Fueling the Future

Volatile oil prices and new technologies are helping the effort to diversify transportation fuels.

BY GLEN ANDERSEN

he oil shocks of the 1970s led to long gas lines, spiraling fuel costs, and an awareness that America's economic success is highly dependent on affordable oil. Forty years later, oil remains a volatile commodity, rattling the world economy with each price spike.

When fuel prices jump, higher costs ripple through the economy causing instability, and often recession. Experts forecast that ongoing tensions in the Middle East and rising global demand mean the days of cheap oil are likely over forever.

Transporting people and goods affordably is vital to the nation's economic health. But the country's exclusive reliance on a single transportation fuel resource runs counter to the advice of any prudent financial adviser: diversify!

New technologies are offering what some say are compelling reasons to develop a variety of transportation fuels, and many policymakers are encouraging this effort.

"Fuel diversity is a driving factor in this," says Representative Stacey Fitts (R) of Maine, who authored a bill to reduce the state's consumption of oil that passed last year. "The cost of moving people and goods in our region is overly dependent on oil."

Ninety-five percent of the country's transportation is powered by oil, leaving few alternatives when prices climb. In contrast, a wide variety of fuels are used to generate electricity and can be adjusted when costs fluctuate. This makes electricity prices relatively stable, compared with oil.

Nearly half of the oil used in the United States is imported, some from unstable regions where government-owned oil companies participate in collusion and market manipulation. Turmoil and political unrest in regions with the richest oil reserves drives price instability, posing a constant threat to the nation's energy security and requiring vast military investments in the Middle East.

Although these concerns have been acknowledged for decades, recent hikes in oil prices have given policymakers and manufacturers a new sense of urgency to diversify-and innovative industries the opportunity to help the nation do so.

> Although the federal government has often played the greatest role in transportation energy policy, the growth of technologies such as electric vehicles, alternative fuels and new natural gas extraction techniques provide state lawmakers greater opportunities to shape transportation energy policy in their states.

> Across the county, lawmakers are looking for ways to tap their own energy assets and protect their governments, citizens and businesses from the economic hardships created by volatile fuel prices.

> Their efforts have taken on a variety of approaches, from promoting oil exploration and drilling to creating incentives for alternative fuels and vehicles.

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The Price of Fuel Uniformity

The United States is responsible for about 9 percent of the world's oil production, but it consumes 20 percent of the oil produced globally. That's more than double the amount China, the second largest oil consumer, uses. Canada, Mexico and Saudi Arabia provide most of our imported oil.

The nation's oil imports have been declining however, thanks to an increase in domestic oil production, rising vehicle efficiency and biofuels.

Oil imports have been responsible for at least half the U.S. trade deficit since 2007, and contributed approximately \$300 billion to the trade deficit last year. This tremendous outflow of wealth does not get recycled back into the U.S. economy. To finance the trade imbalance, the nation borrows money or relies on investments from abroad, adding to external debt.

Businesses and consumers have few alternatives when oil



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prices inevitably spike as a result of political turmoil, natural disasters, or efforts by producing countries to restrict production. Volatility makes it difficult for businesses and industries to plan and budget, driving inefficient investments and creating an unpredictable operating environment. High oil prices also take money from consumer's pockets. The average American now spends nearly 5 percent of his disposable income on gasoline, up from just 2 percent in 2002.

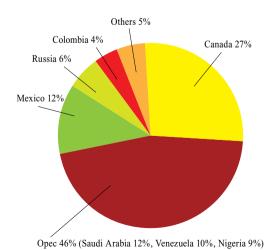
"The run up [in price] in mid-2008 and again more recently has shown that we need to work in a new direction with more urgency if we're to remain competitive in the world," says Fitts.

The growth in U.S. demand for oil is expected to continue, though at a much slower pace, as new cars and trucks become more efficient, while demand for oil in China and India—where just a fraction of the population now owns vehicles compared with the United States—grows rapidly. These countries are becoming the largest drivers of global demand and will keep pushing up oil prices.

