An Energy Efficiency Trading System

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The United States consumes energy so lavishly that the cost is equivalent to nearly 10 percent of our GDP, reducing our competitiveness, constraining our foreign policy, and producing a fourth of the world's greenhouse gases. And because the U.S. economy is far more energy dependent than the economies of other advanced industrialized nations, American industry and families are far more vulnerable to natural catastrophes like hurricanes or political upheavals in oil- and gas-producing countries than industry and families in Europe and Japan. In the coming decade that vulnerability will only increase, as more and more of our energy supply will be concentrated in politically unstable regions. Reducing the economic and environmental risks of excessive energy use therefore must become one of America's most important national goals.

Nearly a century of government efforts to make energy abundant has led many Americans to see cheap energy as a virtual right, creating political rigor mortis with respect to energy policy. Higher energy taxes are unpopular, and manufacturers have fought the imposition of tighter energy standards for appliances and automobiles. So the government has abdicated responsibility for reining in energy use to "market forces." But low prices in the 1990s encouraged consumers to use more—not less—energy. Consequently, they are now spending more money on fuel without being able to cut back.

The government needs to make a fundamental change in the way it approaches energy policy—instead of simply trying to ensure supply, it needs to begin reducing demand by spurring a revolution in energy efficiency. Setting tough energy standards for America's biggest energy users, and making energy efficiency tradable—much the way we now trade oil and natural gas—would quickly reduce our total energy consumption while limiting carbon emissions, stimulating productivity, and creating jobs. Higher taxes on gasoline are political poison, but tougher energy standards have overwhelming support among both Democrats and Republicans—well above 70 percent. Adding a market mechanism to trade efficiency gains would make energy efficiency standards more palatable to industries that have resisted them in the past, at the same time raising economic growth and providing incentives for technological innovation.

Rethinking the Old Supply-Side Bargain

The American way of using energy is based on a grand bargain dating back to the 1930s, in which the government

focused on energy supply rather than demand. The goal of American policy was to secure new cheap supplies of energy by providing tax incentives and other forms of government support for producers and by pursuing "oil diplomacy" internationally. Using military power to protect shipping lanes and pipelines, and making special deals with key producers like Saudi Arabia, allowed the United States to promise cheap energy to the world, while offering energy markets to our trading partners. This approach virtually sanctioned waste, with the result that more than 40 percent of the energy the United States uses is lost as waste heat.

Efficiency is America's largest and most cost-effective potential energy resource.

Increasing competition for global oil and natural gas supplies, on the one hand, and declining U.S. reserves, on the other, mean that the old bargain is no longer effective insurance against either price spikes or the exercise of market power by the Organization of the Petroleum Exporting Countries (OPEC). Despite some gains in efficiency in the 1980s, the U.S. economy remains vulnerable to high oil prices. Any increase in gasoline prices acts as an almost instant regressive tax on American drivers, who rely on the automobile much more than their counterparts in other advanced industrialized economies. It also creates an increasing fiscal burden for the American economy, driving up America's international deficit. In the first two quarters of 2006, petroleum imports accounted for nearly a third of the U.S. trade deficit.

Despite higher prices, both oil and electricity demand continues to grow fast. Overall U.S. electrical demand is expected to grow by 19 percent by 2015, while new power generation will expand by only 6 percent. To manage the gap, utilities will have to consider reducing demand. Another barrier to meeting America's expanding need for energy is that the domestic infrastructure for delivering oil and electricity is old, and in some areas pipelines and grids are operating near capacity. Expanding them to carry more energy will be costly and time consuming. Some isolated sections of the electrical grid are actually facing supply shortfalls within the next two years. In these and other cases, reducing demand would solve the bottleneck more quickly than increasing supply.

