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It Takes a Portfolio: A Broad Spectrum of Policies Can Best Halt Climate Change

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By Jeffrey Rissman

Electricity Policy – the website ElectricityPolicy.com and the newsletter Electricity Daily – together comprise an essential source of information about the forces driving change in the electric power industry.

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Political consensus is coalescing around the urgent need to reduce greenhouse gases and mitigate the worst impacts of climate change, but little agreement exists on which policies should be used to reduce emissions. Regulatory policies like the Clean Power Plan and vehicle fuel economy standards require states or businesses to satisfy certain performance outcomes, while "market-based" policies incentivize

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emissions reductions by economic means, primarily taxes and subsidies. Both types of policy are needed to make the transition to a clean energy system with superior economic outcomes.

Several factors help determine which policies most effectively drive this low-carbon transition, and ranking emission reduction strategies along a "cost curve" evaluates the merits of various policies in terms of emissions abatement potential and cost (per ton) of achieving that abatement.

In the policy cost curve on page 3, each box represents a particular policy at a particular setting—with width indicating potential carbon dioxide (CO_2) emissions abatement and height representing cost/savings per ton of CO_2 abated by 2030. Boxes below the x-axis represent policies calculated to save money by 2030, according to Energy Innovation's Energy Policy Simulator.

Given this array of cost-saving policy options, why don't businesses, consumers, and government undertake actions like buying more efficient equipment or installing solar panels if it would save them money? Is policy intervention really necessary to encourage or require them to do so?

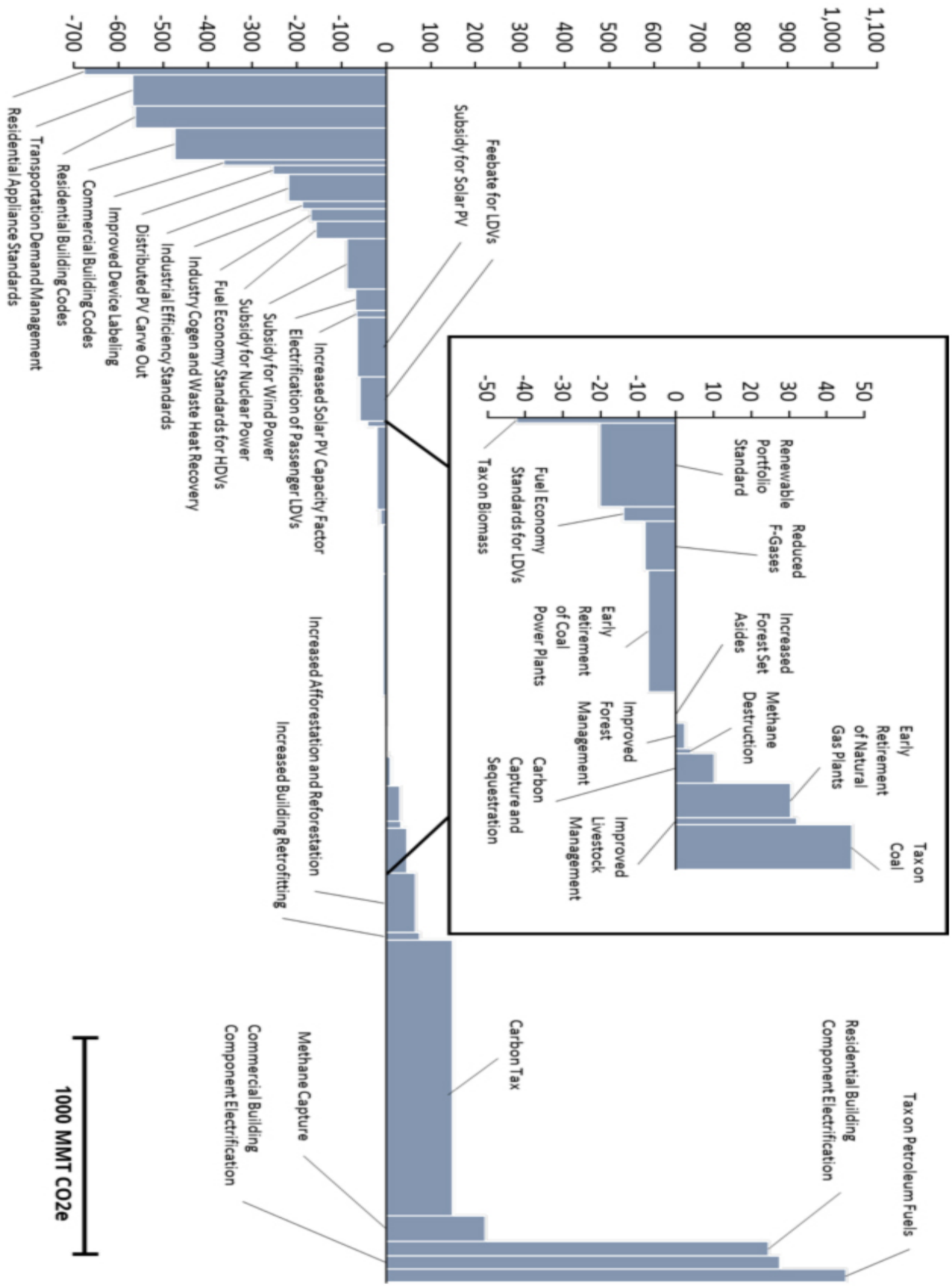
Economic analysis is a powerful tool for policy analysis. Thanks to continued innovations in the field, it can now provide insights into questions previously impossible to answer with a traditional view of economics.

