INDUSTRIAL COMMISSION OF NORTH DAKOTA

NORTH DAKOTA PIPELINE AUTHORITY

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# Refined Products

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The U.S. produces about 5.2 million barrels of crude oil per day. In addition to domestic production, we import about 10.1 million barrels of foreign crude oil. U.S. refineries produce about 17 million barrels per day of refined petroleum products. Texas is the largest oil producing state at about 1.1 million barrels per day. North Dakota is ranked eighth and accounts for about 2.5% of the nation's production. Currently North Dakota oil production is about 140,000 barrels per day. The U.S. imports about 3.6 million barrels per day finished refined products to meet our needs.

Petroleum products made from crude oil are found in every area of our lives. They are easily recognized in the gasoline and diesel fuels we use to power our vehicles and in the heating oil we use to warm our homes. Less obvious are the petroleum-based plastics, medicines, food items, and many other products.

Petroleum products fall into three major categories: fuels such as motor gasoline and distillate fuel oil (diesel fuel); finished nonfuel products such as solvents and lubricating oils; and feedstock for the petrochemical industry such as naphtha and various refinery gases. Demand is greatest for products in the fuels category, especially motor gasoline.

Petroleum products, especially motor gasoline, distillate (diesel) fuel, and jet fuel, provide virtually all of the energy consumed in the transportation sector. Transportation is the greatest single use of petroleum products in the U.S., accounting for over 69 percent of all petroleum consumed in 2005. The industrial market is the second largest petroleum consuming sector and accounts for about 24 percent of all petroleum consumption in the U.S. Residential and commercial usage combined with the electric utility sector account for the remaining 7 percent of petroleum consumption.

The United States is the number one oil importing and consuming country in the world. Demand for petroleum products in the U.S. averaged 20.8 million barrels per day in 2005. That represents about 3 gallons of petroleum consumed each day for every person in the country.

**What are refined products?**

Refined petroleum products are those produced or created from the processing of crude oil and natural gas. They can also be created synthetically by chemical processing plants using other hydrocarbons as feedstock- such as coal. For the purposes of this report we will concentrate our attention on the fuels category of refined petroleum products produced by refineries.

**Motor gasoline** is chiefly used to fuel automobiles and light trucks for highway use. Smaller quantities are used for off- highway driving, boats, recreational vehicles, and various farm and other equipment. Motor gasoline consistently accounts for the largest share of petroleum demand in the U.S. accounting for more than 44 percent of the total demand for petroleum products.

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**Distillate fuel oil** includes diesel oil, heating oils, and industrial oils. It is used to power diesel engines in buses, trucks, trains, automobiles, and other machinery. It is also used to heat residential and commercial buildings and to fire industrial and electric utility boilers. Specifications differ for heating oils and diesel fuels based primarily on the sulfur content.

**Liquefied petroleum gases (LPG's)** rank third in usage among petroleum products, behind motor gasoline and distillate fuel oil. LPG's are used as fuel for domestic heating and cooking, farming operations, and as an alternative to gasoline for use in internal combustion engines. LPG's are also used as inputs (feedstocks) for petrochemical production processes. This is their major nonfuel use, accounting for about 45% of the LPG consumed in the U.S. Individual LPG products have distinct uses. Ethane is used primarily as a petrochemical feedstock. Butane is used as a gasoline blending component, although volatility regulations for gasoline have limited its use. Butane has many other domestic and industrial uses.

**Jet fuel** is a kerosene-based fuel primarily used in commercial airlines. It requires a higher temperature to ignite and is safer for commercial use than naphtha-based fuel. Naphtha jet fuel meets the specifications required for certain military aircraft. It has a lower freezing point than commercial fuel and a lower flash (ignition) point.

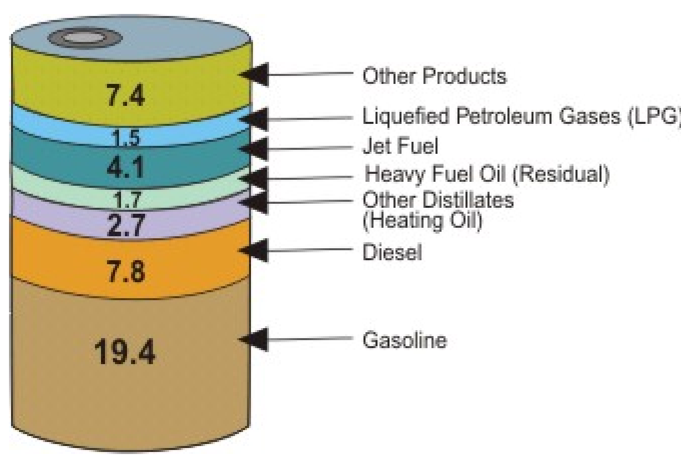
Electric utilities use **residual fuel oil** to generate electricity. Although this sector uses relatively little petroleum compared with the transportation and industrial sectors, the electric utility sector depends on petroleum for about 3 percent of its total energy requirements. Residual fuel oil is also used as bunker fuel (fuel for ships), industrial boiler fuel, and heating fuel in some commercial buildings.

