

LNG



A Quick Reference Guide to LNG 2022



What is LNG?

The term liquefied natural gas (LNG) is used to describe a variety of liquefied gas mixtures composed primarily of methane and small quantities of heavier hydrocarbons and nitrogen. LNG is formed when natural gas is cooled to approximately -260°F at atmospheric pressure. Under these conditions, the natural gas condenses into a liquid, occupying approximately 1/600 of its volume as a gas. LNG has a density of about 26.5 lb/ft³ and vaporizes readily on contact with any solid or liquid surface at a higher temperature. Once in a liquid state, LNG is much easier to transport

LNG storage and peak shaving is a very economical way for Local Distribution Companies (LDCs) to maintain and control costs of natural gas supplies to their customers by storing and regasifying when needed. Given the volatility of spot pricing of natural gas during times of peak loads on transmission lines and the need for peaking demand loads for LDCs, LNG storage and peak shaving allow an LDC to liquify, or purchase LNG, and store during periods of low demand and lower cost of gas; then regasify at times of peak demand and higher cost of gas, potentially generating significant savings.

According to the Pipeline and Hazardous Materials Safety Administration, PHMSA, “LNG storage enables a reliable supply of natural gas in areas where pipeline capacity limitations and weather conditions may cause supply and demand discrepancies, notably in the northeastern United States, thus increasing efficiency and reliability in supplying needed energy resources. LNG peak-shaving plants typically have significantly less LNG storage capacity than import and export terminals but are strategically located in the pipeline system.” There were 165 active LNG facilities in the US in 2020 with over 100 of the facilities are used for peak shaving.

PHMSA - [Liquefied Natural Gas \(LNG\) Facilities and Total Storage Capacities | PHMSA \(dot.gov\)](#)

INGAA - [File.aspx \(ingaa.org\)](#)

PHMSA - [LNG Facility Siting | PHMSA \(dot.gov\)](#)

MYTH: LNG IS NOT ENVIRONMENTALLY RESPONSIBLE

Natural gas is the cleanest-burning fuel available because it generates 75% fewer nitrogen oxide (NO_x) emissions and 30% less carbon dioxide (CO₂) emissions compared to other fossil fuels. It also has no environmentally damaging sulfur dioxide (SO₂) emissions.

The combustion of natural gas does not emit soot, dust or fumes. Unlike crude oil and crude-derived liquid fuels, if LNG spills, it does not cause any residual impact on the environment. This is because it evaporates immediately and dissipates quickly into the atmosphere; it does not require any remediation of soil, groundwater, or surface waters.

LNG helps displace higher-carbon fuels, like coal and oil, and enables the adoption of renewable energy by providing a source of reliable, flexible power generation. In this way, LNG helps global customers to reduce greenhouse gas (GHG) emissions as they transition their energy systems to a lower-carbon future.

LNG can help improve air quality when displacing coal. The combustion of natural gas in place of other hydrocarbon sources can significantly reduce localized air pollution and public health risks in and around power generation sites. Estimates show that when used for power generation in natural gas combined-cycle power plants, natural gas emits virtually no mercury or particulate matter and can reduce nitrogen oxide (NOx) and sulfur dioxide (SO₂) emissions by up to 82% and 99%, respectively, relative to coal on a lifecycle basis. [\[1\]](#)

The International Energy Agency (IEA) estimates that switching from coal to natural gas has already helped limit the rise in global carbon dioxide (CO₂) emissions since 2010 and avoided more than 646 million metric tons of CO₂ emissions between 2010 and 2019. [\[2\]](#)

In addition to fueling power generation, LNG is seeing an increase in use as both a road vehicle fuel and a marine fuel. The benefits of clean-burning LNG displacing traditional fuels such as diesel fuel (including low sulfur diesel fuel) or marine grade heavy fuel oil are similar to displacing coal in the power generation sector. This includes significant reductions in NOx, SO₂ emissions as well as carbon monoxide (CO) and CO₂ emissions. Additionally, using LNG as a fuel generates almost no particulate matter or soot emissions, which cannot be said for diesel fuel or heavy fuel oil.

