BIPARTISAN POLICY CENTER

Energy Security: Goals, Metrics, and Accountability

BPC Energy Project

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A. Introduction

It hasn't been a good year for energy. The last twelve months have included one of the worst coal mine disasters in U.S. history, an unprecedented oil spill in the Gulf of Mexico, a deadly natural gas explosion in a California neighborhood, and a still-unfolding nuclear crisis in Japan. These have all been singular events, though they do add up to a stark reminder that none of our major energy sources is entirely safe, clean, or easily obtained. The more immediate energy worry for most Americans, though, is anything but singular. Sparked by unrest in North Africa and the Middle East, high oil prices are back after a short reprieve in 2009 and 2010. At well over $100 per barrel, there is concern about the repercussions for an economic recovery that was just beginning to gather strength.[1] And long-standing anxieties about our dependence on a far-off region that seems perennially unstable and conflict-prone have re-emerged. Against this backdrop, no one was surprised to see President Obama announce a reinvigorated national effort to reduce our dependence on foreign oil.

After all, we've been here before—most recently in 2008 and before that in 1973, 1980, 1990 and 2007. Then as now high oil prices and fears about oil supply adequacy prompted calls for reducing America's dependence on foreign oil. In fact, nearly every administration for the last 50 years has come up with a new energy plan. And still our nation's overall oil consumption—and with it the amount of oil we import—have continued to rise.

It's time to step back and ask why: Why do we keep having this problem and—perhaps more importantly—why do all of the things we say we're going to do about it never seem to prevent it from happening again?

A large part of the answer starts with two unavoidable facts: First, the United States is the world's largest oil consumer, but it controls only a few percent of global oil reserves. Second, efforts to diversify the fuel mix for our transportation sector have largely fallen short; unlike the power sector, transportation remains overwhelmingly dependent on a single energy source—petroleum. In this context, energy plans driven by a simplistic focus on reducing oil imports not only misunderstand the core problem, they are practically doomed to fail.

[1] Strumpf, Dan. "OIL FUTURES: Crude Hits $100 On Libya Violence, Supply Worries - WSJ.com." *Business News & Financial News - The Wall Street Journal - Wsj.com*. 23 Feb. 2011. Web. 08 Apr. 2011. <http://online.wsj.com/article/BT-CO-20110223-712438.html>.

We can do better, if only because energy security is a goal that unites citizens and political leaders of all parties and persuasions. This paper argues that the first step toward greater energy security starts with a more substantive understanding of where the sources of our current insecurity lie. In addition to long-term goals we must also develop metrics with which we can measure results and hold our programs and institutions accountable. Greater clarity around goals and metrics will also allow us to better coordinate federal energy programs which are currently scattered across a wide array of agencies with different institutional missions and priorities. If we're successful, America could still be importing oil twenty or thirty years from now, just as we do other commodities. But we can also be far more energy secure, far less economically vulnerable to oil price swings, and far less concerned that our energy future is being shaped by forces we can't control.

B. Understanding America's Energy Security Challenge

Few Americans would argue with the premise that we have an energy security problem. For a nation with abundant indigenous energy resources it's worth asking where this pervasive sense of insecurity comes from. That U.S. coal reserves are plentiful has been known for some time. But we've more recently learned that we can also access vastly more natural gas using modern extraction methods than was thought possible even a few years ago. At this point, domestic reserves of both coal and natural gas are thought adequate to support current rates of consumption for hundreds of years—any limits on their future use, it now seems clear, will flow from environmental and social considerations and not from any fundamental shortage of supply. The same could be said for nuclear power and renewable energy sources in the sense that the constraints they face have nothing to do with domestic resource scarcity. This leaves oil as the one conventional energy resource that Americans consume at a rate well above our domestic ability to produce.