**Kerosene** is used for residential and commercial space heating. It is also used in water heaters, as a cooking fuel, and in lamps. Kerosene falls within the light distillate range of refinery output that includes some diesel fuel, jet fuel, and other light fuel oils.

**Petroleum coke** can be used as a relatively low-ash solid fuel for power plants and industrial use (marketable coke) if its sulfur content is low enough, or used in nonfuel applications (catalyst coke), such as in refinery operations.

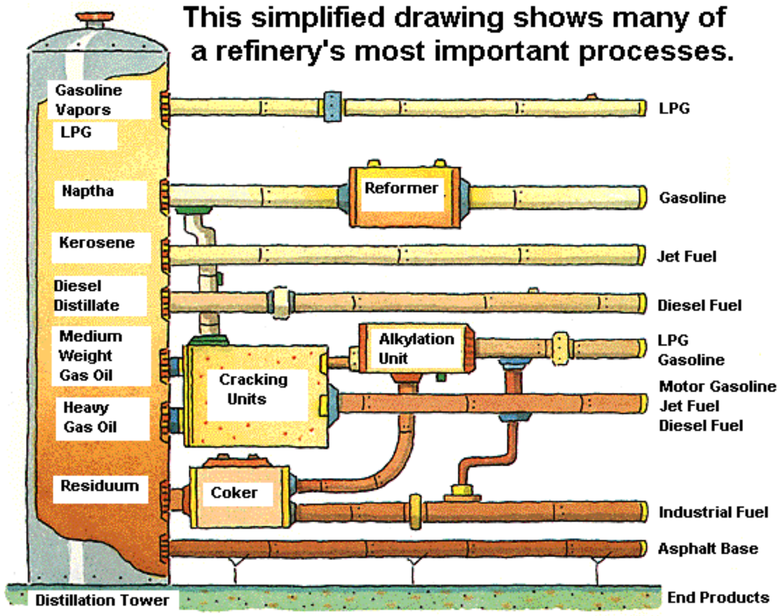
**Where Do They Come From?**

After crude oil is removed from the ground, it is shipped to refineries by pipeline, ships, barges, tank cars, and trucks. At the refinery, crude oil components are separated and then reformed into useable petroleum products. Crude oil is measured in 42-gallon barrels. One barrel of crude oil provides slightly more than 44 gallons of finished petroleum products. There is about a 5% volume gain from processing the crude oil as the hydrocarbon molecules are broken down and reformed into different products.




Source: Energy Information Administration

**Basic Crude Oil Refining**
A refinery takes crude oil and turns it into gasoline and hundreds of other useful products. A typical refinery costs billions of dollars to build and millions more to maintain. A refinery runs twenty-four hours a day, 365 days a year and requires a large number of employees to run. A refinery can occupy as much land as several hundred football fields.




Source: Energy Information Administration

All refineries perform three basic steps: separation, conversion, and treatment.

## Separation:
Modern separation involves piping oil through hot furnaces. The resulting liquids and vapors are discharged into distillation towers. Inside the towers, the liquids and vapors separate into components or fractions according to weight and boiling point. The lightest fractions, including gasoline and liquid petroleum gas vaporize and rise to the top of the tower where they condense back to liquids. Medium weight liquids, including kerosene and diesel oil distillates, stay in the middle. Heavier liquids, called gas oils, separate lower down, while the heaviest fractions with the highest boiling points settle at the bottom.

## Conversion:
The most widely used conversion method is called cracking because it uses heat and pressure to "crack" heavy hydrocarbon molecules into lighter ones. A cracking unit consists of one or more tall, thick-walled, bullet-shaped reactors and a network of furnaces, heat exchangers and other vessels.