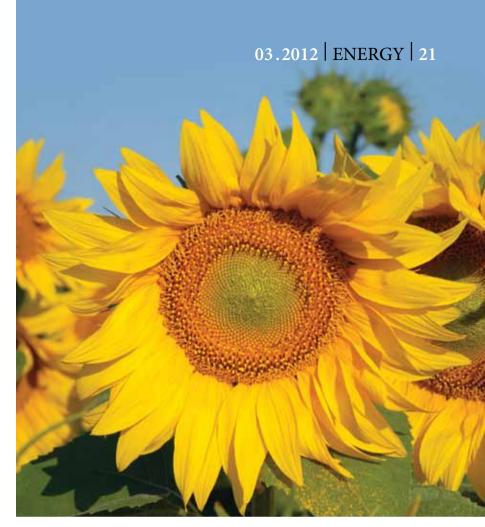
Higher oil prices and domestic policy are driving more oil production, which can provide benefits, such as reducing the money flowing into potentially unfriendly nations, increasing energy security, lowering trade deficits and promoting economic development.

Increasing domestic production does not necessarily lower oil prices, however. Local fuel costs depend heavily on global oil prices. Increasing our domestic oil supply has

U.S. Oil Imports 2011



Source: Energy Information Adminstration, 2011



a very small effect on oil prices globally, and what Americans' pay at the pump.

Rise of the Alternatives

Developing other home-grown energy resources—biofuels, natural gas and electricity—may help diversify transportation fuels and stabilize prices. Federal and state policy, higher across-the-board fuel prices, and new technology are helping to make these alternative fuels competitive, though many still need refinement.

Ethanol and biodiesel, so-called biofuels, are now the leading alternative fuels, providing about 5 percent of the nation's transportation energy. Natural gas, electricity and other alternatives power a small but growing number of the nation's vehicles. These alternatives share many things in common: they are domestically produced, provide economic development, energy security, diversification and price stability.

State and federal incentives have played the largest role in their development. In 2010, domestic production of ethanol reached approximately 13 billion gallons, the equivalent of 445 million barrels of crude oil. These incentives and advances in technology are expected to propel biofuels to more than 12 percent of the fuel mix within 25 years, according to the Energy Information Administration.

Since ethanol and biodiesel are derived mostly from food crops—soybeans, canola, sunflowers or corn—they



Representative Deborah Eddy (D) Washington

are not without controversy. Their cultivation requires heavy amounts of fertilizers and pesticides, which raises concerns about erosion and runoff, water consumption, and converting forest and grassland to farmland.

Many in government and industry are working to

address the food versus fuel conundrum. They are improving the technology so agricultural waste, wood waste, algae and grasses can be used to create what are called cellulosic biofuels. The technology for converting these materials into biofuel remains expensive, but a number of commercial plants will begin operating soon.

One of the strongest drivers of biofuels adoption has been federal and state requirements for their use. The federal renewable fuels standard requires production of 36 billion gallons of biofuels a year by 2022, with at least 16 billion coming from cellulosic ethanol. Since the

standard for conventional ethanol production is nearly met, most of the new production will have to come from cellulosic or advanced biofuels. The strong growth in the ethanol industry allowed the tax credit for conventional ethanol to expire at the end of last year, along with the tariff on imported ethanol.

Most states have biofuels incentives, including rebates, state fleet requirements, fuel production mandates and tax credits. Ten state legislatures have passed laws creating renewable fuel standards. Pennsylvania lawmakers enacted a requirement that all gasoline sold in the state must contain

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10 percent cellulosic ethanol after state production reaches 350 million gallons. Several laws require states to purchase alternative fuel vehicles. Washington, for example, in 2009, required that all state and local government agencies use 100 percent biofuels or electricity in all publicly owned

> vehicles by June, 2015. To phase in this requirement, all state agencies must achieve 40 percent biofuel or electricity use by June 1, 2013.

> "We have as goals stimulating the development of alternative fuels, reducing pollution and as an emergency management strategy," says Washington Representative Deborah Eddy (D), who worked on the bill.

> Protecting the economy is also high on the list, she says. "Energy security is a concern since we need for public agency fleets to be available without regard to supplies of somewhat volatile—in more

ways than one-fuels."



