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## ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL FURNACES

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This comment addresses the efficiency and efficacy of this proposed rule from an economic point of view. Specifically, it examines how the proposed rule may be improved by more closely examining the societal goals the rule intends to achieve and whether this proposed regulation will successfully achieve those goals. In many instances, regulations can be substantially improved by choosing more effective regulatory options or more carefully assessing the actual societal problem.

## SUMMARY

The Department of Energy (DOE) is proposing to increase energy efficiency standards for nonweatherized gas furnaces and mobile home gas furnaces.<sup>1</sup> It is doing so under the authority granted it by the Energy Policy and Conservation Act of 1975 and the Energy Independence and Security Act of 2007.<sup>2</sup> The DOE must review its existing energy efficiency standards for residential furnaces by June 27, 2017. As part of the review, the department must decide whether to propose a rule with an updated standard or issue a notice of determination not to amend the standard.

The regulatory impact assessment (RIA) follows a similar model to the other energy standards issued under the DOE's Energy Conservation Program for Consumer Products. Consequently, it shares many of the same shortcomings, which other commenters have pointed out.<sup>3</sup> In contrast, this comment will focus specifically on the DOE's failure to consider the impact of other regulations and market alternatives that may influence consumers' purchasing decisions and render the energy efficiency standards redundant.

To fulfill its statutory requirements, the DOE has two options regarding the existing energy efficiency standards for residential furnaces. The DOE can amend the current standard, or it can issue a notice of determination not to amend the standard. The DOE chose the first option to amend the existing energy efficiency standard; however, the department fails to provide sufficient evidence that imposing more stringent standards is necessary.

While the regulation pursues multiple goals, the agency's case for establishing energy efficiency standards ultimately rests on its claim that forcing consumers to purchase more energy-efficient furnaces will improve consumers' well-being. The DOE asserts that, left to their own devices, consumers underestimate the projected energy savings from buying a more efficient

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1. Department of Energy, Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnaces, 80 Fed. Reg. 48 (March 12, 2015): 13120–98.

2. Energy Policy and Conservation Act of 1975, Pub. L. No 94-163, 89 Stat. 871 (1975); Energy Independence and Security Act of 2007, Pub. L. No 110-40, 121 Stat. 1492 (2007).

3. See, for example, Robert P. Murphy, "Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans" (Public Interest Comment, Mercatus Center at George Mason University, Arlington, VA, December 2013), <http://mercatus.org/publication/energy-conservation-program-consumer-products-energy-conservation-standards-residential>; James Broughel, "Energy Conservation Program: Energy Conservation Standards for Metal Halide Lamp Fixtures" (Public Interest Comment, Mercatus Center at George Mason University, Arlington, VA, October 2013), <http://mercatus.org/publication/energy-conservation-program-energy-conservation-standards-metal-halide-lamp-fixtures>.

furnace model.<sup>4</sup> By pushing consumers towards a more efficient choice, the DOE claims that the regulation will save consumers \$27.7 billion over a 30-year period.<sup>5</sup> Consumer savings account for 85 percent of the regulation's total benefits. Absent consumer savings, the regulation will not be cost-beneficial—the costs to consumers (\$11.6 billion) far outweigh the environmental benefits (\$4.7 billion).

The DOE's case relies on the assumption that purchasing a more efficient furnace improves consumer welfare. Only then could the agency claim that forcing consumers to purchase energy-efficient furnaces should count as a benefit. If, for a variety of reasons discussed below, the choice that results in the greatest welfare to consumers were buying a less efficient model, forcing them to buy a more efficient furnace would have to count as a cost, not a benefit. As economists Ted Gayer and Kip Viscusi point out, restricting consumer choices is a cost, not a benefit to consumers.<sup>6</sup>

Consequently, the DOE's case rests on two assumptions, both of which have to be correct to justify amending the energy efficiency standard. First, consumers' choices of less efficient appliances result from consumer error rather than serve as a reflection of different preferences or particular circumstances. Second, the only way to correct the consumer error is to restrict consumers' choices to the most efficient furnace models. Both assumptions are questionable.

First, the evidence that consumers undervalue future energy savings is far from settled. There may be rational reasons for consumers to choose less energy-efficient furnaces. In fact, the DOE's own analysis indicates that the standard would result in net costs to one in five consumers.