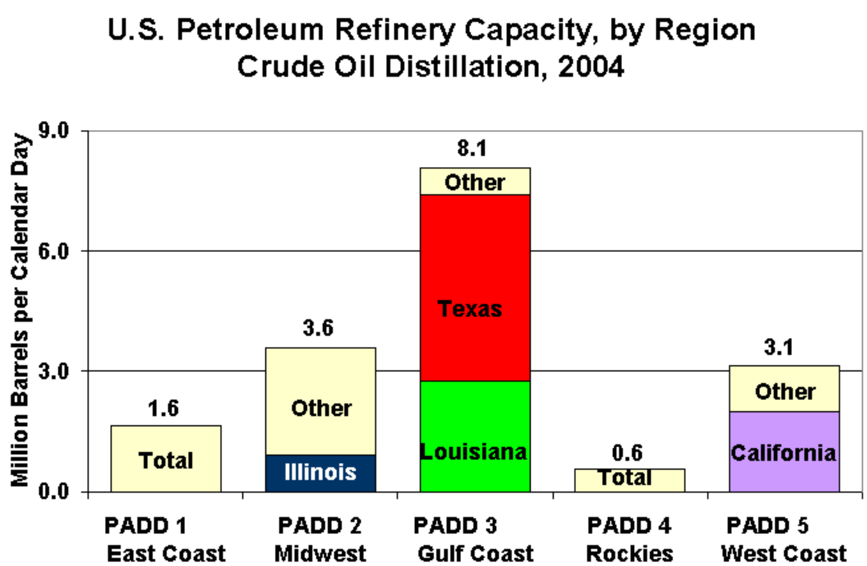
Cracking and coking are not the only forms of conversion. Other refinery processes, instead of splitting molecules, rearrange them to create different molecules. Alkylation, for example, makes gasoline components by combining some of the gaseous byproducts of cracking. That process, which essentially is cracking in reverse, takes place in a series of large, horizontal vessels and tall towers that loom above other refinery structures. Reforming uses heat, moderate pressure and catalysts to turn naphtha, a light, relatively low-value fraction, into high-octane gasoline components.

## Treatment:
The finishing touches occur during the final treatment. Refinery technicians carefully combine a variety of streams from the processing units. Among the properties that are altered or changed in

the final blend might be octane level or vapor pressure ratings. Special additives or mixtures might be created at this point.

**Refining Industry Fundamentals**

U.S. demand for refined products continues to grow. According to the U.S. Energy Information Administration, as of January 2007 U.S. refining capacity was about 17.4 million barrels per day. In 1996, the U.S. capacity was 15.3 million barrels per day. Over the past decade refining capacity has increased about 14 percent. That increase was accomplished even though several refineries ceased operations during that time. The capacity increase was provided by the expansion at remaining facilities. That expansion was approximately equal to 10 new 200,000 barrel per day refineries. Still, this improvement is not enough to keep pace with the growing U.S. demand. The refining industry has effectively maximized their output capacity and is running over 90% of the time, allowing little “down” time for routine maintenance or unexpected outages. Because there is little or no excess refining capacity, storage supplies deplete quickly when natural disasters or other problems affect refineries. Nearly 46 percent of the U.S. refineries exist along the Gulf Coast and these areas are vulnerable to hurricanes.




Source: *Petroleum Supply Annual,* Table 36, Biennial Refinery Report

The following page lists the number and capacity of operable refineries in the U.S. as of January 2007.

