



ISSUE BRIEF

IT'S TIME TO FINALIZE A STRONGER, BETTER STANDARD FOR GAS FURNACES

THE DEPARTMENT OF ENERGY'S PROPOSED ENERGY EFFICIENCY STANDARD CAN SAVE CONSUMERS BILLIONS AND SLASH OUR CARBON EMISSIONS

About 40 percent of U.S. homes are heated by natural gas furnaces, making those the most prevalent heating equipment in the country. These appliances represent a significant household expense, and the technology to make them more efficient has existed for quite some time now. Yet the standard that regulates the efficiency of gas furnaces has remained essentially unchanged for 25 years.

Though the standard was scheduled for revision in 1994 as required by law, the U.S. Department of Energy (DOE) failed to act. This set in motion more than two decades of legal and procedural delays. Stalling on a strong standard has been detrimental to both consumers and the environment. In fact, NRDC conducted an analysis to gauge the extent of lost savings between 2011—a year when a strong standard would have been both technologically feasible and cost effective, because sales of high efficiency furnaces had been on a steady rise for a number of years¹—and the end of 2021, now the earliest likely effective date for a new standard.² The lost savings are significant—equivalent to the energy required to meet the gas and propane heating needs of all of New England for nearly two years.

It is time to change that. We now have the opportunity to implement a strong energy efficiency standard that can deliver up to \$21.7 billion in savings to consumers and avoid approximately 143 million metric tons of climate-altering carbon pollution over 30 years of sales, according to the DOE's projections in its latest proposal.³ It is worth noting that while this is a significant step forward, the proposed standard of 92 percent efficiency for gas furnaces falls short of its full economic value, even by DOE's own analysis. A 95 percent efficient furnace would deliver even greater energy and environmental savings, and that technology is currently

available.⁴ This stronger cost-effective standard is expected to yield up to \$29 billion in savings and avoid 211 million metric tons of carbon pollution.

The DOE is now on track to finalize an updated efficiency standard this year for new gas furnaces (natural gas and propane) manufactured in 2021 and beyond.⁵ When it does, heating equipment in U.S. homes will no longer needlessly waste gas, and manufacturers and installers can unlock further innovation, potentially saving even more energy.

FURNACES KEEP AMERICA WARM

Space heating represents the largest energy expense in the average U.S. home, accounting for about 45 percent of energy bills.⁶ Natural gas is the most common home heating fuel,⁷ used by more than 55 million U.S. households.⁸ Of those, around 44 million homes are heated by natural gas furnaces, and the remainder by other equipment that burn natural gas, including steam or hot water systems, and in-room heaters.

Designed for indoor installations, non-weatherized gas furnaces burn gas for heat and distribute it through a duct system. The current energy efficiency standard requires gas furnaces to meet only 80 percent annual fuel utilization efficiency (AFUE)—wasting 20 percent of the energy in the gas they burn.⁹

HOLDING DOE'S FEET TO THE FURNACE

A strong energy efficiency standard for natural gas furnaces can save consumers billions of dollars and drastically reduce carbon emissions. It's time for the U.S. Department of Energy to update the standard.



Heating—Biggest Home Energy Expense

45% of our energy bill goes toward heating

ABOUT 40% of U.S. homes are heated by natural gas furnaces



The Cost of Delay

25 YEARS since energy efficiency furnace standards were significantly updated

Between 2011-2021, NRDC analysis shows, consumers could have saved:

0.32 QUADS OF ENERGY ENOUGH TO MEET
2 YEARS OF NEW ENGLAND'S GAS AND PROPANE HEATING NEEDS

22 million tons OF CARBON POLLUTION
EQUAL TO THE ANNUAL EMISSIONS
OF MORE THAN **4 MILLION CARS**



Who Benefits from an Updated Standard?

HOMEOWNERS

who often lack time or information to shop for a more efficient model

RENTERS

who often have higher energy bills when landlords install cheapest, least-efficient furnaces

LOW-INCOME HOUSEHOLDS

which spend a larger chunk of their budget on heating

 **EVERYONE** 

because improving efficiency reduces climate-changing carbon pollution, while standards spur innovation in furnace technology and installation

Roughly 50 percent of furnaces on the market today use condensing technology, which captures excess heat from the water vapor that would otherwise be lost up the chimney.¹⁰ These models, known as condensing furnaces, meet or exceed a 90 percent AFUE, with models up to 98 percent efficient.

MISSED OPPORTUNITIES

The failure to update the minimum furnace efficiency standard diminishes our chance to save on energy bills and cut carbon emissions.

NRDC estimated the energy savings and pollution reductions¹¹ that would have occurred between 2011—a year when a 92 percent AFUE standard was technologically feasible and cost-effective—and the end of 2021, now the earliest likely effective date for a new DOE standard. (DOE in 2015 proposed¹² that a 92 percent AFUE standard take effect in 2021.) Our analysis shows that in just those 11 years, a 92 percent AFUE standard would have saved 0.32 quads of energy—enough to meet New England's gas and propane heating needs for nearly two years. In addition, it would have avoided 22 million tons of harmful carbon pollution, equivalent to the annual emissions of more than 4 million cars.