The industry as a whole is committed to minimizing the environmental footprint of LNG by reducing methane emissions with innovative technologies through its production and transportation processes. This includes engagement of stakeholders and partners across the value chain, as well as participating in the development and implementation of scientifically sound, flexible, cost-effective policies.

MYTH: LNG IS DANGEROUS COMPARED TO OTHER FUEL TYPES

LNG has been the safest fuel for the last 50 years. LNG is colorless, odorless, non-toxic, and non-corrosive. Its high ignition temperature of 1200 °F (gasoline: 599 °F) and limited flammability range (5 % to 15 % in air) make its unintentional combustion highly unlikely. LNG, if exposed to the air, returns to its gaseous state and quickly dissipates and evaporates into the air leaving no residue. Unlike propane and diesel, [LNG is NOT flammable when in a liquid state](#).

Breaking Energy - [How Dangerous is LNG? « Breaking Energy - Energy industry news, analysis, and commentary](#)

Safety Incidents Link [Microsoft PowerPoint - Wood_LPG-LNG Accidents by Maureen.pptx \(europa.eu\)](#)

MYTH: TRANSPORTING LNG IS DANGEROUS

False! The truth is that LNG has an excellent transport [safety record](#). Over the last 50 years, [over 80,000 LNG cargoes](#) have been delivered with no loss of cargo tank containment and no onboard fatalities attributable to LNG. [Double hulled with storage tanks](#), LNG carriers are among the most modern ships.

In the rare event of a spill, LNG is non-polluting because it quickly dissipates upon contact with air and water. So, whether a pipeline leak happened on land or a carrier lost cargo at sea, the gas would not harm the ecosystem.

Fears of LNG explosions are unfounded since natural gas is only explosive in its gaseous state under exactly the right conditions. The industry has [well-developed technology and high safety standards to manage the conditions](#) of natural gas and keep it in its liquid state.

MYTH: WE CAN'T GET LNG TO OUR LOCATIONS

Natural gas contracts to 1/600th of its original volume when cleaned, cooled to approximately -261 °F and converted into a liquid. As a result, LNG can be easily stored and transported to remote regions, thus allowing for a natural gas “virtual pipeline”.

With LNG you can get natural gas delivered to your operations whether you're on the grid or not. When natural gas is converted to liquid form it can be [trucked 24/7/365 to operations all-across North America](#), leading to big savings. Storage container remote and automated monitoring provides access to fuel levels and generates reordering alerts for deliveries as needed. Mobile LNG storage tanks and vaporizers are also available with minimal site preparation, which makes it ideal for temporary or seasonal operations.

MYTH: LNG IS NOT A RELIABLE FUEL SOURCE

When the demand for fuel spikes, you'll need a plentiful, affordable fuel source that can be delivered or stored on-site and converted quickly. U.S. Natural Gas supply is PLENTIFUL (approximately 92 years of domestic supply on hand), providing a reliable source no matter the season. This is important in [polar vortex situations](#) where the supply of fuel can be constrained and ultimately compromise operations. LNG can be used as a primary pipeline supply, a resource for emergency backup, peak shaving, or pipeline integrity.

LNG as an Alternative Fuel

MYTH: LNG IS NOT COST EFFECTIVE OR CLEANER

The current use of coal, diesel, heavy fuel oil (HFO) and marine gas oil (MGO / bunkering fuel) for Power Generation and Fuel for the shipping industry are major contributors to greenhouse gas emissions. Natural Gas and more specifically LNG (liquid natural gas) provides a viable and readily available solution to this specific use of Diesel, HFO and MGO. Remote Locations include island nations (i.e. Puerto Rico, Caribbean, Dominican Republic, Etc.)

Shipping Industry <https://carnivalsustainability.com/pioneering-lng>

Power Generation -

https://www.jsu.utexas.edu/lacp/files/Pre-Feasibility_Study_of_the_Potential_Market_for_Natural_Gas_as_a_Fuel_for_Power_Generation_in_the_.pdf

MYTH: LNG TRUCKS NEED REFUELING TOO OFTEN

Long hauls are the inevitable necessity for the transportation of goods. It can take a significant amount of time to get to the final destination, and the additional delays caused by needing to constantly refuel are an unwelcome nuisance.