## Table 1. Number and Capacity of Operable Petroleum Refineries by PAD District and State as of January 1, 2007

| PAD District and State | Number of Operable Refineries | | | Atmospheric Crude Oil Distillation Capacity: Barrels per Calendar Day | | | Barrels per Stream Day | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Operating | Idle [a] | Total | Operating | Idle [b] | Total | Operating | Idle [b] |
| **PAD District I** | **15** | **13** | **2** | **1,717,575** | **1,657,575** | **60,000** | **1,810,200** | **1,743,200** | **67,000** |
| Delaware | 1 | 1 | 0 | 182,200 | 182,200 | 0 | 190,200 | 190,200 | 0 |
| Georgia | 1 | 0 | 1 | 28,000 | 0 | 28,000 | 32,000 | 0 | 32,000 |
| New Jersey | 6 | 5 | 1 | 655,000 | 623,000 | 32,000 | 686,000 | 651,000 | 35,000 |
| Pennsylvania | 5 | 5 | 0 | 773,000 | 773,000 | 0 | 817,500 | 817,500 | 0 |
| Virginia | 1 | 1 | 0 | 59,375 | 59,375 | 0 | 62,500 | 62,500 | 0 |
| West Virginia | 1 | 1 | 0 | 20,000 | 20,000 | 0 | 22,000 | 22,000 | 0 |
| **PAD District II** | **26** | **25** | **1** | **3,587,220** | **3,581,720** | **5,500** | **3,819,260** | **3,812,960** | **6,300** |
| Illinois | 4 | 4 | 0 | 903,600 | 903,600 | 0 | 954,000 | 954,000 | 0 |
| Indiana | 2 | 2 | 0 | 433,000 | 433,000 | 0 | 444,000 | 444,000 | 0 |
| Kansas | 3 | 3 | 0 | 300,700 | 300,700 | 0 | 312,000 | 312,000 | 0 |
| Kentucky | 2 | 1 | 1 | 227,500 | 222,000 | 5,500 | 245,300 | 239,000 | 6,300 |
| Michigan | 1 | 1 | 0 | 100,000 | 100,000 | 0 | 105,000 | 105,000 | 0 |
| Minnesota | 2 | 2 | 0 | 349,300 | 349,300 | 0 | 375,000 | 375,000 | 0 |
| North Dakota | 1 | 1 | 0 | 58,000 | 58,000 | 0 | 60,000 | 60,000 | 0 |
| Ohio | 4 | 4 | 0 | 510,120 | 510,120 | 0 | 579,000 | 579,000 | 0 |
| Oklahoma | 5 | 5 | 0 | 490,700 | 490,700 | 0 | 527,960 | 527,960 | 0 |
| Tennessee | 1 | 1 | 0 | 180,000 | 180,000 | 0 | 182,000 | 182,000 | 0 |
| Wisconsin | 1 | 1 | 0 | 34,300 | 34,300 | 0 | 35,000 | 35,000 | 0 |
| **PAD District III** | **56** | **55** | **1** | **8,354,809** | **7,989,609** | **365,200** | **8,818,462** | **8,411,462** | **407,000** |
| Alabama | 4 | 3 | 1 | 135,300 | 118,600 | 16,700 | 156,000 | 134,000 | 22,000 |
| Arkansas | 2 | 2 | 0 | 77,200 | 77,200 | 0 | 79,600 | 79,600 | 0 |
| Louisiana | 19 | 19 | 0 | 2,971,183 | 2,971,183 | 0 | 3,131,855 | 3,131,855 | 0 |
| Mississippi | 3 | 3 | 0 | 364,000 | 364,000 | 0 | 396,800 | 396,800 | 0 |
| New Mexico | 3 | 3 | 0 | 121,600 | 121,600 | 0 | 124,107 | 124,107 | 0 |
| Texas | 25 | 25 | 0 | 4,685,526 | 4,337,026 | 348,500 | 4,930,100 | 4,545,100 | 385,000 |
| **PAD District IV** | **16** | **16** | **0** | **598,350** | **598,350** | **0** | **639,600** | **639,600** | **0** |
| Colorado | 2 | 2 | 0 | 94,000 | 94,000 | 0 | 104,000 | 104,000 | 0 |
| Montana | 4 | 4 | 0 | 182,500 | 182,500 | 0 | 193,200 | 193,200 | 0 |
| Utah | 5 | 5 | 0 | 167,350 | 167,350 | 0 | 176,000 | 176,000 | 0 |
| Wyoming | 5 | 5 | 0 | 154,500 | 154,500 | 0 | 166,400 | 166,400 | 0 |
| **PAD District V** | **36** | **36** | **0** | **3,185,538** | **3,170,538** | **15,000** | **3,337,800** | **3,321,300** | **16,500** |
| Alaska | 6 | 6 | 0 | 375,000 | 375,000 | 0 | 405,200 | 405,200 | 0 |
| California | 21 | 21 | 0 | 2,037,188 | 2,022,188 | 15,000 | 2,131,300 | 2,114,800 | 16,500 |
| Hawaii | 2 | 2 | 0 | 147,500 | 147,500 | 0 | 152,000 | 152,000 | 0 |
| Nevada | 1 | 1 | 0 | 2,000 | 2,000 | 0 | 5,000 | 5,000 | 0 |
| Oregon | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Washington | 5 | 5 | 0 | 623,850 | 623,850 | 0 | 644,300 | 644,300 | 0 |
| **U.S. Total** | **149** | **145** | **4** | **17,443,492** | **16,997,792** | **445,700** | **18,425,322** | **17,928,522** | **496,800** |
| Puerto Rico | 1 | 1 | 0 | 77,900 | 77,900 | 0 | 85,000 | 85,000 | 0 |
| Virgin Islands | 1 | 1 | 0 | 500,000 | 500,000 | 0 | 525,000 | 525,000 | 0 |

Source: Energy Information Administration (EIA), Form EIA-820, "Annual Refinery Report."

**Affect Of Environmental Regulations On Industry**
Concern over the environmental effects of burning petroleum fuels has led to governmental regulations, and those regulations have had a profound effect on the petroleum industry. EIA estimates the oil industry has spent $89 billion since 1993 to comply with and strengthen its environmental performance. That amounts to almost $310 for every person in the U.S. While the environmental benefit of such improvements is clear in the ever-improving air quality in the U.S., it should be noted this comes at a cost. Many refineries have closed because of their inability to economically comply with more stringent standards. Those remaining have had to make significant expenditures in process improvements in order to comply.

The Clean Air Act of 1970 significantly increased the Environmental Protection Agency's (EPA) role in controlling pollution. It established national air quality standards for the emission of sulfur dioxide, nitrous oxide, carbon monoxide, oxidants (ozone), non-methane hydrocarbons and total suspended particulates. The lead standard was adopted in 1978.