Reducing energy demand is both cheaper and faster than is the alternative of securing new supplies by exploring new oil fields or building more power plants. Efficiency is America's largest and most cost-effective potential energy resource, and it has already provided three-quarters of our new energy needs since 1970. There is much more efficiency to be found. Conservative estimates suggest that buildings and vehicles could halve their energy use without radical changes in design and construction. Emerging technologies, like sensors and supercomputing, nanotechnology, computational fluid dynamics, and bioengineering hold the possibility of radically changing our relationship to energy and improving standards of living.

Promoting efficiency, however, has been an underutilized policy option. In fact, many current government policies do not reward conservation or, worse, encourage waste. The Internal Revenue Service, for example, creates a perverse incentive to waste energy by allowing commercial landlords to write off their energy costs every year. At the same time, it requires building costs to be depreciated on a 30-year schedule, effectively devaluing investments in energy efficiency. Removing such perverse incentives would help encourage greater efficiency but alone would not be enough to spur the efficiency gains we need. Without positive government incentives, it often does not make sense for individual purchasers to spend more on a more efficient car or building, either because they cannot afford the higher initial investment or because they are not sure they will see a return on their investment given the volatility of energy costs. For example, under most scenarios, it is unrealistic for the purchaser of a hybrid car to expect the fuel cost savings to exceed the higher purchase price. Thus, relying on the market alone does not often yield greater efficiency because it does not take into ac-

count the externalities of using energy—pollution, greenhouse gases, road wear by heavy vehicles, energy security costs, and tax breaks to the energy industry—which are borne by society as a whole, but not by the individual purchaser.

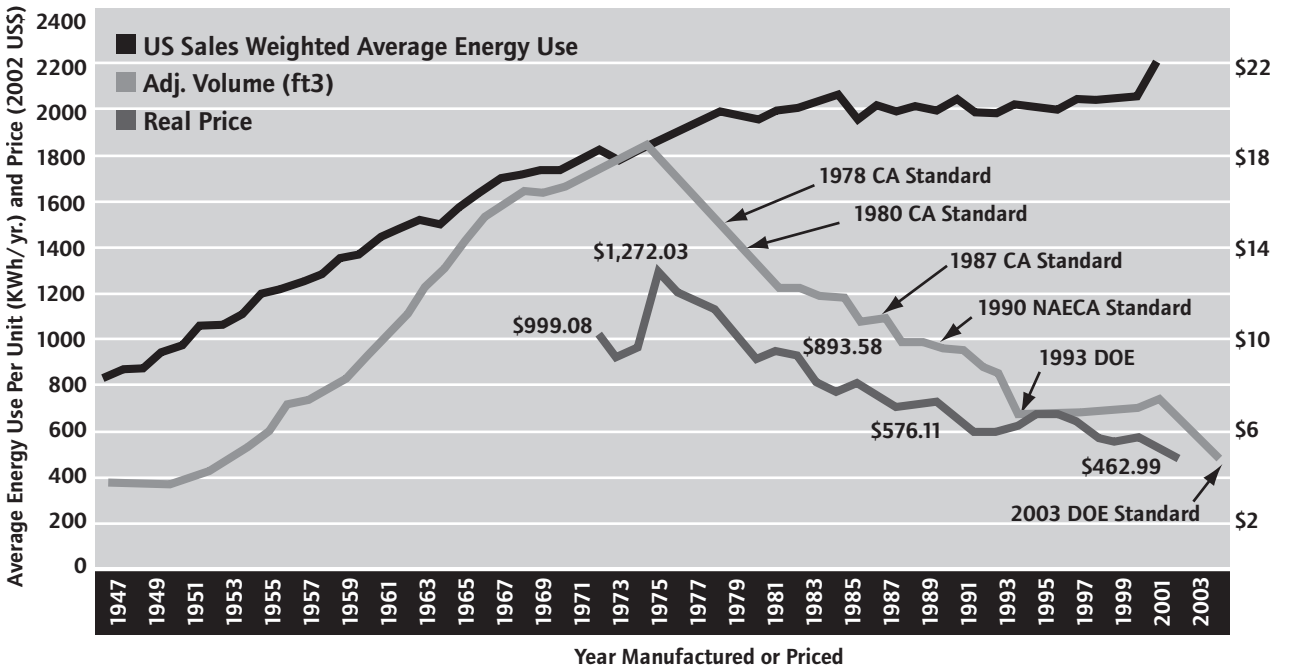
New research from the United States and Europe suggests that improved efficiency brings with it a multiplier value that far exceeds the fuel savings realized by the individual. To return to the metaphor of the hybrid car: its real value may lie not in the energy savings to the individual owner but in the jobs it creates, the technology it stimulates, and the reallocation of capital from energy to investment it encourages. Efficiency is a productivity-enhancing tool, raising the return on capital and increasing GDP output. Reducing energy demand has also lowered energy prices, notably oil prices during the mid-1980s; and forecasts suggest that small drops in U.S. electricity use could precipitate a dramatic fall in the price of natural gas.

