MERCATUS CENTER
George Mason University

PUBLIC INTEREST COMMENT

RECOMMENDATIONS FOR IMPROVING DEPARTMENT OF ENERGY REGULATORY IMPACT ANALYSIS FOR ENERGY CONSERVATION STANDARDS

JAMES BROUGHEL
Senior Research Fellow, Mercatus Center at George Mason University

Energy Conservation Program for Appliance Standards: Procedures for Evaluating Statutory Factors for Use in New or Revised Energy Conservation Standards; Supplemental Notice of Proposed Rulemaking
US Department of Energy
Comment Period Opens: February 14, 2020
Comment Period Closes: March 16, 2020
Comment Submitted: March 16, 2020
Docket No. EERE-2017-BT-STD-0062
RIN: 1904-AE84

The US Department of Energy (DOE) is proposing supplemental amendments to its decision-making process for selecting energy conservation standards. Specifically, the DOE is proposing changes that would require the agency to conduct an analysis of the costs and benefits of various alternative levels of an energy conservation standard in order to gauge whether a chosen standard is economically justified. This comment seeks to provide some broad guidance to the DOE on how costs and benefits of energy conservation standards should be evaluated.

My recommendations include (1) better specifying what model of consumer behavior the DOE is relying on, (2) distinguishing between individual and social discount rates in analysis, (3) better accounting for the opportunity cost of capital, (4) distinguishing between benefits and costs that come in the form of consumption from those that come in the form of investment, and (5) ensuring that analysis is actually used in the decision-making process.

RECOMMENDATION 1: ANALYSIS SHOULD BE BASED ON REVEALED PREFERENCES, UNLESS COMPELLING EVIDENCE EXISTS TO SUPPORT ALTERNATIVE ASSUMPTIONS

The DOE's cost-benefit analysis (CBA) should be guided, whenever feasible, by the principle of "revealed preference." This principle states simply that consumer preferences can be inferred by observing consumers' behavior in the marketplace. When a consumer purchases an appliance, for example, it can be inferred that the consumer values the appliance more than the money spent to

For more information, contact
Mercatus Outreach, 703-993-4930, mercatusoutreach@mercatus.gmu.edu
Mercatus Center at George Mason University
3434 Washington Blvd., 4th Floor, Arlington, VA 22201

purchase the appliance and more than alternative products available to the consumer in the marketplace.

Studies of "stated preference," by contrast, can also be used to infer consumer preferences. However, stated preferences can diverge from revealed preferences for a variety of reasons, and stated preference research methods are usually thought to be less reliable than revealed preference research methods. For example, survey respondents may respond differently to questions about hypothetical scenarios than they would to actual scenarios they face in the real world.[1]

In recent years, economists and legal scholars have also identified the possibility of "behavioral market failures."[2] These are instances where behavioral bias prevents consumers and businesses from acting in a manner consistent with their own preferences. When behavioral bias is present, both revealed and stated preference research methods may be unreliable, as individuals may not be in a good position to speak or act in a manner that reflects their own interests.

This is relevant to DOE analyses because some economists claim that a behavioral market failure is present in markets for energy-using devices.[3] Unfortunately, it is not obvious what should take the place of the revealed preference assumption in CBA when a behavioral bias exists. One option would be to allow analysts to determine what consumers or businesses might want if their thinking were not clouded by bias. But this essentially means analysts substitute their own values for those of consumers. This might be defensible in certain instances, such as with issues related to addiction. It might be reasonable, for example, to assume that people with a drinking problem might want to quit drinking if their judgment weren't clouded by alcoholism. But this kind of value substitution seems much harder to justify in markets for energy-using devices.

