

Promoting Energy Efficiency as a Part of Decarbonization Strategy

Reducing U.S. carbon dioxide emissions to zero, on net, by 2050 will require dramatic changes in the way energy is produced and consumed. Reducing use — by improving the efficiency of energy services, such as more fuel-efficient cars, electricity-sipping appliances, and more — will play a critical role in any decarbonization strategy.

The International Energy Agency recently estimated that the rate of energy efficiency improvements will need to triple the average rate of the past two decades as part of a mid-century net-zero strategy. The most recent Intergovernmental Panel on Climate Change assessment report indicated that energy efficiency — measured by the amount of energy per unit of economic output — would need to improve by 90 percent over this century to prevent warming beyond 2 degrees Celsius.

The challenge in improving energy efficiency lies in designing effective public policy. Energy efficiency has frequently been described as the cheapest energy resource, costing less to reduce demand than producing more energy to meet demand. Engineering studies suggest large potential opportunities in reducing the energy necessary to deliver a desired service, such as to light a room. Some analysts have claimed that efficiency investments have negative costs: the lower energy bills associated with the investment more than pay for the higher up-front cost. In practice, however, our policies have often fallen short of this potential.

Consumers vary considerably in their attitudes and preferences related to energy and the environment. One individual may be willing to buy a more energy-efficient car or an Energy-Star-rated refrigerator at current prices, while another individual would only

do so in response to a significant subsidy. One challenge lies in effectively targeting subsidies — such as rebates and tax credits — to those individuals who would not otherwise adopt the more-efficient option. The typical eligibility for such subsidies, however, usually requires only the purchase of a qualifying technology and fails to distinguish among these types of consumers. In practice, many individuals claiming subsidies would have bought the efficient option even in the absence of the payments.

In the context of weatherizing the homes of low-income households, recent research has shown dramatic variation in the quality of the energy efficiency work, with savings varying by 40 percent across projects. Some weatherization contractors are simply much better at their jobs than others. As a result, the Department of Energy has attempted to address these problems through guidance promoting quality projects.

Regulatory standards could promote new, even more efficient technologies, but these approaches take time to have meaningful impacts on consumption. The relatively long lifetimes of energy-consuming durables — a decade or more for appliances, nearly two decades for cars — means that any new standard will be implemented slowly with the turnover of the existing capital stock.

Moreover, to the extent that such standards may increase new product prices, they may slow the turnover of the existing stock and sustain use of less-efficient technologies. For example, higher new vehicle prices under fuel economy standards have extended the operating lifetimes of older, less-efficient vehicles in the used car market, offsetting approximately 15 percent

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of the energy savings gains associated with these standards.

In light of these lessons, let me briefly describe three ways to design policies to promote energy efficiency. First, we should take advantage of the wealth of microdata to better target subsidies for efficiency. Just as the private sector has learned how to target advertising and sales, energy efficiency programs can be designed to leverage big data and associated analytics to enhance the targeting of efficiency subsidies to drive consumer decisions toward more efficient options.

Second, we should design and implement energy efficiency policies with the intent of learning, revising, and updating programs over time. Integrating program evaluation in the design phase of an energy efficiency policy can ensure rigorous estimates of the impacts of the policy and provide evidence of what works and what can be improved.

Third, we should recognize that policies that raise energy prices can increase energy efficiency. Several recent studies of carbon taxes and fuel taxes suggest that they induce greater reductions in gasoline consumption than would a comparable increase in fuel prices that resulted from conventional market forces. This may reflect the greater salience of taxes or the recognition that a tax-related increase in prices is likely to be more permanent than fuel price swings resulting from transient shifts in supply and demand.