One example of the benefits of energy standards can be found in California, which has been limiting electrical demand through efficiency for the past 30 years. Residents now use 30 percent less electricity per capita than the country as a whole and the state has avoided building many power plants. This prevents the emission of an estimated 18 million tons of carbon, while allowing every Californian to spend $400 per year on things other than energy. The state program has stimulated the rapid commercialization of such technologies as compact fluorescent light bulbs and energy-saving refrigerators and air conditioners. New refrigerators use just 25 percent as much energy as the old; even better, their prices have fallen by more than half. The benefits don't stop at California's borders: energy-saving appliances have proliferated everywhere from China to New York.

How to Trade Efficiency

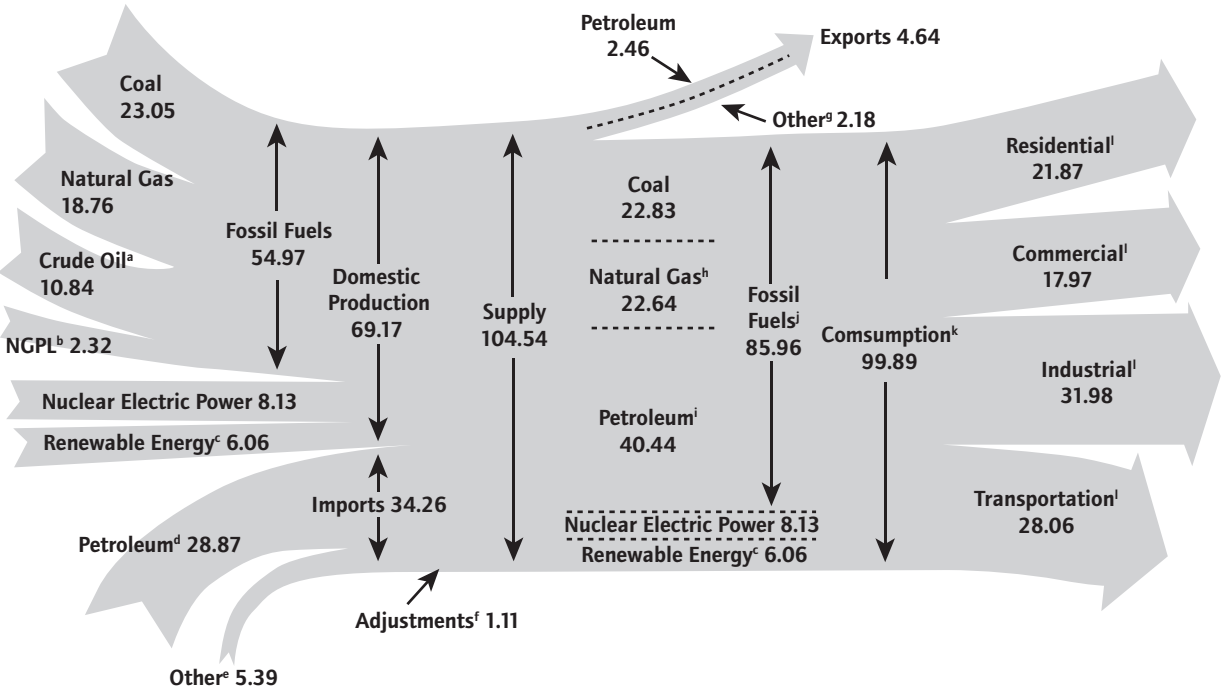
The United States needs to remodel its energy portfolio, abandoning incentives for wasted energy and putting in place a framework to support increasing energy efficiency. Like carbon cap-and-

