



THE PATH TO ZERO

PROPANE'S ENVIRONMENTAL FACT SHEET

CHEMISTRY

- Propane is a straight-chain alkane, with the carbon atoms structured C-C-C. The middle carbon shares one bond with each of the end carbons and has two hydrogen atoms. The end carbons share a bond with the central carbon atom and are each bonded with three hydrogen atoms. In terms of individual carbon atoms, propane can be expressed as CH₃CH₂CH₃ or C₃H₈.
- Because it vaporizes when exposed to air, propane does not harm soil and has negligible effects on the ozone. Similarly, propane poses no hazard to drinking water or marine ecosystems.
- Propane is not mined like battery materials or extracted like oil. It is primarily manufactured from natural gas as a by-product of methane purification.
- When combusted, C₃H₈ transforms into 3CO₂ and 4H₂O.
- Propane only ignites when in the presence of a specific air mixture and an ignition source above 920°F, making it safer than other fuels.
- Propane's low carbon intensity is why it is an approved clean alternative fuel under the Clean Air Act of 1990.

RENEWABLE PROPANE

- Renewable propane is produced by converting plant and vegetable oils, waste greases, and animal fat into fuel. It delivers a high-energy conversion so BTU's aren't wasted, and is price competitive.
- At the point of combustion, renewable propane is carbon neutral, meaning no new carbon is added to the atmosphere when renewable propane is burned.
- Because renewable propane's chemical structure and physical properties are the same as propane produced from fossil fuels, renewable propane can be used for all the same applications.
- Renewable propane has an ultra-low carbon intensity; as low as 19.

ENERGY

- The Energy Star program gives propane a source site ratio of 1.01, compared to 3.03 for electricity from the grid. This means it takes 3.03 units of electricity to produce and deliver one unit of energy to a home, compared to only 1.01 for propane.
- Liquid propane has a higher energy density than ethanol, methanol, and liquefied natural gas. Therefore, propane vehicles go farther on a tank of fuel than most other liquid alternative fuels, assuming comparable equipment efficiency.

SURPRISING FACTS

- Propane prevents deforestation by replacing solid fuels such as wood and coal.
- The flexible form factor of propane storage makes it easy to install in virtually any environment without disrupting sensitive habitat.
- Propane is electric grid free making it a valuable partner energy source at solar and wind generation facilities when the sun doesn't shine or the wind doesn't blow.
- More than four million people die annually in the developing world due to indoor air pollution from cooking with solid fuels like wood and dung - more than deaths from malaria, HIV/AIDS and tuberculosis combined. The Cooking for Life campaign has a goal of transitioning one billion people from cooking with dirty and dangerous fuels to clean-burning propane.
- A 500-gallon tank can hold enough propane to meet the annual energy needs of an average single-family home.
- A typical propane tank has a useful lifespan of between 30 and 40 years, is made from 85% recycled steel and is 100% recyclable after service. The brass fittings used in the tank are made from a high percentage of recycled brass and are 100% recyclable.



EMISSIONS

- Particulate matter is listed as a carcinogen by the W.H.O. Vehicles using propane reduce particulate matter to virtually zero.
- Propane produces 43 percent fewer greenhouse gas emissions than using an equivalent amount of electricity generated from the U.S. grid.
- Propane-fueled technologies produce fewer nitrogen oxide (NOx) and sulfur oxide (SOx) emissions than technologies fueled by electricity, gasoline, and diesel. Because NOx and SOx contribute to acid rain formation and cause respiratory ailments, manufacturers must comply with laws that set limits for these emissions.
- Propane autogas vehicles can produce up to 22 percent fewer greenhouse gas emissions than gasoline vehicles throughout the full fuel cycle.
- Propane autogas buses cut 96 percent more NOx emissions compared with clean diesel buses.
- In agricultural applications such as irrigation engines, propane provides a clean-burning fuel source. Compared to electric, propane emits 73% less SOx. NOx emissions are reduced by 9% vs. diesel and 20% vs. gasoline. GHGs are 8% less than diesel and 18% lower than gasoline.
- Propane-fueled mowers reduce greenhouse gas emissions by up to 17 percent and sulfur oxide (SOx) emissions by up to 16 percent compared to gasoline-fueled mowers.
- Propane-fueled residential furnaces emit up to 50 percent fewer nitrogen oxide (NOx) emissions and 82 percent fewer sulfur oxide (SOx) emissions than electric furnaces.

CARBON EMISSIONS BY ENERGY SOURCE:

SOURCE	POUNDS OF CO2 EMITTED PER MILLION BTUS OF ENERGY
Coal (anthracite)	228.6
Petroleum Coke	225.1
Coal (lignite)	215.4
Coal (subbituminous)	214.3
Waste oil	210.0
Coal (bituminous)	205.7
Diesel fuel, Home heating oil	161.3
Kerosene	159.4
Gasoline (without ethanol)	157.2
Jet fuel	156.3
Propane	139.1
Natural gas	117.0
Municipal solid waste	91.9

Source: https://www.eia.gov/environment/emissions/co2_vol_mass.php

FOR MORE INFORMATION

To learn about propane and the environment, visit CleanAmericanEnergy.us

THE PROPANE EDUCATION & RESEARCH COUNCIL was authorized by the U.S. Congress with the passage of Public Law 104-284, the Propane Education and Research Act (PERA), signed into law on October 11, 1996. The mission of the Propane Education & Research Council is to promote the safe, efficient use of odorized propane gas as a preferred energy source.

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