

Propane Reduces Greenhouse Gas Emissions

Study shows that using propane can help lower carbon emissions

Growing concerns about climate change and the environmental impacts of conventional fuels are encouraging the development and use of technologies and energy sources that can reduce greenhouse gas (GHG) emissions. Propane is approved by the Environmental Protection Agency as a clean alternative fuel, and it also performs better than many other fuels with respect to GHG emissions.

Propane's on-site emissions have lower carbon content than gasoline, diesel, heavy fuel oil, and ethanol. Even when upstream emissions—emissions released as a result of extracting and processing energy—are factored into the equation, propane is still one of the best fuel options from a GHG perspective.

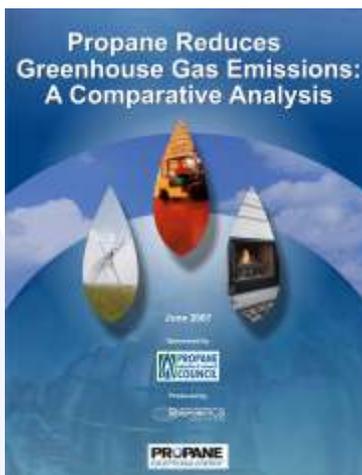
Additionally, propane does not have the contaminants of some other fuels like diesel, and has less criteria pollutants across many applications. Propane's portability, storability, and environmental benefits also qualify it to serve the unique needs of several applications, such as distributed generation.

To further quantify propane's GHG emissions, the Propane Education & Research Council (PERC) commissioned *Propane Reduces Greenhouse Gas Emissions: A Comparative Analysis* (**Docket 12294**). This study, conducted by Energetics Incorporated (Washington, DC), examined the GHG profile of propane and other fuels in major propane market segments. Results show that, compared to conventional fuels, propane generates fewer GHG emissions in almost every application analyzed.

Project Description

The study reviewed the full lifecycle accounting (on-site and upstream) of GHG emissions resulting from the use of propane and other fuels. Largely using the U.S. Department of Energy's GREET Model¹ (which evaluates various vehicle and fuel combinations on a full fuel-cycle basis), the study analyzed energy consumption rates, emissions factors, and equipment efficiencies for the following applications:

- Distributed Generation
- Forklifts
- Light-Duty Trucks
- Residential Space Heating
- Irrigation Pumps
- Heavy-Duty Engines
- Residential Water Heating



Propane's Carbon Footprint

Propane itself is not a direct greenhouse gas when released into the air, according to measurements reported by the Intergovernmental Panel on Climate Change.

Unlike fuels such as natural gas, propane vapor is removed from the atmosphere faster than it takes for it to become well-mixed and impact the global climate.

When propane is used as a fuel, it does generate small amounts of GHG emissions. However, as PERC's study demonstrates, propane's carbon footprint is lower than many other fuels.

Carbon dioxide released per Btu

Fuel Type	kg CO ₂ /million Btu
Natural Gas	52.8
LPG	62.7
Ethanol (E85)	66.6
Motor Gasoline	70.5
Kerosene	70.7
Distillate Fuel (Diesel)	72.5
Residual Fuel (Heavy fuel oil)	78.6
Bituminous Coal	92.7

On-site emissions estimates based on chemical composition of the fuel with 99 percent combustion.

Source: U.S. Department of Energy (DOE). 1994. DOE/PO-00280 Vol. 2 (October).

¹ The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model. 2007. GREET 2, Version 1.7. UChicago Argonne, LLC.

A Comparative Analysis

The study found that propane compares favorably to other fuels in each of the seven applications analyzed. These results demonstrate propane's environmental benefit as it relates to GHG emissions.

Residential Heating

Nearly five million U.S. households rely on propane for home heating and three million use propane for residential water heating. Propane performed as well as natural gas and better than all other fuels for residential water and space heating.

For space heating, furnaces powered by natural gas or propane are the lowest emitters of greenhouse gases. Electric heat pumps, fuel oil furnaces, electric baseboards, and electric furnaces all produce significantly higher GHG emissions. Tankless water heaters running on electricity also have nearly three times more GHG emissions than those fueled by propane.

Distributed Generation

Distributed generation (DG) technology provides power to off-grid areas and serves as a backup source of energy to hospitals, factories, telecommunication centers, and other crucial operations. In total, approximately 12.3 million DG units are currently installed in the U.S., running mainly on diesel fuel. This study shows that propane generates lower GHG emissions than diesel. Propane's high energy density and portability make it the ideal, low-carbon fuel option for DG applications.

Engine Fuel

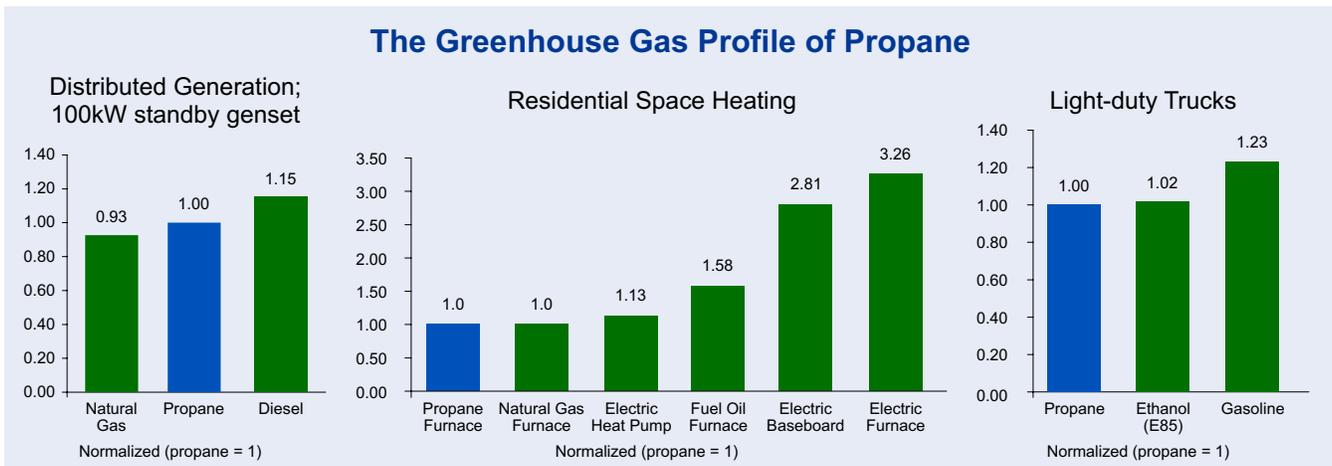
Forklifts, light-duty trucks, and medium-duty engines are all used for vehicle propulsion, with the latter used for many commercial and municipal vehicles, including school buses. Light-duty trucks—which constitute a significant portion of the U.S. vehicle fleet—run on propane, ethanol (E85), or gasoline. Propane's GHG emissions remain the lowest of all three, delivering equivalent performance for lower environmental costs. Additionally, propane's established infrastructure allows for immediate use in these applications.

For forklifts, propane outperforms natural gas, diesel, and gasoline in GHG emissions. For medium-duty engines, only diesel comes out slightly ahead of propane in GHG emissions, but the air pollutants in diesel exhaust are known to cause adverse health effects and remain a concern for officials.

Summary

This analysis demonstrates that propane remains among the most attractive options for avoiding GHG emissions. Results were particularly noteworthy for residential space and water heating and light-duty trucks (see below). With its GHG emissions results, short lifetime in the atmosphere, and low carbon content, propane has less of an impact on the environment than other comparable fuels.

The Greenhouse Gas Profile of Propane



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