

Appliance Standards Awareness Project  
American Council for an Energy-Efficient Economy  
CLASP  
Consumer Federation of America  
Government of the District of Columbia - Department of Energy & Environment  
National Consumer Law Center, on behalf of its low-income clients  
Natural Resources Defense Council  
Northeast Energy Efficiency Partnerships  
Southwest Energy Efficiency Project

October 6, 2022

Ms. Julia Hegarty  
U.S. Department of Energy  
Office of Energy Efficiency and Renewable Energy  
Building Technologies Office, EE-5B  
1000 Independence Avenue SW  
Washington, DC 20585

**RE: Docket Number EERE–2014–BT–STD–0031/RIN 1904–AD20: Notice of Proposed Rulemaking for Energy Conservation Standards for Consumer Furnaces**

Dear Ms. Hegarty:

This letter constitutes the comments of the Appliance Standards Awareness Project (ASAP), American Council for an Energy-Efficient Economy (ACEEE), CLASP, Consumer Federation of America (CFA), Government of the District of Columbia - Department of Energy & Environment, National Consumer Law Center, on behalf of its low-income clients (NCLC), Natural Resources Defense Council (NRDC), Northeast Energy Efficiency Partnerships (NEEP), and Southwest Energy Efficiency Project (SWEEP) on the notice of proposed rulemaking (NOPR) for energy conservation standards for consumer furnaces. 87 Fed. Reg. 40590 (July 7, 2022). We appreciate the opportunity to provide input to the Department.

Heating is the biggest utility cost for most U.S. households and a significant source of emissions that contribute to climate change and harm human health. Yet the energy conservation standards for gas furnaces have not been meaningfully updated in 35 years. In the NOPR, DOE has proposed strong standards for gas furnaces that would ease burdensome energy bills for consumers and help to achieve climate goals. We strongly support the proposed standards and urge DOE to promptly publish a final rule.

**We strongly support DOE’s proposed standards, which would significantly improve the minimum efficiency of non-weatherized gas furnaces (NWGFs) and mobile home gas furnaces (MHGFs) and reduce standby and off mode power consumption.** For active mode efficiency,

DOE has proposed to adopt Trial Standard Level (TSL) 8, which would set national annual fuel utilization energy (AFUE) standards for NWGFs and MHGFs that reflect condensing technology (95% AFUE). DOE estimates that the proposed standards would save close to 6 quads of energy over 30 years of sales and provide net present value savings for consumers of \$6.2 to \$21.6 billion.<sup>1</sup> Affected consumers of both NWGFs and MHGFs would save about \$500 on average over the life of a furnace,<sup>2</sup> and low-income consumers would see average payback periods of just 2.1 years and 4.2 years for NWGFs and MHGFs, respectively.<sup>3</sup> Additionally, the proposed standards would cut 363 million metric tons of CO<sub>2</sub> emissions and would provide \$5.9 to \$19.3 billion in net health benefits due to reduced NO<sub>x</sub> emissions.<sup>4</sup>

For standby mode and off mode, DOE has proposed to adopt TSL 3, which would set a maximum allowable standby mode and off mode power consumption of 8.5 watts for NWGFs and MHGFs. DOE estimates that the proposed standard would result in energy savings of 0.28 quads over 30 years of sales and provide net present value savings for consumers of \$1.1 to \$3.4 billion. Consumers would see average payback periods of just 2.0 years and 1.7 years for NWGFs and MHGFs, respectively, while the percent of consumers with a net cost would be 3.5% and 1.6%.<sup>5</sup> We therefore also strongly support the proposed standby and off mode standard level of TSL 3 for NWGFs and MHGFs.

