Reducing America's Dependence on Foreign Oil Supplies

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The United States now imports nearly 60 percent of the oil that we consume. This dependence on foreign supplies makes us vulnerable to disruptions in world oil markets and to fluctuations in world oil prices. It is significant that a rise in the price of oil preceded each of the economic downturns of the past four decades.

Our dependence on imported oil has profound effects on U.S. foreign relations and on our defense policy. In the September 2002 National Security statement[1] the White House asserted the importance of increasing U.S. energy security and described a policy of doing so by expanding the geographic sources of energy supply.

Other policies being pursued by the U.S. government, like building up the size of the strategic petroleum reserve, focus on dampening the short-run price fluctuations that could result from temporary damage to foreign production. Yet others, like increasing automobile fuel efficiency and opening new domestic sources of oil production, deal with the long-term dependence of the U.S. on foreign oil.

My aim in these remarks is to consider how the extent to which the United States could in principle be able to reduce our economic vulnerability to changes in foreign oil supplies and how such a reduction in dependence might be brought about.

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[1]The White House, The National Security Strategy of the United States, September 2002

Reducing our vulnerability to changes in foreign oil supplies is not the same as reducing our imports of foreign oil. Nor is it the same as diversifying the geographic sources of that oil.[2] Even completely eliminating oil imports would not insulate American consumers and businesses from fluctuations in the global oil price as long as U.S. domestic producers of crude oil are free to export. A rise in the world oil price would induce an increase in U.S. oil exports until domestic and global prices were equal. Although the government could in principle prevent this by limiting oil exports as a matter of national security, we are unlikely to achieve the condition of oil self-sufficiency that would ever make such a policy relevant. As a practical matter, we are likely to require oil imports for the indefinite future.

But even if we cannot completely eliminate the need for oil imports, it is possible to reduce substantially the role of oil in the economy with the technology that now exists and even more so with the technology that will be operational during the next two or three decades. Reducing our consumption of oil would make the U.S. economy less sensitive to global oil prices and therefore to shocks in foreign global supplies. If oil plays a smaller role in the economy, changes in world oil prices would have less of an impact on the domestic price level and on domestic economic output. Reducing the sensitivity of the U.S. economy to foreign oil markets by decreasing oil consumption relative to GDP would also reduce the pressure to bend our foreign policy and our military actions to the geopolitics of oil supply.

Reducing the consumption of oil can also have favorable effects on the emission of carbon dioxide and other specific forms of air pollution. The extent to which it does so would depend on the nature of the alternative energy sources that replace gasoline and other petroleum products.

Some Basic Facts

A few basic facts will indicate both the potential and the limits for reducing oil imports. The United States consumed 20 million barrels of oil per day in the year 2000 of which nearly 60 percent was imported. The U.S. Department of

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[2]Encouraging the existence of several oil producers with excess capacity would however contribute to price stability by providing alternative sources of "swing capacity" that could respond to shortages elsewhere. Now Saudi Arabia is the primary swing producer. Russia might become another.

Energy estimates that by 2020 oil consumption will rise by 30 percent while domestic oil production will decline by 15 percent, raising the share of imports to nearly 75 percent of consumption.

Although the technology exists for sharply reducing and eventually eliminating the use of oil to fuel cars, a subject to which I will return in a few moments, that would not be enough to eliminate the need for oil imports. Oil consumption in automobiles and light trucks amounts to only 40 percent of the total consumption of petroleum products. Residential and commercial use of oil for heating is now down to only 6 percent of oil consumption and oil for electricity production is only 1.5 percent. Thus, converting these three uses of oil to some other source of energy would not be sufficient to eliminate oil imports.

Half of the remaining 50 percent of oil consumption is used by industry, primarily as an input into petrochemical products like plastics rather than as a source of energy. This use of oil would be very difficult to reduce. Moreover, existing technologies for reducing gasoline use by automobiles cannot be applied to airplanes, railroads and commercial trucks.

Nevertheless, cutting our oil imports in half would have a major favorable affect on the sensitivity of the U.S. economy to global oil conditions. To do that would require cutting gasoline consumption substantially, with the possibility of additional help from a further reduction in the use of oil for residential and commercial heating.

I will comment first on some of the new technologies that are or will be available to reduce gasoline consumption and will then discuss the incentives that could be used to bring changes about with or without new technology.

<u>New Technologies</u>

Three classes of technology that are now operational (even if not fully commercial) would permit dramatic reductions in gasoline consumption per passenger mile: non-petroleum carbon fuels (i.e., using natural gas or a mixture of ethanol and gasoline), hybrid electric vehicles that combine small gasoline engines

with electricity from batteries, and cars powered by hydrogen fuel cells.[3] I do not include pure electric cars on this list because the batteries must be charged from ordinary electric sources and their mileage range is very limited, something that could of course change if battery technology is substantially improved.