Unless the DOE can provide significant evidence that bias is present in a market or, similarly, that another market failure, such as information asymmetry, is preventing consumers from acting in a self-interested manner, it should defer to consumers themselves to be the best judge of their own situation. This means the DOE should stick with the revealed preference assumption. This has several implications. First, it means that whatever purchase consumers make is the one that accords with their own interests. For example, if consumers would opt to purchase a less-energy-efficient device, but such a device is banned by the DOE as a result of energy-efficiency standards, this ban represents an unambiguous cost to these consumers.[4]

The fact that consumers bear certain costs does not mean a regulation is not worth enacting, but it might mean that several parts of DOE analysis are unnecessary. For example, in its payback period analysis in its technical support documents, the DOE estimates how long it takes consumers to recoup upfront costs associated with higher purchase prices through later savings on utility bills. However, consumers who would have bought a less efficient device in absence of regulation

1. For a discussion of problems that arise with state preference studies in the context of valuing mortality risks, see Ryan C. Bosworth, Alecia Hunter, and Ahsan Kibria, *The Value of a Statistical Life: Economics and Politics* (Logan, UT: Strata, 2017). On stated preference valuation methods more generally, see Richard B. Belzer and Richard P. Theroux, "Criteria for Evaluating Results Obtained from Contingent Valuation Methods," in *Valuing Food Safety and Nutrition*, ed. Julie A. Caswell (Boulder, CO: Westview Press, 1995).
2. Cass R. Sunstein, *Why Nudge?: The Politics of Libertarian Paternalism* (New Haven, CT: Yale University Press, 2014).
3. This is sometimes referred to as the energy efficiency "gap" or "paradox." See, generally, Hunt Allcott and Michael Greenstone, "Is There an Energy Efficiency Gap?," *Journal of Economic Perspectives* 26, no. 1 (2012): 3–28; and Adam B. Jaffe and Robert N. Stavins, "The Energy Paradox and the Diffusion of Conservation Technology," *Resource and Energy Economics* 16, no. 2 (1994): 91–122.
4. Note that it could still represent a benefit from a social perspective, for example, owing to externalities.

must buy either a more efficient device, no device, or a substitute device after a regulation is enacted. In any of these cases, these consumers bear an unambiguous cost, assuming revealed preference holds and there is no market failure present (such as asymmetric information).[5]

This suggests that the payback period analysis the DOE conducts is largely unnecessary. Implicit in the entire exercise of estimating payback periods is the idea that, owing to a market failure of some kind, revealed preference doesn't hold. However, the DOE often speaks in only vague generalities about the market failures justifying its regulations.[6] In short, the DOE should be clear as to whether it is dropping the revealed preference assumption, and when it does so, what market failure justifies it doing so.

RECOMMENDATION 2: CAREFULLY DISTINGUISH BETWEEN INDIVIDUAL AND SOCIAL DISCOUNT RATES

The DOE's analysis could also better distinguish between individual discount rates and social discount rates. The social discount rate is the rate at which "society" would trade a unit of present consumption for a unit of future consumption. An individual discount rate is the rate at which an individual would trade a unit of present consumption for a unit of future consumption. In some cases, these rates will be the same, but in general they will not be.

Consumers' discount rate will be whatever "the" relevant market interest rate is that consumers face. It can be approximated using some kind of weighted average of various debt and equity instruments households hold, since rational consumers will smooth their consumption over time in order to bring their own internal discount rate into alignment with the market interest rate they face.[7] In some parts of the DOE's analysis, such as the calculation of payback periods, the DOE is carefully making this distinction. However, in other parts, such as when valuing lives saved, the distinction is less clear.

Consider first the approach the DOE takes when it calculates payback periods in its analyses. This payback calculation is from the perspective of certain individuals who buy energy-using devices, not society. In other words, the DOE is trying to ascertain how long it takes consumers (not society) to be paid back after bearing a higher upfront cost of equipment. In its analysis, the DOE estimates consumer and business discount rates for this purpose. In doing so, the DOE identifies sources of funding for purchases of energy-consuming devices, identifies interest rates on those sources of funding, and then identifies the relative weight of each funding source as a percentage of household or business funding sources. This is a sound approach and might even be considered a best practice for other agencies to follow. (Note that this does not imply that the DOE is using the right weights and corresponding interest rates when calculating consumer and business weighted average costs of capital. Nor does it imply payback period analysis should be conducted at all, unless a significant market failure is demonstrated, as described earlier).

