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Oil Dependence: We Do Have a Choice

By Reid Detchon

Only six years ago, gasoline cost less than $1 a gallon. In early September of this year, in the devastating wake of Hurricane Katrina, the U.S. average topped $3 a gallon.

This rapid rise in gasoline prices has refocused the nation's attention on the economic and political dangers of oil—especially, on imported oil from the Middle East. Questions are being asked: What are the real costs of our dependence on oil—not just the economic and political costs, but the military and environmental costs as well? What are the economic implications of a new long-term floor on oil prices—not $20 a barrel (its inflation-adjusted average since World War II), but $40 or $60? And how high might prices go in the face of increasing demand from China and India or instability in the Persian Gulf? Many observers believe a serious disruption would push the price of oil above $100 a barrel and gasoline above $4 a gallon.

These questions have prompted policy makers to call once again for "energy independence," even as they acknowledge that little can be done to bring immediate relief to consumers.

But the situation isn't as bleak as it seems. In fact (and you wouldn't have known it from reading about the energy bill enacted this summer), Congress may have finally done something right about oil.

New Choices for Consumers

While it is true that the production and consumption of oil comprise vast global enterprises, change is possible, and markets can do wonders with the right signals. The energy bill, as critics appropriately noted, did little to stimulate additional domestic oil production (where the potential is small in any case) or improve fuel economy (where the potential is large, but the politics are tricky). But relatively little attention has been paid to what the energy bill did to advance a third option to reduce U.S. dependence on oil: giving consumers,

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Ethanol has been frequently ridiculed as a heavily subsidized, inefficient pork-barrel handout to corn farmers and the largest producer, Archer Daniels Midland. But a closer look at the facts tells a different story:

Ethanol is a high-octane transportation fuel—preferred by Henry Ford at the dawn of the auto industry and again today by Indy car drivers, who will switch to it in 2007. It can be used with very little adaptation by today's transportation infrastructure (unlike hydrogen, for example).

Also known as grain alcohol, ethanol is a familiar and benign product (except when imbibed to excess) that has been fermented from plants for thousands of years. At current corn prices, it can compete with a wholesale gasoline cost of $1.35 a gallon—70 cents below the market in mid-August (although that level may prove quite temporary).

Advances in the new field of industrial biotechnology have made it possible to make ethanol not just from the valuable kernel of the corn plant, but from cellulose, the fiber found abundantly in corn and all plants, even in yard clippings and waste paper. Such "cellulosic ethanol," as it is known, could be produced in very large quantities and would virtually eliminate the global warming impact of fuel use in transportation. (The reason is that plants need carbon dioxide to grow. Thus, the carbon dioxide emitted when ethanol is burned is part of the natural atmospheric cycle and adds no new greenhouse gases to the air.)

Oilseed plants, such as soy, palm, and rape (canola), can produce substitutes for diesel. Animal wastes can also be transformed to "biodiesel."

What would we pay for such fuels? About what we are paying today—and some years from now, maybe a good deal less.

These facts give rise to a novel feeling in energy circles: hope. We are not as a nation permanently shackled to oil—a fuel that has allowed us to transport our goods and ourselves efficiently and at low cost, but one that is increasingly derived from unstable, corrupt and hostile regions at inherently volatile prices, and whose use pollutes our air and damages our health and may wreck the climate on which so many lives and livelihoods depend. For the first time, we have a real choice about what fuel to use for transportation—a choice that won't bankrupt us.

The Energy Policy Act of 2005 set a first-ever minimum level for renewable fuel use nationally, rising to 7.5 billion gallons by 2012. It authorized loan guarantees and capital assistance for the construction of first-of-a-kind commercial biofuels facilities using advanced production technology. And it authorized a dramatic increase in spending on research and development to move the technology faster and farther forward. Altogether, Congress provided the authority to spend half a billion dollars a year on biofuels development (although it remains to be seen how much of that will actually be appropriated).

Challenges of Our Time

The Energy Future Coalition, a nonpartisan public policy initiative, has organized its efforts around three great challenges that arise from the way we produce and use energy:

Our dependence on oil puts our economic and national security at risk.

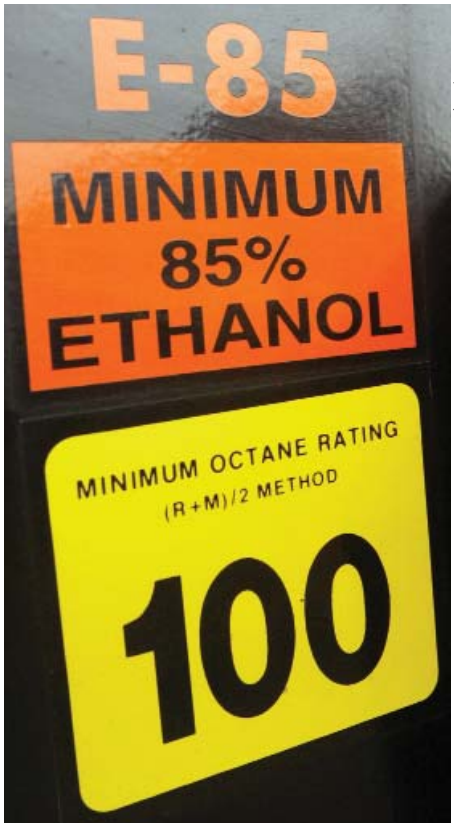
Our use of fossil fuels threatens the climate and causes significant environmental harm.

