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PUBLIC INTEREST COMMENT

Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans

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Department of Energy, Office of Energy Efficiency and Renewable Energy

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INTRODUCTION

The Regulatory Studies Program of the Mercatus Center at George Mason University is dedicated to advancing knowledge about the effects of regulation on society. As part of its mission, the program conducts careful and independent analyses that employ contemporary economic scholarship to assess rulemaking proposals and their effects on the economic opportunities and the social well-being available to all members of American society.

This comment addresses the efficiency and efficacy of this proposed reconsideration from an economic point of view. Specifically, it examines how the relevant rule may be improved by more closely examining the societal goals the rule intends to achieve and whether this reconsideration 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 residential furnace fans.[1] It is doing so under the authority granted to it by the Energy Policy and Conservation Act of 1975[2] and the Energy Independence and Security Act of 2007.[3] Currently there are no standards in place. The DOE is required by the Energy Policy and Conservation Act "to consider and establish energy conservation standards

1. US Department of Energy, Office of Energy Efficiency and Renewable Energy, "Energy Conservation Program for Consumer Products: Energy Conservation Standards for Residential Furnace Fans; Proposed Rule," 78 Fed. Reg. 207 (October 25, 2013).
2. The Energy Policy and Conservation Act of 1975, Pub. L. No. 94-163, 89 Stat. 871 (1975).
3. Energy Independence and Security Act of 2007, Pub. L. No. 110-140 (2007).

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for residential furnace fans by December 31, 2013."[4] To that end, the DOE has proposed minimum energy-efficiency standards for residential furnace fans (both manufactured domestically and imported) that would apply five years after adoption, which is to say, beginning in the year 2019.

Although the DOE presents a case to justify the proposed rule, there are serious shortcomings in each element of the justification. The rule will impose higher prices on consumers that, by the DOE's own analysis, will take longer than three years to "pay for themselves" in seven out of eight product classes. (We mention this criterion of a three-year payback period because it underlies the "rebuttable presumption" for demonstrating economic justification for a conservation measure.) Further, the DOE's own analysis shows that only a minority of Americans will experience net financial benefits for most of the product classes analyzed. Beyond these problems, the entire premise that the DOE must force consumers to save money for themselves is dubious; there could be perfectly "rational" reasons for them to opt for lower-efficiency products, such as facing higher financing costs than what the DOE assumed.

The DOE's estimate of benefits accruing from a reduction in carbon dioxide emissions is also problematic. In particular, the reported estimates of $11.5 billion in benefits at a seven percent discount rate is simply incorrect, as it ignores the most appropriate estimate for the social cost of carbon available, and it neglects to follow OMB guidelines to adopt a domestic (not global) perspective in assessing federal regulations. Correcting for these two issues makes the estimated benefits (from reduced carbon dioxide emissions at the seven percent discount rate) fall from the DOE's reported figure of $11.5 billion down to a more accurate figure of $547 million.

The alleged financial benefits to consumers from lower energy costs and the reduction in future climate-change damages because of lower carbon dioxide emissions constitute almost the entirety of the reported benefits of the proposed rule. As we have just explained, the DOE's reported benefits from emissions reductions would fall by 95 percent (using a seven percent discount rate) if OMB's guidelines were followed. Rather than resorting to a one-size-fits-all standard, the DOE could attempt to mitigate genuine consumer error through a voluntary educational campaign. This approach is more robust than the proposed rule, because it would still capture much of the net benefits (if they actually exist) for consumers, while it would avoid imposing net harms in the case that the DOE is overstating consumer irrationality. If the DOE maintains that it is obligated to issue an efficiency standard—rather than merely providing educational materials to consumers and businesses—then it is still the case that the present comment shows the DOE has not demonstrated that its recommended efficiency standard is economically justified, as required by statute.

In the following sections, we will elaborate upon these and other considerations, to conclude that the DOE has not adequately justified the proposed rule.

