

TIME to ELECTRIFY

REDUCING OUR DEPENDENCE ON IMPORTED OIL—WHILE ADDRESSING THE THREAT OF CLIMATE CHANGE

by MICHAEL B. McELROY

THE RECENT SPIKE IN OIL PRICES, to more than \$100 per barrel—and the resulting, predictable outcry over the return of the \$4 gallon of gas—have prompted hurried responses from policymakers in Washington, eager to do something about constituents' economic fears. We have seen this movie before—from the 1973 OPEC oil embargo to the 2008 run-up in costs to nearly \$150 per barrel, before the world economy crashed and demand for petroleum-based fuels shrank. Throughout those nearly four decades of roller-coaster oil prices, the United States has accomplished relatively little in the way of more effective energy policy—and virtually nothing in terms of addressing the rising threat of climate change, which is tied to the emissions produced by burning fossil fuels. Perhaps now we can begin a debate that holds seri-

ous promise of making needed gains on both fronts: a more economically sensible energy policy that puts us on a much sounder footing to reduce greenhouse-gas emissions.

THE CLIMATE CHANGE CONTEXT

THE OBAMA ADMINISTRATION came into office with ambitious plans to deal with the challenge of climate change. The president proposed that the United States reduce annual emission of climate-altering greenhouse gases by 14 percent by 2020, and by 80 percent by 2050. The House of Representatives, then controlled by the Democratic party, took an even more aggressive stance: the comprehensive Waxman-Markey bill, which narrowly passed the House (219–212) in June 2009, would have required the nation to cut emission of greenhouse gases by 3 percent in 2012 relative to 2005, by 17 percent by 2020, by 42 percent by 2030, and by more than 80 percent by 2050. But the Senate failed to act on this initiative, and in the current political context, prospects for U.S. climate-change legislation are dim at best.

Earlier this year, the House, now under Republican control, in a largely party-line vote (244–179) went so far as to decree that the nation should suspend its support for the periodic international assessments of climate science conducted by the Intergovernmental Panel on Climate Change (IPCC). There is an irony to this development. IPCC was established under the UN Framework Convention on Climate Change (UNFCCC) negotiated in 1992 with active participation by President George H.W. Bush during the so-called Earth Summit in Rio de Janeiro. The resulting treaty was ratified by the U.S. Senate that Octo-

ber and was signed into law one day later by President Bush. Regrettably, climate change is now a partisan political issue.

THE ECONOMY AND THE ENVIRONMENT

RESPONDING TO PRESIDENT OBAMA'S State of the Union message this past January, Representative Michele Bachmann, speaking on behalf of Tea Party supporters, argued that "the president could stop the EPA [Environmental Protection Agency] from imposing a job-destroying cap-and-trade" market to deal with climate change; she was referring to the proposed system of tradable permits, originally embraced by Republicans, as a way to reduce greenhouse-gas emissions (which would most likely require legislation, not mere regulatory action). She went on to suggest "that the president could agree on an energy policy that increases American energy production and reduces our dependence on foreign oil."

Given that current oil prices threaten the recovery of the economy, this last point merits serious consideration. Why not take it on and address it with an integrated response? A thoughtful approach to reducing our dependence on imported oil could alleviate, at least to some extent, the threat of disruptive climate change. Properly implemented, it could also provide a stimulus for the millions of new jobs needed to get us out of our present economic malaise (an ancillary objective of the original Waxman-Markey bill).

Imports currently account for approximately 60 percent of U.S. oil consumption: we bought 4.2 billion (42-gallon) barrels of crude oil and petroleum products in 2009. At the recent \$100 a



Oil in, dollars out: tankers in the Houston Ship Channel

barrel, this implies an annual expenditure of \$420 billion. To put this in context, the total U.S. trade deficit amounted to \$498 billion in 2010. Oil prices hit a peak of \$147 a barrel as recently as July 2008. Few would argue that prices could not return to this or to even loftier levels in the future: the price of oil is dictated by international events largely beyond our control. Think what would happen if the current instability in the Middle East were to extend to Saudi Arabia. And we are not the only party in the market for oil. China's dependence on foreign oil is rising rapidly: with its economy booming, China has moved from self-sufficiency in 1995 to importing more than half of its petroleum and equivalents in 2009, as consumption nearly tripled during that period. Given this increasing demand, even higher prices are very likely.