**DOE should not adopt TSL 7 as an alternative to TSL 8.** In the NOPR, DOE requests comment on the merits of instead adopting TSL 7, which represents a 95% AFUE standard for furnaces with capacities greater than 55 kBtu/h only, given the smaller percentage of low-income consumers experiencing a net cost at TSL 7 compared to TSL 8. Specifically, DOE estimates that 13.7% and 12.6% of low-income NWGF consumers and MHGF consumers, respectively, would experience a net cost at TSL 8 compared to 5.0% and 1.5% at TSL 7. However, importantly, the percentage of low-income consumers benefitting from potential amended standards is significantly greater at TSL 8 compared to TSL 7. For NWGFs, TSL 8 would result in 46.1% of low-income consumers experiencing a net benefit compared to 24.7% at TSL 7. Likewise, for MHGFs, TSL 8 would result in 69.6% of consumers with a net benefit compared to 47.4% for TSL 7.<sup>6</sup> TSL 8 would therefore benefit a significant group of low-income consumers who would otherwise not be impacted by the proposed AFUE standard.<sup>7</sup>

---

<sup>1</sup> 87 Fed. Reg. 40679-40682.

<sup>2</sup> DOE estimates average life-cycle cost savings of \$464 and \$526 from the proposed AFUE standards for NWGFs and MHGFs, respectively.

<sup>3</sup> 87 Fed. Reg. 40671.

<sup>4</sup> 87 Fed. Reg. 40593-40594.

<sup>5</sup> 87 Fed. Reg. 40694.

<sup>6</sup> 87 Fed. Reg. 40668-40671.

<sup>7</sup> Many low-income consumers (39.4% of low-income households with a NWGF and 32.8% of low-income households with a MHGF) have furnaces with capacities at or below 55 kBtu/h and therefore would not see the benefit of amended standards at TSL 7.

<https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0320>. p. 11-7.

In addition, energy efficiency programs can help offset the costs of switching to a higher-efficiency gas furnace or electric heating system. In particular, some programs specifically exist to help low- and moderate-income (LMI) households fully transition off fossil fuels, which can help eliminate the need to pay fixed charges to two utilities (gas and electric). For example, the Sacramento Municipal Utility District (SMUD) offers rebates up to \$3,000 for switching from a gas-powered HVAC system to a qualifying electric HVAC system.<sup>8</sup> Additionally, the Inflation Reduction Act (IRA) of 2022 has extended and expanded programs that can help consumers save even more money. Namely, the IRA includes \$4.3 billion to implement the High-Efficiency Electric Home Rebate Program, which will provide point-of-sale rebates to LMI households for certain electrical appliances or efficiency projects. Low-income households (less than 80% of the Area Median Income) will be eligible for up to \$8,000 to cover the cost of space heating and cooling heat pump equipment and \$4,000 to upgrade electrical panels.<sup>9</sup> These and other similar programs will reduce the number of low-income consumers that may be disproportionately impacted by the proposed standard.

Furthermore, TSL 8 would result in additional energy savings of about 0.8 quads, additional health benefits of \$1.3 to \$4.1 billion, and additional CO<sub>2</sub> emissions reductions of 96 million metric tons compared to TSL 7.<sup>10</sup> Finally, as described below, DOE may be significantly underestimating the cost savings from the proposed standards. Thus, we do not support TSL 7 as an alternative to TSL 8.

**DOE may be significantly underestimating the potential cost savings resulting from amended energy conservation standards.** We believe that DOE is being conservative when estimating some of the inputs to the life-cycle cost (LCC) analysis and thus may be underestimating the potential cost savings from higher-efficiency furnaces.

