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HEAT PUMPS: Gaining Ground in Cold Climates

by Xcel Energy

From advantages such as lower operating costs, potentially less maintenance and lower carbon emissions, the reasons to use a heat pump versus a fossil-fuel powered furnace or another heating and cooling system are clear. But old misconceptions, a lack of knowledge about new technology and a lack of consumer demand have left heat pumps out in the cold, especially in the north. However, attitudes and education are changing perceptions and habits. Technology is advancing with the advent of cold climate heat pumps, which are designed to operate efficiently in cold temperatures. Also, better trainings exist for installers and better educational and marketing programs are reaching the general public. The combination of efforts means that heat pumps—when installed correctly—are a better, cleaner and more sustainable option, and are gaining ground. Now it's up to the energy industry to spread the word.

Challenges in Cold Climates

“A heat pump is an air conditioner that has the ability to run in reverse,” says Greg Olson, Channel Manager at Xcel Energy in Minneapolis, explaining the system in simplest terms. “HVAC installers here have been hesitant to recommend them when an air conditioning unit or furnace do the job during the extremes of hot summers and cold winters.”

For decades, Xcel Energy has provided incentives for customers to buy more energy efficient appliances in the form of rebates. Cash back helps offset the cost of a system that costs more up front but saves money in energy bills over time.

New heat pump technology can operate to sub-zero temperatures, overcoming old objections that heat pumps couldn't keep up during cold weather. Installers are aware of the technology, but it's more complicated, and requires more time to get up to speed.

“There's still very little appreciation for the technology here,” says Josh Quinnell, Senior Research Engineer at the Center for Energy and Environment (CEE) in Minneapolis. “We've been blessed with cheap natural gas for a long time and we put a lot of time and money developing an infrastructure to keep it that way. There's no real incentive to explore other options.” Quinnell says that makes it difficult for new technologies to break into the space.

Awareness is greater among people who are buying new, high-performance homes where mini-split and centrally-ducted heat pump systems work well.

“A heat pump is a great option for new construction where the house is designed appropriately or if it's an all-electric house,” he says. Existing buildings, conversely, might require a heat pump and a backup system for sub-zero nights. It's also more expensive to run in severe cold.



Quinnell suggests Minnesotans look at heat pumps from a cooling perspective.

“When air conditioners fail, people should be considering heat pumps to replace them. They'll work great for heating in the spring and fall when loads are moderate and operate as high efficiency air conditioners in the summer.”

An Alternative to Propane

Andrew Kotila, Program Manager at Slipstream, says promoters of heat pumps should focus on homes that don't have access to inexpensive natural gas. “Propane is more expensive than natural gas so for propane users, heat pumps are more financially viable,” he says.

Slipstream is a non-profit that partners with utilities, local and state governments, regulatory agencies and other organizations to create, test, deliver and scale the next generation of energy efficiency and renewable energy programs.

Kotila recommends promoting heat pumps through a “push-pull” strategy, educating contractors and homeowners simultaneously. “If your furnace dies and you need heat right now, it's usually up to the heating contractor to make a recommendation,” he says. “If you can get contractors to explain to homeowners that heat pumps are competitive to propane and that using a heat pump along with a back-up heating source can save them money, word will spread.”

Kotila says a larger industry issue is fuel switching. Traditional utility efficiency programs were created by statute with the goal of ensuring the supply of a scarce energy resource or to manage consumer energy costs by reducing the construction of new power plants. Heat pumps don't fit well into this structure because they usually result in offsetting gas with an *increase* in a home's electricity consumption. With increasing amounts of renewable energy on the electric grid, heat pumps can be an example of “beneficial” electrification by reducing net carbon emissions, but decarbonization is not currently the driver of the efficiency programs.

“As a society, we need to have a discussion about fuel switching and decide what to do,” he says. “While some states offer exceptions for low-income customers or unregulated fuels like propane, most utility incentive programs are forbidden from promoting fuel switching from gas to electricity. But to reduce carbon emissions as the electric grid gets cleaner, that’s something policy-makers should consider.”