Second, energy efficiency standards are not the only, or the best, way to correct consumer error. The DOE relies on a supply-side approach to achieve energy efficiency—it seeks to remove less efficient products from the market to force the consumer to buy more efficient furnaces. In contrast, economists Hunt Allcott and Michael Greenstone suggest a demand-side management approach, which focuses on helping consumers make better choices.<sup>7</sup> Private companies offer a number of demand-side solutions provided to consumers (e.g., feedback tools and energy calculators) and other regulatory agencies (e.g., energy efficiency labels), which render the DOE's regulation redundant.

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4. Department of Energy, Energy Conservation Standards for Residential Furnaces, 13153.

5. *Ibid.*, 13123.

6. Ted Gayer and W. Kip Viscusi, "Overriding Consumer Preferences with Energy Regulations" (Mercatus Working Paper, Mercatus Center at George Mason University, Arlington, VA, July 2012), <http://mercatus.org/publication/overriding-consumer-preferences-energy-regulations>.

7. Hunt Allcott and Michael Greenstone, "Is There an Energy Efficiency Gap?" (NBER Working Paper No. 17766, National Bureau of Economic Research, Cambridge, MA, January 2012), <http://www.nber.org/papers/w17766>; see also Brandon Davito, Humayun Tai, and Robert Uhlener, "The Smart Grid and the Promise of Demand-Side Management" (McKinsey on Smart Grid No. 1, McKinsey & Company, 2010), [http://www.mckinsey.com/client\\_service/electric\\_power\\_and\\_natural\\_gas/latest\\_thinking/mckinsey\\_on\\_smart\\_grid](http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/mckinsey_on_smart_grid); Hunt Allcott and Sendhil Mullainathan, "Behavior and Energy Policy," *Science* 327, no. 5970 (March 5, 2010): 1204-05.

The advantage of the demand-side approach is that it addresses the sources of consumer error, to the degree error is present, but it does not impose a single solution on all consumers. Given consumer heterogeneity and the possibility that the DOE overestimated the potential energy savings, it is important to let consumers decide what purchasing decision makes sense in their specific circumstances.

This is especially important since the DOE's analysis shows that 20 percent of consumers would be worse off under the amended standard. The standard will hit low-income families even harder. It will take an average low-income family a year longer to see the lower energy costs pay for the higher upfront costs, and 23 percent of these families will experience a net cost.

While the demand-side approach may not result in the same energy savings levels, it is a better alternative for consumers. This approach ensures that consumers fully account for future energy costs. If some consumers choose less efficient furnaces after weighing the tradeoffs between energy costs and other variables, the DOE must consider those informed choices to be better choices for those consumers. In such cases, a requirement forcing consumers to purchase more energy-efficient furnaces may help advance the DOE's environmental goals, but the requirement would no longer improve consumer welfare, as it forces consumers away from their optimal choices. The requirement to purchase a more efficient furnace would have to count as a cost, not a benefit, to consumers.

The DOE should not force a single solution on all consumers through an energy efficiency standard. Instead, it should determine that amendment to the current energy efficiency standard is unnecessary and let market forces, in conjunction with previous regulatory solutions, help consumers make better choices.

## DO CONSUMERS UNDERESTIMATE ENERGY SAVINGS?

The DOE established its efficiency standard based on the products already on the market.<sup>8</sup> This means that consumers interested in reducing their energy bills can readily purchase the more efficient furnaces. According to the DOE's analysis, consumers who purchase energy-efficient furnaces stand to reap substantial profits from energy savings.

The DOE estimates that it would cost consumers an additional \$493.96 to opt for a more efficient model that satisfies the proposed standard.<sup>9</sup> It estimates that the payback period—the number of years it would take for energy savings to cover the higher upfront price of energy-efficient furnace—would be 7.2 years on average.<sup>10</sup> After that, all energy savings would accrue to consumers as net benefit. Over the furnace's lifetime of 21.5 years,<sup>11</sup> the total savings to a

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8. Department of Energy, Energy Conservation Standards for Residential Furnaces, 13133.

9. Department of Energy, *Technical Support Document: Energy Efficiency Program for Consumer Products and Commercial and Industrial Equipment: Residential Furnaces* (Washington, DC, February 10, 2015), chapter 8, 13–16.

10. *Ibid.*, chapter 8, 37.

11. *Ibid.*, chapter 8, 23.

typical consumer would amount to \$636 on average.<sup>12</sup> Thus, the present discounted value of the lifetime energy savings would exceed the higher sticker price of the more efficient appliance and it would be rational for most consumers looking to upgrade their furnace to opt for the efficient model.