Starting in the early 90s with the Clean Air Act amendments, automobile tailpipe emissions in several areas of the country were restricted. In 1992 California was one of the first states to require oxygenates in gasoline blends to reduce smog. MTBE (methyl tertiary butyl ether) was used to improve engine performance and reduce carbon monoxide emissions after the phase out of leaded gasoline. In later years when environmental concerns arose about MTBE polluting groundwater, refineries had to find other blending agents to keep carbon monoxide emissions beneath regulated levels. Ethanol (grain alcohol) is now blended with gasoline in several areas of the country for oxygenation purposes.

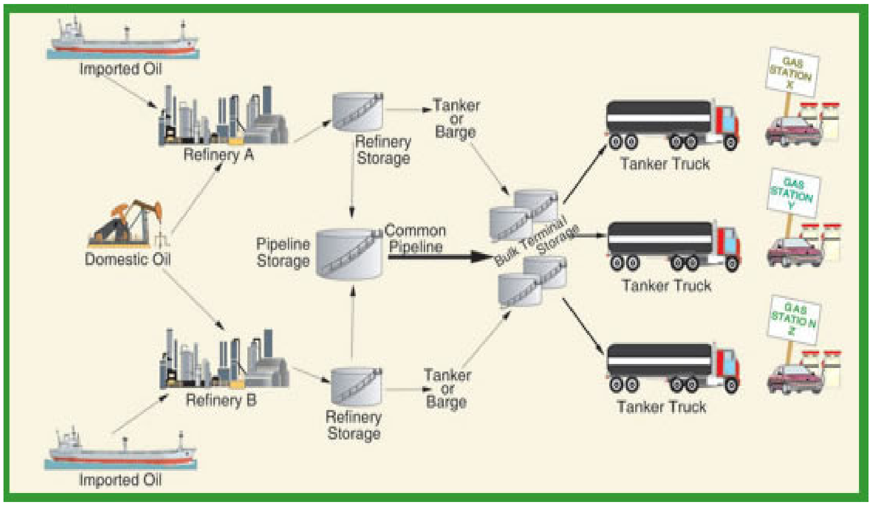
Concerns over the release of volatile organic compounds (VOCs) from evaporating gasoline resulted in Reid Vapor Pressure (RVP) restrictions in the late 80s-early 90s. These rules vary from warm to cold climates, from summer to winter seasons, and also depend on altitude. This drove the industry to make significant expenditures in gasoline refining by creating reformulated gasoline blends that contained higher octane properties but kept vapor pressures low. By 1995 reformulated gasoline was required to be used in over 30 percent of the U.S. gasoline market.

Starting in 1993 the sulfur content of over-the-road diesel fuel was mandated by the EPA to be lower than 500 parts per million(ppm) in order to decrease diesel engine particulate emissions. This was known as Low Sulfur Diesel Fuel (LSD). Between 2006 and 2010 the sulfur content of all distillate fuels will be gradually reduced to less than 15 ppm. This is known as Ultra Low Sulfur Diesel (ULSD). Ultra low sulfur fuel is required for use in new over-the-road diesel engines from model year 2007 on. Only ULSD will be available for highway use after 2010. Making ULSD has forced U.S. refiners to invest a significant amount of money in their refinery process and the price of the fuel is therefore higher than previous diesel blends.

These are some of the more significant environmental regulations which have affected the petroleum industry in the last 40 years. This is not a complete list of all the regulations and changes that have been mandated. They have been discussed here because it is important to note that environmental regulations requiring different blends and formulations of fuels to be used in different areas of the country and at different times during the year, makes the interchangeability of fuels a real problem during localized shortage situations.

**Distribution of refined products:**

Source: Energy Information Administration




After crude oil is refined into gasoline and other petroleum products, the products must be distributed to consumers. The majority of gasoline is shipped first by pipeline to storage terminals near consuming areas, and then loaded into trucks for delivery to individual gas service stations. Gasoline and other products are sent through shared pipelines in "batches." Since these batches are not physically separated in the pipeline, some mixing or "commingling" of products occurs. This is why the quality of the gasoline and other products must be tested as they enter and leave the pipeline to make sure they meet appropriate specifications. When the product fails to meet local, state, or federal product specifications, it must be removed and trucked back to a refinery for further processing.

After shipment through the pipeline, gasoline is typically held in bulk storage terminals that service many companies. At these terminals the gasoline is loaded into tanker trucks destined for various retail gas stations. The tanks in these trucks, which can typically hold up to 10,000 gallons, usually have several compartments, enabling them to transport different grades of gasoline or petroleum products. When the tanker truck reaches a gas station, the truck operator unloads each grade of gasoline into the appropriate underground tanks at the station.