So, what is it about oil? And why is the fact that we import roughly 60 percent of what we need in terms of this one energy resource widely viewed as such a problem?[2]

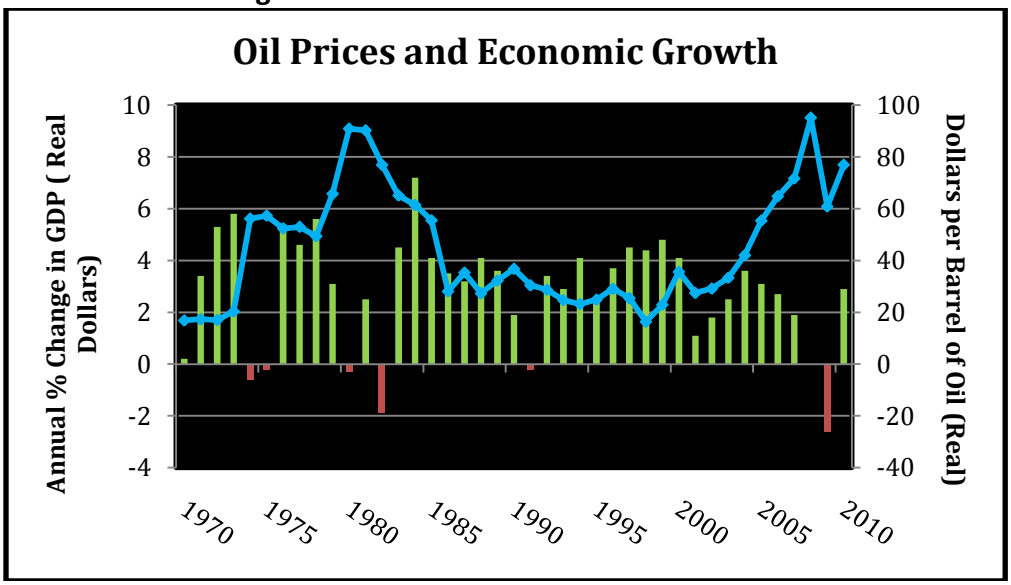
Three observations seem immediately pertinent to understanding why oil has been at the center of America's energy security concerns for nearly half a century.

First, oil plays a very large role in our energy portfolio and in the broader economy. In fact, no other single energy source accounts for a larger share of overall U.S. energy use and expenditures. Every day, as a nation, we consume roughly 19 million barrels of oil and spend well over half a trillion dollars for the privilege.[3] This makes our economy directly vulnerable to high oil prices. Historically, economic downturns or recessions (see Figure 1) have often followed oil price shocks.

[2] U.S. Department of Energy, Energy Information Administration, Annual Energy Outlook 2011, Early Release, Table 11.

[3] U.S. Department of Energy, Energy Information Administration, Annual Energy Report 2010, Table 5.11 Petroleum Products Supplied by Type, 1949-2009. < http://www.eia.doe.gov/aer/txt/ptb0511.html>; and "U.S. Energy Information Administration (EIA) - Annual Energy Review." Table 5.1 Petroleum Overview, 1949-2009. 19 Aug. 2010. Web. 10 Apr. 2011. <http://www.eia.doe.gov/aer/petro.html>.

Figure 1: Oil Prices and Economic Growth



Second, a vital sector of the U.S. economy—transportation—is overwhelmingly dependent on oil. With our transport systems 97 percent dependent on petroleum-based fuels, oil is literally the lifeblood of the U.S. economy.[4] Other sectors, like the power sector, have some ability to switch among fuels. This is true only to a very limited degree in the transport sector. Moreover, the average citizen is reminded of his or her dependence on gasoline—and his or her direct exposure to higher prices—on a near-daily basis.

Third, a large share of global oil supplies comes from regions or countries that are either (or both) unstable and conflict-prone, or in some cases actively hostile to the United States. This concern comes into focus whenever unrest in major supplier regions—most recently in North Africa and the Middle East—leads to higher prices or sparks fear of supply interruptions. Even when markets are calm, Americans are understandably concerned about the national security implications—not to mention the other undesirable trade and employment impacts—of transferring large financial sums in the form of oil revenues to foreign suppliers generally, and to undemocratic governments in particular.