THE STIPULATED BENEFITS OF ENERGY SAVINGS

Naturally, a proposed rule for energy conservation derives its stipulated benefits from a projected reduction in aggregate energy use. These benefits accrue in the form of (a) net savings to consumers, with lower lifetime energy bills more than compensating for higher upfront prices of furnace fans; (b) a reduction in various atmospheric emissions that may endanger human welfare through different mechanisms; and finally (c) an increase in the safety and reliability of the nation's power infrastructure because of lower electricity demand.

This comment will address each of these three categories of stipulated benefits in dedicated sections, below. Before doing so, it is important to establish that the three types of benefits are all based on DOE projections of energy savings associated with the proposed rule. Yet these projections are themselves highly speculative, making them a poor foundation for the proposed rule.

4. Fed. Reg. Vol. 78, No. 207, p. 64073.

In order to estimate the national energy savings accruing from the rule, the DOE projected a baseline case (with no energy standards imposed on residential furnace fans) of energy consumption, in order to contrast it with projected energy consumption under the six Trial Standard Levels (TSLs) considered in its assessment. Each of the six TSLs in turn consists of different combinations of Efficiency Levels (ELs) for the various classes of furnace fans subject to the proposed rule.

The DOE estimates that the actual rule—which selects Trial Standard Level 4 as the minimum standard for newly produced units—would yield cumulative energy savings of 4.576 quads, where 1 quad = 1 quadrillion British Thermal Units (i.e., 1,000 trillion Btu). This projected reduction in energy consumption in turn underlies the estimated reductions in various types of emissions, including 429.8 million metric tons of CO_2 and 230.9 thousand tons of NO_x.[5] Yet these projected energy savings (and implied emissions reductions) are highly speculative, because the trajectory of energy consumption in the baseline (no rule) and with the rule (Trial Standard Level 4) are subject to a large degree of uncertainty.

The relevant period of analysis is a 30-year stretch beginning with the first full year of compliance, which means the years 2019 through 2048. The DOE must therefore predict the evolution of US population growth, climate trends, and furnace-efficiency improvements through the year 2048, both with and without the proposed rule. To appreciate the humility that should accompany such a projection, we should stop and imagine how even the best engineers and energy economists in the late 1970s and early 1980s would have described today's distribution of furnace fans (with varying degrees of energy efficiency) and total US energy consumption due to their usage.

To take but one example, William Nordhaus—a leading energy economist and creator of the "DICE" model used by the Interagency Working Group on the Social Cost of Carbon—published a pioneering article in 1973 assessing the future of the US energy market.[6] Nordhaus's article was wildly off the mark, predicting that under "optimal" energy usage, the United States would experience a "virtual exhaustion of domestic petroleum resources" by 1980, and that during the period 1980–2010 the United States would need to rely on imported natural gas because its domestic supplies would be too expensive to develop.[7] Thus Nordhaus completely failed to anticipate the boom in US petroleum production, which is understandable, given the "expert consensus" of the 1970s on US energy scarcity. Nonetheless, cost/benefit policies based on his predictions of future US energy markets would have been wildly off the mark. To say this is not a criticism of Nordhaus's modeling—nor of the DOE's projections, for that matter—but merely to state that making projections three decades into the future is very difficult.

Beyond citing the general difficulty of forecasting the baseline scenario over such long periods, we can identify three specific sources of uncertainty that may be leading the DOE to overestimate the projected energy savings from the proposed rule. First, the so-called Jevons Paradox (named after the economist William Stanley Jevons, who first discussed the effect regarding coal[8]) is the term economists give to the possibility of consumers *increasing* total energy consumption in the face of increased efficiency. This phenomenon has also been called the "rebound effect" and has been studied in the context of Corporate Average Fuel Economy (CAFE) standards.[9] In the case of residential furnaces, consumers may be led—whether "rationally" or "irrationally"—to set their thermostats

5. 78 Fed. Reg. 207, 64127, Table V.28.
6. William Nordhaus, "The Allocation of Energy Resources," Brookings Papers on Economic Activity 3 (1973): 529–576, http://www.brookings.edu/~/media/projects/bpea/1973%203/1973c_bpea_nordhaus_houthakker_solow.pdf.
7. Nordaus, "Allocation of Energy Resources," 552, Table 5.
8. William Stanley Jevons, *The Coal Question* (London: Macmillan and Company, 1866).
9. See, for example, Eric O'Rear, Kemal Sarica, and Wallace E. Tyner, "The Impacts of the Rebound Effect on the U.S. CAFE Standards for Light-Duty Vehicles," Agricultural and Applied Economics Association 2012 Annual Meeting, Number 124837 (August 12–14, 2012).

higher in the winter, and lower in the summer, when they know that they have purchased a federally approved energy-efficient unit.