Yet, this leads us to a puzzle: if, as the RIA asserts, it is rational and highly beneficial for consumers to purchase a more efficient furnace model, why would they need to be forced into this decision through a federal regulatory standard?

In their seminal article, economists Adam Jaffe and Robert Stavins referred to this puzzle as the energy paradox, by which they meant the low rate of consumer adoption of a cost-saving technology.<sup>13</sup> Understanding why this happens is important to develop policies that effectively counter the energy paradox. There are two possible scenarios that could explain the energy paradox.

#### Expert Error

One possible explanation for the seemingly irrational consumer behavior is that the problem is not with consumers but with the model and assumptions that the DOE uses to evaluate consumer behavior. To estimate the potential energy savings, economists have to make a number of assumptions about consumer preferences, appliance characteristics, typical usage patterns, and the potential energy savings of different appliance models that are likely to accrue under real world conditions. These assumptions may be flawed or too optimistic.

Economists Michael Greenstone and Hunt Allcott point out that DOE's estimates of potential energy savings are typically based on engineering models that overestimate energy savings.<sup>14</sup> Since the energy savings in these models are measured under tightly controlled conditions, they may not fully materialize in a representative home. The estimates do not account for opportunity costs and other unobserved variables that may rationally influence consumer decisions. In addition, consumers may be rationally concerned about large upfront costs of more efficient appliances in the face of uncertain future energy savings.<sup>15</sup>

#### Consumer Error

Another possibility is that the DOE experts are correct and the future energy savings considerably exceed the upfront costs even after accounting for opportunity costs and other variables. It is possible that consumers make mistakes in their purchasing decisions. There are several possible scenarios that could explain consumers' behavior.

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12. Calculated as the difference between life cycle costs between the proposed and baseline efficiency standards. The reported \$305 LCC savings estimate is lower since it includes consumers who already have energy-efficient furnaces and would not be impacted by the standard. *Ibid.*, chapter 8, 37.

13. Adam B. Jaffe and Robert N. Stavins, "The Energy Paradox and the Diffusion of Conservation Technology," *Resource and Energy Economics* 16, no. 2 (May 1994): 91-122.

14. Allcott and Greenstone, "Is There an Energy Efficiency Gap?"

15. Gayler and Viscusi, "Overriding Consumer Preferences with Energy Regulations."

1. *Behavioral biases.* While buying a more efficient appliance may be rational, research in behavioral economics shows that consumers do not always make rational decisions.<sup>16</sup> Consumers may choose less energy-efficient appliances because they are present-biased.<sup>17</sup> They put too much value on immediate costs and too little value on future benefits, which leads them to procrastinate and put off the energy-efficient purchases. For example, DOE's analysis shows that consumers expect the payback period for most energy-efficient appliances to be less than 3.5 years.<sup>18</sup> This is considerably lower than the 7.2-year payback period for furnaces under the proposed efficiency standard.
2. *Complexity.* Estimating future energy costs and potential savings resulting from purchasing a more efficient appliance involves a complex set of calculations and requires extensive data on energy costs, production, investments, etc. Such complex calculations require considerable time, resources and expertise that few consumers possess.

Even if future energy price estimates were available from the DOE or firms that specialize in energy forecasts, it would still take specialized expertise to be able to apply this information to the context of a particular appliance. Consumers would have to understand performance and energy usage characteristics of the appliance and have a good estimate of their own energy usage in order to calculate the future energy savings they will receive from a particular appliance.

As a result, while consumers may understand in broad terms that energy-efficient appliances may save them money in the future energy costs, they may not appreciate the full extent of such savings.

3. *Limited attention.* When purchasing new appliances, consumers have to consider a variety of characteristics (sticker price, quality, design, product features). Energy efficiency is only one characteristic among many and may not be as salient to consumers at the time of purchase as the sticker price or design. Since attention is a limited resource, it is possible that consumers simply forget to consider future energy costs.<sup>19</sup>

## REGULATORY ALTERNATIVES

The presented scenarios are not mutually exclusive. It is possible that DOE experts use unrealistic assumptions that lead them to overestimate the potential future savings. Yet, this does not mean that consumers would not benefit from switching to more energy-efficient appliances. Even if the ultimate savings are smaller, they could still be substantial and worth the investment.