First, DOE may be significantly underestimating future natural gas prices using the current approach in the LCC analysis. DOE used projections from the Energy Information Administration's Annual Energy Outlook (AEO) 2021 to estimate future natural gas prices by census division.<sup>11</sup> However, as the movement towards electrification continues and the efficiencies of gas-fired appliance improve, both customer base and overall natural gas sales will likely decline over time, thereby impacting the future price of natural gas. For example, a 2022 analysis conducted by the Natural Resources Defense Council (NRDC) found that customer exits (*i.e.*, consumers who switch to electric appliances thereby disconnecting from the gas system) would result in gas prices that exceed 600% of the AEO projections in the Pacific and Mid-Atlantic regions in multiple electrification scenarios. These results are consistent with other studies indicating that remaining gas customers see large cost increases as the number of gas

---

<sup>8</sup> <https://www.smud.org/en/Rebates-and-Savings-Tips/Rebates-for-My-Home/Heating-and-Cooling-Rebates>.

<sup>9</sup> <https://www.rewiringamerica.org/policy/high-efficiency-electric-home-rebate-act>.

<sup>10</sup> 87 Fed. Reg. 40692.

<sup>11</sup> <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0320>. p. 8E-39.

customers and/or consumption declines.<sup>12,13</sup> Thus, DOE may be significantly underestimating the operating cost savings from potential amended standards for gas furnaces.

Second, we believe that DOE may be overestimating the installation costs of condensing NWGFs in certain scenarios. In the NOPR analysis, DOE analyzed an installation scenario which considered the use of alternative venting technology to accommodate an orphaned water heater. DOE's analysis found that new venting technology developed by DuraVent, which can vent a condensing furnace with an atmospheric combustion water heater through the same vent, could reduce the average payback period for 95% AFUE NWGFs by over 2 years when compared to the reference case.<sup>14</sup> Furthermore, DOE determined that the DuraVent design would be especially beneficial for high-cost row houses and condos and less expensive for the majority of households with pre-existing common venting of a non-condensing NWGF and water heater.

Finally, we believe that DOE may be overestimating the future cost of condensing furnaces by not applying a learning rate associated with condensing technology. In the NOPR analysis, in analyzing historical prices of furnaces, DOE examined prices of warm air furnaces as a whole.<sup>15</sup> While DOE acknowledged that the price of condensing and non-condensing furnaces may not change at the same rate and that a condensing standard could result in a decline in the cost of condensing furnaces, DOE could not find detailed data regarding price trends related to different furnace technologies.<sup>16</sup> DOE therefore used the same price trend projection for condensing and non-condensing NWGFs and MHGFs. We agree that the price trends associated with condensing technology will likely be different than the overall price trends of furnaces and therefore believe that DOE may be overestimating future product cost for condensing furnaces.

**DOE's sensitivity analyses demonstrate that the proposed standards are cost-effective even with alternative assumptions for key parameters.** DOE's LCC analysis relies on Monte Carlo simulations, which randomly sample input values based on probability distributions and NWGF and MHGF user samples. As described in the NOPR, due to the recognition that there are uncertainties associated with some of the parameters in the analysis, DOE conducted sensitivity analyses on various key parameters including product price trends, furnace lifetime, consumer discount rates, downsizing criteria, price markups, and product switching criteria.<sup>17</sup> For example, DOE analyzed three product switching scenarios in addition to the reference case: no switching, low product switching, and high product switching. While higher product switching

---

<sup>12</sup> <https://thefutureofgas.com/content/downloads/2022-03-21/3.18.22%20-%20Independent%20Consultant%20Report%20-%20Decarbonization%20Pathways.pdf>. p. 101.

<sup>13</sup> <https://www.nber.org/papers/w28955>.

<sup>14</sup> <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0320>. p. 8L-6.

<sup>15</sup> <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0320>. p. 8C-3.

<sup>16</sup> 87 Fed. Reg. 40629.