While that debate plays out in cities and states across the country, Kotila remains optimistic about the use of heat pumps. “The needle is moving,” he says. “I’ve been involved in residential HVAC for over a decade and we’ve finally seen acceptance of heat pumps start to improve in the last couple years.”

Progress on the Coasts

When it comes to heat pump use in Oregon, Suzi Asmus, Program Manager of the Northwest Ductless Heat Pump Project at the Northwest Energy Efficiency Alliance (NEEA), says they’ve come a long way. “93% of recently-surveyed HVAC installers offered ductless heat pumps,” she explains, adding, “What that stat doesn’t tell us is how comfortable or confident they are in selling them.” Asmus says the technology is maturing fast and there are many permutations such as multi-head, whole-home, short-ducted, and others, that installers have to fully understand to be able to make a recommendation to the homeowner. “The goal of our ductless program has always been displacement, a concept which requires consumer and installer education,” she says. “But as the technology changes, it requires even more sophisticated training and education to respond. Installers who were comfortable with displacement now have a whole new set of solutions to offer and need to have a greater understanding of these options to educate consumers.” For that reason, NEEA delivers installation best practices trainings for installers. The onus is then on the installer to educate the consumer, which NEEA and the region’s utilities rely on to ensure the delivery of energy savings. “The more our installers know, the more they can share with consumers, which will reduce call-backs,” she says.

Asmus is seeing other educational efforts, too, such as manufacturers offering seasonal trainings and distributors building hands-on training rooms inside their warehouses.

“Those are great signs of market transformation,” she says. She adds that utilities and efficiency organizations across the country ramping up ductless programs is another good sign. The more regions move to ductless, the more she expects to see manufacturers invest on a national level.

Room to Grow

David Lis, Director of Technology and Market Solutions at Northeast Energy Efficiency Partnerships (NEEP) in Lexington, Massachusetts, says furnace and boilers dominate in the northeast, but that the growth opportunity is in heat pumps. He agrees with CEE’s Quinell that the current market is still largely driven by interest in cooling solutions. “We have all of these hydronic distribution heating systems in the northeast like water-based radiators, so it’s hard to drop in a cooling system,” he says. “What heat pumps do is create an opportunity for more whole-home cooling solutions that also provide heating.”

FOUR THINGS NEEDED FOR HEAT PUMPS TO GAIN TRACTION

1. Installer Training. Heat pumps are more complex systems than furnaces and air conditioners, requiring more education.

2. Installer Confidence. If installers are champions of heat pumps, and sell them as cutting edge, energy efficient, greener and cheaper to operate with long-term cost-savings, that will give consumers the confidence to choose a heat pump.

3. Aggressive Incentives. Money is always a great incentive for consumers and installers.

4. Policy. A decarbonization policy that updates or augments traditional energy efficiency programs would allow fuels to be switched when it is beneficial.

Similar to an abundance of cheap natural gas in Minneapolis, they have a lot of delivered oil in their region. “There was a big spike in oil prices five years ago and people were paying a lot to heat their homes. That helped the heat pump cause since it provided a cooling option, energy efficiency, comfort and cost savings all in one,” Lis says. He says Maine and Vermont were early adopters, which trickled into other states. People also liked that it was considered a greener option.

“The combination of all of that created a buzz around the technology,” he says. “The average consumer started to hear about heat pumps and realize what the benefits were.” Lis says the most common application is in single zone ductless systems that are not designed to handle the entire load. They also see people choosing properly sized systems that can handle the entire heating load who still buy or maintain backup systems for peace of mind. “It will likely take a generation of happy consumers for people to start trusting them without backup systems,” he says.

Environmentally Viable

Industry analysis reveals heat pumps are typically environmentally beneficial today compared to propane, fuel oil, and in some scenarios, natural gas. However, the environmental benefits of heat pumps depend heavily on when they are in use and how clean the supply of electric power is at those times. “Electricity will get cleaner over time which means heat pumps will get cleaner over time,” he says.

Overall Optimism

Many in the industry agree that it’s an exciting time in the market, but also know there’s work to be done toward a long-term transformation. The keys are collaboration, innovation – and finding ways to promote the technology while delivering on the promises of comfort and satisfaction.

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