Though obviously connected, each of these facets of our oil security problem is also distinct. Not all policy responses are equally effective for addressing all of them. Expanding domestic biofuels production, for example, helps with concerns two and three but does not reduce our economic exposure to oil price shocks because the price of alternative liquid fuels tends to track that of oil—when oil prices are high, biofuels prices will also be high. Policies to improve the energy efficiency of the transportation sector, by contrast, clearly help with concerns one and three but may or may not have much impact on transportation fuel diversity. Perhaps ironically, the solution that is almost always offered first and most fervently—expanding domestic oil production—is irrelevant for

[4] U.S. Department of Energy, Energy Information Administration, Monthly Energy Review, February 2011, Table 1.3. http://www.eia.gov/emeu/mer/pdf/mer.pdf

addressing the first and second concerns, and is only partly effective for addressing the third. To understand why this is so, it is important to understand a few basic facts about the world oil market and about our nation's ability to influence that market as both producer and consumer. These nuances are the subject of the next section. The overarching point here is that much of our failure to find effective solutions to America's energy security challenges stems from a failure of clarity—both about the policy ends we're after, and about the means available for achieving them.

C. U.S. Oil Dependence in a Context

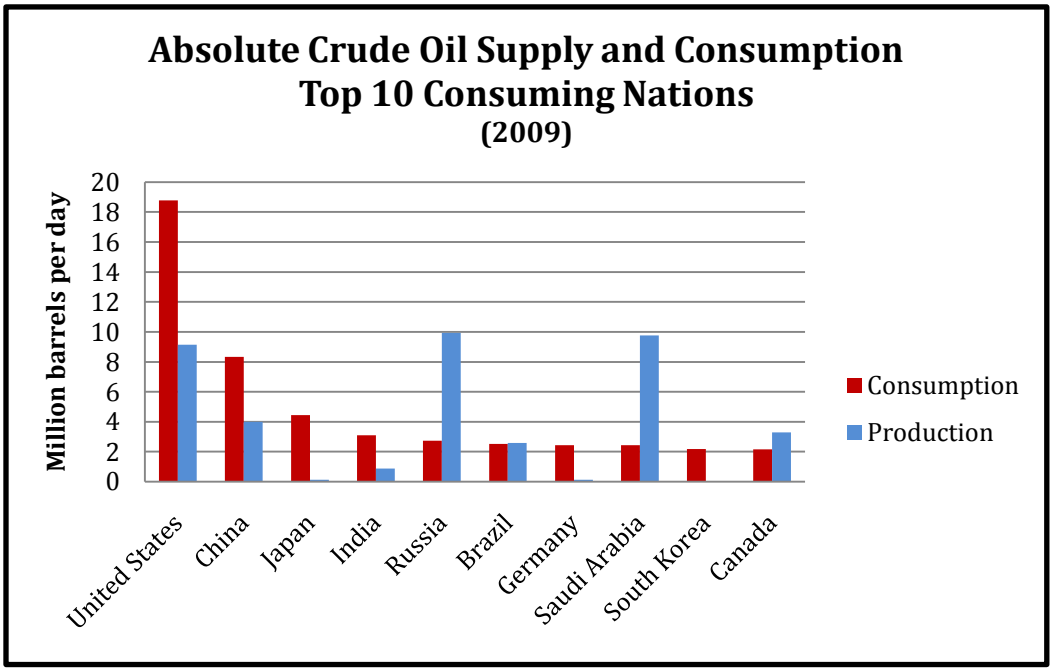
The previous section identified three distinct issues that are frequently conflated in the debate about how to improve America's energy security: (1) economic impacts of high oil prices, (2) lack of fuel diversity in the U.S. transportation sector, and (3) trade and national security implications. To understand how we might address these issues it's important to recognize the constraints and opportunities the United States faces as both a buyer and supplier of oil to the world market.

The first point to understand is that oil prices are set in a complex, integrated global market in which oil is traded as a fully fungible commodity among multiple suppliers and consumers. Within this framework, it is economically self-defeating for a given buyer of oil to seek to avoid purchases from a particular supplier, just as it is self-defeating in the long run for any supplier nation to seek to reserve domestic production for domestic consumption. A reduction in demand or an increase in supply anywhere, provided the change is sufficient in magnitude, will reduce prices for everyone. Conversely, an increase in demand or a reduction in supply will increase prices for everyone. If the United States expands domestic production, thereby adding to global supply, consumers everywhere in the world will benefit from slightly lower prices. But U.S. consumers will still pay the same price as everyone else.