Second, the proposed rule will increase the initial purchase price of residential furnaces, which will lead some households to postpone their purchases of new units. This effect will reduce the actual energy savings from the proposed rule, compared to a naïve approach that simply assumed households replaced furnaces at the same rate, regardless of the implementation of the rule. The DOE explicitly acknowledges this subtle possibility in discussion of the proposed rule, as it was brought up by previous commenters.[10] Although the DOE agreed with these comments on its preliminary analysis and sought to incorporate the possible effect in its procedure, the point remains that it is difficult to predict the amount of actual energy savings that federal conservation measures will provide.

Third, the DOE estimate of energy savings doesn't refer simply to the direct reduction in electricity used to power residential furnace fans (and the related primary fuels, such as coal and natural gas, used to produce this electricity), but also to the "energy consumed in extracting, processing, and transporting primary fuels." The DOE calls this broader approach a "full-fuel-cycle (FFC) metric."[11] The problem here is similar to the Jevons Paradox: if utilities reduce their demand for primary fuels because households use less electricity (due to the implementation of the proposed rule on furnace fans), this will lower the market prices for these primary fuels. But lower coal, natural gas, and oil prices will lead other users to demand *more* of these fuels than they would have done in the baseline scenario.

Even fully taking this phenomenon into account, the overall effect will still be a reduction in aggregate consumption because total market demand will have fallen. Nonetheless, the actual reduction in total quantity will be smaller than the reduction attributable to electricity producers because their reduction will be partially offset by increased use from others. To grasp this outcome, we can imagine an exaggerated scenario in which the federal government completely prohibits the use of gasoline in domestic trucks. A naïve estimate of the reduction in total oil consumption would project how many barrels of oil would have been devoted to truck use in the absence of the rule, and then cite that as the savings from the rule. Yet in reality, such an enormous drop in demand for gasoline and thus oil (because the oil refiners would experience a corresponding drop in demand as well) would cause automobile and motorcycle drivers to purchase more gasoline and would induce airlines to offer more flights because of the lower world price of crude oil. Thus the total decline in gasoline and oil consumption would not be as significant as a crude look at truck consumption would have led a naïve analyst to believe.

The above considerations do not suggest that the DOE is ignorant of such subtleties. The DOE relies on long-run estimates of baseline energy consumption that include projections of energy-efficiency innovations emanating from purely market forces (i.e., that would occur in the absence of direct regulation), and its National Energy Modeling System (NEMS) is couched in a "general equilibrium" framework that (at least in principle) handles feedback effects of demand from various sectors interacting with market prices.[12] The present comment details these specific issues only to underscore just how uncertain the DOE's projected energy savings must be, by their very nature. The estimation procedure must forecast not only engineering developments, but also economic factors, for three decades into the future. As such projections provide the entire foundation for the stipulated net benefits of the proposed rule, we can appreciate the sensitivity of the benefit-cost analysis to such forecasts.

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10. Specifically, Lennox, No. 47 at 3 and Goodman, No. 50 at 6, as cited in 78 Fed. Reg. 207, 64098.
11. 78 Fed. Reg. 207, 64078.
12. Ibid. The DOE explains that the base case projection "considers market forces and policies that affect demand for more-efficient products" on p. 64078, while the sophisticated feedback modeling of NEMS is mentioned on p. 64079.

Now that we have discussed the problematic nature of the projected energy savings, we will take them as stipulated and move on to further problems when the DOE attempts to quantify the actual benefits from such savings. As mentioned above, these benefits come in three major categories: financial savings to consumers, lower emissions of various harmful substances, and enhanced energy security. We now discuss each category in turn.

