Pro-Profit, Pro-Planet

How Adam Smith can help us solve the climate crisis

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Introduction: toward a market-based approach to climate change

U.S. energy policy needs an electric shock. Last December's much-anticipated Copenhagen conference on climate change failed to produce a binding agreement to slash greenhouse gas emissions. And today, the Waxman-Markey bill that passed the U.S. House has been stalled in the Senate.

Underlying both of these setbacks is a nagging belief among Americans of all ideological stripes that curbing climate change will hurt the economy. Whether people believe climate change is real or the hoax of the century, everyone assumes that serious economic pain is part of the deal.

Sure, many political leaders have used terms like "green jobs" to frame environmental spending as inherently stimulative. But the sense remains that all paths to reduced greenhouse gas emissions will increase energy prices. In a time of recession, that doesn't bode well for the prospects of reform. Any workable, lasting solution to climate change must be simultaneously pro-profit and pro-planet.

Sound impossible? It isn't. Outside the parameters of the current Washington debate lie a slew of market-based solutions. These proposals, which would induce profitable reduction of greenhouse gas emissions, transcend the stale categories of left and right, pro-environment and pro-business. Their premise is simple: global warming is the defining challenge of our time—and if we're going to tackle it, we must find a way to grow the economy in the process.

No matter how dire our climate crisis is, the best of intentions won't solve the problem. As Adam Smith, the original free market economist, taught us back in the 18th century, "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest." Similarly, we cannot expect results from the benevolence of the utility, the independent power producer, or the manufacturer. We must adopt policies that harness self-interest to serve both the economy and the planet.

Unfortunately, a century of regulations and vested interests in the energy markets have violated Smith's vision. Perhaps most importantly, market distortions are hindering efficiency in the way we produce power, effectively forcing citizens to pay to warm the planet. These barriers make it virtually impossible to cope with the climate crisis. But with a little creativity, we could use Smith's 18th century wisdom to rescue our planet from a 21st century calamity.

How? This policy paper provides part of the answer. First, it traces a brief history of the energy industry, showing how a system created with the best of intentions has become calcified, destructive, and profoundly anti-competitive. It outlines the origins of these problems and explores why the electric grid's efficiency gains ground to a screeching halt in 1960.

As a case study, this paper looks at the restraints this system has imposed on energy recycling, an approach to power that's far more efficient than the typical power plant. Combined heat and power and waste heat recovery, two of the most common forms of energy recycling, achieve double the efficiency of today's conventional power generation. Deploying these approaches would lower energy costs *and* global warming pollution.

This paper ends by explaining nine steps Congress can take to harness the power of self-interest—of markets—to achieve real reform. Each part of the plan provides a resounding "yes" to four key questions:

1. Is it market-based?
2. Will it cut energy costs and improve the bottom line?
3. Will it substantially reduce greenhouse gas emissions?
4. Can it induce immediate results, without waiting for the development of new technologies?

With solutions that satisfy these criteria, there's no reason why energy reform can't happen this year.

The problem: governance failure

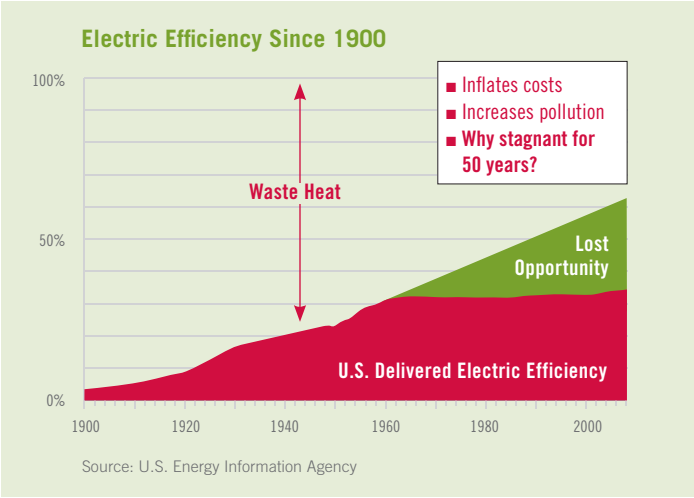
There's an old joke about an economist who goes for a walk with his 8-year-old son. The boy sees a $100 bill on the ground, shrieks with joy, and starts to pick it up. The economist stops him and says, "Son, that's not real money. If it were, someone would have taken it by now."