Blending facilities are located at refineries, terminals that are used to introduce additives to the gasoline. These might be performance enhancing agents or ethanol

**How are refined products pipelines regulated?**

Regulatory jurisdiction over refined product pipelines is very similar to regulation of crude oil pipelines. The level of regulation and the regulatory body having jurisdiction depends upon the pipeline's operation, function, and location.

## Rates and Terms of Service

If the pipeline carries only the owner company's product and does not offer shipping services to others, it is considered a proprietary line and not subject to rate regulations at either the federal or state level.

If the pipeline crosses state lines and operates as a common carrier, meaning it offers shipping services to others, its rates and terms of service are governed by the requirements of the Interstate Commerce Act (ICA). At the federal level, the Federal Energy Regulatory Commission (FERC) will have jurisdiction over rates and terms of service. In addition depending on applicable state laws, there could be additional state jurisdiction over the pipeline operation. In North Dakota, the Public Service Commission has jurisdiction if the hydrocarbon pipeline operation meets the state's definition of transmission, common carrier, or a utility.

When requests for product shipments on a common carrier's facilities exceed the pipeline's capacity, the space must be allocated among shippers in a non-discriminatory manner. This usually occurs on what is called a "pro rata" basis but there are other methods of allocation.

## Pipeline Safety

Refined product pipeline safety is regulated by the Pipeline and Hazardous Material Safety Administration (PHMSA). This agency is part of the federal Department of Transportation (DOT). If the pipeline's operation meets the criteria of state laws, there might be additional state jurisdiction over pipeline safety. In North Dakota, the Public Service Commission is responsible for pipeline safety matters on intrastate facilities.

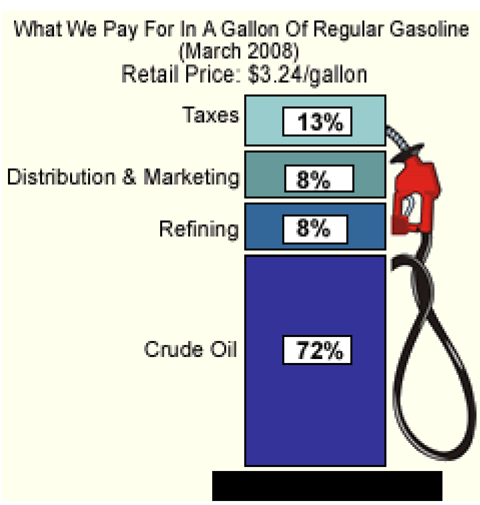
## Pipeline Construction

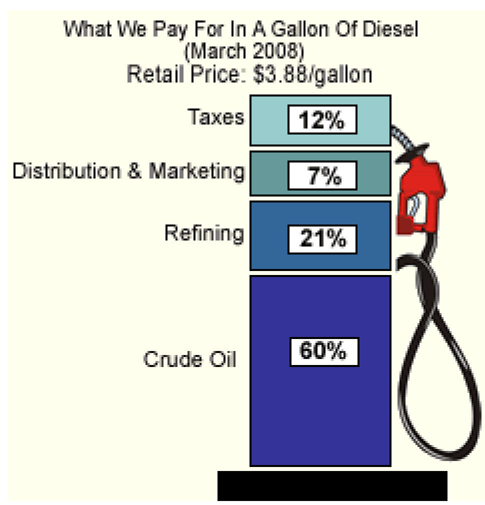
There are many other state and federal agencies who must issue permits for the actual construction of facilities. Some examples are: air and water quality permits, wildlife agency permits, historical society permits, public land permits, and many more.

**What factors affect the price of gasoline?**

The cost to produce and deliver gasoline to consumers includes the cost of crude oil to refiners, refinery processing costs, marketing and distribution costs, and finally the retail station costs and taxes. The prices paid by consumers at the pump reflect these costs, as well as the profits (and sometimes losses) of refiners, marketers, distributors, and retail station owners.

These diagrams, obtained from the U.S. Energy Information Administration show the average March 2008 breakdown of cost components for gasoline and diesel.

