

Thought-Piece for Energy Efficiency Rebound Workshop  
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Technical, engineering models of energy services do not typically reflect the economics of energy services, resulting in skewed expectations associated with energy efficiency. The rebound effect (“rebound”) occurs when surplus gained through efficiency is re-spent in a manner that reduces efficiency gains. For consumers, the direct rebound effect occurs when consumption increases as a result of cost reductions gained by efficiency, which is closely related to the price elasticity of demand. Indirect effects occur when consumer savings are re-spent on other goods or services. Both of these effects are short-run. The long-term capital impacts of consumer rebound are not well-understood. For firms, efficiency reduces the costs of production, which can lead to short- and long-run economy-wide effects. Sorrell and Dimitropoulos (2009) and Greening 2000 provide a more thorough documentation of neoclassical applications to energy efficiency.

The magnitude of rebound is currently unclear. Two types of experimental techniques have been used to estimate rebound: direct measurements of energy services and econometric models of energy services. Most experimental estimates are for direct rebound associated with household services and personal transportation [Dimitropoulos 2009]. Reported values typically demonstrate inconsistent definitions, inconsistent measurement techniques, poor experimental design, and inadequate energy modeling.

The magnitude of rebound and its role in energy planning and policy is subject to considerable debate. At the macro-scale, international comparisons of economic energy intensities (energy consumption per gross domestic product) and per capita energy use suggest that real opportunities to improve domestic energy efficiency exist [EIA 2011]. At the micro-scale, some estimates of direct rebound alone (not including indirect effects) suggest that efficiency is easily eroded.

Efficiency advocates clearly see economic (and other) opportunities associated with efficiency. “Rebounders” see the limitations. This workshop presents an opportunity to connect these two perspectives (or at least identify a path to connect them). Common ground may provide a helpful starting point for generating meaningful research activities.

Several research tasks that may further an understanding of how to meaningfully achieving energy efficiency given the limitations of rebound include:

- (1) Experimental standards for measuring efficiency and rebound, which clearly calls for a more consistent set of definitions associated with rebound;
- (2) A clearly distinction between the technical and behavior sources of rebound;
- (3) A better understanding of saturation by end use and income;
- (4) Improved understanding of the long-run implications of rebound. Cross-sectional, decomposition analyses at various economic scales of interest (national, state, maybe local) may offer helpful insights;

- (5) Measurement of rebound in sectors others than households, especially energy- (or carbon-) intensive sectors. Such studies may more broadly identify differences in the magnitude and fundamentals of “supply” rebound versus “demand” rebound;
- (6) A clearer understanding of the indirect effects for households and firms. (My concern is that the indirect surplus achieved through energy efficiency is no different than an increase in real income, and, as result, can be treated similarly.)

In the short-term (maybe a decade), significant investment in efficiency is likely to continue independent of the implications of rebound. This group could provide some helpful short-term practical advice for efficiency program design recognizing the limitations of rebound. To my knowledge, no such guidance exists. Helpful guidance may include analytical techniques for reflecting rebound in efficiency planning. Given the resources required to perform effective experiment work, expert judgment may be helpful in addressing major uncertainties in the short-term.

Finally, it would also be helpful to better understand how market for carbon would impact rebound. Given current uncertainties and inadequate rebound measurement techniques, this may be impracticable. However, it seems any reasonable long-term planning for rebound should generally assess the influence of a carbon market.