

Comparative Analysis of Residential Heating Systems Study 2010

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Overview

Evaluating 14 different heating systems in 16 locations across the United States in both new and existing homes, this 2010 study measured each system's comparative equipment and installation cost, annual operating cost, carbon dioxide (CO₂) emissions, and return on investment (ROI). The study used regionalized 2009 energy price data from the U.S. Energy Information Administration and did not consider equipment maintenance costs. Systems were evaluated for new homes and as efficiency upgrades for existing homes.

Overall findings

The study revealed that selecting the optimal home-heating system is a balance of several factors, including upfront costs, efficiency and monthly operating costs, ROI, and long-term carbon emissions. Propane furnaces performed very strongly both as a primary option, and as a backup heating source when paired with air-source heat pumps (ASHPs) in "dual fuel" systems.

Southeast Region overview

The Southeastern United States is defined by year-round temperate weather and the outdoor living opportunities it affords. The region's residents rely heavily on their HVAC systems to deliver comfort and relief from intense Gulf moisture and humidity, which can also trigger violent and dangerous storms.

Legacy energy sources in the region, particularly electricity, present shortcomings to homeowners and construction professionals, including cost and reliability. During even a run-of-the-mill, moderate tropical storm, winds can knock down power lines, cutting off electricity and leaving households without basic space and water heating, space cooling, or refrigeration capabilities — sometimes for days.

In the wake of Hurricanes Andrew, Ivan, and Katrina, homeowners and construction professionals have found on-site propane to be a reliable, cost-efficient way to supplement or replace legacy energy sources.

Southeast Region findings: cost

A comparative analysis based on typical housing in Alabama found that:

- Compared with a high-efficiency electric ASHP — a common HVAC setup in the Southeast — a dual fuel system using propane offers more fuel flexibility when energy prices fluctuate, as well as the ability to avoid electric backup heating, which is the least efficient, most expensive, and most carbon-emitting mode of operation.
- A dual fuel system will cost roughly 8% more than an ASHP system while reducing annual heating costs by about 14%.
- Compared with a high efficiency ASHP, a high efficiency propane furnace coupled with a standard central A/C system costs 14% less for equipment and installation.
- A ground-source heat pump system (GSHP) is more than \$10,000 more expensive to install than a high efficiency propane furnace with central A/C for a typical house. Even when accounting for lower monthly bills and potential tax credits, the GSHP system will take 10 years or more to make up for the added first cost.

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For
eco-conscious
homeowners
looking to reduce their
home's carbon emissions,
propane systems offer a
compelling choice.

Southeast Region findings: environment

Highlights from the study's findings on the environmental performance of propane versus competitive fuels include:

- Propane systems' CO₂ emissions profile is either comparative to, or surpasses, other energy and heating systems options.
- Compared with a high efficiency ASHP, a high efficiency propane furnace coupled with a standard central A/C system has 23% lower CO₂ emissions. The emissions reduction gained by using propane is like the carbon captured by 9 trees over 10 years.
- Dual fuel systems will reduce CO₂ emissions from heating by nearly 1 ton annually, compared to heating with an ASHP system alone. Dual fuel systems do this by avoiding the need for electric resistance back-up heat in the heat pump.

Conclusion

Energy-conscious homeowners shopping for a home heating and cooling system almost always ask a construction professional: "Which system costs the least to operate and is the cheapest to install?" This study shows how that question warrants a careful answer, one that covers first costs as well as energy costs.

For eco-conscious homeowners asking "Which system has the lowest carbon emissions footprint?" it's clear that propane systems are a compelling option.

Because residential heating systems are generally replaced every 12 to 18 years, construction professionals have ongoing opportunities to improve the energy and environmental performance of residential heating systems across the United States.

About the author of the study

Newport Partners LLC, a building industry research firm based in Davidsonville, Md., conducted this study in 2010. Newport Partners specializes in the analysis of building systems' energy performance.

For more information

Download the full heating analysis study at buildwithpropane.com.

For more information on the reliability, efficiency, and performance of propane furnaces and boilers, contact Tracy Burlison, PERC director of residential programs, at 202-452-8975 or tracyburlison@propanecouncil.org.