Likewise with U.S. energy policy. Decision-makers generally assume there's no way to mitigate global warming while simultaneously cutting energy prices. After all, if companies that generate power could somehow save money by being good to the planet, they would already be doing it, right?

Wrong. A century of governance compromises has saddled the U.S. with a highly inefficient national energy system. The typical U.S. power plant is about 33% efficient, venting most of its energy into the atmosphere in the form of waste heat. This abysmal efficiency rate has

barely budged in 50 years.

Despite millions of words spoken and written about the climate change crisis, few policy-makers have thought to ask the single most important question on this topic: **Why is our energy system stuck at Eisenhower-era efficiency levels?**



Electric efficiency has not increased for 50 years.

After all, there's more computing power in an average children's game than there was on Apollo 11 or even the space shuttle. Yet five decades, ten presidents, and a nearly sixfold increase in electricity consumption later, the U.S. electric industry continues to waste two-thirds of the energy it consumes.

The most discouraging answer would involve physical limits. Is there an Einstein-like "speed of light" limit making it impossible to convert more than 33% of a fuel's potential energy to electricity? Happily, no. Efficient plants in the U.S. and around the world achieve energy efficiencies more than twice the U.S. average.

Wherefore art thou efficient market?

Economic theory says that, under the right conditions, free market forces will optimize production. But those conditions make all the difference. To work, markets require a series of characteristics including accurate prices, many sellers and buyers, no barriers to entry or exit, rewards for improving productivity, and a level playing field. **The current governance of our energy system denies every one of these characteristics.**

Why such flawed governance? The reasons lie in a century of U.S. regulatory policy, as short-term fixes to yesterday's problems and compromises with vested interests became barriers to solving today's problems. In an effort to quickly electrify the American countryside in the early

20th century, governments created monopoly electric utilities. These utilities were insulated from competition and guaranteed profits based almost entirely on how much they spent on capital, with all power production costs simply passed along to consumers. Responding to these signals, utilities found themselves with every incentive to build large, capital-intensive plants and with no incentive to generate power efficiently.

Consequently, the vast majority of America's power comes from so-called "central generation" facilities. That means most power is generated remotely, far from the consumers of both electric and thermal energy.

At first blush, this remoteness might seem sensible: pollution is emitted farther from population centers, and we assume that building a few giant plants instead of numerous small ones creates economies of scale. But with modern technology, these benefits are illusory. The reality is that centralized power costs a lot to build, requires extensive transmission systems, wastes massive amounts of energy, and is the main source of our electric and thermal inefficiency.

Consider the average U.S. power plant: as mentioned, only a third of the input fossil fuel energy becomes electricity with nearly two-thirds vented as waste heat. In many places around the world, this heat is used to warm nearby buildings or serve some other productive purpose. But with remote power plants, that can't happen for a very simple reason: heat can't travel far before turning cold. Waste heat can't be used without homes, manufacturing facilities, universities or hospitals being nearby. For this reason, most of the energy generated by a remote power plant is simply thrown away. That's like milking a cow, keeping the cream, and dumping the milk.

Two-thirds of the fuel's energy is lost as waste heat.

And we wonder why energy prices and greenhouse emissions keep rising?

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Efficiency barriers: a regulatory Hydra

The rules blocking more efficient generation are manifold. Even if one or two rules were changed, several more would rear their heads to preserve the inefficient power grid. This regulatory Hydra imposes countless direct barriers to clean, cheap power.

In most states, for instance, no one but the local utility is allowed to run electric wires across a public street. If an independent clean power generator, or even a manufacturer with excess power, wishes to sell power to its neighbor, it must first contract with the local utility to move the electricity. Under the Public Utility Regulatory Policies Act of 1978 (PURPA), the utility can charge anything it considers "reasonable" to use the lines.

Unlike telecommunications firms that routinely lay hundreds of miles of their own cable, non-utility electricity companies are generally forbidden from doing so, even if they're willing to make the investment themselves. As a result, utilities get big profits for doing almost no work while the independent generator is forced to cut its prices to absorb the cost.