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16. Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus, and Giroux, 2013); Richard H. Thaler and Cass R. Sunstein, *Nudge: Improving Decisions About Health, Wealth, and Happiness* (New Haven, CT: Yale University Press, 2008).

17. Allcott and Mullainathan, "Behavior and Energy Policy."

18. Department of Energy, *Technical Support Document*, appendix 8J, 6.

19. Saugato Datta and Sendhil Mullainathan, "Behavioral Design: A New Approach to Development Policy," *Review of Income and Wealth* 60, no. 1 (2014): 7–35.

Thus, expert error may be responsible for only a portion of the energy paradox. Consumer error may play a part in consumers' failure to seize the potentially cost-saving technology. The complexity of calculation and the resulting uncertainty about future savings may lead consumers to discount future savings too heavily or to pay them little attention.

The DOE has two regulatory options to deal with the energy paradox. It can amend the energy efficiency standards, or it can issue a notice of determination not to amend the standard.

#### Amend Energy Efficiency Standards

To correct the potential consumer mistake, the DOE proposes to amend the energy efficiency standard for residential furnaces. The regulation forces all consumers to purchase the most efficient furnaces that are currently available on the market. Thus, the agency effectively replaces consumers' decision making with its own expert judgment.

There are several problems with the DOE's approach. First, the agency could be wrong. If the energy paradox stems primarily from the agency experts' unrealistic assumptions, then the regulation will force consumers to pay higher upfront prices for future savings that are unlikely to be realized. In other words, the more energy-efficient furnaces would not be cost-beneficial for most consumers.

Second, the DOE's estimates do not apply to all consumers. The DOE estimates energy savings for a typical consumer. Yet, given the wide variety of consumers' income levels, access to credit and energy usage patterns, some consumers would not benefit from paying a higher price for the most energy-efficient furnace. Imposing a single solution on all consumers regardless of their circumstances is likely to lead to suboptimal choices for a substantial portion of consumers. According to the DOE's analysis, for 20 percent of consumers the proposed energy efficiency standard will result in net costs.<sup>20</sup> An even higher number of low-income consumers, 23 percent, would be worse off under the amended standards.

#### Issue Notice of Determination Not to Amend the Standard

Another regulatory option available to the DOE is to keep the current standards and let the market forces help consumers make better choices.

In the absence of amended standard, the DOE expects a marginal increase in the share of more efficient furnaces (annual fuel utilization efficiency [AFUE] at or above 92 percent, the DOE's proposed new standard). The DOE attributes the projected increase in efficiency to the impact of the EPA's Energy Star program.<sup>21</sup> The DOE considers no other programs or market products that might impact consumers' furnace purchasing decisions.

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20. Department of Energy, *Technical Support Document*, chapter 8, 38.

21. *Ibid.*, chapter 10, 6-7.

However, the DOE's assumption that there are no market alternatives to DOE regulation is misguided. In recent years, advances in behavioral sciences have led to a rapidly growing industry that specializes in helping consumers make more energy-efficient choices. Instead of replacing consumers' decisions with those of DOE regulators, these companies use insights from behavioral sciences and human factors engineering to help consumers correct their mistakes. Examples of products addressing different sources of consumer error are discussed below.

1. *Countering behavioral biases.* As described earlier, consumers may fail to incorporate future energy costs into their purchasing decision because they are too focused on the present costs. The reward, future energy savings, is meant to incentivize consumers to take an unpleasant action—paying a higher price for an energy-efficient furnace. Since the reward is far in the future and the costs are immediate, completing the action requires consumers to exert considerable willpower and self-control. Given that self-control is a scarce mental resource, many consumers find it easier to put off an unpleasant action and opt for a cheaper but less efficient furnace.

Growing research in behavioral sciences provides insights into a range of behavioral mechanisms (e.g., precommitment devices, social approval, default options) that consumers can use to reduce the need for self-control in purchasing decisions.<sup>22</sup> The advantage of these mechanisms is that they help consumers overcome their biases but do not restrict consumer choice.

This is precisely what Virginia-based company Opower has done. The company teams up with utilities around the country to provide feedback to customers on energy use through its Home Energy Report, which is included with the monthly utility bill.<sup>23</sup> The distinct feature of the report is that it not only provides information on the household's energy consumption but also shows how the household's consumption stacks up against its neighbors.