FINANCIAL SAVINGS TO CONSUMERS

The DOE estimates that the proposed rule will yield "Consumer Operating Cost Savings" with a net present value (in 2012$) of $11.6 billion using a seven percent discount rate and $32.0 billion using a three percent discount rate. These are a significant proportion of the total benefits of the rule, constituting exactly 50 percent of the total benefits at the three percent discount rate, and 73 percent at the higher discount rate of seven percent.[13] The proposed rule yields these estimated cost savings because consumers will end up spending less on electricity due to the higher energy efficiency of their furnace fans (compared to what would have occurred in the no-regulation baseline). The lower electricity bills will more than offset the higher initial price of furnaces due to the proposed rule. (Because the higher purchase price is an upfront expense, while the energy savings flow over the full thirty years of the analysis period, the net present value of the cost savings is much higher at the lower discount rate of three percent.)

The problem with this estimate of consumer benefits is that it rests on systemic and irredeemable consumer irrationality, drawing on the behavioral economics literature to make its argument.[14] The DOE is implicitly assuming that consumers must be *forced* to reap the benefits of energy efficiency, even when these benefits "pay for themselves." Unlike justifications flowing from correction of an apparent externality, here the case for the proposed rule is based on pure paternalism, in which the DOE is more concerned with the financial well-being of American households than they are themselves. If, on the contrary, we assume that consumers can spend money in their own interest, then forcing them to buy more expensive (albeit more energy-efficient) furnaces imposes a *harm* on them, not a benefit.

There are several explanations for why some consumers are not taking advantage of apparently obvious cost savings by the purchase of more energy-efficient devices (such as furnaces). Some are simply (alleged) intellectual mistakes on the part of consumers; the DOE's discussion cites a "lack of information" and "computational or other difficulties associated with the evaluation of relevant tradeoffs."[15] Yet rather than imposing a single, minimum standard on the entire country, an alternative approach would be for the DOE to provide information to households regarding these topics. Especially in light of the fact that people have different preferences, this voluntary dissemination of information is arguably much more welfare-enhancing, to the extent that consumers are currently impoverishing themselves out of simple ignorance.

However, there is reason to suspect that consumers' unwillingness to purchase more energy-efficient products may be quite rational. In particular, the DOE calculates the cost savings at a three percent and seven percent discount rate. This is in accordance with OMB guidance for regulatory benefit-cost analysis, but it hardly reflects the actual situation of many American households, who may have large revolving debts at much higher interest rates. Forcing such households to pay more for a new furnace—even though this will yield lower future energy bills—may actually make them poorer if they cannot effectively borrow money at the rates assumed in the DOE analysis.

13. 78 Fed. Reg. 207, 64071, Table I.3.
14. For a critical survey of this literature as it has been used to justify paternalistic government regulations on consumer choice, see Christopher Koopman and Nita Ghei, "Behavioral Economics, Consumer Choice, and Regulatory Agencies" (Economic Perspectives, Mercatus Center at George Mason University, Arlington, VA, August 27, 2013). See also Ted Gayer and W. Kip Viscusi, "Overriding Consumer Preferences with Energy Regulations," *Journal of Regulatory Economics* 43, no. 3 (June 2013): 248–264.
15. 78 Fed. Reg. 207, 64127.

Interestingly, we note that the proposed rule fails the criterion for the "payback period" across most of the product classes. The Energy Policy and Conservation Act (EPCA) "creates a rebuttable presumption that an energy conservation standard is economically justified if the additional cost to the consumer of a product that meets the standard is less than three times the value of the first year's energy savings resulting from the standard."[16] In other words, there is a rebuttable presumption in favor of the proposed rule if it yields a payback period (without discounting) of three years or less.

To repeat, by the DOE's own analysis, the proposed rule fails this criterion in all but one of the eight product categories. (To be sure, just because the rule does not satisfy the "rebuttable presumption" for economic justification does not by itself prove that the rule is unjustified. We are merely pointing out that it fails to meet this benchmark in seven of the eight product categories.) The following table is adapted from Table V.29 and lists the "Consumer Median PBP [Payback Period] years" for Trial Standard Level 4, which is the proposed standard of the rule.