Moreover, roughly 15 states ban non-utilities from selling electricity directly to consumers. Instead, independent generators can sell power only to the electric grid. The rates for these sales are set by state regulatory commissions—boards that prioritize the preservation of financially healthy utilities and are not especially inclined to pay full value to independent generators of non-utility power.

Given these factors—along with needlessly expensive grid connection charges, requirements to pay utilities excessive fees for backup power, and dozens of other local barriers to efficiency—Adam Smith's vision of an efficient market lies in tatters when it comes to the U.S. electricity industry. The incentives are backwards, with predictable results.

The Clean Air Act: a source of efficiency paralysis for existing plants

One of the most troubling barriers to increased efficiency is an unintended consequence of the 1970 Clean Air Act. While the Act has been remarkably successful at reducing conventional emissions, it also sowed the seeds of our current efficiency predicament.

The 1970 rules gave existing generators (using yesterday's technology) grandfathered permits to keep polluting at the same levels indefinitely. This approach was built on the assumption that, like automobiles, power plants would wear out over time and require replacement. As old plants wore out, the Environmental Protection Agency (EPA) would only authorize replacement plants

that used the "best available [pollution] control technology," or BACT, to minimize pollution. Lawmakers thought time would heal all wounds.

It was a nice theory. Unfortunately, power plants don't wear out. Operators can and do replace failed part after failed part in perpetuity, just as long as the plant remains profitable. And since replacement plants are not permitted without extensive pollution controls—which are expensive both to install and to operate—the Act tilts the playing field in favor of existing plants using obsolete technology. The competitive landscape for new power plants is like an Olympic ski race where old, dirty plants get to ski down the hill while the new, clean ones must ski up the hill. Indeed, many of the 550,000 stationary pollution sources in the U.S. today have been operating since the Clean Air Act was adopted, bringing the age of the average coal plant from ten years in 1970 to 40 years today. In effect, the Clean Air Act has given old, inefficient power plants immortality.

Compounding the problem, the Act's New Source Review (NSR) standards treat any meaningful efficiency improvement as a "major modification." Such "modifications" effectively invalidate a plant's operating permit and trigger a requirement for plant owners to either add expensive pollution controls or cease operations. Consequently, plant owners generally choose to keep repairing yesterday's technology and make no efficiency improvements at all, thus freezing efficiency at antediluvian levels. And who can blame them?

To put this problem into perspective, an efficient power plant today emits only 1–2% of the conventional pollution released by old plants operating under grandfathered permits. Simply replacing an old central generation plant with new plants that make use of their waste energy could double efficiency, cut conventional pollution by 98% or more, and cut greenhouse pollution in half.

What would be needed, however, is a national commitment to energy efficiency. **After all, 67% of our nation's CO_2 emissions come from the generation of heat and power.** More efficiency in these areas would mean lower fossil fuel use, lower energy costs and less greenhouse pollution. The current confluence of climate change and high energy costs cries out for such an approach, which in turn demands systemic reform. It's time to end five decades of stagnant energy efficiency.

The opportunity: energy recycling as a case study

Despite myriad problems, there is hope. Big opportunities exist to profitably improve energy generation efficiency. Although these opportunities are abundant, consider just one as a case study: energy recycling.

Given how much energy conventional power plants throw away, the opportunity for energy recycling is substantial. Energy recycling includes capturing normally wasted energy and using it for a productive purpose. In particular, small power plants located near energy consumers can recycle their own waste heat to warm nearby buildings and supply process heat, displacing the need for these building's fossil-fuel burning boilers that emit more pollution. Why use two fires when one can do the job just fine? Meanwhile, transmission losses could be all but eliminated, since we would no longer need remote generators. Energy recycling results in a simultaneous and dramatic reduction in both pollution and energy costs.

This is precisely how Thomas Edison's first plant operated when it opened on Pearl Street in Manhattan in 1883. Seeking to maximize his profits, the great inventor marketed waste heat to nearby buildings and factories. As a result, the Pearl Street Station utilized more of its input energy than most power plants today. Sadly, the aforementioned regulatory scheme implemented in the early 20th century has rendered most producers incapable of utilizing as much of the input energy as Edison did.