Tommy Williams (R) Texas

Natural Gas

Advances in drilling techniques are increasing the supply of domestically produced natural gas, a transportation fuel burns cleaner than gasoline or diesel. While there are few natural gas passenger vehicles in the U.S. market, natural gas buses and delivery trucks are becoming more common, and nearly 18 percent of transit buses run on the fuel. Fleet ow ners are increasing their use of natural gas since it costs about \$1.60 less than a gallon of gasoline and keeps the city air cleaner.

"Converting one waste truck from diesel to natural gas is the equivalent of removing as many as 325 cars from the road," says Texas Senator Tommy Williams (R), author a bill to promote conversion of vehicles to natural gas.

Range limitations, lack of refueling stations, and higher up-front costs present challenges. There also is concern about the environmental effects of hydraulic fracturing, as well as the release of methane, a potent greenhouse gas, during natural gas extraction.

Most states offer a variety of tax incentives, rebates and financing programs for infrastructure and vehicle purchases. Texas passed a bill last year that diverts money from the state emissions reduction program to help pay for vehicle conversions to natural gas. The state is also looking to create natural gas filling stations on highways connecting Austin, San Antonio, Dallas and Houston.

"In addition to reducing pollution, natural gas vehicles will generate more clean energy jobs, facilitate economic growth and move us closer to energy independence," Williams says.





Louisiana passed a bill in 2009 creating a 50 percent tax credit for the cost of converting a vehicle to run on alternative fuel or to construct alternative fueling stations. Oregon passed legislation last year providing grants and loans to retrofit school bus fleets to operate on natural gas or other alternatives.

Electric Vehicles

Electricity may play a large role in powering the vehicles of the future. It's domestically produced, relatively inexpensive and has a history of price stability. The electric grid has enough electric capacity available at night to fuel 73 percent of the nation's light-duty vehicles, according to the Federal Energy Regulatory Commission.

Although electric cars are pricier than their gasoline counterparts, they are far less expensive to fuel. At the national average price of residential electricity, an electric vehicle can travel approximately 30 miles on about 80 cents of electricity—a quarter of the cost of driving a similarly equipped, gasoline-powered car.

Electricity prices fluctuate far less than oil prices, so an increased reliance on electricity for transportation could help make costs more predictable and reduce the economic damage caused by oil price fluctuations.

For electric vehicles to catch on, more charging places at office buildings, shopping malls and other public places—are needed and driving ranges need to improve.

"The challenges with electric vehicles continues to be accessibility to recharging facilities and the high initial cost of these cars," says Eddy. "I do expect prices to plummet in future years, as battery technology continues to improve."

Much of the support for electric vehicles is driven by

the fact that they have no tailpipes and no emissions. Electric power plants, however, do have emissions, although less than the equivalent of gas-powered vehicles, even in regions where coal is used to produce electricity, based on statistics from the U.S. Environmental Protection Agency.

Manufacturing batteries, however, is energy intensive. In fact, building an electric vehicle creates more emissions than a building a gas-powered one. Over the electric vehicle's lifetime, however, it more than makes up the difference.

States also have created tax credits, infrastructure development programs, state fleet requirements and other incentives to drive the push for electric vehicles. State rebates or tax credits range from \$500 in Montana up to \$7.500 in West Virginia.

The federal \$7,500 tax credit for all fully electric vehicles currently being sold in the United States has also fueled sales. The tax credit expires for each manufacturer after they sell a minimum of 200,000 vehicles—and they have a long way to go before they reach this target.

Efficiency

One of the most obvious, and least expensive ways to limit dependency on oil is to use less of it. A number of technologies help make a gallon of fuel, or kilowatt of electricity, go further. Gasoline-electric hybrids, for example, can increase mileage by about 30 percent to 40 percent. Diesel powered engines, which are not especially popular for passenger cars, can get 30 percent better fuel economy than their gasoline powered counterparts. There are also technologies already being used by some large U.S. companies, such as Wal-Mart, that can double truck fleet efficiency.

States are on a path to continue and expand on their alternative fuel policies. As policies work to overcome infrastructure challenges and technologies evolves, it's likely that some states will finally see true diversification of their transportation energy resources.

"The challenge will be finding the money to keep this moving," says Fitts. "As with everything, attracting the capital and being in the good favor of the investment community requires some will on the part of policy makers as well—no one likes a shifting target."

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