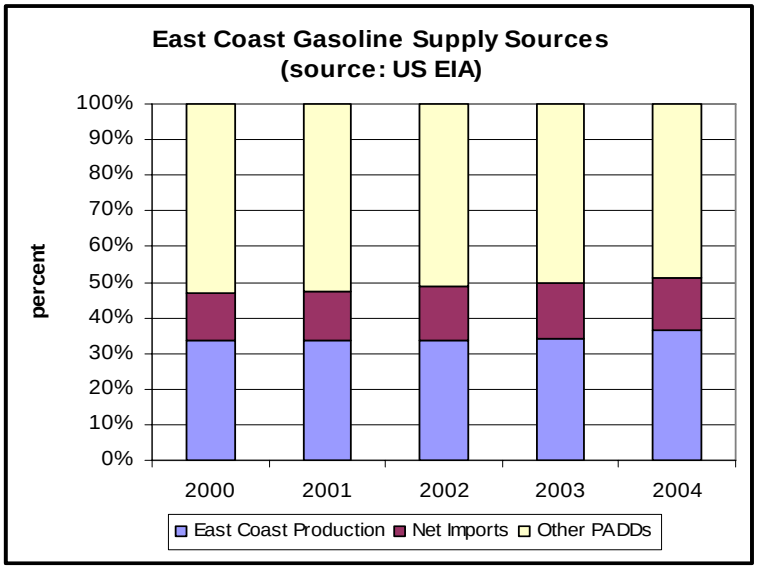
Figure 18



Like distillate fuel inventories, gasoline inventories play a critical role in ensuring adequate supplies of motor gasoline, particularly during the peak summer driving season. Total gasoline inventories for the Central Atlantic Region, which includes New York State, for both conventional and reformulated types of gasoline are presented in Figure 17. Unlike distillate fuels, that show a downward trend in total volume, annual average gasoline inventories have remained relatively stable at about 30 million barrels since January 1997. In general, the petroleum industry increases stock levels during the spring in anticipation of higher demand during the summer driving season. Stocks are then drawn down to meet the peak demand period and reach their traditional low quantities in the fall.

Gasoline Imports

Figure 19



Since the increase in domestic gasoline production has not kept pace with the rise in demand, volumes of imported fuel have been on an upward trend. Monthly total U.S. gasoline imports are shown in Figure 18. The graph illustrates that since 1997 the quantity of gasoline imports has been steadily rising. In 1997, imports averaged 309,000 b/d. By 2005, the volume had risen to 604,000 b/d, an increase of 295,000 b/d or approximately 95.5%. During the 1997 to 2005 period, U.S. dependence on gasoline imports to meet domestic demand climbed from 3.9% of total supply to 6.6% in 2005. While it is expected that product imports will continue to be available, the difference in U.S. gasoline regulations compared to other areas of the world may limit supply availability in the future.

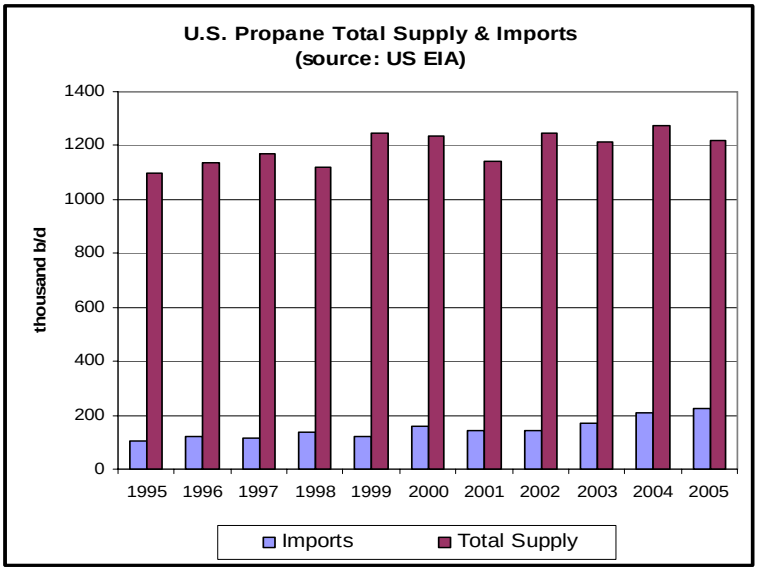
New York Gasoline Focus

New York State gasoline consumption equaled approximately 5.8 billion gallons in 2004, 4.1% of total U.S. and 11.3% of PADD 1 demand. The state's gasoline requirements are satisfied by either conventional grade fuel or U.S. Environmental Protection Administration (U.S. EPA) mandated reformulated (RFG) gasoline. Gasoline retailers are required to sell the RFG grade gasoline throughout the year in New York City, Long Island, and in the counties of Westchester, Putnam, Orange, Dutchess, and Rockland. In 2005, this region of the state used an estimated 3.0 billion gallons, or approximately 51.5% of New York's annual gasoline demand.