A second fundamental point is that the United States has far more leverage over world oil markets as consumer than a producer. We are the world's largest consumer (in 2010, U.S. oil consumption was more than double that of China, the world's next largest consumer).[5] By contrast, we are only the third largest producer. Moreover, America's leverage as a producer seems destined to decline further in the future because we control only a small fraction—2 percent—of global oil reserves. This means that our long-term ability to influence the global supply–demand equilibrium rests largely on the demand side.

[5] U.S. Department of Energy, Energy Information Administration, International Energy Statistics, 2010. "Total Petroleum Consumption." http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=54&aid=2.

Figure 2: Global Oil Consumption and Supply



In the short run, however, the United States has very little ability to counter world oil price fluctuations. Only producers with enough swing capacity to quickly shift the global supply and demand balance (such as Saudi Arabia) are in a position to directly dampen price spikes (see Figure 2). America's capacity to respond with large demand shifts in the short run is also limited, given the transportation system's current dependence on petroleum fuels and the slow turnover of transportation technologies and infrastructure (the average car is driven for 15 years, the average train, ship, or airplane lasts far longer). High prices do provoke a response: as long as they persist, people drive less and tend to purchase more efficient cars. Occasionally, these periods have also prompted longer-term policy interventions, from fuel economy standards to subsidies for alternative fuels. But none of these reactions has been sufficiently far-reaching or sustained to bring about a fundamental transformation of our transportation systems.

The fact is that oil, with its high energy density, ready portability, and—until recently—relative affordability, is a difficult transportation fuel to replace. Episodic oil "crises" have tended to inspire passionate rhetoric, but they have never lasted long enough—here or anywhere else in the world—to inspire the kind of wholesale technological, institutional, and social commitment that would have been required to make a decisive break with this otherwise convenient and widely available fuel.

D. Goals and Metrics for Improving U.S. Energy Security

Past efforts to improve U.S. energy security have suffered from a failure to articulate clear goals and from a lack of quantitative metrics with which to measure progress. This section identifies a series

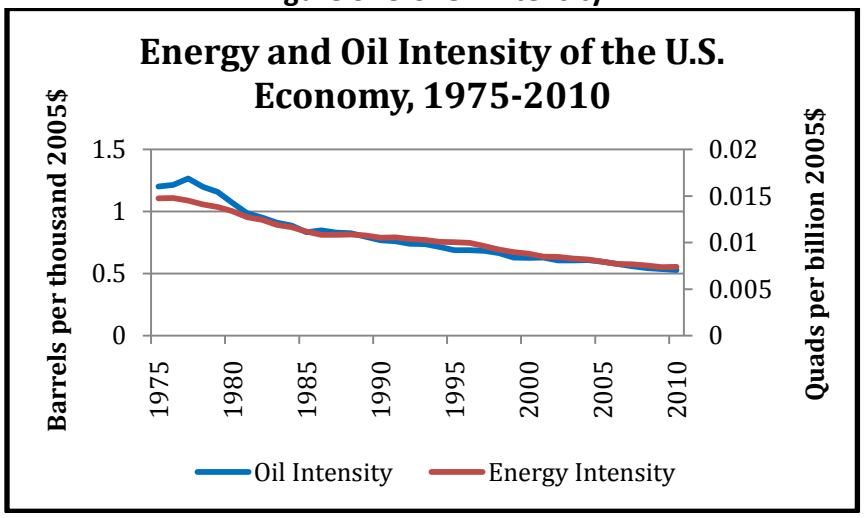
of goals aimed at addressing the different dimensions of oil security discussed previously. In each case we include a short discussion of policy options and identify one or more appropriate metrics.

Goal: Reduce the vulnerability of the U.S. economy to oil price shocks

Since there is little the United States can do to avert or mitigate oil price shocks in the short term, reducing our economy's overall dependence on oil offers the best opportunity to reduce our exposure to high oil prices in the future. The metric generally used to measure the oil intensity or oil dependence of our economy is consumption divided by the size of the economy as measured in economic output or GDP (e.g. barrels per $1000 GDP).