Minimum efficiency standards are a proven approach to spreading the benefits of efficient technologies, and a stronger furnace standard would ensure the efficiency of all furnaces on the market. This more efficient market would be especially helpful to renters, most of whom pay for utilities but are unable to choose their furnaces. An improved standard would force landlords to purchase efficient furnaces and save renters money. This may be especially valuable for occupants of affordable multifamily housing, whose energy bills typically consume a disproportionately large chunk of household income.¹³ Without a stronger standard, most landlords have few incentives to install anything but the cheapest (and usually least efficient) furnaces—burdening their tenants with higher utility bills.

Even homeowners who are free to choose their heating equipment may lack the time or information necessary to select more efficient furnaces, especially when they need to quickly replace one that fails during the winter. Even when time is not an issue, consumers tend to focus on short-term, up-front expenses rather than long-term, life-cycle costs.¹⁴ An improved furnace standard would ensure that all consumers enjoy the benefits of highly efficient furnaces, regardless of income or circumstance.

An updated standard for gas furnaces can also spur further innovation in furnace technology and installation solutions. When manufacturers enhance the energy efficiency of their products, these products often outperform the minimum federal standard at a lower cost than that projected by the DOE.^{15,16}

MOMENTUM BUILDS TO FINALIZE A STRONG STANDARD

The DOE has powerful momentum to finalize a strong standard, slashing consumer utility bills and collective carbon emissions alike. In fact, the DOE's 2016 proposal is in many ways the result of collaboration among industry, efficiency advocates, and various other stakeholders.

In early 2015, the DOE proposed a 92 percent AFUE national standard for all gas furnaces, which would generate significant benefits for consumers and the environment.¹⁷ The process of improving that proposal spurred productive discussions among efficiency advocates, utilities, manufacturers, consumer groups, and other diverse stakeholders.

Some industry stakeholders, for example, raised concerns that some households with below-average heating needs would not recoup the higher costs of more-efficient equipment. For example, a small or medium-size house in Nashville has moderate heating needs compared with a similar home in Chicago. Thus, the Nashville home would see smaller savings from a 92 percent AFUE furnace, but would still pay the higher fixed costs for equipment and installation that could accompany a more efficient furnace. In response to this concern, the new proposal that DOE just released includes a two-tier standard that requires 92 percent AFUE for larger furnaces and 80 percent for smaller models (at or below 55,000 Btu/hour input capacity). This approach would allow consumers in well-insulated, small and medium-size homes in moderate and warm climates to continue using noncondensing furnaces.

Other industry stakeholders noted that replacing an old furnace with a high-efficiency model can sometimes require modifying the venting system, which could lead to unusually high installation costs.¹⁸ For example, these cases can occur in old row homes lacking an exterior wall to accommodate the requisite exhaust pipe for venting.¹⁹ To address these concerns, DOE accounted for these few cases in its cost calculations in both its 2015 and newest proposals. In both cases, the analysis showed the standard would still be cost-effective for the nation. In addition, properly distinguishing a small furnace capacity threshold would address a significant portion of these concerns without compromising the significant savings for the majority of homes that need larger furnaces.

Improved analysis and collaboration have paved the way to finalize the DOE's 2016 proposed standard, which would take effect in early 2022 and cover natural gas and propane furnaces. There is good momentum to implement a strong standard and cut consumer utility bills and carbon emissions.

THE MARKET IS ALREADY MOVING IN THE RIGHT DIRECTION

The considerable uptake of condensing furnaces, particularly in colder climates, can be credited to a suite of policy tools, including federal weatherization assistance programs, local utility efficiency programs, and federal tax credits offered under the 2009 American Reinvestment and Recovery Act (ARRA).^{20,21,22} While these programs and policies constitute a powerful engine for promoting energy efficiency, market efforts alone are not enough. A strong DOE standard will help the thousands of homeowners that these programs haven't reached save up to \$21.7 billion—or \$29 billion with the stronger 95 percent AFUE standard—beyond the current savings.

SUCCESSFUL POLICIES IN PROMOTING ENERGY EFFICIENT FURNACES

The federal Weatherization Assistance Program was the main force in rolling out high-efficiency condensing furnaces in Wisconsin.²³ In the 1990s, state-level program administrators required the use of condensing furnaces, forcing furnace installers to learn how to install them properly. This drove the installation price down and increased demand for condensing furnaces. As a result, in 2006, more than 80 percent of new furnaces sold in Wisconsin were already ENERGY STAR®-certified condensing furnaces, which means that they met or exceeded 90 percent AFUE.²⁴

Outside of Wisconsin, natural gas utilities have sponsored energy efficiency programs to incentivize purchases of highly efficient furnaces. For example, Norwich Public Utilities in Connecticut offers a \$400 rebate on furnaces rated 95 percent AFUE and above.²⁵ Likewise, in 2010 and 2011, the American Reinvestment and Recovery Act offered a 30 percent tax credit to homeowners nationwide for energy efficiency improvements, including installing energy-efficient furnaces, air conditioners, windows, and doors. This tax credit boosted the sales of condensing furnaces, particularly in 2010.²⁶

TIME TO FINALIZE THE NEW STANDARD

The time for delays is over. U.S. consumers should no longer wait to save billions on their winter heating bills, as well as cut harmful carbon pollution. The DOE should finalize the long-overdue furnace standard.

