

NATURAL GAS



Natural gas, a domestically produced gaseous fuel, is readily available through the utility infrastructure. Whether produced via conventional or renewable methods, this clean-burning alternative fuel must be compressed or liquefied for use in vehicles.

NATURAL GAS FUEL BASICS:

Natural gas is an odorless, gaseous mixture of hydrocarbons—predominantly made up of methane (CH₄). It accounts for about 30% of the energy used in the United States. About 40% of the fuel goes to electric power production and the remaining is split between residential and commercial uses, such as heating and cooking, and industrial uses.

Alternatively, renewable natural gas (RNG), also known as biomethane, is a pipeline-quality vehicle fuel produced from organic materials—such as waste from landfills and livestock—through anaerobic digestion. RNG qualifies as an advanced biofuel under the Renewable Fuel Standard. Because RNG is chemically identical to fossil-derived conventional natural gas, it can use the existing natural gas distribution system and must be compressed or liquefied for use in vehicles.



TWO FORMS OF NATURAL GAS:

Two forms of natural gas are currently used in vehicles: compressed natural gas (CNG) and liquefied natural gas (LNG). Both are clean burning, domestically produced, relatively low prices, and available.

CNG is produced by compressing natural gas to less than 1% of its volume at standard atmospheric pressure. To provide adequate driving range, CNG is stored onboard a vehicle in a compressed gaseous state at a pressure of up to 3,600 pounds per square inch.

CNG is used in light-, medium-, and heavy-duty applications. A CNG-powered vehicle gets about the same fuel economy as a conventional gasoline vehicle on a GGE basis. One GGE equals about 5.66 pounds of CNG.

LNG is natural gas in its liquid form. LNG is produced by purifying natural gas and super-cooling it to -260°F to turn it into a liquid. During the process known as liquefaction, natural gas is cooled below its boiling point, removing most of the extraneous compounds found in the fuel. LNG must be kept at cold temperatures and is stored in double-walled, vacuum-insulated pressure vessels. LNG is suitable for trucks that require longer ranges because liquid is denser than gas and, therefore, more energy can be stored by volume. LNG is typically used in medium- and heavy-duty vehicles.

NATURAL GAS BENEFITS:

Energy Security

- United States imported 3% of its petroleum in 2019
- Using domestic natural gas can minimize the impact of trade deficits, supply disruption, and price changes
- Supports the U.S. economy and helping diversify the U.S. transportation fleet

Vehicle Performance

- Have less overall energy content can be stored in the same size tank
- Extra natural gas storage tanks or LNG can increase range for larger vehicles
- In heavy-duty vehicles, dual-fuel, compression-ignited engines are more fuel efficient than spark-ignited dedicated natural gas engines

Lower Emissions

- Light-duty vehicles running on conventional and shale natural gas can reduce life cycle greenhouse gas emissions by 15% and 84% if running on RNG
- CNG fuel systems are completely sealed, the vehicles produce no evaporative emissions
- RNG is essentially biogas—capturing biogas from landfills and livestock operations reduces emissions by preventing methane release into the atmosphere. Methane is 25 times stronger than carbon dioxide as a greenhouse gas

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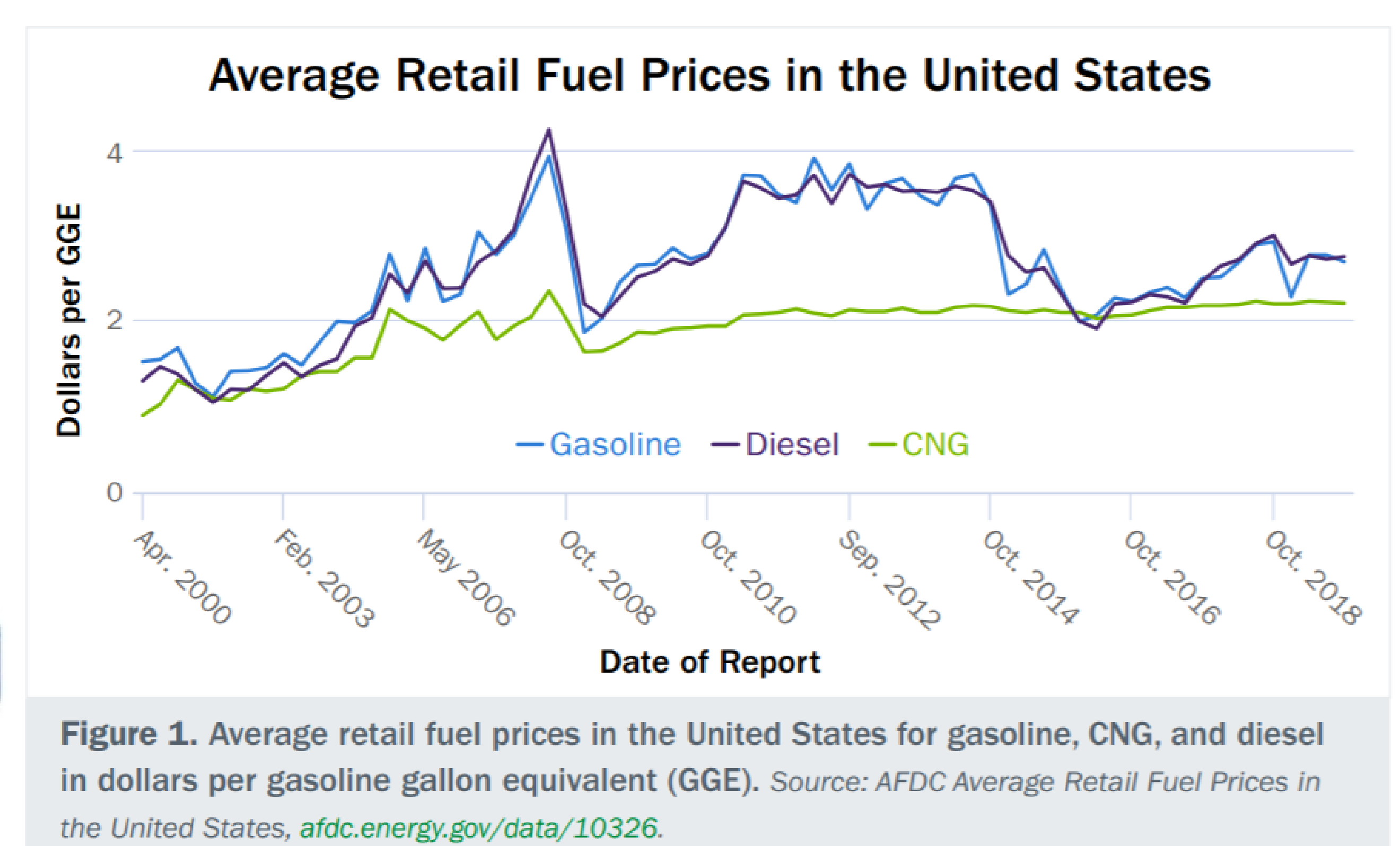


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Infrastructure and Vehicle Availability

- Heavy-duty natural gas vehicles are available from U.S. original equipment manufacturers
- Fleets and consumers also have the option of reliably converting existing gasoline or diesel vehicles for natural gas operation using qualified system retrofitters
- Many fleets choose to install their own natural gas fueling infrastructure, which can be costly, or partner with other fleets to establish shared infrastructure. Partnering on infrastructure this way has many benefits, such as reduced payback period and higher throughput, which often translates to lower fuel costs



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