The nitty-gritty of energy recycling

This decentralized way of producing energy usually centers on combined heat and power (CHP). Also known as cogeneration, this is an approach involving many of the same technologies and fuels as large electric-only plants. But instead of one remote central generating station, CHP plants are considerably smaller and located near manufacturing facilities, universities, commercial complexes and other large institutions. The by-product thermal energy that would otherwise be wasted is used to replace boilers that service the host facilities. This decentralized way of producing energy can yield efficiency rates of more than 80% — over twice the 33% efficiency of the U.S. electric system.

Industrial processes often vent tremendous amounts of heat that can be captured to generate clean power.

Another form of decentralized energy recycling is called waste energy recovery, or "bottoming cycle" cogeneration. This process captures and recycles the inherent waste energy from various manufacturing processes involving metals, glass, paper and pulp, chemicals, lime, cement, and gas compression. Waste energy recovery burns no added fossil fuel and emits no added pollution of any kind, including greenhouse gases. It is as pristine as solar and wind generation but typically operates 24/7 and next to electricity loads. Both kinds of energy recycling turn waste energy into electricity and useful heat, vastly improving efficiency.

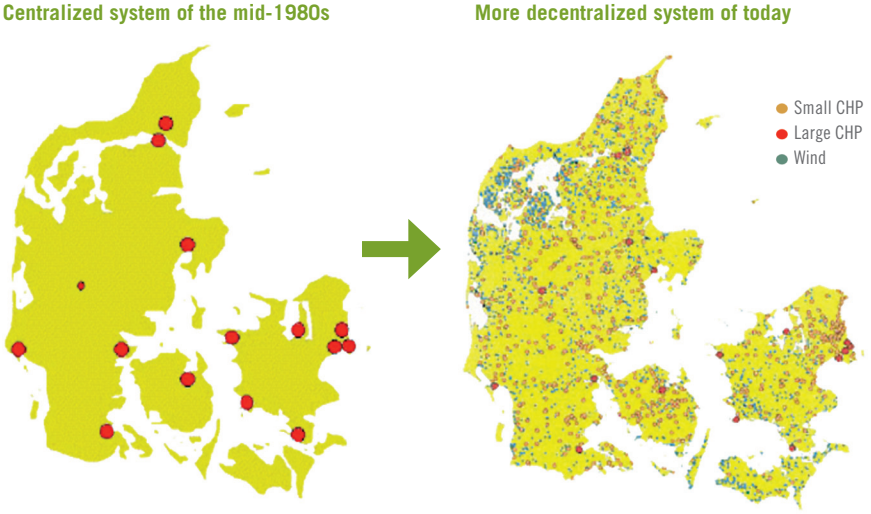
Proven potential

Recent studies done for the U.S. EPA and Department of Energy suggest energy recycling could provide almost 40% of our electric needs, or double the power generated in a typical year by the current nuclear fleet. About a third of that would be totally fuel-free power harnessed from waste energy. The rest would come from fossil fuel powered cogeneration plants operating at more than double the efficiency of the U.S. grid.

The gains from this so-called "gray power" would be dramatic. Greenhouse gas emissions would drop by an estimated 20% — as much as if every passenger vehicle and truck were taken off the road. Meanwhile, as generation efficiency rose, costs would fall, resulting in a bigger bang for the energy consumer's buck. One study estimates that the U.S. would save $80–100 billion a year.

If this truth sounds just a little too convenient, tell that to Denmark. The Danes obtain more than half of their power from CHP, making Denmark the most energy efficient country in the world. The U.S., by contrast, gets only about 8% of its electricity this way. As a result, Denmark needs 60% less energy to produce a dollar of GDP. **If the U.S. adopted Danish practices, we could transform our energy system from a gas-guzzling Hummer into a sleek, efficient hybrid.**

Make no mistake; remote generation used to have some logic. Old plants emit pollutants that cause harm to nearby people and property, making it sensible to have located those plants far from population centers. But today's reality is vastly different. New plants are not permitted unless they emit only 1–2% of the conventional pollution associated with pre-Clean Air Act plants. That means they're good neighbors. Although they do emit some greenhouse gases (at about half the rate of old plants), carbon dioxide, the most significant greenhouse gas, is a global pollutant with no direct regional impact. Recycling waste energy is key to reducing this pollutant.