Non-petroleum carbon fuels

Shifting the stock of US cars from gasoline a compressed natural gas (CNG) technology would eliminate all of the petroleum used by automobiles. This is a feasible technology. There are more than 100,000 vehicles on U.S. roads powered by CNG. All three of the major U.S. auto firms sell cars that use CNG in full sized cars and vans. These include the Chevy Silverado, the Ford Crown Victoria, and the Daimler-Chrysler Ram Wagon.

Natural gas is not the only non-petroleum carbon fuel. All three major US car manufacturers also make full size cars and/or SUVs powered by engines that use a combination of 85 percent ethanol and 15 percent gasoline.[4] Shifting the stock of US cars to such an ethanol-gasoline mixed fuel would eliminate about 60 percent of the current use of oil for motor vehicle fuel. The overall net reduction in oil use would, however, depend on the extent to which oil was used as fuel for the fermentation and distillation of alcohol from corn or agricultural waste. The net reduction in oil use would be much greater if the ethanol is produced from agricultural waste, a feasible process but one that is not yet fully developed as a commercial technology.[5]

The Hybrid Car

The hybrid car uses a wholly different approach to reducing gasoline

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[3]Ford and Nissan also make pure electric vehicles. These have relatively limited ranges and have not been popular with customers, with fewer than 5000 private owners even after being on the market for at least five years.

[4]There are also more than 250,000 vehicles powered by propane. Since propane is derived as a by-product in refining oil and natural gas, it cannot be scaled up to a much larger share of the market.

[5]Compressed natural gas could also be used as a fuel in the production of ethanol but this may be a less efficient use of CNG than its direct use as a fuel in cars.

consumption. These cars, such as the Toyota Prius, are powered by a combination of electric batteries and a small internal combustion engine powered by gasoline. The batteries are charged in the operation of the car, particularly during braking. The Prius, which feels to the driver like any ordinary car, is rated as achieving 52 miles per gallon in cities and 45 MPG on the highway, nearly twice the average for all new cars that are now being sold. With a 12 gallon fuel capacity, it can go more than 500 miles on a tank of gas. It is a five passenger vehicle and weighs about 2800 pounds, similar to other popular Toyota models. The list price is $20,480, about 20 percent more than the list price of a comparable Toyota with a traditional gasoline engine. With normal driving, however, the lower fuel cost can offset the extra purchase price over the life of the car. Although the Prius is now the largest selling hybrid car, the other major auto makers in the U. S. will be bringing such cars to the market within one or two years.

Hydrogen Fuel

The auto technology of the future, according to many experts, is the fuel cell car that uses hydrogen to generate electricity to power the car. Unlike the hybrid car, no petroleum at all is used to power such a car. Electric energy is created when the hydrogen that is carried by the car is combined with oxygen from the air.[6] Ford, General Motors, Daimler-Chrysler and BMW are all developing such cars. Prototype models have been demonstrated to the public based on large SUV vehicles.

Hydrogen can now be extracted from natural gas, leaving carbon dioxide as a residual. In the longer run, the technology that is now being developed should be able to extract hydrogen from water by an electrolysis process. The electricity needed for this process could come from nuclear power or renewable sources like wind and hydro. Using the hydrogen for automobile fuel cells would then require establishing a network of hydrogen stations to supply hydrogen to cars on the

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[6]There are several variations on the basic theme of the hydrogen-powered car. Instead of fuel cells, the internal combustion engines in cars could be designed or converted to run on hydrogen instead of gasoline.

road just as gasoline stations now supply gasoline. Unlike current electric cars, the range of hydrogen powered cars would be as great as that of current gasoline cars.

The U.S. government is supporting research on fuel cell technology and the European Union has recently committed more than $2 billion for research on this technology over the next few years. Even so, widespread use of fuel cells is likely to be at least twenty years away and could be much further into the future. How quickly policies are adopted to move toward this oil-free technology will depend on how concerned governments are about the risks associated with oil dependence.

Creating the Incentives to Reduce Gasoline Consumption

Even without the adoption of any of the new fuel technologies it is possible to reduce oil consumption. Individuals can drive fewer miles by using public transportation more or by increased car pooling. Moderate speeds and better tires can also increase the miles per gallon of existing cars. New smaller or lighter or more energy efficient cars will also consume less fuel per mile.

Changing behavior requires changing incentives. One of the reasons for the high level of gasoline consumption per capita and per mile in the United States is that gasoline prices are relatively low by international standards and have declined substantially in real terms since the early 1980s. The real price of a gallon of gasoline is the same as it was in 1950 (when incomes and car fuel efficiency were both much lower than they are today) and less than half of the typical price in most European countries.

In order to reduce gasoline consumption, the U.S. government in 1978 imposed gas mileage standards for new cars and now levies fines on those auto manufacturers who do not meet the standard. In practice these Corporate Average Fuel Economy rules (known as CAFÉ standards) succeeded in raising gasoline mileage on the fleet of cars but also induced individuals who prefer larger and heavier vehicles to shift their purchases to sports utility vehicles and light trucks that are permitted to have lower gasoline efficiency. The net effect has been essentially no overall increase in the total miles per gallon of all vehicles.