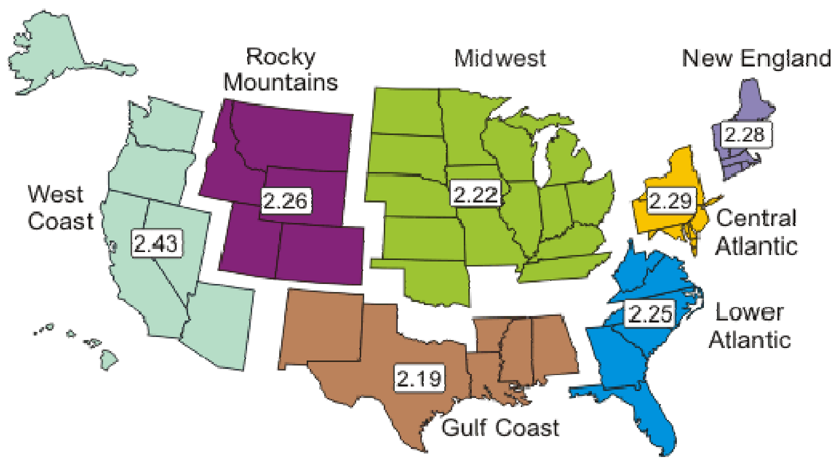



Federal, State, and local taxes are large components of the retail price of gasoline. Taxes account for approximately 13 percent of the cost of a gallon of gasoline. Within this national average, Federal excise taxes are 18.4 cents per gallon and State excise taxes average about 21 cents per gallon. Also, eleven States levy additional State sales and other taxes, some of which are applied to the Federal and State excise taxes. Additional local county and city taxes can have a significant impact on the price of gasoline. Distribution, marketing and retail dealer costs and profits combined make up 8 percent of the cost of a gallon of gasoline. From the refinery, most gasoline is shipped first by pipeline to terminals near consuming areas and then loaded into trucks for delivery to individual stations. Some retail outlets are owned and operated by refiners, while others are independent businesses that purchase gasoline for resale to the public. The price on the pump reflects both the retailer's purchase cost for the product and the other costs of operating the service station. It also reflects local market conditions and factors, such as the desirability of the location and the marketing strategy of the owner. Refining costs and profits comprise about 8 percent of the retail price of gasoline. This component varies from region to region due to the different formulations required in different parts of the country.

**Why do gasoline prices differ according to region?**
Although price levels vary over time, Energy Information Administration (EIA) data indicate that average retail gasoline prices tend to typically be higher in certain States or regions than in others. Aside from taxes, there are other factors that contribute to regional and even local differences in gasoline prices.
These are:

Proximity of supply
Areas farthest from the Gulf Coast (the source of nearly half of the gasoline produced in the United States and, thus, a major supplier to the rest of the country), tend to have higher prices. The proximity of refineries to crude oil supplies can even be a factor, as well as shipping costs (pipeline or waterborne) from refinery to market.



Source: Energy Information Administration, *Average Monthly Data, 2005.*

Any event which slows or stops production of gasoline for a short time, such as planned or unplanned refinery maintenance can prompt bidding for available supplies. If the transportation system cannot support the flow of surplus supplies from one region to another, prices will remain comparatively high. This was the situation in North Dakota in the fall of 2007.

Competition in the local market
Competitive differences can be substantial between an area with only a few gasoline suppliers versus one with a large number of competitors in close proximity. Consumers in remote locations may face a trade-off between higher local prices and the inconvenience of driving some distance to a find a lower priced alternative.

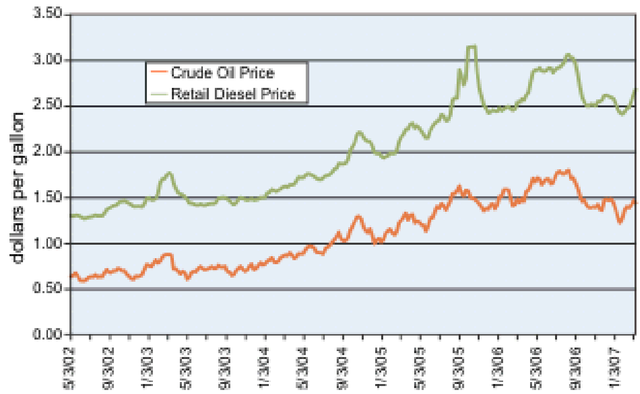
## Environmental programs

Some areas of the country are required to use special gasolines. Environmental programs, aimed at reducing carbon monoxide, smog, and air toxics, include the Federal and/or State-required oxygenated, reformulated, and low-volatility (evaporates more slowly) gasolines. Other environmental programs put restrictions on transportation and storage. The reformulated gasolines required in some urban areas and in California cost more to produce than conventional gasoline served elsewhere, increasing the price paid at the pump.

# What factors affect the price of diesel fuel?

## Cost and supply of crude oil

Crude oil prices are determined by worldwide supply and demand, and over the past few years increasing demand has put intense pressure on available supplies. The Organization of Petroleum Exporting Countries (OPEC) has significant influence on prices by setting an upper production limit on its members who produce about 40% of the world's crude oil. Prices spike in response to disruptions in the international and domestic supply of crude oil, such as the Arab oil embargo in 1973, the Iran/Iraq war in 1980, the current war in Iraq, unrest in the Niger River delta region of Nigeria, and the hurricanes in the Gulf of Mexico in 2005.