Table 1. Consumer median payback period years for proposed rule, by product class

Consumer median payback period years for proposed rule, by product class product class	**consumer median PBP years (Trial Standard Level 4)**
non-weatherized, non-condensing gas furnace fan	5.38
non-weatherized, condensing gas furnace fan	5.39
weatherized non-condensing gas furnace fan	6.39
non-weatherized, non-condensing oil furnace fan	5.49
non-weatherized electric furnace/modular blower fan	3.55
manufactured home non-weatherized, non-condensing gas furnace fan	3.35
manufactured home non-weatherized, condensing gas furnace fan	2.73
manufactured home electric furnace/modular blower fan	4.61

Source: 78 Fed. Reg. 207, 64128, Table V.29..

As Table 1 indicates, only one out of the eight product classes fulfills the payback period criterion. Although not decisive by itself, such a result shows that even with the (dubious) procedures underlying the DOE's calculations, it is difficult for them to demonstrate economic justification for the proposed rule. They cannot rely on the "rebuttable presumption" benchmark.

Finally, if we accept the calculated consumer savings at face value, there is still the problem of the distribution of the benefits and losses. Surprisingly, the DOE's analysis shows that the proposed rule will confer net benefits on a majority of the consumers for only one product class. We present these results in Table 2:

16. Ibid., 64079.

Table 2. Percentage of consumers who reap net benefits (in reduced life cycle costs) from proposed rule, by product classss

product class	percentage who benefit financially
non-weatherized, non-condensing gas furnace fan	53%
non-weatherized, condensing gas furnace fan	42%
weatherized non-condensing gas furnace fan	41%
non-weatherized, non-condensing oil furnace fan	18%
non-weatherized electric furnace/modular blower fan	48%
manufactured home non-weatherized, non-condensing gas furnace fan	32%
manufactured home non-weatherized, condensing gas furnace fan	26%
manufactured home electric furnace/modular blower fan	40%

Source: 78 Fed. Reg. 207, 64129, Table V.30.

As Table 2 indicates, only for the first product class does the DOE estimate that an actual majority of consumers will receive net financial benefits from the proposed rule. This is not to suggest that the losers outnumber the winners for other product classes; rather, there are large percentages who experience "no impact." Even so, Table 2 shows that the aggregate financial benefits to consumers are not spread uniformly over the population, but instead are (mostly) concentrated in a minority of households, and for some classes a very small minority (as low as 18 percent).

THE SOCIAL COST OF CARBON

Another problematic component of the estimated benefits of the proposed rule is in discussion of the benefits of emissions reductions. In this comment we will restrict our attention to the handling of carbon dioxide emissions. The DOE and other federal agencies are placed into an untenable position, where they are required by OMB guidelines to conduct benefit-cost analysis using discount rates of three and seven percent.[17] Yet the Interagency Working Group on the Social Cost of Carbon has only provided estimates of the social cost of carbon for 2.5, three, and five percent.[18] Therefore, when the DOE reports the benefits of the proposed rule at seven percent—as it must—it lacks the relevant estimate with which to place a dollar value on the reduction in CO_2 emissions.

Having acknowledged the DOE's awkward position, it nonetheless has chosen a procedure that vastly overstates the alleged benefits from the proposed rule. In the first place, when assessing the rule at the seven percent discount rate (as OMB requires), the DOE analysis inexplicably uses the three percent value of the social cost of carbon, even though it has available the Working Group's estimate at five percent. Either number is wrong, of course, but the five percent estimate is closer to seven percent than three percent is.

Furthermore, OMB guidelines specifically require that benefit-cost analysis of federal regulations be reported for domestic estimates, with global estimates being optional. This is quite significant in the context

17. The OMB guidelines discussed in this section—regarding both the discount rates to be used, as well as the insistence on domestic versus global analysis—are laid out in Office of Management and Budget, *Circular A-4*, "Regulatory Analysis" (September 17, 2003).
18. Interagency Working Group on Social Cost of Carbon, "Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866," (May 2013).

of anthropogenic climate change, where the future damages are spread over the entire planet. This means that a US regulation to reduce emissions will have the costs borne entirely by Americans, with the benefits (in the form of reduced future climate change damages) accruing largely to non-Americans.

