

Facts about Oil

Introduction

The most versatile fossil fuel, oil has made possible many of the necessities and conveniences of modern society. Without oil, much of today's transportation system would grind to a halt and many products we rely on would not exist. This dependence, which sometimes leads to international conflict, along with oil's finite supply and environmental problems, has become an increasing concern in a world that thirsts for the miracle liquid many call "black gold."



Crude oil is a yellow-to-black, sticky substance found inside sponge-like sedimentary rocks that remains a liquid when brought to the surface. It is made of hydrocarbons, organic compounds consisting entirely of hydrogen and carbon atoms. Petroleum products are produced from the processing of crude oil and other liquids and include liquefied petroleum gases, aviation gasoline, motor gasoline, kerosene, fuel oil, petrochemical feedstocks, lubricants, waxes, asphalt, road oil. Petroleum is a broad category that includes both crude oil and petroleum products. The terms oil and petroleum are sometimes used interchangeably.

The crude oil we extract today was formed millions of years ago when dead organisms such as plankton, bacteria, and plant matter were deposited on the sea floor. Sediments accumulated above the organic material over millions of years, the organic material decomposed and the heat and pressure broke it into hydrocarbons/oil. Because they were formed in similar ways, crude oil is often found together with natural gas.

One gallon of crude oil contains 138,095 Btu of energy. One barrel of oil contains 42 gallons. One quad equals 172.4 million barrels.

Reserves, Production, and Consumption

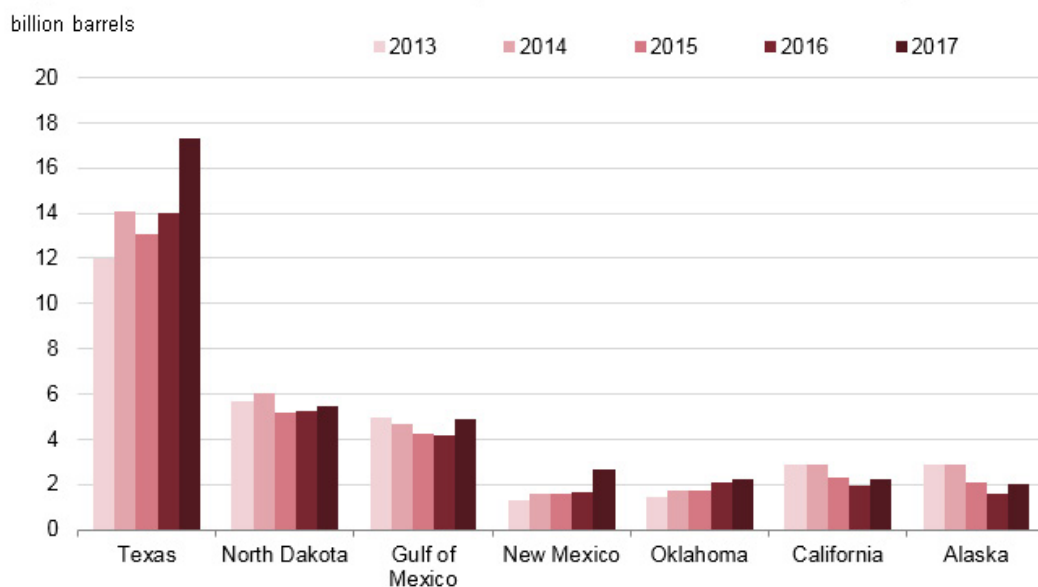
Known crude oil reserves in the United States in 2015 equaled 35.2 billion barrels. Outside the U.S. Venezuela has the largest amount of known oil reserves at 302 billion barrels, followed by Saudi Arabia, Iran, Iraq, and Kuwait.

Total domestic crude oil production averaged about 8,900,000 barrels per day in 2016. The top crude oil producing states/regions in 2016 were Texas, North Dakota, California, Alaska, Oklahoma, and the Gulf of Mexico. (see chart Proved reserves of the top five U.S. oil reserves states, 2011-2015) The world produced 80,557,000 barrels per day in 2016 with about 44 percent of world production from OPEC countries. OPEC is the Organization of the Petroleum Exporting Countries, which was formed to secure fair and stable prices for petroleum producers and regular supply to consumers. The top oil producers in the world are Russia, Saudi Arabia, the United States, Iran, Iraq, China, and Canada.

In 2016, the United States consumed a total of 7.21 billion barrels of petroleum products, an average of about 19.69 million barrels per day. The United States imported approximately 10 million barrels per day in 2016 coming from 70 different countries including Canada, Saudi Arabia, Venezuela, Mexico, and Colombia. Over 3.5 billion gallons of petroleum products were used in Wisconsin in 2012, all of which were imported into the state. Total world consumption of petroleum and other fuel liquids increased 1.5% between 2015 and 2016. A similar trend is projected to continue.

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Figure 2. Proved reserves of the top seven U.S. oil reserves states, 2013–17



Notes: Oil reserves include crude oil and lease condensate. Gulf of Mexico represents the federally owned offshore portion of the Gulf of Mexico. Although not a state, it is an important U.S. oil and natural gas production area.