Beginning in 2004, New York banned the use of the gasoline additive methyl tertiary-butyl ether (MTBE) because of water contamination concerns. This additive had been used in gasoline since 1979. Initially it was used as an octane enhancer to replace lead as an additive, and later, as an oxygenate to reduce ozone, carbon monoxide, and other air pollutants. In New York the MTBE was replaced by ethanol to meet the oxygenate requirements in place at that time. By 2005 many other states and gasoline producing companies also began to remove MTBE from their gasoline. In July 2005, the U.S. Congress passed the Energy Policy Act of 2005 which eliminated the oxygen content requirement for RFG. The Act also established a renewable fuel standard. This law requires 7.5 billion gallons of renewable fuels such as ethanol to be mixed with gasoline by 2012. As of 2006, many companies are blending ethanol into the gasoline to replace the octane and clean burning properties of MTBE.

Once again, while New York State specific data are not available, East Coast PADD 1 information, shown in Figure 19, indicates that in 2004 approximately 49% of all gasoline delivered to New York State was produced at Gulf Coast refineries, down from the 53% level in 2000. Most of this fuel is shipped by pipeline to storage terminals in the New York Harbor area. Additionally, a small volume of this Gulf Coast supply is transported by coastal tanker to New York Harbor. Approximately 37% of the gasoline consumed on the East Coast is produced at Mid-Atlantic refineries, an increase from the 34% rate in 2000. These facilities are located primarily in New Jersey and Pennsylvania, and the fuel they produce is moved into New York Harbor and Long Island terminals by barge and by pipelines to central and western New York. The remaining 14% of East Coast gasoline supply is imported from foreign sources, a slight gain from the 13% rate in 2000. The majority of this fuel is from the Caribbean area, largely from Virgin Islands and Venezuelan refineries, or from Canada. Gasoline reaching New York Harbor is also barged to regional terminals along the Hudson River, north to Green Island, and east to Long Island. Tanker trucks then move the gasoline from these regional terminals to neighborhood retail outlets.

Figure 20



Propane Overview

Compared to other refined petroleum products, propane fuel is a small volume, essential source of energy for New York residents and business owners. Propane, often referred to as "bottled gas" or "LP-gas," is used in the residential sector for heating homes and water, cooking, drying clothes, and fueling fireplaces. In the commercial and industrial sectors it is used for heating and to drive manufacturing processes. Finally, it is used in very limited quantities by the transportation sector.

Propane Supply and Demand

Propane is produced as a by-product of natural gas processing and petroleum refining. Domestically, propane is shipped to New York State via the Texas Eastern Products Pipeline (TEPPCO), which originates in the U.S. Gulf Coast, and by rail car and by truck. Propane is also imported from Canada by rail car, truck, and pipeline, as well as from foreign sources by ocean going tankers. As shown in Figure 20, since 1995 U.S. total annual propane supply has increased from 1.096 mmb/d to 1.22 mmb/d, an increase of 11.3%. During this same period, propane imports rose from 102,000 b/d to 226,000 b/d, an increase of 121.6%. On a percentage basis, in 1995 imports accounted for 9.3% of total supply. By 2005 the import share had climbed to 18.5%.

Propane Storage

Pre-winter season propane inventory build is important because peak cold temperature demand often exceeds the resupply capacity of the propane distribution system. For example, rail car deliveries and truck transport may be delayed due to severe cold and snowy weather conditions during the winter months. In New York State there are three levels of storage for propane inventories: primary, secondary, and tertiary. At the primary level, in central New York, there are several underground salt dome storage caverns that hold large volumes of propane. These caverns are connected to the TEPPCO pipeline or have railcar capacity. They are injected with propane during the summer and early fall in anticipation of high demand during the winter months. At the secondary level there are many pressurized above-ground tanks located at retail dealers around the state. Finally, tertiary storage is represented by small above-ground storage tanks located at residences and commercial properties.