ENDNOTES

- 1 Air Conditioning, Heating & Refrigeration News, “Condensing Furnace Sales Rise”, 2010, <http://www.achrnews.com/articles/114527-condensing-furnace-sales-rise>; Consortium for Energy Efficiency, *Residential Heating and Cooling Systems: Initiative Description*, May 28, 2015, library.cee1.org/sites/default/files/library/12006/CEE_ResidentialHeatingAndCoolingSystemsInitiative_May2015.pdf.
- 2 NRDC did not compute the lost savings associated with the full 25 years of delays, but rather bracketed the analysis in the 2011 – 2021 time frame where a 92 percent AFUE standard for gas furnaces would have been both technologically feasible and cost-effective for the nation.
- 3 U.S. Department of Energy, “Energy Conservation Standards For Residential Furnaces, Supplemental Notice of Proposed Rulemaking,” September 2, 2016, <http://energy.gov/sites/prod/files/2016/09/f33/Residential%20Furnaces%20SNOPR.pdf>.
- 4 In its latest proposal, DOE analyzed the costs and savings for a range of efficiency levels and found that a 95 percent efficiency requirement for large furnaces was also cost-effective for the nation. Yet, the proposed standard is 92 percent efficiency.
- 5 Natural gas furnaces make up the majority of gas furnace sales. The Energy Information Administration’s 2009 Residential Energy Consumption Survey shows that over 90% of U.S. homes heated by a gas furnace have a natural gas furnace installed.
- 6 DOE, “Energy Saver 101 Infographic,” 2013, energy.gov/articles/energy-saver-101-infographic-home-heating.
- 7 DOE, “Energy Saver 101 Infographic.”
- 8 Energy Information Agency, “2009 Residential Energy Consumption Survey, 2009 RECS Survey Data,” www.eia.gov/consumption/residential/data/2009/#sh.
- 9 EIA, “Gas Furnace Efficiency Has Large Implications for Residential Natural Gas Use,” *Today in Energy*, December 5, 2013, www.eia.gov/todayinenergy/detail.cfm?id=14051.
- 10 Appliance Standards Awareness Project, “Appliance Standards Questions and Answers: Facts About DOE’s Proposed New Furnace Standards,” April 2015, www.appliance-standards.org/sites/default/files/Gas_furnace_fact_sheet_final.pdf.
- 11 In estimating the missed energy savings between 2011 and 2021, NRDC relied on data (unit energy consumption, shipment numbers, emissions factors, etc.) from DOE’s 2015 standard proposal for non-weatherized gas furnaces. Energy savings delivered by the standard between 2011 and 2021 were calculated as the difference between energy consumption in the baseline case and the hypothetical scenario with the 92 percent AFUE standard taking effect in 2011. For the baseline, we used DOE’s modeled numbers for furnace shipments and unit consumption data between 2011 and 2021. These numbers are included in the 2015 proposal. In estimating the impact of a 92 percent AFUE standard taking effect in 2011 (for the hypothetical scenario), we mimicked the percentage drop in unit energy consumption and furnace shipments that DOE’s analysis projected would be induced by a 92 AFUE standard taking effect for the first 11 years after implementation. The energy consumption difference between the baseline and 92 AFUE standard scenario yielded cumulative energy savings of 0.32 quads between 2011 and 2021. These energy savings include the impact of switching from gas furnaces to alternate heating products that could occur after the standard takes effect, based on DOE’s estimates for increased electricity consumption induced by the switch. Carbon emission reductions associated with the energy savings were computed using DOE’s emissions factors, also included in the 2015 proposal.
- 12 DOE, “Energy Conservation Standards for Residential Furnaces: Notice of Proposed Rulemaking and Announcement of Public Meeting,” March 12, 2015, www.regulations.gov/document?D=EERE-2014-BT-STD-0031-0032.
- 13 Ariel Drehobl and Lauren Ross, *Lifting the High Energy Burden in America’s Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities*, ACEEE, April 2016, energyefficiencyforall.org/sites/default/files/Lifting%20the%20High%20Energy%20Burden_0.pdf.
- 14 S. Vaidyanathan et al., *Overcoming Market Barriers and Using Market Forces to Advance Energy Efficiency*, American Council for an Energy-Efficient Economy (hereinafter ACEEE), 2013, aceee.org/research-report/e136.
- 15 ACEEE, “Newer Appliances Not Only More Efficient—They Perform the Same or Better as Older Models and Include a Slew of New Features,” press release, May 21, 2013, aceee.org/press/2013/05/newer-appliances-not-only-more-effic.
- 16 American Council for an Energy Efficient Economy, *Appliance Standards: Comparing Predicted and Observed Prices*, 2013, http://appliance-standards.org/sites/default/files/Appliance_Standards_Comparing_Predicted_Expected_Prices.pdf.
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- 22 The White House, *The Recovery Act*, www.whitehouse.gov/recovery/about.
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