Fortunately, there has already been considerable progress on this front: intensity was more than 50 percent lower in 2010 than in 1980. Some of the explanation is structural: as the United States shifted from a manufacturing-based economy to a services- and information-based economy, energy consumption per dollar of GDP naturally declined. At the same time, there was a decisive shift away from oil in industries outside the transport sector that had once been major consumers, including the electric power industry. Technology improvements allowed for major efficiency gains throughout the economy, including in transport industries that were especially sensitive to fuel prices like commercial aviation and freight shipping. Finally, government policies introduced in the wake of the OPEC oil embargo of the 1970s and during subsequent oil crises slowed the rise of oil consumption by, among other things, mandating higher mileage standards for light-duty vehicles and, more recently, by promoting the expanded use of alternatives like biofuels.

Figure 3: U.S. Oil Intensity



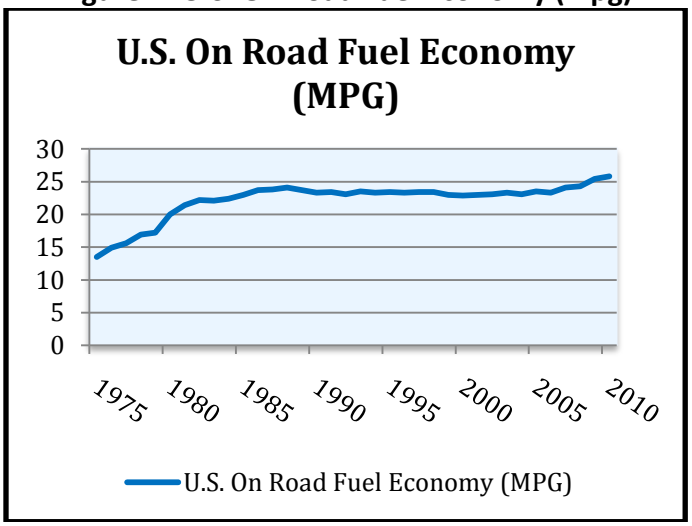
The question going forward is whether it will be possible to extend the downward-sloping line in Figure 3 while inducing, if possible, a steeper rate of decline. The Energy Information Administration projects that oil intensity will decline 2percent annually from 2010 through 2035 (Annual Energy Outlook 2011). If, for example, we could accelerate this decline to 3percent per year, actual oil consumption (not intensity) in 2035 would be nearly 10percent below last year's level. A decline of

2.6percent per year would be needed to keep oil consumption in 2035 at 2010 levels (from 1980 through 2010, oil intensity declined on average 2.3percent annually). Clearly these are ambitious goals, and additional analysis is needed to determine if they are feasible.

Our options for achieving this outcome—that is, for using less oil *without* sacrificing economic growth—generally fall into one of two categories: we can use oil more efficiently or we can find substitutes. Since the 1970s, various policy interventions of both types have been tried, with varying degrees of success. Vehicle fuel economy standards, in particular, produced substantial oil savings throughout the 1980s. After a long period of stagnation in the 1990s, new fuel economy legislation was passed in 2007: under this legislation, combined new car and light-truck fuel economy requirements will rise to a fleet average of 34 miles per gallon by 2016. No further increase in standards is currently mandated beyond 2016.

Because transportation oil demand is dominated by light-duty vehicle consumption, fleet average fuel economy is another relevant metric for assessing progress toward reducing our oil dependence more generally.