Denmark made efficiency a national priority three decades ago. Since then, it has shifted from a few electric-only power plants to numerous CHP plants.

Of course, energy recycling is not the only way to improve efficiency. Even with the existing distorted energy market, a 2010 study from McKinsey identified 1.4 gigatons of profitable CO_2 savings potential per year. That amounts to 19% of U.S. emissions. According to McKinsey, these savings "could be achieved at negative marginal costs, meaning that investing in these options would generate positive economic returns over their life cycle."[1] Translation? Curbing climate change can fatten our wallets.

The question for policymakers, though, is how they can ensure that these environmental and economic gains are realized. How can they follow the wisdom of Adam Smith and harness self-interest to work for society's interest? That's where things really get interesting.

The solution: paging Adam Smith

Adam Smith might as well have been describing the U.S. energy market when he said, "This is one of those cases in which the imagination is baffled by the facts." The facts of the current system have stifled the imagination of energy entrepreneurs and policy makers for more than a century.

Conventional wisdom sees a binary choice: climate change solutions or a strong quality of life. If we don't all lower the heat and put on our sweaters, as Jimmy Carter advocated, the planet will suffer. But conventional wisdom is wrong. We can align environmental and economic interests. And that, ultimately, is our best hope for forging a clean energy future.

Climate policies that will sell

To gain political acceptance while meeting the existential challenge of climate change, U.S. policy prescriptions need to meet several criteria. They must:

- Be market-based.
- Cut energy costs.
- Slash global warming pollution.
- Be able to enact and then quickly achieve results.

Simply put, we must make efficiency the fuel of the future and do more with each unit of fuel. National policies that remove barriers and market distortions can lower energy costs, grow the economy, and be implemented at no net cost to taxpayers.

Policies to move America's energy system from a Hummer to a hybrid

What follows are nine big ideas for transforming American energy policy:

1. **Enact a "results standard" for pollution regulations.** Today's pollution measurements are based on "inputs"—the amount of pollution per unit of fuel burned. The current metric rewards inefficiency and penalizes efficiency: the more fuel you burn, the more pollution you are allowed to emit. Instead, we should measure emissions against "outputs," which reflect the amount of pollution for each unit of energy delivered. This approach would radically alter regulatory incentives to which energy producers respond.

2. **Stop guaranteeing returns on electric generation investments.** Utilities need only convince their regulators that a fifty-year investment in a new central plant is the "best" option, and are then able to attract low-cost capital based on guaranteed profits. Would-be competitors, with no guarantees, pay much higher prices for capital. This ignores the market wisdom of Adam Smith. If utilities' profits on new generation weren't guaranteed and inefficiency were costly, the market would work its magic and efficiency would increase. We must create a level playing field between utility and independent generators to ensure incentives for innovation and efficiency.

3. **Remove the "immortality rule" from the Clean Air Act.** The intent of the original legislation was to clean up the environment, not keep ancient, dirty plants alive in perpetuity. It's time to take the benefit of 40 years of experience to reform the system to serve its intended goals.

   - Reform the New Source Review rules to allow all major heat and power plants—about 550,000 in all—to improve efficiency without losing operating permits.
   - Phase out grandfathered allowances for old plants. Create an "upgrade or die" approach that equalizes treatment on all types of generation. Phase it in over five years.

4. **Establish a truly market-based cap-and-trade system for all criteria pollutants and CO_2.** Having government set the standards while markets determine the methods for achieving those standards will harness self-interest and ease the transition to a clean energy economy.

   - Give every major generator of electrical and of thermal energy an allowance to emit each pollutant per kWh of generation equal to the average emissions from all base year U.S. electricity or thermal production. Start with current levels.
   - Reduce the allowances per kWh each year to cap and cut total emissions of each pollutant.
   - Allow clean plants to sell excess allowances to dirty plants, precisely matching sticks and carrots, rewarding efficiency and keeping all pollution allowance money in the energy system.
   - With standards set, markets will choose the most productive and cost-effective method of reducing emissions, including CO_2.[2] The government would not pick the winners and losers.