Source: Energy Information Administration

## Tight refining capacity and international diesel fuel demand

U.S. refineries have been operating at above 90% capacity over the last ten years. Most other countries rely even more heavily on distillates and diesel for overall transportation than does the U.S., and refining capacity is tight worldwide. U.S. diesel fuel prices are more and more affected by competing international demand for refined distillates.

## Product supply/demand imbalances

Prices of transportation fuels are generally more volatile than prices of other commodities because the U.S. transportation fleet is so heavily dependent on petroleum and few alternative fuels are available. If supply declines unexpectedly due to refinery problems or lagging imports, diesel inventories (stocks) may decline rapidly. When stocks are low and falling, some wholesalers and marketers may bid higher for available product. If the transportation system cannot support the flow of surplus supplies from one region to another quickly, prices will remain comparatively high. These are normal price fluctuations experienced in all commodity markets.

## Seasonality in the demand for diesel fuel and distillates

While U.S. diesel fuel demand is fairly consistent and generally reflects the overall health of the economy, prices tend to gradually rise during the fall, decline in the late winter, rise through the early spring, and then drop a bit in the summer. Diesel fuel use by farmers and for transporting goods for stores to build inventories during the winter holiday season, and cold weather in the North East, where most heating fuel oil is consumed, can apply upward pressure on diesel prices.

### Transportation Costs

Transportation costs generally increase with increasing distance between the retail location and distribution terminals and refineries. Areas farthest from the Gulf Coast (the source of nearly half of the diesel fuel produced in the U.S.) tend to have higher prices.

### Regional operating costs and local competition

The cost of doing business by individual dealers can vary greatly depending on where the dealer is located. These costs include wages and salaries, benefits, equipment, lease/rent, insurance, overhead, and state and local fees. Even retail stations next to each other can have different traffic patterns, rents, and sources of supply that affect their prices. The number and location of local competitors can also affect prices.

## What about propane?

Propane is produced from both the refining of crude oil and the processing of natural gas. Since propane fuel typically competes with crude oil-based fuels, its price is influenced mainly by the cost of crude oil. Propane prices are affected by several factors, some common to all petroleum products, and others unique to propane. Because propane is portable, it can serve many different markets, from fueling barbecue grills to producing petrochemicals. The price of propane in these markets is influenced by many factors, including the prices of competing fuels in each market; the distance propane has to travel to reach a customer; and the volumes used by a customer.

Propane supply and demand is subject to changes in domestic production, weather, and inventory levels, among other factors. While propane production is not seasonal, residential demand is highly seasonal. This imbalance causes inventories to be built up during the summer months when consumption is low and for inventories to be drawn down during the winter months when consumption is much higher. When inventories of propane at the start of the winter heating season are low, chances increase that higher propane prices may occur during the winter season. Colder-than-normal weather can put extra pressure on propane prices during the high demand winter season because there are no readily available sources of increased supply except for imports. And imports may take several weeks to arrive, during which time larger-than-normal withdrawals from inventories may occur, sending prices upward. Cold weather early in the heating season can cause higher prices sooner rather than later, since early inventory withdrawals affect supply availability for the rest of the winter.

### Proximity of Supply

Due to transportation costs, customers farthest from the major supply sources (the Gulf Coast and the Midwest) will generally pay higher prices for propane.

### Markets Served

Propane demand comes from several different markets that exhibit distinct patterns in response to the seasons and other influences. Residential demand, for instance, depends on the weather, so prices tend to rise in the winter. The petrochemical sector is more flexible in its need for propane and tends to buy it during the spring and summer, when prices decline. If producers of petrochemicals should have to depart from this pattern for some reason, the coinciding demand could raise prices. And when prices rise unexpectedly, as they do sometimes in the winter, petrochemical producers pull back, helping to ease prices. Prices could also be driven up if agricultural sector demand for propane to dry crops remains high late into the fall, when residential demand begins to rise.

**Why Do Propane Prices Spike?**

Propane prices occasionally spike, increasing disproportionately beyond that expected from normal supply/demand fluctuations. The main cause appears to lie in the logistical difficulty of obtaining resupply during the peak heating season. Because propane is produced at a relatively steady rate year-round by refineries and gas processing plants, there is no ready source of incremental production when supplies run low. Propane wholesalers and retailers are forced to pay higher prices as propane markets are bid higher due to dwindling supply. Consequently, higher propane prices are simply passed on to consumers. Imports do not offer much cushion for unexpected demand increases or supply shortages due to the long travel time. On the other hand, when propane prices do spike, the petrochemical sector may cut back on its use, thus freeing up supplies for other uses.

Source: The information used to prepare this paper was obtained from the U.S. Department of Energy (DOE) Energy Information Administration (EIA). website: http://www.eia.doe.gov/