Figure 21

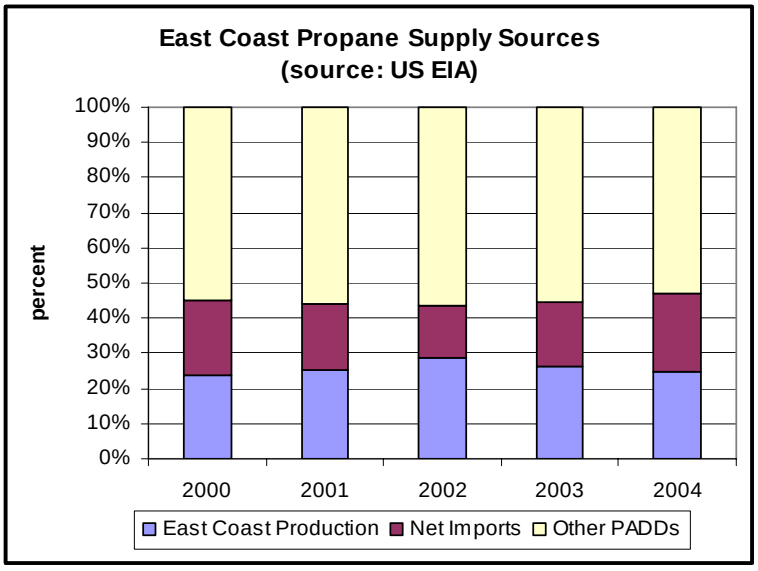
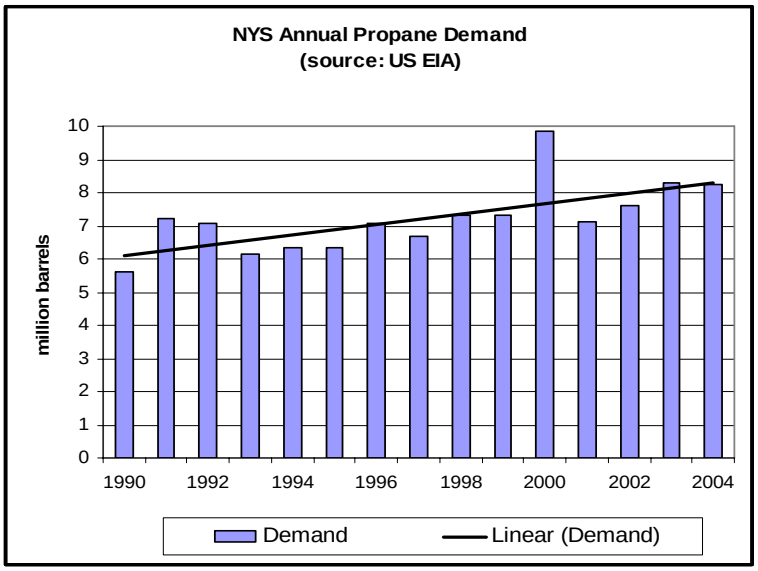


Figure 22

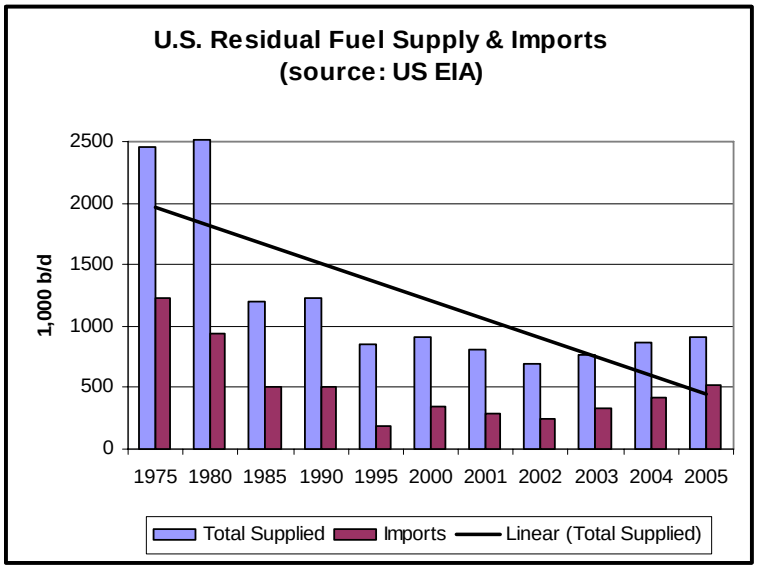


As illustrated in Figure 21, in 2004 the East Coast states received 53% of their propane supplies from other parts of the country, primarily the U.S. Gulf Coast region. This percentage share has remained stable over the past five years. Supplies from PADD 1, which equaled 24.8% in 2004, have ranged from 23.9% to 28.7% since 2000. Finally, imports to PADD 1 ranged from a low of 14.9% in 2002 to a high of 22.1% in 2004.