The company harnessed the power of social norms to incentivize consumers.<sup>24</sup> Behavioral research indicates that social comparisons, e.g., showing that the consumer's neighbors are energy-efficient, are effective in persuading consumers to reduce their energy consumption. As a result, Opower's customers have reduced energy use by approximately 2 percent.<sup>25</sup> It would take an 11 to 20 percent short-run energy price increase to match this energy reduction.

2. *Reducing complexity.* Another possible source of consumer error is the sheer complexity of the decision. Few consumers have the time, resources, and expertise to be able to

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22. Allcott and Mullainathan, "Behavior and Energy Policy"; Datta and Mullainathan, "Behavioral Design."

23. Hunt Allcott, "Social Norms and Energy Conservation," *Journal of Public Economics* 95, no. 9-10 (October 2011): 1082-1095.

24. P. Wesley Schultz, Jessica M. Nolan, Robert B. Cialdini, Noah J. Goldstein, and Vidas Griskevicius, "The Constructive, Destructive, and Reconstructive Power of Social Norms," *Psychological Science* 18, no. 5 (May 1, 2007): 429-434; Allcott, "Social Norms and Energy Conservation."

25. Allcott, "Social Norms and Energy Conservation."



correctly estimate the future energy savings to incorporate this information into their purchasing decision.

One way to help consumers understand future energy costs is to make them visible.<sup>26</sup> For example, the Federal Trade Commission's EnergyGuide label, which most appliances must display, provides consumers with a furnace's AFUE rating.<sup>27</sup> Since all furnaces use the same rating system, the label allows consumers to easily compare energy efficiency across different models. EnergyGuide labels for other appliances go further by displaying the estimated annual energy costs in dollar amounts, which would make it even easier for consumers to incorporate energy costs into their purchasing decision.

In addition, private companies provide tools that consumers can use to easily compare the energy savings from more efficient furnaces.<sup>28</sup> In contrast to the DOE's analysis, which only estimates savings over the entire lifetime of the appliance, these tools provide estimates for different time periods.<sup>29</sup> The more detailed estimates may prove more useful to consumers who do not expect to remain in residence for the furnace's entire lifetime.

Alameda County went one step further in its use of energy analytics tools.<sup>30</sup> The county ran a pilot program in which residents could sign up to have their energy use analyzed using SmartMeter data. The detailed analysis allowed the county to identify high heating, ventilating, and air conditioning (HVAC) energy users and target them for a follow up action. These residents received a call advising them on options to upgrade their HVAC equipment in order to reduce their energy bills. The personal communication increased the chances that the residents would look for energy-efficient HVAC equipment when they decide to upgrade. The advantage of this approach is that it pinpoints the source of inefficient energy consumption for consumers, so that they know which appliances are driving up their energy costs.

Another possible behavioral design solution to reduce information complexity is to use natural mapping of mental models to help consumers use energy savings information. Designers can use natural mapping to exploit mental models that consumers currently use (e.g., physical analogies or cultural standards) so they can more easily understand energy savings analytics.<sup>31</sup>

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26. Don Norman, *The Design of Everyday Things* (New York: Basic Books, 2013).

27. Federal Trade Commission, Energy Labeling Rule, 78 Fed. Reg. 25 (February 6, 2013): 8362-89.

28. Timothy Oleson, "Apps: Improving Home Energy Efficiency in 2013," *Earth*, January 4, 2013, <http://www.earth-magazine.org/article/apps-improving-home-energy-efficiency-2013>; "Top 10 Energy Efficiency Smartphone Apps," *Alliance to Save Energy*, March 18, 2013, <https://www.ase.org/resources/top-10-energy-efficiency-smartphone-apps/>.

29. See, for example, "HVAC Operation Cost Calculator," accessed Jun 30, 2015, <http://www.hvacopcost.com/>.

30. Stephanie Stern and David Bates, "Achieving Residential Energy Savings: Combining Behavior Change and Home Upgrades," in *The Next Generation: Reaching for High Energy Savings*, ACEEE Summer Study Proceedings (Washington, DC: American Council for an Energy-Efficient Economy, 2014), 317-27, <http://aceee.org/files/proceedings/2014/data/toc.htm>.