Traditional economic analysis assumes markets largely behave rationally—for instance, it suggests markets reach equilibrium, actors are mostly rational (and any irrationality is corrected without outside intervention via arbitrage), actors have perfect knowledge of goods for sale, transaction costs are minimal, and so forth. However, many of these assumptions were introduced to ease the application of mathematics to the field of economics, rather than because they realistically reflect the characteristics of markets.[1]

In recent years, economics has made great headway in improving how we think about markets. Modern tools and insights from Behavioral Economics and Complexity Economics make it easier than ever to explain questions ranging from why people underinvest in retirement savings to how subtle environmental cues (unrelated to the price or value of the products) can influence consumers' choices about what to buy.[2]

But to see the true value of a suite of different policies, we need to remember that markets operate within the political system, which can hinder certain types of policy implementation. Thus, a number of market failures, political barriers, and other challenges help illustrate why so many existing policies can achieve cost savings, as well as why a broad spectrum of policies is the best approach for tacking climate change.

[1] Beinhocker, Eric. 2007. The Origin of Wealth. p 33.
[2] Thaler, Richard and Cass Sunstein. 2008. Nudge.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Transportation Demand Management
Residential Building Codes
Commercial Building Codes
Improved Device Labeling
Distributed PV Carve Out
Industrial Efficiency Standards
Industry Cogen and Waste Heat Recovery
Fuel Economy Standards for HDVs
Subsidy for Nuclear Power
Subsidy for Wind Power
Electrification of Passenger LDVs
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Improved Forest Management
Carbon Capture and Sequestration
Methane Destruction
Improved Livestock Management
Early Retirement of Natural Gas Plants
Tax on Coal
Increased Afforestation and Reforestation
Increased Building Retrofitting
Carbon Tax
Methane Capture
Commercial Building Component Electrification
Residential Building Component Electrification
Tax on Petroleum Fuels
1000 MMT CO2e

Split Incentives

Investment in energy efficiency in the buildings sector shows how the actor incentivized to save energy or reduce emissions by market policy is not always the same actor responsible for making investments to deliver those energy savings or emissions reductions. For example, renters are typically responsible for paying their own energy bills and landlords are responsible for installing more efficient windows, insulation, and heating systems. A policy increasing energy costs would simply cause renters to pay higher utility bills without incenting landlords to invest in efficiency upgrades. Landlords can't price efficiency upgrades into the rent because more efficient windows and heating systems are largely "invisible" improvements not particularly valued by potential renters (a type of information failure).[3] Tenants will instead make choices based on factors they can see and easily compare across different properties, such as the size, location, and amenities.

Short Payback Horizons / Inconsistent Discount Rates

Consumers often resist paying more money now for a higher payout later. For example, a consumer might refuse to buy a fuel-efficient appliance or vehicle unless they expect to recoup additional costs via fuel savings within a year or two, regardless of whether the investment has a high long-term value. The same consumer who keeps thousands of dollars in a bank account earning less than 2 percent interest annually might demand an effective return of 50 percent before they will invest $1,000 in more efficient equipment. Thus, consumers' behavior is inconsistent and can't be explained by assuming they simply have a high discount rate.

This effect can be described in terms of prospect theory, which highlights people's tendency to place psychological emphasis on highly certain outcomes, leading to "risk aversion in choices involving sure gains and risk seeking in choices involving sure losses."[4] There is a sure loss of money upfront by paying more for efficient equipment, whereas promised future energy savings is less assured, so individuals will demand unreasonably high levels of anticipated energy savings before paying more for efficient equipment.

Habituation to Pricing Levels

People consider things to be cheap or expensive based on price "anchors" in their minds, not on objective calculus.[5] Gasoline

[3] Golove, William and Joseph Eto. "Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency." Lawrence Berkeley National Laboratory. 1996. p 21. http://eande.lbl.gov/sites/all/files/lbnl-38059.pdf

[4] Kahneman, Daniel and Amos Tversky. "Prospect Theory: An Analysis of Decision Under Risk." Econometrica. 1979. http://www.princeton.edu/~kahneman/docs/Publications/prospect_theory.pdf

[5] Ariely, Dan. 2009. Predictably Irrational. p 23-48.

at $4 per gallon seems expensive because people remember gasoline at $1 per gallon. Today, gasoline seems cheap at $2.25 per gallon because people remember it at $4 per gallon (even though $2.25 would seem expensive to people used to gasoline at $1 per gallon).