New York Propane Fuel Focus

On a national scale, New York's percentage share of consumption is small, 1.1% of total U.S. demand. However, when compared to the East Coast the state accounts for 11.6% of demand, the third largest market behind North Carolina and Pennsylvania. As shown in Figure 22, demand for propane fuel in New York State has risen steadily since 1990. Between 1990 and 2004 annual propane demand increased from 5.6 to 8.2 million barrels, a gain of 2.6 million barrels or 46.4%. In 2000, propane demand spiked at 9.8 million barrels. In 2004 the residential sector accounted for 71.5% of demand, the commercial sector 12.6%, industrial 15.0%, and the transportation 0.9%.

Figure 23



Residual Fuel Overview

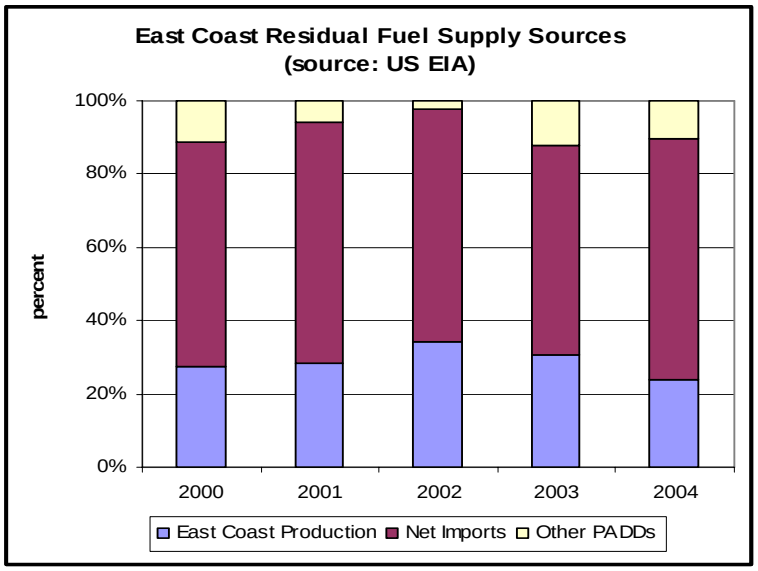
Since 1991 consumption of residual fuel oil has ranked as the third largest petroleum fuel on a volumetric basis used in New York, behind gasoline and distillate fuel oil. The fuel is traditionally refined and blended to different levels of sulfur content to meet varying air emission standards. These sulfur contents are measured as a percentage by weight. The allowable sulfur content in New York State ranges from a low of 0.3% to over 2.0%. The fuel is blended at terminals to meet different local sulfur requirements. In New York City residual fuel is required to have a sulfur content of no greater than 0.3%. Residual oil is not shipped in pipelines because of its high viscosity. Rather it is transported by tanker, barge, and, for local delivery, by truck. It is traditionally used in large boiler applications such as electric power generation, space heating in large apartment and commercial buildings, vessel bunkering, and in industrial facilities.

Residual Fuel Supply and Demand

U.S. demand for residual fuel oil has fallen steadily since 1980 when the market for this fuel began to erode. Beginning in the 1970's, many residual fuel oil use applications converted to natural gas because of the cleaner emission characteristics of that fuel and the price advantages at that time. This was particularly true for electric power generation. Another consideration at that time was the effort to reduce U.S. dependency on petroleum fuels. As depicted in Figure 23, U.S. total annual residual fuel oil supply peaked at 2.5 mmb/d in 1980. The recent low of 700,000 b/d in 2002 equates to a 72.0% decline. Since the 2002 low, demand has climbed to 913,000 b/d in 2005, an increase of 30.4%. This increase is primarily the result of high natural gas prices. Many residual fuel users have dual fuel capability. The dual fuel option allows users to select between residual fuel and natural gas on an economic basis. Beginning in 2003, the higher natural gas prices resulted in higher demand for residual oil.

The U.S. used approximately 316 million barrels of residual fuel oil in 2004. Almost two-thirds were consumed in PADD 1 states, with Florida and New York being the largest users. In 2004, New York used over 51 million barrels, approximately 16% of total U.S. demand and 25% of PADD 1 demand. While it is not possible to determine NYS specific sources of residual fuel, Figure 24 shows that in 2004 the majority of residual fuel used on the East Coast, 65.7%, originated from foreign sources. Additionally, over the past five years East Coast refineries have supplied between 23 to 31 percent of supply. Finally, the U.S. Gulf Coast area has generally accounted for about 10% of supply. For many years U.S. refiners have acted to reduce residual fuel production capacity in favor of more profitable gasoline and distillate fuels. Consequently, the trend toward higher import dependence for residual fuel is likely to continue.