31. Norman, *The Design of Everyday Things*, 23.

For example, the EPA's Energy Star logo provides a simple symbol that quickly identifies energy-efficient appliances.<sup>32</sup> Used in conjunction with the EnergyGuide label, it was found to increase consumers' willingness to pay for more efficient appliances to reduce future energy costs. The effect was large enough to offset consumers' present bias.<sup>33</sup> Similarly, the European Union's energy-efficiency label not only provides estimated annual savings but also grades an appliance's efficiency.<sup>34</sup> Thus, it maps the familiar mental model of school grading onto energy-efficiency information. The label was found to be equally effective in offsetting consumers' present bias.<sup>35</sup>

3. *Increasing salience of energy efficiency.* Since purchasing decisions involve so many variables, consumers may simply forget to include future energy costs in the final decision. There are two possible solutions that could help consumers overcome this error. The first solution would be to make energy costs visible and salient, to ensure that consumers remember to consider energy costs. This is what EnergyGuide, Energy Star, and similar labels accomplish.

Another approach is to provide consumers with feedback on their energy usage.<sup>36</sup> For example, Opower's Home Energy Report works not only through appealing to social norms but also by providing consumers meaningful feedback on their current energy consumption. If the energy consumption is higher than the neighborhood average, consumers will know from the report that they may need to look for ways to cut their energy costs. The report goes even further to provide a personalized action plan.<sup>37</sup> This allows consumers to easily identify the next step—purchasing a more efficient appliance.

The advantage of the demand-side approach is that it improves consumer decision-making by addressing the sources of error. Consequently, each consumer can take the action that is best for that consumer. Importantly, it does not restrict consumer choice and therefore does not impose costs on consumers who rationally choose less efficient furnaces. In contrast to the one-size-fits-all energy efficiency standard, the demand-side approach can readily accommodate consumer heterogeneity and avoid regressive effects.

Note that these tools are unlikely to result in the same energy-saving behavior as the regulation. Yet, maximum energy savings cannot be the goal of the regulation as it is currently structured.

32. Marla C. Sanchez, Richard E. Brown, Carrie Webber, Gregory K. Homen, "Savings Estimates for the United States Environmental Protection Agency's ENERGY STAR Voluntary Product Labeling Program," *Energy Policy* 36, no. 6 (June 2008): 2098–2108.

33. Richard G. Newell and Juha V. Siikamäki, "Nudging Energy Efficiency Behavior: The Role of Information Labels," (NBER Working Paper No. 19224, National Bureau of Economic Research, Cambridge, MA, July 2013), <http://www.nber.org/papers/w19224>.

34. Department for Environment, Food, and Rural Affairs, "The New EU Energy Label Explained" (London, UK, April 12, 2011), [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69295/pb13466-eu-energy-label.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69295/pb13466-eu-energy-label.pdf).

35. Newell and Siikamäki, "Nudging Energy Efficiency Behavior."

36. Norman, *The Design of Everyday Things*, 28.

37. Allcott, "Social Norms and Energy Conservation."

To be able to count energy savings as benefit to consumers, the regulation has to demonstrate that its action improves consumer choice, even if such action results in less energy savings. If the regulation prioritizes energy savings over consumer choice, than it should count its restrictions as costs, not benefits, to consumers.

## CONCLUSION

The DOE's proposed energy efficiency standard for residential furnaces seeks to reduce energy consumption and thereby reduce environmental impacts of energy consumption and improve consumer welfare through higher energy savings. The estimated consumer savings constitute the overwhelming share of the regulation's benefits and are crucial to justify its substantial costs. Unfortunately, the DOE fails to present convincing evidence that the energy efficiency standard will produce the estimated consumer savings.

The agency's consumer savings estimates are based on two assumptions. First, consumers' choice of less efficient appliances is a result of a consumer error rather than reflection of different preferences or particular circumstances. Second, the only way to correct the consumer error is to restrict consumers' choices to most efficient furnace models.

Both assumptions are questionable. The DOE's own analysis shows that many consumers, especially low-income consumers, would be worse off under the amended standard. Furthermore, studies show that engineering models may overstate the true extent of energy savings. In addition, consumer may rationally opt for less efficient furnaces given concerns over high upfront cost of efficient models or other considerations not included in the DOE model.

Even if consumers do undervalue future energy savings, the DOE's evidence in support of amending energy efficiency standard is insufficient. There is a growing market for products that help consumers correct their mistakes and choose more efficient products, which renders the DOE's regulation redundant. Instead of imposing a single standard on all consumers, the DOE should let markets address the sources of consumer error and help consumers make informed choices.