Anchoring depresses long-term price-demand elasticities because, as people habituate to price changes (i.e. adjust their anchors), goods that used to seem unusually expensive or cheap will start seeming normal. Thus, a market policy that is currently effective at driving emissions reductions by influencing consumer behavior will gradually lose its ability to influence consumers.

R&D Payback Horizons and Investor Expectations

Due to investor demands and the need to deliver strong quarterly financial performances, companies often have trouble justifying investments in long-term, high-risk, high-payback R&D projects.[6] Instead, government offers R&D support to help bring a technology closer to commercialization, at which point the business case to go the rest of the way with R&D is stronger and might reasonably be undertaken by private firms.

Benefits Are Not Captured by the Investor

In many cases, investments return more than sufficient financial benefits to justify investment, but the investing actor cannot capture the benefits. Consider a firm investing in R&D when aspects of the resulting innovation cannot be patented, the patent is too narrow to prevent other firms from deriving benefit from their work, or another firm is able to copy the innovation without legal repercussions.

Sometimes benefits accrue to society as a whole rather than to the investor—called "positive externalities"; they are common for investments improving urban infrastructure. Whoever builds bike paths or upgrades a subway system does not capture these improvements' full value. Many of the benefits are diffuse, including reduced congestion on roadways, reduced fuel use by drivers, and improved public health.

Political Unwillingness to Price Negative Externalities

Market-based policies may tax goods with negative externalities (such as polluting the environment or harming public health), but politicians are often unwilling to assign a sufficient tax to incorporate the full external

[6] Rissman, Jeffrey and Maxine Savitz. Unleashing Private-Sector Energy Innovation: Insights from Interviews with 17 R&D Leaders. p 46. http://americanenergyinnovation.org/wp-content/uploads/2013/01/Unleashing-Private-RD-Jan2013.pdf

cost. For example, due to partisan political opposition, America hasn't enacted a carbon tax to align fossil fuel prices with their true social costs.

Coordination Failures (Leakage)

Many nations' states or provinces have power to set their own regulations, which may be weakened or made ineffective without coordinating similar regulations with nearby states or provinces. For example, individuals may avoid a tax on inefficient cars by crossing the border and buying one in an adjacent state, a concept known as leakage. Similar problems can happen at the national scale: Buyers might opt for a cheaper product imported from a country without externality pricing, and companies might move production to states or countries without externality pricing.

Imperfect Information

Many consumers are unaware of energy technology options, costs, and savings. They may not recognize that an upgrade could be a good investment, or that an improved version of a given technology is available. For example, low-emissivity films for windows can significantly improve insulation at lower cost than replacing the windows, but few consumers are aware of this technology.

High Transaction Costs

Sometimes the cost of new equipment or building components (in money or time) is a barrier to uptake. Even a consumer who understands the value proposition of replacing insulation or windows might hesitate to do so due to the hassle of vetting and hiring quality contractors and losing access to part or all of his home during construction. A large business might choose to focus on achieving efficiencies in large costs (such as employee salaries, rent, and supply chain). Even if an energy efficiency measure creates better returns as a percentage of the investment, savings may be smaller in absolute dollar terms, making the transaction cost appear too high.

People Tend to Overvalue What They Already Have

People tend to value things they possess more than similar items they do not already possess,[7] a barrier to upgrading to a more efficient product. For example, a consumer may be attached to the car she has driven for years and may be surprised at its low resale value. This attachment to preserving existing possessions becomes a barrier that must be outweighed by economic considerations or other factors (such as new features or style) before a consumer is willing to make an economically rational upgrade.

[7] Ariely, Dan. 2009. Predictably Irrational. p 127-138.

Other types of market failure exist as well. Although these failure modes are expressed as a list, in reality, they are manifestations of a larger truth: Markets are complex, non-equilibrium systems filled with irrational actors, political barriers, and other challenges to the success of market-based policies.

A comprehensive package of policies can overcome many of these barriers because each type of policy targets a market segment that is impervious to another policy. For example, fuel economy standards improve market laggards who only do the minimum required to comply with the law but fail to give market leaders incentive to innovate. A carbon tax can incentivize efficiency investments in sectors where the equipment owner also pays the energy bills. Clever policy designs, such as revenue-neutral feebates, may avoid political sensitivity associated with traditional "taxes" or "subsidies." Labeling and disclosure policies help overcome information barriers. Carefully-designed IP protections can provide an incentive for market leaders to innovate. And so forth.

Market-based policies can be powerful, effective in certain contexts, and extremely useful. But they are not a silver bullet. A holistic package of policies, taking advantage of the strengths of market and non-market mechanisms, can achieve better results at lower cost than market policies alone. ■