5. For those consumers who would have bought an efficient device with or without the regulation, there is presumably no welfare change from the regulation and hence also no payback period to estimate.
6. For example, in a 2017 regulation setting efficiency standards for ceiling fans, the DOE threw together a hodgepodge of justifications for the regulation, including justifications related to behavioral bias and asymmetric information, without providing much in the way of evidence. James Broughel, "The Tradeoffs between Energy Efficiency, Consumer Preferences, and Economic Growth," in *Regulation and Economic Opportunity: Blueprints for Reform*, ed. Adam Hoffer and Todd Nesbit (Logan, UT: Center for Growth and Opportunity at Utah State University, forthcoming 2020).
7. This is an implication of the Fisher model and the Ramsey growth models in economics, for example. See also, Paul A. Samuelson, "A Note on Measurement of Utility," *Review of Economic Studies* 4, no. 2 (1937): 155–61.

When calculating social benefits and costs, the appropriate discount rate is the social discount rate. In general, an individual's discount rate will not be appropriate for this purpose because, although individuals adjust behavior in response to market interest rates, markets are imperfect for a variety of reasons, and market rates will thus generally not reflect the social discount rate. This occurs because externalities are present, taxes create economic distortions, and future generations who stand to gain or lose from present market transactions cannot trade in current markets to influence the allocation of resources in a way that would benefit them. Hence, market interest rates, and prices more generally, are often not a reliable gauge of the opportunity cost of resources to society.

This is also why estimates of willingness to pay for policy benefits and costs can be misleading. If they are based on present market conditions, without adjustments for tax distortions, externalities, and the preferences of future generations, estimates of willingness to pay will reflect the opportunity cost of resources to particular individuals, not the opportunity cost to society as a whole. This is particularly relevant to some of the health benefits the DOE estimates from its regulations, which can be based on market estimates of willingness to pay.[8]

When analyzing policy impacts from an individual's perspective, such as when estimating lifecycle costs or payback periods, the individual's discount rate is the correct discount rate to use. When evaluating benefits and costs from a social perspective, the social discount rate is correct. The DOE is already making this distinction in some parts of analysis, but it would be helpful if DOE analysts were more explicit about when and why they use each rate, and if analysts were to make this distinction between individual and social discount rates more consistently across all aspects of analysis.

RECOMMENDATION 3: THE DOE SHOULD PROPERLY ACCOUNT FOR THE OPPORTUNITY COST OF CAPITAL

The DOE's benefits analyses in its technical support documents usually document a variety of benefits emanating from its standards rules. These benefits include things like operating cost savings from reduced energy use and environmental and health benefits emanating from reductions in CO_2 emissions and other pollutants, such as nitrogen oxide emissions. However, some of these benefits will come in the form of increased investment in the economy and others will come in the form of increased consumption. For example, some fraction of the operating cost savings is likely to be invested, while the remaining portion is likely to be consumed. Similarly, some health benefits, such as those related to reduced mortality risk, are also a mix of consumption and investment gains. Meanwhile, CO_2 emissions benefits are generally expressed in "consumption equivalent" form,[9] meaning they can be thought of as representing increased consumption associated with reducing CO_2 emissions.