5. **Adjust the federal tax code to induce utility efficiency improvements.** This approach boosts fossil fuel efficiency while avoiding complex states' rights questions over who can legitimately regulate electric utilities.

   - Using the "results standard" mentioned above, provide income tax credits per unit of electricity for all generators that reduce fossil fuel use per delivered kilowatt hour (kWh) and income tax surcharges to all generators that fail to reduce fossil fuel use per kWh.
   - Let every generator start at its current average efficiency so no generator is initially disadvantaged versus others.

6. **Tax hidden costs.** Dirty power producers emitting SOx, NOx, and particulate matter impose well-documented costs on society including adverse health effects, premature deaths, etc. For Adam Smith's principles to work, dirty energy producers must pay for these "externalities."

   - Tax every ton of criteria pollutant emission, from any source, at a price equal to the hidden cost calculated by the 2009 National Academy of Sciences. This pollution fee will level the environmental playing field between old and new generation.[3]
   - Harness individual self-interest to find the least costly ways to reduce criteria pollution.
   - Make these fees revenue-neutral through a blend of reduced income taxes on manufacturers and reduced Medicare taxes, since medical costs will drop.

7. **Ensure markets for clean energy.** Clean energy developers need to be able to sell their power. One approach is a portfolio standard that mandates the goal—reduced fossil fuel use per unit of heat and power—but not the specific types of clean power to achieve that goal. Another approach is a feed-in tariff that offers a price and long-term contract for clean electricity. The most market-oriented approach is a Clean Energy Standard Offer Program (CESOP) that would have distribution utilities offer long-term contracts to any clean energy plant that can generate and deliver electricity at a fossil efficiency at least 60% greater than the current U.S. average. For this plan:

   - Pay the clean energy plants 85% of the delivered cost of new central generation (meaning, central plants that meet EPA standards), giving the public a 15% savings.
   - Ensure the cost of power accounts for the transmission and distribution expenses and losses that plague central generation.

8. **Promote rapid deployment of district energy networks.** Incentivizing development of district energy networks, such as the one in Philadelphia that supplies heat to downtown buildings, will increase the potential to recycle waste heat. Rapid deployment of these systems has revolutionized Denmark's energy system and could do the same in the U.S.

9. **Minimize energy subsidies of all kinds.** Energy subsidies lower the apparent price of energy, encourage consumption, stifle efficiency, and prevent fair competition. Instead of favoring some energy options with subsidies, we should set a national goal of efficiency and reward *anyone* that can meet it.

Caveats: the "yes, but" questions

Is this all that needs to be done? No. Myriad other anachronistic rules block efficiency. Collectively, these policies force our citizens to pay to heat the planet. But the nine steps outlined above would be a great start toward unleashing the power of markets to protect the environment.

Will there be pain? Absolutely, and particularly for those that have become accustomed to profiting from environmental degradation by producing and delivering power in a dirty, expensive way. Just as buggy whip producers suffered when the automobile came along, energy producers that cling to the old ways will suffer as we bring our energy system up to date. But that's a good thing. It's how progress happens in America.

Will these solutions solve the climate crisis? Not by themselves. Ultimately, we need a fossil-free energy system and extensive deployment of renewable energy sources like wind, solar, biomass, and geothermal. But a market-driven, efficiency-based approach will provide the bridge to a clean energy future and give all clean power more of the value it creates. It's a bridge that will allow market power, not government mandates, to foster a rational, efficient energy system.

Indeed, with this approach, we can bring our nation back to its free market roots—forging commonsense solutions that are simultaneously pro-profit and pro-planet. And that's a goal everyone should embrace.

For further information: contact Dick Munson at Recycled Energy Development LLC, 640 Quail Ridge Drive, Westmont, Il 60559 or dmunson@recycled-energy.com.

(Endnotes)

[1] Creyts, J., Derkach, A., Nyquist, S., Ostrowski K., Stephenson, J. (2007) "Reducing US Greenhouse Gas Emissions: How Much at What Cost?" US Greenhouse Abatement Mapping Initiative, Executive Report, McKinsey & Company.

[2] See www.recycled-energy.com/_documents/articles/dm_elecjournal_output-based.pdf for details on output allowances.

[3] National Research Council, National Academies Press, (2010), "Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use," Washington DC.

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