These two factors have quite serious quantitative repercussions. By using the global estimate at a three percent discount rate, the DOE values a ton of CO_2 emission reduction in 2015 at $40.80 (measured in 2012$). Yet if the DOE had used a five percent discount rate and the midpoint estimate of the domestic proportion of benefits, the value of reducing emissions by one ton would fall to a mere $1.94 per ton.[19]

Currently, the DOE reports the "National Economic Benefits" of the proposed rule at the seven percent discount rate as $23.2 billion. Correcting for the above two factors—namely, using a domestic (not global) social cost of carbon and using the Working Group's five percent estimate rather than the three percent—would reduce total national benefits to roughly $12.2 billion, cutting the total benefits almost in half.[20]

CONCLUSION

The DOE's proposed rule on energy conservation standards for residential furnace fans has not been adequately justified. It will impose higher prices on consumers that, by its own analysis, will take longer than three years to "pay for themselves" in seven out of eight product classes. Further, the DOE's own analysis shows that a minority of Americans will experience net financial benefits in all but one of the product classes. Beyond these problems, the entire premise that the DOE must force consumers to save money for themselves is dubious; there could be perfectly "rational" reasons for them to opt for lower-efficiency products, such as facing higher financing costs than the three and seven percent rates used in the DOE's analysis.

Yet another troubling aspect of the DOE's analysis is the quantification of benefits from the reduction in carbon dioxide emissions. Even if we take the DOE's projections of the emissions reductions at face value, the valuation of these reductions is not being computed in accordance with OMB guidelines. Adjusting for discount rates and using a domestic (not global) perspective, the estimated benefits collapse some 95 percent from the levels reported in the DOE's analysis (at the seven percent discount rate).

Finally, we must remember the context of these considerations: the DOE is proposing a rule and estimating its impact through the year 2048. No matter what the specifics, the results of such a forecast will be highly speculative. In conjunction with the particular problems already mentioned, this comment recommends that the DOE reconsider alternative approaches that respect consumer choice and that acknowledge the limits of long-term forecasting. For example, simply providing consumers with information concerning energy conservation and tradeoffs might capture many of the same benefits while not being susceptible to the pitfalls outlined in this comment.

If the DOE maintains that it is legally required to issue some efficiency standard, this comment still has shown that the DOE has not adequately demonstrated that the proposed rule is economically justified. Based

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19. The 2015 social cost of carbon (in 2012$) is $12.90 per ton. To convert global social cost of carbon values into domestic ones, the Working Group suggested multiplying by a factor between seven and 23 percent. The midpoint of this range is 15 percent. Applied to $12.90/ton, this makes the domestic social cost of carbon (at a five percent discount rate) $1.94/ton.

20. 78 Fed. Reg. 207, 64071, Table I.3 shows total benefits at the seven percent discount rate at $23.2 billion. Of this total, $11.6 billion is due to "Consumer Operating Cost Savings," $11.5 billion is the monetized value of carbon dioxide emissions reductions, and $100 million is the monetized value of NO_x emission reductions. Because the DOE analysis uses a $40.80 social cost of carbon rather than the $1.94 we derived in the previous footnote, its aggregate valuation of the CO_2 emissions reductions should likewise be reduced by the same percentage to yield savings of $547 million, not $11.5 billion. Adding the revised figure of $547 million to the $11.6 billion in consumer operating cost savings and $100 million in NO_x reductions, yields total benefits of $12.2 billion.

on the analysis in this comment, a less stringent standard—such as using Trial Standard Levels 3, 2, or 1 rather than the proposed Trial Standard Level 4—would be preferable to the proposed rule. Yet even these weaker standards have not been economically justified because the DOE's method for quantifying benefits in any of these scenarios is deficient; it would seek to justify these weaker standards by reference to consumer irrationality and reductions in carbon emissions that are valued improperly according to OMB guidelines.