It is simply inappropriate to add together consumption-related benefits and investment-related benefits because they are not growing in value at the same rate. An example may make this

8. For example, benefits estimated using the value of a statistical life (VSL). For a discussion of problems associated with the value of a statistical life, see James Broughel, *Rethinking the Value of Life: A Critical Appraisal of the Value of a Statistical Life* (Logan, UT: Center for Growth and Opportunity at Utah State University, 2020).
9. Richard Newell, "Unpacking the Administration's Revised Social Cost of Carbon," *Resources*, October 10, 2017.

clearer:[10] Assume that a regulation generates $1 billion in operating cost savings, generates $500 million in reduced losses to consumption as a result of mitigating climate change, and costs $1.25 billion in compliance spending. Can these numbers simply be added together? The public won't spend all of the saved money from reduced energy use on additional consumption. Rather, some fraction of the funds will go toward capital investment and will hence grow in value in the future. Similarly, some of the financial costs imposed by regulations would have gone toward capital investment in absence of a regulation. These benefits and costs will evolve very differently from the consumption benefits from reduced CO_2 emissions.

The correct way to account for these differences is to apply a shadow price to investment.[11] The shadow price of capital is a conversion factor that converts investment-related benefits into their consumption equivalent. However, the DOE does not in general apply a shadow price to investment goods in its CBA.[12] As a result, it is implicitly assuming (1) that only consumption is displaced by its regulations or (2) that the economy is operating on an optimal growth path such that society is indifferent between an additional dollar of investment and an additional dollar of consumption at current margins. Neither of these assumptions seems plausible.[13]

As such, the DOE is not properly accounting for the opportunity cost of capital in its regulatory analyses, and hence its estimates of social benefits and costs cannot be directly used to make apples-to-apples comparisons. If the DOE is interested, it can refer to a recent comment I wrote to the Office of Management and Budget (OMB) about how to properly account for the opportunity cost of capital in CBA.[14] The same recommendations made to OMB apply to the DOE.

RECOMMENDATION 4: THE DOE SHOULD DISTINGUISH BETWEEN CONSUMPTION AND INVESTMENT

In order to better account for the opportunity cost of capital, the DOE must first begin to separate its costs and benefits in terms of consumption and investment.[15] As already stated, the benefits estimated using the social cost of carbon are already expressed in consumption equivalent form.[16] Other benefits and costs, meanwhile, are a mix of consumption and investment. As discussed earlier, this is the case with operating costs savings, some fraction of which comes in the form of investment and some fraction of which will be consumed. It is also true of compliance costs. Another benefit that constitutes a heterogeneous mix of consumption and investment are

10. For more discussion along these lines, see James Broughel, "The DOE Should Clarify Model Uncertainty and Strengthen Cost and Benefit Comparisons in Its Analyses" (Public Interest Comment, Mercatus Center at George Mason University, Arlington, VA, November 20, 2019).
11. OMB calls this the "analytically preferred" method. Office of Management and Budget, *Circular A-4*, September 17, 2003.
12. Rather, it inappropriately uses a 7 percent discount rate for this purpose, which presumes that all benefits and costs are growing at the marginal rate of return to capital. This is clearly implausible for most nonpecunariary consumption benefits.
13. An alternative possibility is that the DOE's analysis is simply incoherent.
14. James Broughel, "Accounting for the Opportunity Cost of Capital in Cost-Benefit Analysis: Public Interest Comment on the Marginal Excess Tax Burden As a Potential Cost under Executive Order 13771" (Public Interest Comment, Mercatus Center at George Mason University, Arlington, VA, 2020).
15. A popular approach is to keep investment goods on the cost side of the ledger and nonpecuniary consumption goods on the benefits side. Each should be discounted at its corresponding growth rate, while investment goods should also be multiplied by a shadow price to account for the opportunity cost of capital. See Liqun Liu, "A Marginal Cost of Funds Approach to Multi-Period Public Project Evaluation: Implications for the Social Discount Rate," *Journal of Public Economics* 87, no. 7-8 (2003): 1707–18.
16. It should be noted, however, that social-cost-of-carbon-related benefits could still not be directly comparable to other consumption benefits and costs if they are calculated using a different social discount rate.

mortality risk reductions estimated using the value of a statistical life (VSL), which underlies some estimates of health benefits from DOE regulations.