U.S. REFRIGERATOR ENERGY USE VS. TIME WITH REAL PRICE



Source: David Goldstein, Natural Resources Defense Council.

ENERGY FLOW, 2005



a Includes lease condensate.

b Natural gas plant liquids.

c Conventional hydroelectric power, wood, waste, ethanol blended into motor gasoline, geothermal, solar, and wind.

d Crude oil and petroleum products. Includes imports into the Strategic Petroleum Reserve.

e Natural gas, coal, coal coke, and electricity.

f Stock changes, losses, gains, miscellaneous blending components, and unaccounted-for supply.

g Coal, natural gas, coal coke, and electricity.

h Includes supplemental gaseous fuels.

i Petroleum products, including natural gas plant liquids.

j Includes 0.04 quadrillion Btu of coal coke net imports.

k Includes, in quadrillion Btu, 0.34 ethanol blended into motor gasoline, which is accounted for in both fossil fuels and renewable energy but counted only once in total consumption; and 0.08 electricity net imports.

l Primary consumption, electricity retail sales, and electrical system energy losses, which are allocated to the end-use sectors in pro portion to each sector's share of total electricity retail sales.

Source: *Annual Energy Review 2005,* Energy Information Administration.

Notes: Data are preliminary. Values are derived from source data prior to rounding for publication. Totals may not equal sum of components due to independent rounding.

trade programs, the energy efficiency initiative proposed here would combine setting national limits on energy use with letting the market determine who pays. By instituting efficiency standards that increase over time, the government will be able to guarantee that the country's economy will become more efficient by at least 1–2 percent a year over the next decade and beyond. As with carbon cap-and-trade programs, businesses that exceed their efficiency targets can sell excess credits, while those that fail to meet them can buy credits from other producers or the government. This differs from the policies of the 1970s, when government "command-and-control" regulations essentially picked which products would succeed. The key is to internalize the true costs of energy inefficiency and allow the market to work out which users should produce or consume efficiency gains.

The place to begin implementing standards is with transportation and electricity—together these two sources account for 67 percent of the energy the United States uses. Both vehicle manufacturers and utilities are source producers, able to employ a variety of strategies to reduce energy demand while being relatively easy to identify and regulate. Once standards are in place and trading has begun, standards could be extended to other markets, such as industry and buildings, and trading could be allowed between categories.

Corporate Average Fuel Economy (CAFE) standards have allowed overall fleet efficiency to fall since the late 1980s because there are separate requirements for cars and for light trucks, and none at all for heavy trucks. More effective standards should be set to include all vehicles in the fleet so that the total amount of fuel used is reduced. Fleet efficiency is calculated by multiplying the amount of gasoline consumed by each model car over its lifetime by the number of units sold, so that the targets apply to all the vehicles a company makes. If Ford produces a pickup that gets, say, 22 miles per gallon (mpg), the company would need to buy credits to bring it up to the fleet target of 30 mpg. If, on the other hand, Ford also produces twice as many Escorts getting 40 mpg as pickups, it would be able to cover the "price" of credits for the pickups and still sell extra credits. Gradually, though, the cost of inefficiency would be integrated into the purchase price of the pickup truck, changing the market.