THE SHORTCOMINGS OF ETHANOL AND ENERGY TAXES

APPROXIMATELY 70 PERCENT of oil consumed in the United States is used to power transportation. George W. Bush's administration set a goal of having up to 7.5 billion gallons of so-called renewable fuel deployed as an additive to gasoline by 2012. We have comfortably surpassed this objective already: more than 10 billion gallons of corn-based ethanol were blended with gasoline in 2010.

But we accomplished this milestone at significant cost. Refiners blending ethanol with gasoline benefit from a subsidy of 45

cents a gallon. Nearly 40 percent of the U.S. corn crop is now used to produce ethanol—with limited benefit in terms of reducing either oil consumption or greenhouse-gas emissions, but with significant impacts on the price of corn as a food (see “The Ethanol Illusion,” November–December 2006, page 33). We live in an interconnected world and there are persuasive arguments that the emphasis on growing corn as a feedstock for ethanol has at least contributed to the recent rise in global food prices. Why not abolish the corn-ethanol subsidy? This would not directly affect farmers, because the subsidy is paid to those who blend the ethanol with gasoline. That would save taxpayers nearly \$5 billion a year—and would have a minimal, or even positive, effect on the price of gasoline.

If we are to seriously reduce our dependence on imports, we need to cut back significantly on consumption of oil to fuel our cars, trucks, and buses. Oil-industry veteran T. Boone Pickens has proposed that we use compressed natural gas (CNG) as a substitute for oil-based fuels for large trucks and buses. And indeed, the United States has abundant sources of natural gas that can be extracted profitably with current technology from shale—enough perhaps to accommodate anticipated demand for a century or more—assuming that we can address the related environmental challenges, specifically the recent suggestion that production of gas from shale is associated with a sig-



Electricity from towering turbines: wind-energy farm in Ethridge, Montana

nificant release to the atmosphere of methane, a greenhouse gas that is even more consequential than carbon dioxide.

But proposed legislation to implement the plan would require a subsidy in excess of \$500 billion to convert eight million trucks and buses to CNG—not to mention the infrastructure required to service these vehicles (think of CNG service stations deployed along all major highways). CNG could conceivably play an important role on a local level, for city buses and taxis that could have convenient access to a limited number of central fueling stations. As proposed, though, the Pickens proposal is too expensive, and would tend to lock us into a pattern of continuing unsustainable emission of greenhouse gases from the transportation sector.

Alternatively, we could reinforce market pressure to change fossil-fuel consumption. *New York Times* columnist Thomas Friedman has suggested that \$4-a-gallon gasoline represents “a red line where people really start to change their behavior.” He proposed that “the smart thing for us to do right now is to impose a \$1-a-gallon gasoline tax, to be phased in at five cents a month beginning in 2012, with all of the money going to pay down the deficit.” I agree that gas prices are too low—the equivalent prices in some European countries are now close to \$10 per gallon—and in the best of all worlds his proposal makes eminent sense. Politically, though, it would appear to be dead on arrival. The predictable response was that such a tax would hurt the economy and that the cost would fall inequitably on those least equipped to deal with

it. As for a tax only on imported oil, at current prices, a levy of \$20 per barrel would raise more than \$80 billion annually for the Treasury and could accomplish much the same objective as Friedman’s tax on gasoline—but it may not be permissible under world trade regulations not to mention the fact that Canada, our largest supplier, might be expected to register a strong protest.

THE CASE FOR ELECTRIFICATION

CAN WE COME UP WITH A BETTER IDEA? In the long run, I believe we need a more efficient, lower-cost, more sustainable energy alternative to oil to reduce our dependence on expensive imports—one that would at the same time accommodate our essential requirements for an energy source for transportation. The internal combustion engine is intrinsically inefficient. Less than a quarter of the energy consumed is used to drive the vehicle: the balance is rejected as waste heat. A better option would be to use electricity to drive our cars and light trucks. In this case, more than 90 percent of the energy would be deployed usefully. What this means is that we could provide the driving potential of a gallon of gasoline by substituting as few as 8 kilowatt hours (kWh) of electricity. Given the current national average retail price of electricity of about 10 cents per kWh, the implication is that we could drive the equivalent of a gallon’s worth of gasoline for as little as 80 cents.