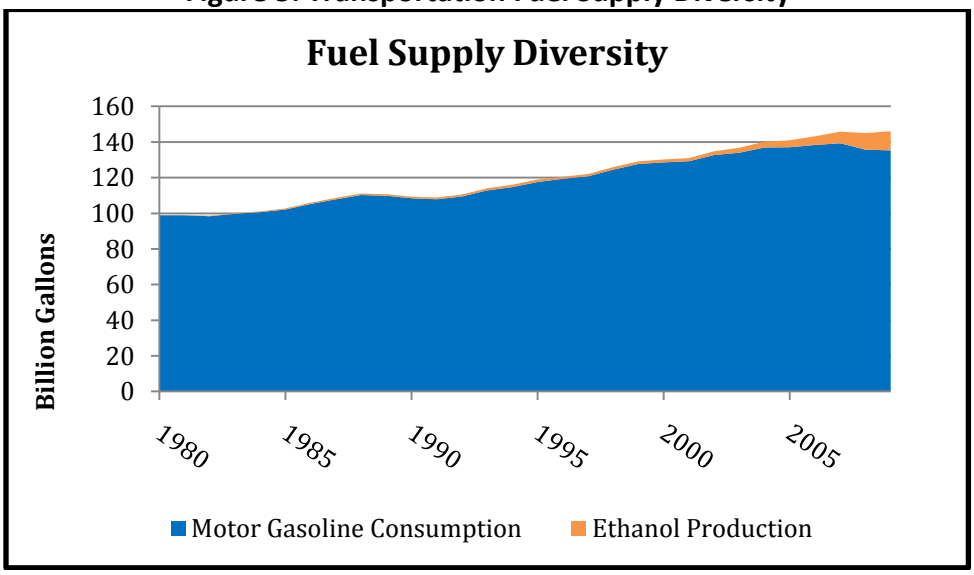
Figure 4: U.S. On Road Fuel Economy (mpg)



Goal: Increase transportation sector fuel diversity

Developing alternatives to petroleum directly addresses the problem of fuel diversity in the transportation sector. It also advances the goal of reducing overall oil intensity, although—for reasons noted earlier—the production of non-petroleum-based liquid fuels is unlikely to mitigate oil price swings unless and until these alternatives come to account for a much larger share of the market. A primary metric for tracking progress toward enhanced fuel diversity would be share of total transportation sector energy requirements supplied by petroleum versus other liquid fuels versus non-liquid fuels (such as electricity). Other potentially relevant metrics could include total biofuels production and fleet penetration of electric, hybrid-electric, and other alternative-fueled vehicles.

Figure 5: Transportation Fuel Supply Diversity



Past policy interventions to advance petroleum alternatives have had a mixed record of success. The synthetic fuels (synfuels) program of the 1970s is widely viewed as a failure. More recent efforts to commercialize biofuels and electric vehicle technologies, by contrast, have produced more promising results. Subsidies and regulatory requirements helped propel ethanol from less than 1 percent of total U.S. liquid fuel consumption in 2005 to more than 5 percent in 2010.[6] Recent progress on the development of all-electric and hybrid-electric vehicle technologies has likewise been encouraging, but it remains the case that alternatives to conventional, liquid-fueled internal combustion engine vehicles account for only a small share of the overall vehicle market.

Goal: Reduce the contribution of oil imports to the U.S. trade deficit

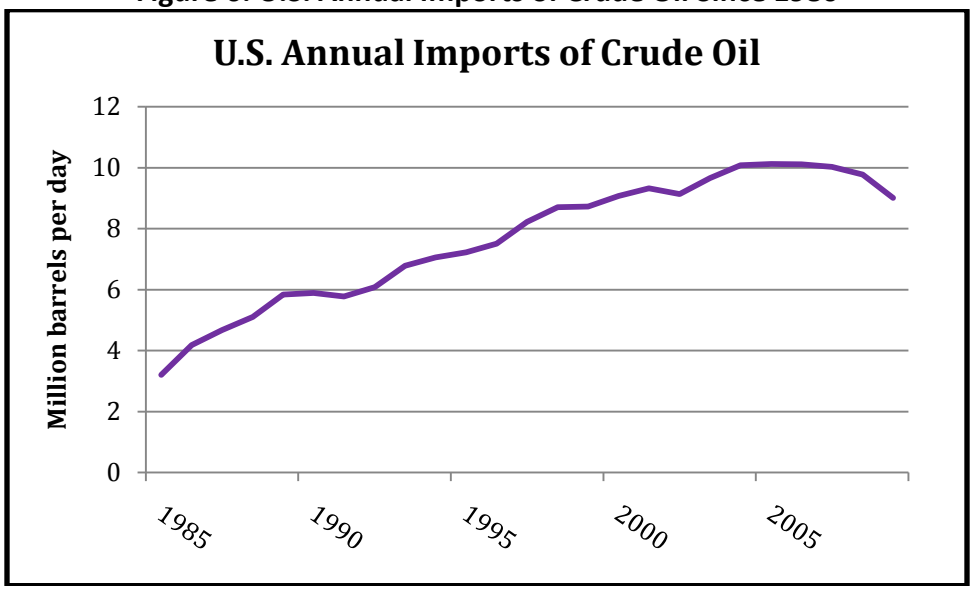
Petroleum imports are the largest single contributor to the U.S trade deficit. In 2010, the U.S. imported more than 9 million barrels of petroleum and petroleum products every day, valued in excess of $300 billion. In 2008, when petroleum prices reached a new peak, U.S. expenditures for oil imports—which averaged 11 million barrels per day that year—totaled nearly $400 billion.[7] Reducing