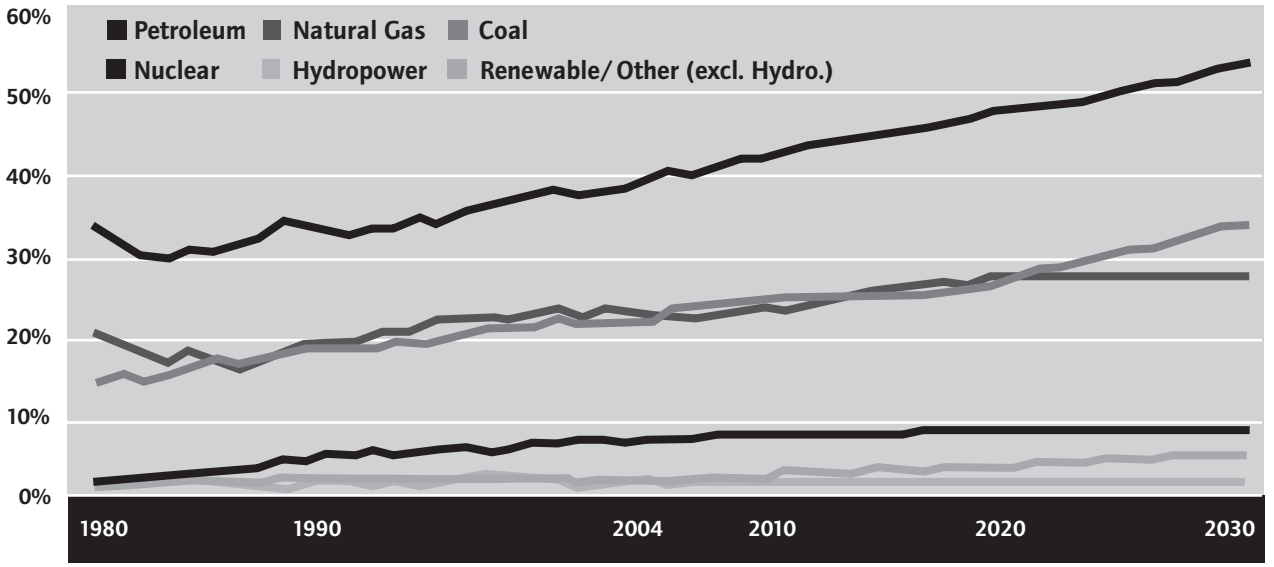
Targets for vehicles will need to be set for at least ten years in advance, requiring perhaps a one mpg improvement a year for the first five years, and a two mpg a year improvement for the second five years. The point of this system is that it is flexible but insures results. As the standards go into effect, and the valuation of efficiency credits begins, the government will be able to influence the price of efficiency credits by selling them, which will give the emerging market a safety valve and prevent prices from getting prohibitively high.

Phasing in tough energy standards for America's biggest energy users – and making energy efficiency tradable – would quickly reduce total energy consumption while limiting carbon emissions.

Vehicle makers will be able to use many strategies to meet the standards—from buying credits to changing marketing and sales practices, substituting more efficient components like air conditioners and tires, changing the way they finance and lease, as well as altering vehicle designs, materials, and power trains. A study by the Congressional Budget Office found that tradable credits would allow automakers to increase the fuel economy of cars and trucks by 3.8 miles per gallon for 17 percent less cost.

As targets for standards, utilities have proven to be powerful actors because they can use efficiency investments to avoid buying peak power and building power plants, both expensive undertakings. The ability to promote more efficient appliances, buildings, and transmission systems among their customers gives utilities extraordinary leverage over consumer markets. Utility standards could be phased in

U.S. ENERGY CONSUMPTION BY FUEL (1980–2030)



Source: U.S. Department of Energy, Energy Information Administration.

so that the first year might require half a percent of reduced demand a year; years two to four, 1 percent a year; years five to seven, 2 percent; and years eight to ten, 3 percent. In addition to reducing demand, utilities also have the ability make their generation facilities and transmission lines much more efficient, and if those goals are added to the program, the targets should be set accordingly.

