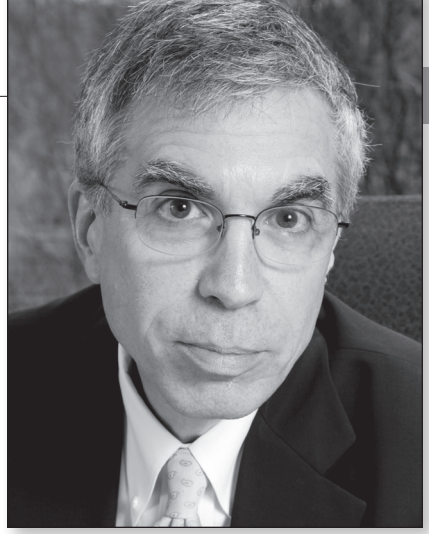

By Robert N. Stavins

Assessing the Energy Paradox

Energy efficiency offers great promise for reducing the costs and environmental damages associated with power use, but these technologies are not utilized by consumers and businesses to the degree that would apparently be justified, even on the basis of their private financial benefit. For some thirty years, there have been debates about this phenomenon among researchers and others in academia, government, non-profits, and private industry, typically couched in terms of potential explanations of the so-called "energy-efficiency gap" or "energy paradox."

Two years ago Professor Richard Newell of Duke University and I launched an initiative — sponsored by the Alfred P. Sloan Foundation — to identify potential explanations of the energy paradox. The result is a monograph just released, co-authored with Todd Gerarden, a Harvard Ph.D. student in public policy. We examined both the energy paradox, the apparent reality that some energy-efficiency technologies that would pay off for adopters are nevertheless not adopted, and the broader phenomenon we characterize as the "energy-efficiency gap," the apparent reality that some energy-efficiency technologies that would be socially efficient are not adopted.

We started by decomposing cost-minimizing energy-efficiency decisions into their fundamental elements, which allowed us to identify four major questions, the answers to which are germane to sorting out the causes (and reality or lack thereof) of the paradox and gap.

First, we asked whether the energy efficiency and associated pricing of products on the market are economically efficient. To answer this question, we examined the variety of energy-efficient products, their energy-efficiency levels, and their pricing. Although the theory is clear, empirical evidence is — in general — quite limited. More data that could facilitate potential future empirical research are becoming available, although company-level data are less plentiful than data on consumers.

Second, we asked whether energy operating costs are inefficiently priced and/or understood. Even if consumers make privately optimal decisions, energy-saving technology may diffuse more slowly than the socially optimal rate, because of negative externalities. So, even if the energy paradox is not present, the energy-efficiency gap may be. The theoretical arguments are strong. Empirical evidence is considerable, and in many cases data are likely to be available for additional research.

Third, we asked whether product choices are cost-minimizing in present-value terms, or whether various market failures and/or behavioral phenomena inhibit such cost-minimization. We found that the empirical evidence ranges from strong (split incentives/agency issues, and inattention/salience phenomena) to moderate (heuristic decisionmaking/bounded rationality, systematic risk, and option value) to weak (learning-by-using, loss aversion, myopia, and capital market failures). Here, as elsewhere in our review, the bulk of previous work has focused on the residential sector and much less attention has been given to the commercial and industrial sectors.

Fourth, we asked whether other unobserved costs may inhibit energy-efficient decisions. We found that the empirical evidence is generally sound, and that data needed for more research are available. We assigned a relatively high priority to future research, particularly to aid understanding of consumer demand for product attributes that are correlated with energy efficiency, thereby informing policy and product development decisions.

Finally, we asked what these findings have to say about the three categories of explanations for the apparent underinvestment in energy-efficient technologies relative to the predictions of some engineering and economic models: market failures, behavioral effects, and modeling flaws.

In brief, potential market-failure explanations include information problems, energy market failures, capital market failures, and innovation market failures. Potential behavioral explanations include inattentiveness and salience, short sightedness, bounded rationality and heuristic decisionmaking, prospect theory and reference-point phenomena, and systematically biased beliefs. Finally, potential modeling flaws include unobserved or understated costs of adoption; ignored product attributes; heterogeneity in benefits and costs of adoption across potential adopters; use of incorrect discount rates; and uncertainty, irreversibility, and option value.

The design of scientifically sound and economically sensible policies

It turns out that all three categories of explanations are theoretically sound and that limited empirical evidence exists for every category as well, although the empirical research is by no means consistently strong across all of the specific explanations.

Identifying the answers to these questions is critical for the design of public policies that are scientifically sound and economically sensible.

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