[6] U.S. Department of Energy, Energy Information Administration, Annual Energy Report, Table 2.8 Motor Vehicle Mileage, Fuel Consumption, and Fuel Economy, 1949-2008. http://www.eia.doe.gov/aer/txt/ptb0208.html.

[7] U.S. Department of Energy, Energy Information Administration, Annual Energy Report 2010, Table 5.11 Petroleum Products Supplied by Type, 1949-2009. < http://www.eia.doe.gov/aer/txt/ptb0511.html>; and "U.S. Energy Information Administration (EIA) - Annual Energy Review." Table 5.1 Petroleum Overview, 1949-2009. 19 Aug. 2010. Web. 10 Apr. 2011. <http://www.eia.doe.gov/aer/petro.html>.

these expenditures would improve the nation's balance of trade and keep resources in the United States for reinvestment and job creation in the domestic economy. Policy options for achieving this goal include those already discussed—i.e., reducing overall oil consumption and promoting alternatives, such as biofuels and electricity, that can be domestically produced using indigenous resources—and expanding U.S.-based oil production. Assuming environmental and other concerns are appropriately addressed, expanded domestic production would provide additional benefits in terms of stimulating local and regional economies, generating jobs, and increasing the amount of production capacity under direct U.S. control in the event of a severe global crisis or major worldwide supply disruptions.

Figure 6: U.S. Annual Imports of Crude Oil Since 1980



Goal: Support an increase in the number and geographic diversity of oil suppliers world-wide as a way to increase global spare production capacity and promote greater competitiveness and stability in world oil markets

The fact that current world production is dominated by a few, mostly OPEC supplier nations gives rise to a number of concerns. One is that it allows for the exercise of monopoly power and results in oil prices above the levels that would prevail in a truly competitive market. Economists point out that this leads to a direct loss of potential GDP in nations that rely on oil as an input to production. It also has the effect of transferring a large amount of wealth from oil consumers to oil suppliers—in this case from American households and businesses to oil companies and foreign governments, including some that may be undemocratic or even actively hostile to U.S. interests.