Tightening CAFÉ standards would do nothing to encourage less driving or

more fuel efficient driving habits. Doing so would also discourage scrapping existing cars and shifting to new and more fuel efficient vehicles.

The same objections apply to the proposal for so-called cap-and-trade rules that would impose average fuel standards on car manufacturers but would allow individual manufacturers to "sell" extra fuel savings to other companies that choose not to produce enough fuel efficient vehicles.[7]

Raising the price of gasoline to European levels by increasing the gasoline tax by about $2 a gallon could achieve substantial reductions in gasoline demand through changes in driving styles and by encouraging the demand for new and more fuel efficient vehicles. But such an increase in the existing gasoline tax has been shown to be politically unacceptable to the American public and our representatives in Congress. Although economists may reason that the resulting extra tax revenue of more than $200 billion a year (about one-fifth of the total personal income tax revenue) could in principle be returned to the tax payers in the form of lower income taxes, voters rightly fear that much of the extra revenue would remain in Washington where, as in Europe, it would finance increased government spending on a wide range of activities.[8]

The same objection applies to the proposal for an oil company cap-and-trade policy that would limit the amount of gasoline that the petroleum companies as a whole could sell.[9] Each company would require a permit per gallon of gasoline that it sells. Regardless of whether they are given these permits by the government or required to buy them from the government, the permits would have a market value that would have to be reflected in the price that consumers pay for gasoline. Reducing overall gasoline demand by the same amount as a $2 a gallon

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[7]The net effect of such a cap-and-trade approach to CAFÉ rules would be to achieve the desired overall fuel efficiency in new cars without forcing each company to alter its product mix in inefficient ways. See Congressional Budget Office, Reducing Gasoline Consumption: Three Policy Options (2002).

[8]The existing 18 cent federal gasoline tax was originally earmarked for a trust fund to be used only for federal highways. That restriction has since been changed to allow spending on mass transit.

[9]The proposal is described in Congressional Budget Office, Reducing Gasoline Consumption: Three Policy Options (2002).

tax would make the permits worth $2 each and would therefore raise the price of gasoline by two dollars a gallon. Since selling the permits to the oil companies would also generate as much revenue as a $2 retail gasoline tax, this form of oil company cap-and-trade policy should be seen as nothing more than a way of thinly disguising an increase in the gasoline tax.

The alternative of giving the permits to the oil companies instead of selling them is also politically impossible; it would still raise the price to consumers by $2 a gallon and would generate a $200 billion a year windfall to the oil companies.

It is possible however to achieve all of the favorable incentive effects of an increased gasoline tax without any actual tax increase by using a system of tradeable personal "voucher points".[10] In such a system, the government would give each adult a number of voucher points, with the number of voucher points varying to reflect urban-rural geographic differences that are likely to affect driving miles. Individuals would be required to use one voucher point for each gallon of gasoline that he or she purchases. The total number of voucher points given to all individuals would be set equal to the maximum amount of gasoline that the government wants to have purchased in the year. Individuals who do not need their full quota of voucher points could sell them to individuals who need more than their quota of points. Thus individuals who economize on their use of gasoline would be directly rewarded.

The mechanics of this tradeable voucher system could be simplified by giving each individual a gasoline voucher debit card. When the individual purchases gasoline, he would pay the money price and would also debit his gasoline voucher card by one point per gallon. Gasoline pumps could be modified to read these cards just as they now read credit and debit cards for regular money payment. The pumps could also allow the individual to sell or buy voucher points for cash if he has excess points or inadequate points. A separate allocation of voucher points could be given to truck owners who would also be

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[10] The current discussion is a modified version of the idea presented in my "Oil Dependence and National Security: A Market-based System for Reducing U.S. Vulnerability." The National Interest, November 2001 (http://www.nber.org/feldstein/oil.html) and discussed also in my Vouchers Can Free U.S. From Foreign Oil," The Wall Street Journal, December 27th 2001 (http://www.nber.org/feldstein/wj122701.pdf)

required to “pay” voucher points as well as money to purchase gasoline.

The key feature of this system of tradeable personal voucher points is that each invidual would face a “combined price” for each gallon of gasoline (i.e., the sum of the cash price and the value of the voucher point that he must buy or can sell) that would be determined in the market in a way that limits total national gasoline consumption to the annual level determined by the government. No taxes would be collected and no money would go to Washington as part of this plan. Announcing a series of annual targets for decreasing future gasoline consumption would provide experts with a basis for predicting future costs of gasoline to consumers and would therefore provide a guide for planning future oil consumption strategies.

Strong incentives to reduce oil consumption now and to shift over time to a different technology that does not rely on oil would reduce U.S. economic vulnerability to changes in world oil conditions and in the world price of oil. Although we can never expect to achieve full independence from the conditions in global oil markets, any reductions in our use of oil will increase our national security and enhance our freedom of action in military planning and foreign policy.

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