Utilities that beat their targets can aggregate their savings into bundles of efficiency—usually a megawatt of demand—called *white tags*. European utilities have already begun trading white tags, and Connecticut and Pennsylvania are now preparing to do so. In the late 1990s, the energy service company Enron began experimenting with standardizing and trading efficiency. Now a Georgia-based company called Sterling Planet is launching a system for verifying and trading white tags.

Once these trading systems were in place, a number of related secondary trading systems would become possible. For example, consumers could reduce their energy use and aggregate the savings to sell to a utility much the way a producer of wind electricity might sell back power. A mortgage company like Fannie Mae, which already encourages homeowners to invest in energy efficiency, could start collecting those improvements into credits to sell, providing greater penetration of very high-efficiency buildings. An American city considering a massive neighborhood-by-neighborhood efficiency program to save as much as 20 percent of the region's power would be able to aggregate and sell credits.

While the vehicle and electrical credits would not be immediately interchangeable, it is reasonable to expect to see outside players aggregating credits here too. Cascade Sierra Solutions, an Oregon-based nonprofit, already has a program to help truckers install inexpensive kits to retrofit their long-haul trucks and save as much as 5,000 gallons of fuel a year. United Parcel Service has developed software that saves fuel by optimizing delivery routes, using information about package weights and GPS route setting. Other companies might decide to use their leverage over employees or suppliers to acquire credits. Wal-Mart, for example, might provide scheduled van pools for employees, and bundle and sell the commuter miles saved. (These companies would also save money by not providing employee parking spaces, and see benefits from on-time employees and reduced

road congestion.) Auto insurers might start offering low-cost insurance rewarding drivers who limit their miles, aggregating and selling the credits.

The Advantages of the Tradable Efficiency Option

Combining standards and tradable efficiency would have some clear advantages over the conventional Republican and Democratic policy approaches for reducing energy use and greenhouse gas emissions. Unlike voluntary measures, this approach would ensure results; but unlike taxes and the command-and-control strategies often associated with liberal Democrats, it would not constrain the economy or hurt economic growth. While traditional Democratic and Republican approaches to energy have led to policy gridlock, tradable efficiency offers a third way with wider and deeper benefits—and fewer drawbacks—than the commonly discussed alternatives.

Republican solutions to energy issues tend to encourage energy supply while leaving demand management to the market or voluntary initiatives. But without new incentives and penalties, neither industries nor consumers are likely to become more efficient. In 1998, utilities in Texas voluntarily saved a modest 300 million kilowatt hours of electricity. By 2003, under a utility efficiency standard signed by former Governor George W. Bush, they saved 5 billion kilowatt hours, greatly exceeding their targets. Although the efficiency programs were cost-effective, the utilities were reluctant to adopt a new business model without being pushed.

Market choices do not always favor efficiency, either because manufacturers have other priorities or because consumers lack information. Take cell phones, for example. Because consumers are focused on features, manufacturers save money by using inefficient chargers that draw 2–5 watts per hour, even when they are not charging. Highly efficient chargers use just half a watt, and cost slightly more, but who chooses a phone by the charger? Left to individual choice, consumers end up buying power vampires whether they want to or not. Imposing standards on the billion chargers (for phones, computers, and other appliances) used in the United States would save as much as $2 billion in electrical costs and eliminate a million tons of greenhouse gases, according to the Environmental Protection Agency. This kind of market failure is best fixed by a combination of standards and marketable efficiency because it discourages manufacturers from cutting corners on energy efficiency, while allowing the market to decide which combination of price and efficiency works best.

The ability to trade efficiency gains would make energy efficiency standards more palatable to industries that have resisted them in the past.