Source: U.S. Energy Information Administration, Form EIA-23L, *Annual Report of Domestic Oil and Gas Reserves, 2013–17*



Extracting Crude Oil

Geologists and geophysicists search for oil by conducting underground seismic, gravitational, and magnetic tests. Wells are drilled when tests indicate a strong likelihood of oil. Crude oil under pressure flows to the surface on its own. This type of extraction is referred to as primary oil extraction. Secondary extraction techniques typically make use of water or gas injected to displace oil and drive it to a production wellbore. Tertiary, or enhanced oil recovery (EOR) techniques are more invasive but have the potential to ultimately produce 30 to 60 percent of the reservoir's original oil in place.

Processing and Transporting

Crude oil is transported by pipelines and oceangoing tankers to refineries. About 45 percent of a typical barrel of crude oil is refined into gasoline. An additional 29 percent is refined to diesel fuel. The remaining oil is used to make plastics and other products (see image Products made from a barrel of crude oil, 2016). After refining, gasoline and other types of fuel oil are transported by barges, rail, and pipelines to local storage tanks, and then delivered to homes, businesses, and gas stations by tanker trucks (see map Wisconsin Petroleum Pipelines).

Electricity Production

In some parts of the United States, fuel oil is used in power plants to produce electricity, although it accounts for less than 1 percent of total electricity generation. These power plants are usually smaller than those that use coal, natural gas or nuclear energy. Many oil-fired power plants are only used when the demand for electricity is high, because it costs less to produce electricity using other sources.

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Other Uses

Fuels made from oil run power machinery, cars, trucks, and airplanes. Petroleum fuels also provide heat for homes. Over 3,000 different kinds of products can be made from oil. These products include asphalt, lubricants, ink, cosmetics, and waxes. Crude oil is also used to make plastic products such as bags, bottles, inline skate wheels, and parts for computers, stereos, and automobiles.

Effects

Because of its many uses, some view oil as the lifeblood of modern civilization. Numerous occupations, ranging from geologists and drill rig workers to gas station managers and attendants have been created by the oil industry. However, oil drilling can damage sensitive wilderness areas. Uncontrolled releases of oil from drilling (called blow-outs) have been a problem in the past, although successful steps have been taken to prevent them. Spills by oil tankers have polluted oceans and inland waterways, harming aquatic life.

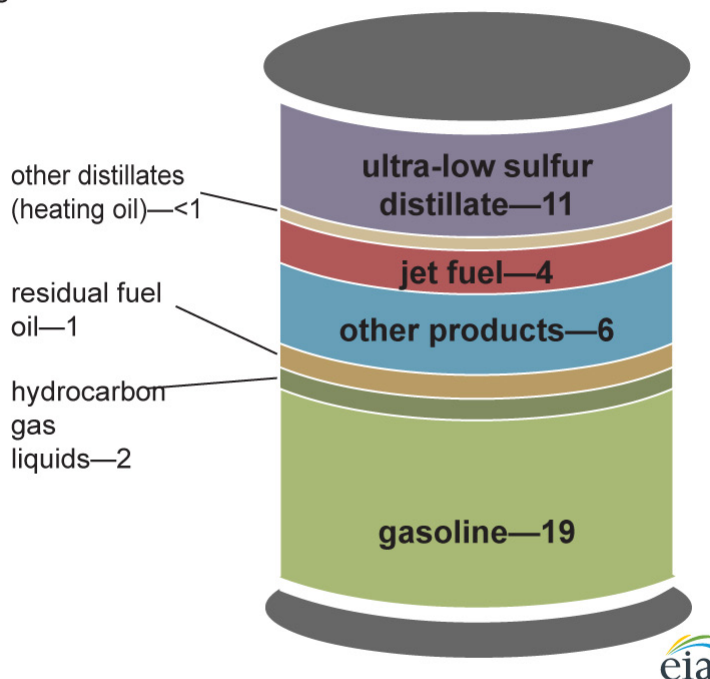
Although cleaner burning than coal, petroleum fuels release carbon dioxide, unburned hydrocarbons, sulfur oxides, and carbon monoxide into the atmosphere when burned. Emissions of these substances from automobiles contribute to smog and ground level ozone formation in urban areas, which can lead to respiratory illness. However, automobiles made today are more fuel-efficient and emit fewer pollutants than older models, reducing or slowing increases of harmful emissions.

A significant portion of human-generated greenhouse gases come from oil combustion. Scientists assert that the buildup of human-caused greenhouse gases have contributed to widespread climate change.

Increasing oil imports by the United States have led to concerns over dependence on unreliable oil supplies. For instance, turmoil in the Middle East in 1973, 1979, and 1990 led to worldwide oil supply disruptions and sudden price increases. In response, the United States began to store crude oil in old salt mines and other underground formations. The strategic Petroleum Reserve has a design capacity of 714 million barrels of oil, enough to last the nation up to three months.