We would not need a technological revolution to convert the

THE BEST OPTION WOULD BE TO DRIVE OUR CARS AND LIGHT TRUCKS USING ELECTRICITY FROM A RENEWABLE RESOURCE SUCH AS WIND OR SOLAR POWER. UNDER FAVORABLE CIRCUMSTANCES, WIND IS ALREADY COST-COMPETITIVE WITH COAL.

bulk of our personal driving to electrically assisted propulsion. The Chevy Volt, for example, is capable of driving all-electrically for approximately 40 miles using power drawn from a conventional electric socket. If you wish to drive farther, the car switches to burning gasoline to generate the necessary electricity on board the vehicle. The U.S. average car or light truck is driven approximately 12,000 miles per year—about 33 miles per day. The conclusion: if your personal transportation needs were supplied by the Chevy Volt, the bulk of your driving could be fueled by cheap grid-supplied electricity. And the Volt is but one possibility for the electrically powered cars of the future. We may anticipate not only plug-in competitors but also pure electric vehicles as advances in battery technology allow for the extension of driving range for the latter.

Approximately 40 percent of electricity in the United States is produced using coal, with natural gas (23 percent), nuclear fission (20 percent) and hydropower (7 percent) accounting for most of the balance, and a small though rapidly growing contribution from wind. Driving your car using electricity generated from coal could reduce demand for imported oil, but would represent a step backward in terms of reducing emissions of greenhouse gases (coal accounts for 40 percent of U.S. emissions of the most important greenhouse gas, carbon dioxide, or CO₂). Using electricity generated by burning natural gas would make a modest contribution to the greenhouse-gas problem, while power generated using either nuclear or hydropower would of course be largely free of carbon emissions.

By far the best option would be to drive our cars and light trucks using electricity generated from a renewable resource such as wind or solar power. Wind accounted for 40 percent of all new electricity-generating capacity installed in the United States in 2009 (admittedly, a year when not much new capacity from other sources was added). Bloomberg News reports that even in the absence of subsidies, wind is already cost-competitive with coal as a source of new electricity (6.8 cents per kWh for the former as compared to 6.7 cents per kWh for the latter) under favorable circumstances (see “Saving Money, Oil, and the Climate,” March-April 2008, page 30).

Our country has abundant sources of wind, sufficient to supply our entire demand for energy for the foreseeable future. But there are two problems. First, the supply from wind is intrinsically variable: U.S. demand for electricity generally peaks during the day and in summer; supplies from wind are typically greatest at night and in winter. Second, the cheapest sources of wind are located in the middle of the country, far removed from the highest demand centers on the coasts.

There are solutions to both challenges. We could construct a network of high-voltage direct-current supply lines capable of efficiently connecting regions of high demand with regions of high potential supply—a twenty-first-century distribution network extending from coast to coast and from border to border. This would require, of course, a significant investment of

capital, perhaps as much as a trillion dollars. To put this number in context: the U.S. gross domestic product (GDP) in 2010 amounted to \$14.5 trillion; national retail sales of electricity totaled \$270 billion; and of course our current bill for oil imports has been running at the rate of \$400 billion. An investment in an updated transmission system could pay for itself with a modest surcharge on electricity delivered to the high-demand regions without imposing a significant burden on consumers in those regions (they might even save money in the aggregate). Customers in the high-demand regions already pay a significant premium for electricity relative to the 6.8 cents per kWh currently estimated to produce power from wind in the most favorable regions. Right-of-way for the proposed distribution system potentially could be allocated along the existing interstate highway and rail systems. Think of the jobs that could be created with such an initiative, not to mention the benefits that would accrue to landowners providing siting facilities for the proposed new wind farms.

Wholesale electricity prices vary significantly over the course of a day and over the course of a year, responding in real time to variations in demand. The efficiency of the electrical system could be markedly improved if the proposed fleet of electrically enabled cars could be charged at times when demand was otherwise low. Better still, a two-way connection between utilities and customers could allow cars to be charged when excess electricity was available, and to serve as a power source when electricity was otherwise in short supply. The batteries of the cars could provide a valuable means for storage of electricity. Utilities would be better able in this case to balance supply and demand, reducing the challenge of integrating a variable source of power such as wind or solar into the national distribution system, and minimizing the need to maintain expensive back-up facilities that are deployed only infrequently to meet temporary increases in demand.

The federal government has responded in the past to the need for investment in the infrastructure required to improve the nation’s security and to promote economic growth. Abraham Lincoln was responsible for the extension of the railroad system that opened up the West. The Eisenhower administration built the interstate highway system. The Department of Defense sponsored the research that led to the World Wide Web and the global positioning system. Each of these path-breaking initiatives was undertaken by a Republican administration. Now, with thoughtful public investment in our infrastructure, capitalizing on our significant national resources of renewable low-carbon energy, we can enhance our national security and reduce our adverse balance of trade, improve the quality of our environment, minimize the risks of future adverse climate change, and enhance conditions for renewed growth of our private-sector economy. □

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