Many Democrats favor raising energy taxes to encourage consumers to conserve. But this idea does not make either political or economic sense. A regressive tax on fuel will hurt not only businesses but also poorer working families and rural drivers without access to public transportation while doing little to reduce the amount of gasoline middle-class consumers use. Although they complain vociferously about fuel prices, American drivers do not use significantly less gas when prices are high. And high fuel costs do not consistently inspire them to buy fuel-efficient cars. Even in Europe, where taxes make gasoline very expensive, governments have still found it necessary to institute voluntary fuel economy targets for automakers. A program that combined fuel economy standards and tradable efficiency would produce much better results because manufacturers would need to ensure that the fleet's fuel consumption falls, thus making fuel-efficient cars less expensive and fuel-inefficient ones more expensive. It might also lead to more transportation choices for many poor and rural families because governments would have more incentive to provide public transportation for these populations.

Limiting greenhouse gas emissions through a cap-and-trade system is another favorite liberal idea. But it is not a substitute for an efficiency trading system and in fact would work best if it were combined with one. One problem with carbon cap-and-trade proposals is that the initial value of carbon credits may be too low to change energy-use patterns. Thus they tend to encourage responses that put the emphasis on carbon mitigation rather than on energy reduction. This may encourage a different choice of energy—natural gas rather than coal—but not result in new technologies to reduce energy use in any significant way. When tradable efficiency is combined with cap and trade, however, companies would be able to leverage both efficiency credits and emissions credits to achieve their goals faster.

One of the clear benefits of a standards-and-efficiency trading system is that it will spur both technological innovation and the diffusion of that technology more rapidly than other policy alternatives. Already there is evidence that combining standards with tradable credits can speed up the commercialization of cutting-edge technology. A fuel-cell generator normally has a payback time of more than three years, which most companies consider to be too long to justify the investment. With tradable efficiency credits soon to be available in Connecticut, one large company found that the payback time for the fuel cell fell to just over two years, making it a much more feasible investment.

A standards-and-efficiency trading system has other advantages as well. For one thing, it is business friendly in that it gives businesses more ways to meet their targets, encouraging both experimentation and innovation. For another, it is market oriented in that it begins the process of reallocating the price of inefficient energy use to the purchase price of a product, thus changing buying patterns by use of the market. Thirdly, energy service companies, new industries, and even nonprofits like cities and states may begin to bundle efficiency, taking advantage of synergies between efficiency and other economic and social goals. And finally, when it is more thoroughly financialized and packaged as a credit, efficiency has the potential to become a powerful productivity-enhancing tool in the same vein as supply-chain management, just-in-time production, and financial instruments like derivatives. Just as the potential for new technology to save energy is unknown, the potential uses of tradable efficiency may be much greater than we can grasp now. Failing to encourage efficiency, by contrast, may have a high opportunity cost for U.S.-based manufacturers because the European Union, Japan, South Korea, and China all have committed themselves to aggressive energy standards.

An Opportunity for a New Grand Bargain

Energy is an intensely politicized subject in the United States. Steep gasoline prices have led to the defeat of at least one president, while California's electricity crises caused the recall of one governor. The high political stakes of another crisis and public anxiety about energy security make this a fertile time to make a new grand bargain. The standoff between liberals and conservatives on the topic of energy makes America vulnerable to a crisis of cripplingly high prices. In the longer term, energy prices will be volatile, and the costs of emitting carbon (whether explicit carbon credits or implicit rising temperatures) will become very high.

Tradable efficiency, coupled with high standards, is a grand bargain that combines the security of regulation with the creativity of the market. This plan not only reduces U.S. exposure to high energy costs, it offers considerable economic and environmental benefits. The objection to most demand-side energy proposals is that they could be "forced downsizing," but a market-based efficiency program will stimulate productivity. Tradable efficiency has the potential to remodel the American economy by harnessing emerging technologies and new tools for managing information and finances to tackle one of our most intractable problems.

James Schlesinger, former secretary of energy, once said that the United States has two modes regarding energy: complacency and panic. Adopting energy efficiency is a smart third mode, and it would steadily lead us toward greater economic and environmental security.❖