One third of the world's people lack the modern energy services they need to participate in the global economy.

The Coalition has placed particular emphasis on the efficient and sustainable use of biomass for energy because it addresses each of those three great challenges.

The close relationship between plants, or biomass, and oil is not as surprising as it first seems. Oil, after all, started out as plants (and dinosaurs and other organic matter) millions of years ago. They are both principally mixtures of hydrogen and carbon atoms—respectively, hydro-carbons and carbo-hydrates. And it is increasingly apparent that biomass can be "cracked" like oil to produce the whole range of petrochemical products that so pervade our lives today.

Biomass is everywhere. Plant matter and other organic material—in the form of agricultural crops, farm and forest wastes, and post-consumer trash—is an enormously underutilized natural resource that is endlessly renewable and, when properly managed, carbon-neutral. Essentially a form of stored solar energy, biomass has the theoretical potential to supply all of the world's transportation needs and more. Indeed, cellulose has been estimated to make up half of all the organic carbon on the planet.



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A sticker on a gas pump designates "E-85" fuel in Chicago, Illinois. E-85 fuel is 85% ethanol. Only "Flexible Fuel Vehichles" can burn the fuel but many of those that can are late model SUVs and light trucks. The fuel, which burns cleaner and has a higher octane rating than conventional gasoline, normally runs about 20 cents or more per gallon cheaper than regular.

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Gas prices nearing the 4 dollar mark are listed at a Mobil service station in Bourne, Massachusetts.

Ethanol: Fuel of the Future

Starch from corn and other grain crops has been the principal feedstock for ethanol production in the United States and will continue to be for some time. This pathway has been an essential first step toward developing an ethanol infrastructure, and the efficiencies of corn production and ethanol conversion continue to increase. But starch-based ethanol requires substantial fossil fuel inputs to grow grain and convert it to alcohol and thus has limited benefits in terms of oil displacement and greenhouse gas emissions, and the amount of land suitable for grain production is also finite.

The recent development by biotechnology companies of cheaper, more efficient enzymes has made it practical to break down cellulose into sugars that can be fermented into ethanol. This is opening up a vast new market for agricultural resources now considered wastes (such as wheat straw and corn stover), as well as perennial grasses. The crop most studied for this purpose in the United States is switchgrass, a native perennial prairie grass. The environmental benefits of cellulose conversion are quite dramatic. For example, a conventional engine operating on cellulosic ethanol produces fewer net global warming emissions than a fuel cell that uses hydrogen derived from natural gas.

The conversion of cellulose will increase the amount of ethanol that can be produced from grain and cane because more of the plant will be used. It also makes possible the use of non-food crops for industrial applications. Thermochemical processes have the potential to convert a still wider range of biomass feedstocks, including animal wastes and sewage, to clean renewable fuels—even gasoline.

This is not a scenario that will only take shape a half-century from now. A Canadian company, Iogen Corporation, is already producing ethanol from the cellulose in wheat straw, supported by a $50 million investment by Shell. A senior Shell official has predicted that "the global market for biofuels such as cellulose ethanol will grow to exceed $10 billion by 2012."

To put the current market in context, 3.4 billion gallons of ethanol were produced in the United States in 2004, almost entirely from corn. Studies by Battelle Memorial Institute and Oak Ridge National Laboratory have found that 50 billion gallons of cellulosic ethanol could be produced from available land without a significant disturbance to the agricultural economy. Due to the fact that ethanol has less energy content per gallon than gasoline, this is equivalent to about one quarter of current U.S. gasoline consumption of 140 billion gallons a year.

Ethanol is not only an excellent fuel for today's automobiles; unlike hydrogen or natural gas, it is largely compatible with the existing transportation infrastructure. Flexible-fuel vehicles—meaning cars capable of running on blends of up to 85 percent ethanol, or E-85—can be manufactured at almost no additional cost. More than 4 million of these cars are already on the road in the United States today. In Brazil, where domestically produced ethanol is 40 percent cheaper than gasoline, their market share now exceeds 50 percent. Combine flexible-fuel technology with a hybrid vehicle like the Toyota Prius, and it will go 250 miles on an E-85 blend and use just one gallon of gasoline. Add a larger battery and the capacity to recharge it from the grid, and that vehicle will go 500 miles for every gallon of gasoline it consumes.

In terms of tailpipe emissions, low-level ethanol blends have some adverse effects on smog formation and have therefore been of concern to environmental groups and regulators; however, high-level blends like E-85

have substantial air quality and public health benefits compared to gasoline.