<sup>17</sup> 87 Fed. Reg. 40627.

was found to result in greater LCC savings and a lower simple payback period, no product switching still resulted in positive LCC savings for the proposed standard level. Additionally, DOE evaluated the LCC and payback period results using alternative Monte Carlo simulation iterations of 1,000 and 30,000. In each of the sensitivity analyses performed, DOE found results that were similar to the results presented in the NOPR. Furthermore, for each sensitivity analysis performed, the proposed standard was still shown to be cost effective.<sup>18</sup>

**DOE's analysis shows that the majority of consumers, and especially low-income consumers, benefit from the proposed standard level for MHGFs.** At the public meeting on August 3, 2022, a representative from the Manufactured Housing Institute (MHI) argued that there would be no significant cost savings for the vast majority of manufactured housing consumers and that consumers in southern climates would be disproportionately impacted from the proposed rule.<sup>19</sup> On the contrary, DOE's analysis shows that the majority of consumers (57%) benefit from the proposed MHGF standard,<sup>20</sup> and consumers would save an average of \$526 from the AFUE standard over the life of the furnace. When focusing on DOE's analysis of just the South region, average savings for consumers are around \$600 over the life of the furnace. Furthermore, 75% of low-income consumers would benefit from the proposed AFUE standard at TSL 8.<sup>21</sup>

**We are not aware of any issues regarding the size or installation of condensing MHGFs in new or replacement applications.** At the public meeting, MHI also argued that a condensing standard would require larger furnace cabinets and ductwork, which would reduce living space and increase component space.<sup>22</sup> However, as DOE notes in the NOPR, condensing MHGFs are often designed with similar cabinet sizes as non-condensing MHGFs and would not necessitate a larger footprint.<sup>23</sup> In fact, manufacturers who sell both condensing and non-condensing MHGFs often use the same cabinet sizes for both types of equipment.<sup>24</sup> Furthermore, as we describe below, DOE has thoroughly evaluated issues and additional costs associated with the installation of condensing MHGFs. Thus, we believe that installation and size issues associated with condensing MHGFs have been adequately considered and addressed.

**DOE thoroughly evaluated installation scenarios and costs for consumer furnaces in the NOPR analysis.** As DOE notes in the NOPR, condensing furnaces have already achieved substantial market penetration in both the northern and southern U.S, and installers are becoming more

---

<sup>18</sup> <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0320>. See appendices 8B, 8C, 8G, 8J, 8M, and 8N.

<sup>19</sup> Public meeting transcript, pp. 24-27. <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0363>.

<sup>20</sup> Additionally, the proposed standard would have no impact on 21% of consumers.

<sup>21</sup> <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0324>.

<sup>22</sup> Public meeting transcript, p. 26. <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0363>.

<sup>23</sup> 87 Fed. Reg. 40614.

<sup>24</sup> See for example, <http://www.thermopride.com/wp-content/uploads/PS040009.pdf> and <http://www.thermopride.com/wp-content/uploads/PS040008.pdf> or <https://www.ecomfort.com/Revolv-MG2R-072FA/p101048.html> and <https://www.ecomfort.com/Revolv-MG1E-070A/p101034.html>.

familiar with proper installation methods.<sup>25</sup> Furthermore, condensing furnaces have been required in Canada for over 10 years, where there have been no significant implementation issues.<sup>26</sup> However, we understand that venting systems for condensing furnaces are different from those for non-condensing furnaces and can be complex to install in certain retrofit applications. We believe DOE has thoroughly evaluated installation issues associated with condensing furnaces in the NOPR analysis.

For NWGFs, DOE first accounted for various factors that would affect both non-condensing and condensing furnaces including the cost of ductwork upgrades, baseline electrical installation costs, additional labor required, cost of venting adjustments, and premium installation costs for emergency replacements.<sup>27</sup> In addition, DOE evaluated various installation scenarios and costs associated with switching from a non-condensing to a condensing NWGF, such as new flue venting, combustion air venting, concealing vent pipes, condensate removal, and installation with an orphaned water heater.<sup>28</sup> DOE also assessed the additional costs specifically associated with replacing a non-condensing furnace with a condensing furnace in a multi-family building.<sup>29</sup> For MHGFs, DOE evaluated the costs associated with installing any furnace in replacement applications, including updating the flue venting. Additionally, DOE determined costs for replacing a non-condensing MHGF with a condensing MHGF, including the costs associated with new flue venting, combustion air venting, and condensate removal. Furthermore, DOE included an additional cost associated with installing MHGFs in mobile homes.<sup>30</sup> Thus, based on the extensive cost evaluation that DOE conducted for the NOPR, we believe that DOE's analysis of installation costs is comprehensive and reasonable for condensing furnace installations.