Petroleum products made from a barrel of crude oil, 2018

gallons



Note: A 42-gallon (U.S.) barrel of crude oil yields about 45 gallons of petroleum products because of refinery processing gain. The sum of the product amounts in the image may not equal 45 because of independent rounding.

Source: U.S. Energy Information Administration, *Petroleum Supply Monthly*, April 2019, preliminary data.

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Outlook

Crude oil is a finite resource and is predicted to run out within the next 25 years; however, there is the potential that global reserves could increase with technological advances in methods of production/extraction. U.S. production, which had been declining from 1970 to 2012, is a more immediate concern. Sources of oil, such as shale oil extraction, that were previously more expensive have now become more economically feasible. Although oil exploration within the United States continues and new oil fields are still being discovered, much of the United States has been thoroughly explored. However, the increase in types of extraction may aid in future production. Imports into the U.S. are likely to be reduced as crude oil production is expected to rise through 2020. Continued improvements in automobile efficiency and increasing the use of other efficient means of transportation should help to extend oil supplies and reduce imports in the future.

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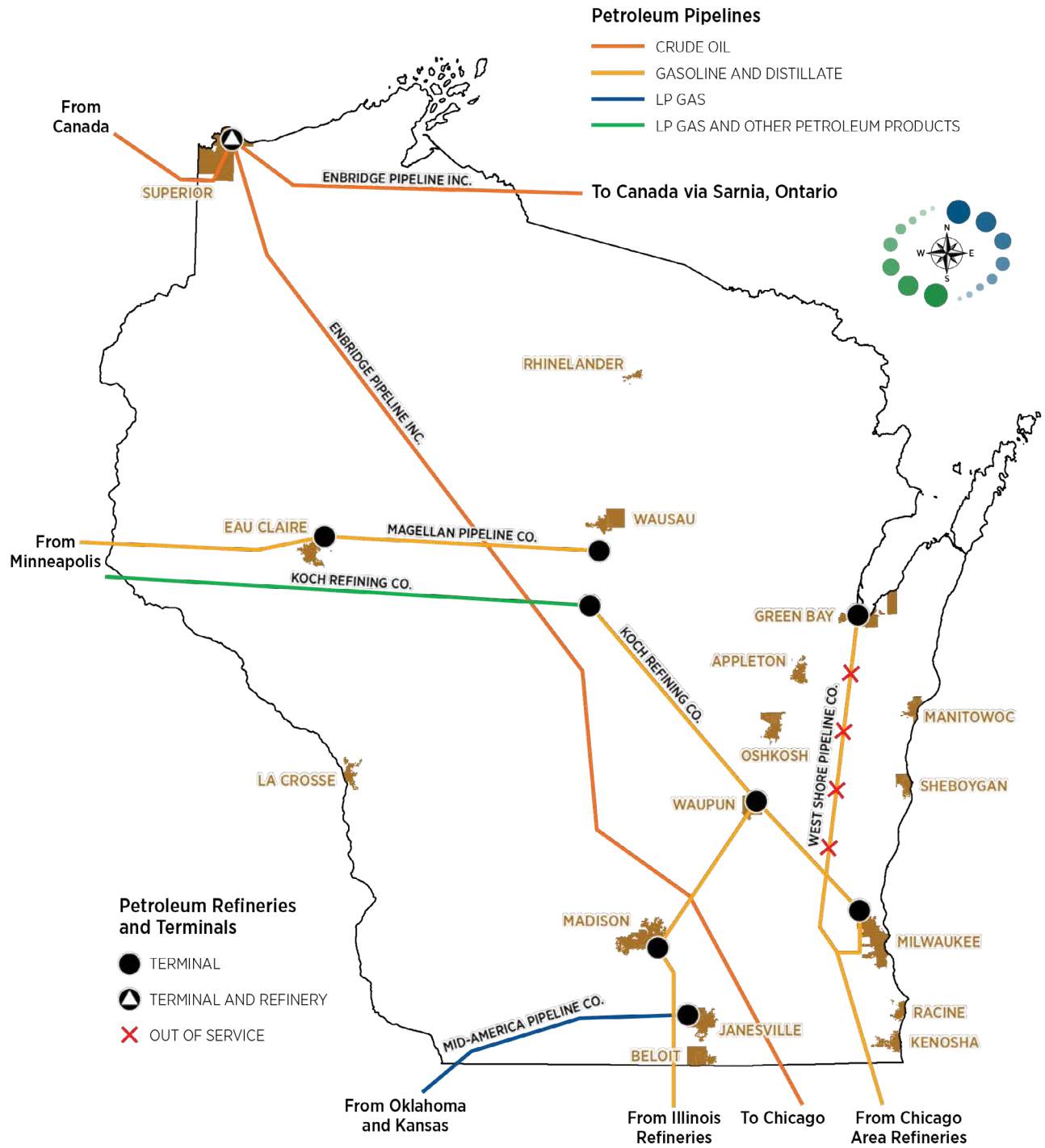
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Wisconsin Petroleum Pipelines, 2015



Source: Wisconsin Office of Energy Innovation. [Wisconsin Energy Statistics Book](http://www.wisconsinenergy.com).