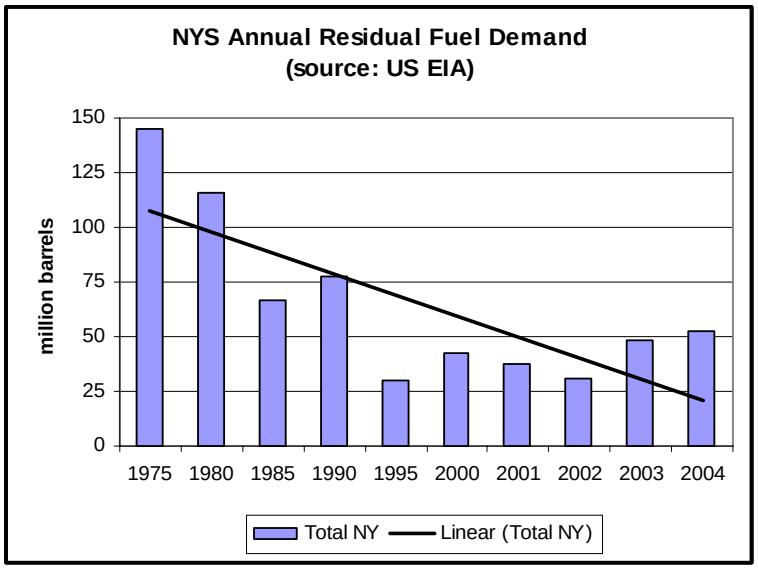
Figure 24



New York Residual Fuel Focus

Matching the national trend, New York residual fuel demand has fallen very sharply since 1975. Between 1975 and 2004 statewide demand declined from 144.7 to 52.3 million barrels, a reduction of 63.9%. Much of the residual fuel used in the state is consumed by the electric sector. In 2004 the electric sector accounted for 64.4% of total residual fuel demand, not much lower than the 1990 level of 69.7%. Similarly, in 2004 the commercial sector, that includes large apartment buildings common in New York City, accounted for 21.7% of residual demand, very close to the 1990 share of 22.5%. Again reflecting the national trend, the rebound in residual consumption in recent years is primarily the result of fuel switching by dual fuel units away from higher cost natural gas. Should natural gas prices once again fall below the comparable residual fuel price, it is expected that users will switch back to lower emission natural gas.

Figure 25



New York Petroleum Demand and Price Forecast Summary

New York State's residential distillate fuel (home heating oil) demand, as shown in Table 1, is projected to decrease 1.4% annually over the next 20 years, whereas motor gasoline demand is projected to increase 0.6%. The total decline in residential distillate is calculated to be 45.5 TBtu, from 197.7 TBtu in 2006 to 152.2 TBtu in 2025. The total increase in motor gasoline demand is calculated to be 85.5 TBtu, from 722.7 TBtu in 2006 to 808.2 TBtu in 2025. Over the 2006 to 2025 forecast period, residential distillate fuel price is projected to decrease 1.0% annually, and motor gasoline price is expected to decrease 0.9%. The total decline in residential distillate price is 42¢/gallon in constant 2004 dollars, from $2.34/gallon in 2006 to $1.92/gallon in 2025. The total decline in motor gasoline price is 38¢/gallon in constant 2004 dollars, from $2.35/gallon in 2006 to $1.97/gallon in 2025. A fuel price projection in constant 2004 dollar units removes the natural rate of inflation within the New York state's economy and allows for analysis of real changes in future relative to current prices.

Table 1

New York Petroleum Demand and Price Forecast				
Year	Residential Distillate		Motor Gasoline	
	Demand (TBtu)	Price 2004$/gal	Demand (TBtu)	Price 2004$/gal
2006	197.7	2.34	722.7	2.35
2010	177.5	2.05	739.9	2.09
2015	170.9	1.97	762.0	2.02
2020	161.9	1.95	784.7	2.00
2025	152.2	1.92	808.2	1.97
Annual Growth Rate (2006-2025)	-1.4%	-1.0%	0.6%	-0.9%

The Petroleum Resource Assessment was prepared by NYSERDA Energy Analysis Program Staff. If you have any questions, please contact:

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