When consumers are willing to pay something to reduce mortality risks, part of what they are paying for is reducing the risk of lost consumption in the future, and part of what they are willing to pay for is reducing the risk of lost future earnings. Kip Viscusi has claimed that roughly 90 percent of the VSL represents the value individuals place on future consumption, while 9 percent or so represents the present value future financial earnings.[17]

These different benefits need to be distinguished from one another in analysis, because they are growing at different rates. Furthermore, the VSL value is based on individual willingness to pay, and hence individual discount rates. From a social perspective, when adding up total social benefits and costs, such individual willingness to pay values need to be adjusted to reflect their value if future benefits and costs were discounted at the social discount rate.[18] This can mean that the value of resources to society can diverge dramatically from willingness to pay estimates generated based on the value of resources to certain individuals.

RECOMMENDATION 5: THE DOE SHOULD ACTUALLY USE ITS ANALYSIS TO INFORM DECISIONS

I recently served as a consumer representative in a working group for a negotiated rulemaking related to setting test procedures and energy efficiency standards for a particular kind of commercial heating and air conditioning equipment.[19] Although this working group met on and off for over a year between July of 2018 and November of 2019, all of its recommendations to the DOE were made before the technical support document was completed by the consultants that work for the DOE.[20] The working group should have waited for the consulting report. Instead, recommendations were made to the DOE about policy without the benefit of information being available that would have proved useful in the working group's decision-making process. Because the working group consisted primarily of interest groups with a direct stake in the outcome of regulation, it seems likely that the recommendations of the group simply reflected the interests of the members of the working group and not members of the public who lacked representation on the group.[21] This problem could have been alleviated to some degree if objective analysis, free from the influence of parochial interests, had been produced in a timely manner to inform the group's decisions.

In the future, the DOE should ensure that analysis precedes deliberation so that decisions are informed by the analysis.

CONCLUSION

Along each of the dimensions discussed in this comment, there are substantial ways that DOE analysis could be improved:

17. Specifically, economist Kip Viscusi has argued the consumption component is about an order of magnitude larger than the financial component. W. Kip Viscusi, *Pricing Lives: Guideposts for a Safer Society* (Princeton, NJ: Princeton University Press, 2018).
18. It is most obvious that the VSL does not reflect social values at the end of life, when an individual's time horizon is very short. However, the general problem with the VSL that future benefits and costs are discounted from an individual perspective instead of from a social perspective extends across all of life.
19. The rulemaking in question related to variable refrigerant flow multisplit air conditioners and heat pumps.
20. These were primarily Navigant and Lawrence Berkeley Labs.
21. As I was the sole "consumer representative" on the working group, some public interest viewpoints were represented, even if only from a minority position.

The DOE should be clearer about when it is rejecting the revealed preference assumption. If it believes a market failure is present, it should characterize it with observable data. The DOE should also be more careful to distinguish between benefits and costs from individuals' perspective and benefits and costs from a social perspective. In some cases, the DOE already does this, but practices are inconsistent.

The DOE is also not properly accounting for the opportunity cost of capital in its analyses. Health, safety, and environmental regulations, such as the DOE's energy efficiency standards, tend to have a heterogeneous mix of benefits and costs that come in the form of consumption and investment. These benefits and costs need to be carefully distinguished from one another, and shadow prices need to be applied to capital investment values to account for their different growth trajectories from consumption benefits.

Finally, there is a cookie-cutter-like nature to the DOE's technical support documents, which are all very similar, and it is not clear how much analysis is even used to inform rulemaking. Even if it is produced in a timely manner, there is a danger that the analysis will simply become a box-checking exercise. Furthermore, the DOE's CBA can be highly misleading, and is likely to lead to poor decisions if its numbers are taken at face value, as headline social benefit and costs estimates are not directly comparable to one another in an apples-to-apples fashion.

To serve the public interest, regulations should be designed in such a way that they achieve substantial benefits for the public in excess of costs. Analysis can help in that endeavor, if conducted properly. When conducted improperly, however, analysis can actually be a barrier to sound policymaking. This comment has offered a few recommendations to overcome such barriers.