RESIDENTIAL PROPANE APPLICATIONS:

COMPARING PROPANE HEATING WITH NEW, HIGHER STANDARD HEAT PUMPS

FACT SHEET

New, more stringent federal standards for air-source heat pumps went into effect in the United States on January 1, 2015.

Both the heating and cooling efficiency levels for residential heat pump units have increased; split system heat pump units manufactured after 1/1/2015 must now have rated efficiency levels of at least 14 SEER for cooling and 8.2 HSPF for heating.

FEDERAL ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL HEAT PUMPS[1]		
Efficiency Metric	**Units Manufactured Prior to 1/1/2015**	**Units Manufactured On/After 1/1/2015**
SEER[2]	13	14
HSPF[3]	7.7	8.2

1. Table covers split system heat pumps. Single package heat pump systems have slightly different standards.
2. SEER is a measure of cooling efficiency, and stands for Seasonal Energy Efficiency Ratio.
3. HSPF is a measure of heating efficiency, and stands for Heating Seasonal Performance Factor.

ANNUAL ENERGY COSTS

The energy performance for a propane furnace (with an electric air conditioning system for cooling) compared with a heat pump system will vary depending on the efficiency levels, a home's insulation levels, outdoor conditions, and energy prices. New homes differ from existing homes, due to improvements in insulation and air sealing.

ANNUAL ENERGY COST COMPARISON: PROPANE[1] VS. HEAT PUMP[2]	
Annual Heating & Cooling Cost Savings from Propane Furnace System[3]	
New Home	$57
Existing Home	$117

1. Propane System Specs: 92 AFUE propane furnace paired with a 13 SEER split system A/C system, centrally ducted. "AFUE" is a measure of a furnace's heating system efficiency.
2. Heat Pump Specs: 8.2 HSPF and 14 SEER, centrally ducted.
3. Modeling analysis based on 4 Cold Climate cities located in Midwest and Northeast. Average pricing (based on US EIA Jan – Mar 2015 data) for these locations was propane at $1.83/gallon and electricity at 14 cents/kWh.

As the modeling results show, high efficiency propane heating with a central A/C system for cooling can offer energy savings even compared with the new higher efficiency heat pumps.

PROPANE VS. HEAT PUMPS AT A GLANCE

- Federally mandated minimum efficiency levels for air-source heat pumps have increased on a national basis for all units manufactured on or after January 1, 2015.
- A high-efficiency propane furnace coupled with a standard A/C system still offers energy savings over the new higher efficiency heat pumps.
- Total costs for the new, more efficient heat pump system are about 20 percent higher than for the 92 AFUE propane furnace with a 13 SEER central A/C system.
- The new higher efficiency heat pumps still produce more CO_2 emissions compared with a high efficiency propane furnace with a central A/C system.
- In most climate zones, heat pumps produced less-than-comfortable heat nearly 60 percent of the time. Propane consistently delivered comfortable heat in all climate zones.*

*Results are based on research conducted using software simulations.

EQUIPMENT COSTS

Federal standards requiring higher efficiency equipment almost always incur a cost increase. Heat pumps' minimum efficiency levels have increased by 6 to 7 percent, which manufacturers achieve by using a larger coil, and more efficient motors and compressors, adding to a system's material cost.

Analysis shows the total costs for the new, more efficient heat pump system are about 20 percent higher than the 92 AFUE propane furnace with a 13 SEER central A/C system. This includes the cost to purchase and install the system, and is based on cost data from RS Means, U.S. Department of Energy rulemaking analysis, and the HVAC market.

THE COMFORT TEST

Cost alone isn't the reason a homeowner chooses a heating system. The deciding factor is most often comfort. Newport Partners, LLC recently completed the *Residential Space Heating Comparative Analysis* evaluating comfort in homes, using U.S. DOE software. The study analyzed the supply temperatures throughout the heating season for both furnaces and heat pumps.

The study found that at least 60 percent of the time in mixed-humid and cold climate locations, heat pump supply temperatures dropped to less than comfortable levels. Heat pumps didn't fare much better in hot climates either: 20 percent of the time they produced less than comfortable heat.

Propane forced-air furnaces consistently delivered very warm supply temperatures — between 115-125 degrees Fahrenheit — and were unaffected by cold outdoor temperatures. While comfort is also affected by variables such as a home's insulation, windows, and drafts, the ability of propane furnaces to provide a reliable supply of hot air is a major advantage.

ENVIRONMENTAL IMPACTS

Despite increased efficiency levels for heat pumps, the electricity used to operate these systems is often generated by power plants using coal, resulting in significant CO_2 emissions.

CO_2 emissions from heating and cooling for both electric heat pumps and propane furnace/air conditioning systems were calculated using "emission factors" from the U.S. Environmental Protection Agency. The propane furnace/air conditioning system saves an average of about 4,600 pounds of CO_2 emissions per year. Over a 15-year life cycle, these emission savings[1] become very significant — equal to burning more than 3,500 gallons of gasoline, or 16 tons of coal.

3,522
GALLONS OF GASOLINE CONSUMED

33,617
POUNDS OF COAL BURNED

CO_2 emission savings equivalents which result from using a high efficiency propane furnace (with a central A/C) instead of a heat pump meeting the new federal standards, over a 15 year life cycle.

PROPANE VS. HEAT PUMPS: WHAT CONSTRUCTION PROFESSIONALS SHOULD KNOW

Below are important factors construction professionals should know about the new federal standards for heat pumps.

- Construction professionals need to be well versed on efficiency levels, pricing (first cost as well as operating cost), and performance in cold weather. Flexibility is also another powerful incentive for homeowners to choose propane. If they're using it as a home heating energy source, they can easily enjoy the other benefits of this clean, American fuel: water heating, cooking, clothes drying, and fireplaces. With the Virtual Propane Energy Pod Home at buildwithpropane.com you can compare fully or partially equipped propane homes to standard homes to see costs, energy savings, and more.
- Both heat pumps and split system air-conditioning systems face efficiency hikes, but for split systems the efficiency hikes are only in the Southeastern and Southwestern parts of the country. This introduces complications for contractors working across the borders of the standard's regions. For more information visit: **http://www1.eere.energy.gov/buildings/appliance_standards/product.aspx/productid/75**
- Complying with minimum SEER and HSPF standards involves selecting matching components (indoor blower and coil + outdoor condenser) that collectively meet the efficiency specs as a system. The Air Conditioning, Heating, and Refrigeration Institute Directory of Certified Product Performance contains listings of matched systems and their efficiency ratings for this purpose: **https://www.ahridirectory.org/ahridirectory/pages/home.aspx**
- HVAC contractors are on the front lines of the new standard changes, and must be familiar with product options for builder and homeowner clients. Resources such as this fact sheet, cost estimates from distributors, and PERC's online Energy Cost Calculator at **buildwithpropane.com/energycalc**, can help contractors understand the issues and select heating systems that provide long-term value and comfort.

[1] Equivalency metrics generated through the use of the U.S. EPA's Greenhouse Gas Equivalencies Calculator. http://www.epa.gov/cleanenergy/energy-resources/calculator.html

FOR MORE INFORMATION

To learn more about residential propane applications and the Propane Education & Research Council, visit **buildwithpropane.com**.

Propane Education & Research Council / 1140 Connecticut Ave. NW, Suite 1075 / Washington, DC 20036
P 202-452-8975 / **F** 202-452-9054 / propanecouncil.org

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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