Some critics have complained of a supposedly negative ethanol "energy balance." That is largely a red herring. The corn ethanol process uses both the renewable energy of the sun and non-renewable fossil fuels for cultivation, harvest, and processing of corn into ethanol. Some studies have argued that the amount of non-renewable energy put into making ethanol exceeds the amount of energy obtained from it. However, improvements in cultivation practices, corn yields, and ethanol processing have changed this picture. A recent definitive analysis concludes that the amount of energy in ethanol exceeds the fossil-fuel input by one-third.

Even more important to understand is that all energy conversion processes invariably have a "net energy" loss. Electricity, for example, has a terrible energy balance—it takes three units of coal to make one unit of electricity. But electricity is a much more useful form of energy than coal, so we are happy to make that trade. Ethanol is a way to convert solar energy, coal and natural gas into liquid transportation fuel. Very little petroleum is used in its production. From the point of view of energy security, it's a winner.

Expanding Economic Opportunities

In the United States, a new domestic fuels industry would be a major economic stimulus to the rural economy, creating many thousands of new jobs, increasing farm income by billions of dollars, and reducing the need for government support. It would also make a dent in our enormous trade deficit, one quarter of which is attributable to petroleum. As a country we import oil and export dollars—more than $450 million every day, a total of $166 billion last year. That's more than $500 a year for every man, woman, and child in America. Our traditional strength—agriculture—could be the answer.

In light of the recent WTO rulings against U.S. cotton subsidies and EU sugar subsidies, and the European Union's offer to abandon agricultural export subsidies, the structure of the agricultural support system as it has existed in the West is poised for change. Farmers in the United States and the EU are understandably concerned that their well-being is threatened. While the development of a new market for agricultural resources—for energy—cannot instantly resolve those fears, it does promise an important new source of income that can ease the inevitable transition that lies ahead. The use of agriculture for energy thus promises to become a major element in future farm bills. Indeed, farm leaders allied with the Energy Future Coalition have embraced an ambitious "25 by '25" vision for the future—that agriculture will provide 25 percent of the total energy consumed in the United States by 2025 while continuing to produce abundant, safe and affordable food and fiber.

Bio-energy also has vast potential for poor countries around the world. New projects are popping up from Poland to the Philippines to Peru. Rural areas in the developing world—especially, but not exclusively, the tropics—could become major energy producers, both for domestic use and for export. With the right technology and basic training, developing countries will be able to grow their own fuels, allowing them to redirect scarce foreign exchange earnings to more productive purposes—including critical social investments in health, education, and welfare.

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Brazil Blazing the Energy Path

Brazil has led the way on alternative fuels with the production of ethanol from sugar cane and biodiesel from soybeans and palm. Its ethanol program, launched 30 years ago in response to the 1973 oil embargo, initially suffered from the common defects of state-directed market interventions—inefficient mandates and subsidies, excessive costs and periods of both shortage and excess. However, the program today is unmistakably a success.

Brazil derives 40 percent of its transportation fuel—and a significant amount of its electricity—from sugar cane. Newly introduced flexible-fuel vehicles, which can operate on ethanol or gasoline interchangeably, now account for half of all new car sales. The reason is simple: Ethanol costs 40 percent less than gasoline at the pump. Even allowing for the lower energy content of ethanol—a difference that can be mitigated by operating the engine at higher compression ratios to take advantage of ethanol's higher octane—that's a bargain.

Brazil's experience is also instructive in thinking about the meaning of energy security and "energy independence." Achieving "independence" does not require 100 percent self-sufficiency, but rather a lack of dependence on any one fuel or any one region. Considering this issue more than 90 years ago, a young Winston Churchill told Parliament, "On no one quality, on no one process, on no one country, on no one route and on no one field must we be dependent. Safety and certainty in oil lie in variety, and variety alone." To that litany today we must add "on no one fuel."

Ending Our Oil Dependence

In a global economy, dependence on oil is a problem not just for the United States but for every oil-consuming country. Disruptions in the market will affect prices everywhere, whether the oil is pumped in Canada or Kazakhstan. Finding more oil is only a partial and temporary solution; developing sustainable alternatives to oil is a robust and long-lasting answer.

Developing those alternatives, however, may take a long time. Can anything be done in the near term to reduce the price of gasoline? Yes, if the political will is there. Automakers could be encouraged to produce flexible-fuel vehicles as standard equipment. Also, the United States could eliminate trade barriers to ethanol and biodiesel. This would stimulate investment in low-cost production throughout the hemisphere, even if domestic production is protected through incentives and preferences.

The "demand shock" that would follow such steps might well cause oil prices to fall below the point at which biofuels could compete economically. However, at that moment we could as a nation, for once, choose our future—between a domestic industry producing sustainable, carbon-neutral fuels, keeping U.S. dollars and jobs at home, or continued fealty to a small number of despotic and hostile oil-producing states that wish to take our money and do us harm. That choice, surely, we will get right.

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