However, the belief that trucks powered by LNG can only go a few hundred miles at a time is false. Recently, an Iveco Stralis NP 460hp truck completed a 1073 miles haul without the need for refueling. It is considered to be the longest ever journey by road on a single fill of LNG. According to Iveco, it saved about \$244 of fuel costs for the outward journey – that's 40% cheaper than using diesel.

MYTH: LNG EMISSIONS ARE JUST AS BAD AS DIESEL

Since LNG is a fossil fuel like oil or coal, some believe it is counterproductive to use it as a way to protect the environment. While LNG does not guarantee zero emissions, it still is the cleanest burning fossil fuel around.

According to a 2015 Journal of Environmental Science and Technology study, diesel trucks emit more than 8 grams bhp/hour of nitrogen oxides, while LNG trucks produce just .2 NOx grams bhp/hour. Compared with a Euro VI diesel engine, a heavy duty truck running on LNG emits 99% less particulate matter, and up to 15% less CO₂, making it a far more environmentally friendly alternative.

MYTH: CO₂ EMISSIONS FROM LNG ARE NO LESS THAN THAT OF COAL

False! The truth is, that natural gas is a non-renewable fossil fuel, and like all fossil fuels it creates carbon dioxide (CO₂) emissions. Too many emissions have harmed the earth's atmosphere and reducing emissions worldwide, especially CO₂ (carbon dioxide) is needed to help combat global warming and climate change.

Natural gas is the [cleanest burning fossil fuel](#) available at the moment. A natural gas power plant produces [half as much carbon dioxide](#), less than a third as much nitrogen oxides, and one percent as much sulfur oxides as a coal-fired power plant.

References and Additional Resources

eCFR – [49cfr Part 193](#)

INGAA - [File.aspx \(ingaa.org\)](#)

FERC – [Natural Gas > LNG](#)

PHMSA – [LNG Overview](#)

PHMSA - [Liquefied Natural Gas \(LNG\) Facilities and Total Storage Capacities | PHMSA \(dot.gov\)](#)

PHMSA - [LNG Facility Siting | PHMSA \(dot.gov\)](#)

PHMSA LNG FAQs

(<https://www.phmsa.dot.gov/pipeline/liquified-natural-gas/lng-plant-requirements-frequently-asked-questions>).

Breaking Energy - [How Dangerous is LNG? « Breaking Energy - Energy industry news, analysis, and commentary](#)

Safety Incidents Link [Microsoft PowerPoint - Wood LPG-LNG Accidents by Maureen.pptx \(europa.eu\)](#)

Shipping Industry <https://carnivalsustainability.com/pioneering-lng>

Power Generation -

[https://www.jsq.utexas.edu/lacp/files/Pre-Feasibility Study of the Potential Market for Natural Gas as a Fuel for Power Generation in the .pdf](https://www.jsq.utexas.edu/lacp/files/Pre-Feasibility_Study_of_the_Potential_Market_for_Natural_Gas_as_a_Fuel_for_Power_Generation_in_the_.pdf)

US Natural Gas pipeline overview and map.

<https://www.eia.gov/energyexplained/natural-gas/natural-gas-pipelines.php>

[LNG - the safe fuel - YouTube](#)

[LNG Properties Video - YouTube](#)

[LNG Virtual Pipeline - Liquefied Natural Gas Delivery | Kinetrex Energy](#)

[LNG Gas System for Manufacturing Plant | Kinetrex Energy](#)

[Midwest LNG supplier keeps customers warm on subzero days - Kinetrex Energy](#)

[LNG industry has a strong safety record around the world | BC Gov News](#)

[LNG shipping has an enviable safety record - The Globe and Mail](#)

[LNG 101 - NextDecade \(next-decade.com\)](#)

[1] National Energy Technology Laboratory (2016), Grid Mix Explorer Version 3; National Petroleum Council (2011), Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources.

[2] International Energy Agency (IEA) (2019), The Role of Gas in Today's Energy Transitions, additional data provided by the IEA (March 2021).

Acknowledgments

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Photo Credit: Piedmont Natural Gas

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