**We believe that DOE's assignment of efficiency levels in the no-new-standards case reasonably reflects actual consumer behavior.** At the public meeting on August 3, 2022, a representative from Spire, Inc. argued that the DOE analysis is flawed by assigning efficiencies in the no-new-standards case randomly.<sup>31</sup> However, as DOE explained, the assignment of furnace efficiency in the no-new-standards case is not entirely random. First, DOE used historical shipment data provided by the Air Conditioning, Heating, and Refrigeration Institute (AHRI) and Heating Air-conditioning & Refrigeration Distributors International (HARDI) to help derive the base case distribution of condensing furnaces. These estimates were further refined based on State and application type (replacement vs. new construction). For example, the share

---

<sup>25</sup> 87 Fed. Reg. 40616.

<sup>26</sup> 87 Fed. Reg. 40691.

<sup>27</sup> 87 Fed. Reg. 40633.

<sup>28</sup> 87 Fed. Reg. 40634.

<sup>29</sup> Ibid.

<sup>30</sup> Ibid.

<sup>31</sup> Public meeting transcript, pp. 70-71. <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0363>.

of higher-efficiency condensing furnaces was higher in the North, where the ENERGY STAR criteria specify 95% AFUE.<sup>32</sup>

Furthermore, we agree with DOE's determination that the method of assigning furnace efficiencies, which is in part random, is more representative of actual consumer behavior than assigning efficiencies based solely on cost-effectiveness. As DOE describes in the NOPR, there are various market failures as well as aspects of consumer preference that significantly impact how products are chosen by consumers.<sup>33</sup> For example, there are often misaligned incentives in rental properties where the landlord purchases and installs the furnace while the renter is responsible for paying the utility bill. Similarly, contractors install a large share of furnaces in replacement situations and can often influence the type of furnace purchased. DOE further notes that the installation of a furnace is done very infrequently, and operating cost impacts would take at least one full heating season to be realized. Information about the purchase price, installation cost, and projected energy costs of a furnace is not always transparent, and consumers are likely to make decisions that do not result in the highest net present value for their specific scenario. We therefore believe that DOE's assignment of efficiency levels in the no-new-standards case is sufficiently representative of actual consumer behavior.

Thank you for considering these comments.

Sincerely,



Kanchan Swaroop  
Technical Advocacy Associate  
Appliance Standards Awareness Project



Michael Waite, Ph.D., P.E.  
Senior Manager, Buildings Program  
American Council for an Energy-Efficient Economy



Matt Malinowski  
Director of Climate Research  
CLASP



Richard Eckman  
Energy Research Associate  
Consumer Federation of America

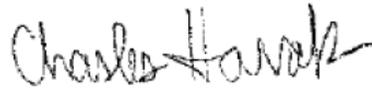
---

<sup>32</sup> <https://www.regulations.gov/document/EERE-2014-BT-STD-0031-0320>. pp. 8I-1 – 8I-5.

<sup>33</sup> 87 Fed. Reg. 40641.



Tommy Wells  
Director of the Department of Energy and  
Environment  
Government of the District of Columbia



Charles Harak, Esq.  
National Consumer Law Center  
(On behalf of its low-income clients)



Joe Vukovich  
Energy Efficiency Advocate  
Natural Resources Defense Council



Arah Schuur  
Executive Director  
Northeast Energy Efficiency Partnerships



Christine Brinker  
Senior Associate, Buildings Efficiency Program  
Southwest Energy Efficiency Project