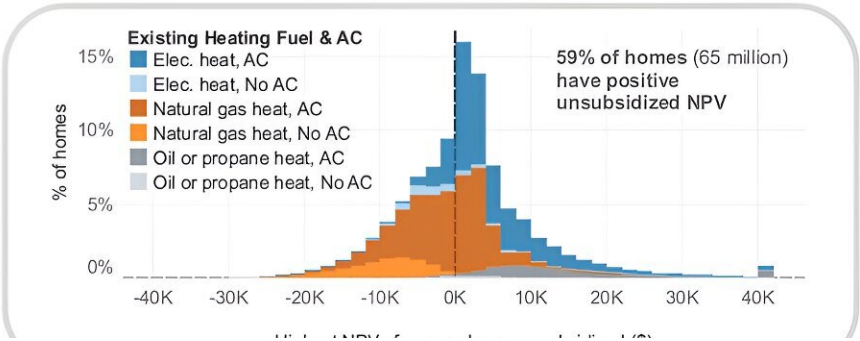


Benefits of heat pumps detailed in new report

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Credit: *Joule* (2024). DOI: 10.1016/j.joule.2024.01.022

Millions of U.S. households would benefit from heat pumps, but the cost of installing the technology needs to come down to make their use a more attractive proposition, according to researchers at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL).

The [findings](#), detailed in the journal *Joule*, quantify the costs and benefits of air-source heat pumps across the United States and consider various climates, heating sources, and types of homes. The researchers based their conclusions on simulations of 550,000 statistically representative households. Their analysis considered such factors as the performance of different heat pumps and whether additional steps to upgrade the insulation had occurred.

The analysis revealed a majority of Americans (62% to 95% of households, depending upon heat pump efficiency) would see a drop in their [energy bills](#) by using a heat pump. Improving the weatherization of a home, such as by installing better insulation, would increase the range to 82% to 97%. However, due to high installation costs, heat pumps may only be financially feasible for a smaller portion of households.

"There are millions of people who would benefit from putting in heat pumps, and there are incentives made available through the Inflation Reduction Act, both tax credits and rebates, that millions of households can benefit from," said Eric Wilson, a senior research engineer in the Buildings Technologies and Science Center at NREL and lead author of the paper, "Heat pumps for all? Distributions of costs and benefits of residential air-source heat pumps in the United States."

"But what this paper shows is that there are still millions more households for whom the technology is still pretty expensive, and we need work to bring down the cost of installing heat pumps," said Wilson.

His co-authors are Prateek Munankarmi, Janet Reyna, and Stacey Rothgeb, all from NREL; and Brennan Less from Lawrence Berkeley National Laboratory.

Because heat pumps provide both heating and air conditioning, homeowners who do not already have air conditioning benefit from

additional comfort, but that comes with an additional cost. The researchers also noted installers who lack experience with heat pumps may also charge higher prices "to cover the hassle and risk of working with unfamiliar equipment and sizing procedures."

Nationally, the researchers calculated, heat pumps would cut home site energy use by 31% to 47% on average, depending on its efficiency level, and 41% to 52% when combined with building upgrades such as better insulation. The big difference between [energy savings](#) and energy cost savings is that [natural gas prices](#) are much lower than electricity prices on a Btu basis in many parts of the country.

The housing characteristics that had the largest bearing on savings were the heating fuel type and the presence of air conditioning. For the 49 million homes that use electricity, fuel oil, or propane for heat and have [air conditioning](#), 92% to 100% of homes would see energy bill savings, with median savings of \$300 to \$650 a year depending on heat pump efficiency.

Co-author Munankarmi said the savings were most significant in colder climates. Additionally, he said, homeowners can "save thousands of dollars on average" by putting in a smaller heat pump if they first have taken steps to improve the energy efficiency of their dwellings.

The researchers also found that installation of a heat pump prompted greenhouse gas emissions to decline in every state, but the drop was especially large when it replaced a heating system that had been powered by [fossil fuels](#). Nationally, [heat pumps](#) would cut residential sector [greenhouse gas emissions](#) by 36%–64%, including the emissions from new electricity generation.

More information: Eric J.H. Wilson et al, Heat pumps for all? Distributions of the costs and benefits of residential air-source heat

pumps in the United States, *Joule* (2024). DOI: [10.1016/j.joule.2024.01.022](https://doi.org/10.1016/j.joule.2024.01.022)

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