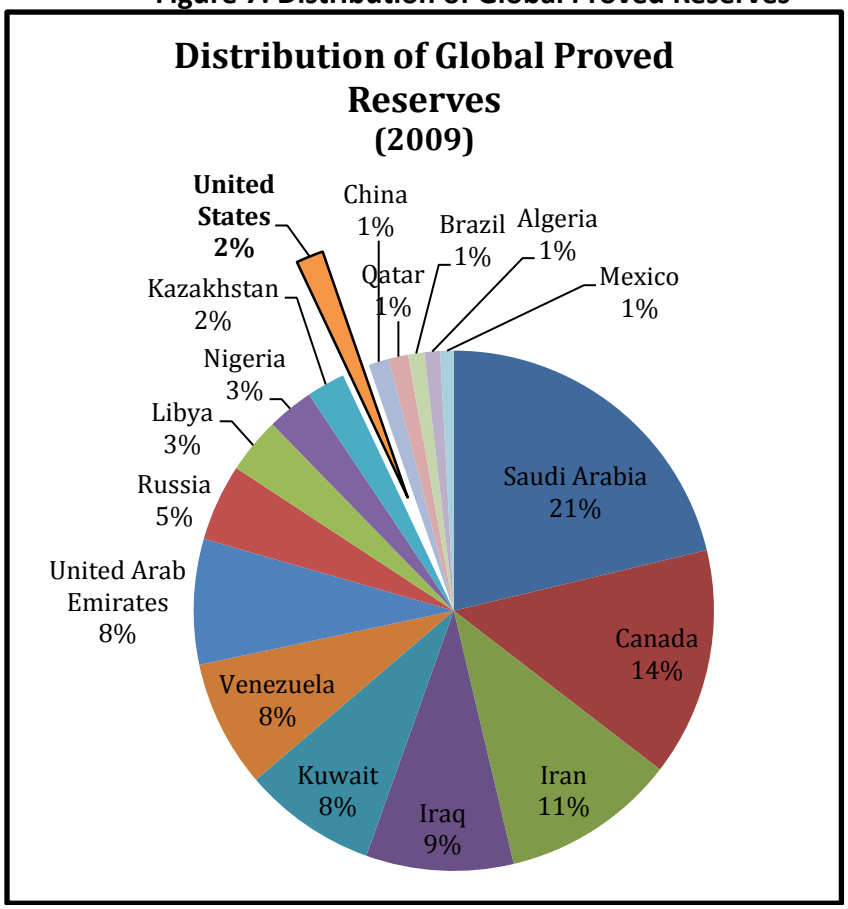
In addition, a market characterized by tight supplies and small margins of swing production capacity relative to demand is naturally more susceptible to instability, extreme price volatility, and speculation. Volatility imposes additional macroeconomic adjustment costs on oil-consuming nations as firms and individuals are forced to make rapid changes in behavior and resource allocation in

response to large, unexpected price swings. And to the extent that price spikes exacerbate political unrest and geopolitical tensions, they also increase the potential for conflict and create national security risks.

Unfortunately, none of these features of the existing world oil market is widely expected to improve in the coming decades. On the contrary, most analysts expect things to get worse as global consumption, driven by rapid economic development in countries like China and India, continues to grow more quickly than global production capacity. The United States, because its own domestic oil reserves are relatively small, has only limited capacity over the long run to sustain increased production. But opportunities may exist to encourage investment and technology transfer to regions with less developed oil resources as a way to promote a greater number and diversity of suppliers, especially outside the Middle East. In addition, the development of new technologies and methods that would enable us to tap a broader array of potential supplies in an environmentally responsible manner could further ease supply pressures and improve the functioning of the world oil market. Some alternatives to conventional oil are already being developed—an example would be tar sands production in Canada, but the processes that are currently being used for this purpose create substantial and probably unsustainable environmental liabilities.

Metrics for tracking global supply diversity and the robustness of world oil markets might include global swing production capacity as a percent of global demand, percent of world consumption supplied by OPEC countries, the regional distribution and concentration of global production capacity, proved reserves owned by national vs. investor-owned oil companies (this is relevant because production that is directly controlled by national governments could be more susceptible to manipulation in the service of strategic political objectives), and the contribution to global supplies from unconventional resources, among others.

Figure 7: Distribution of Global Proved Reserves



E. Organizing the U.S. Government around Energy Security Goals and Metrics

A clearer articulation of goals and better metrics for tracking and reporting progress will be helpful in pursuing energy security goals only if they are paired with efforts to better coordinate and improve the effectiveness of government programs and policies. At present, the federal decision-making apparatus for energy issues is spread across many domestic agencies and institutions. For instance, the Department of Energy (DOE) oversees much of the nation's high technology research enterprise (such as the national labs) and manages a portfolio of applied energy research programs. In addition, DOE helps commercialize important advanced energy technologies through a variety of other mechanisms and partnerships including its still unproven loan guarantee programs.

Other important centers of influence over national energy policy and related natural resource decisions in the Executive Branch include the Department of the Interior, the Environmental Protection Agency, the Department of Commerce, the Federal Energy Regulatory Commission, the Nuclear Regulatory Commission, the Department of Treasury, the Department of Transportation, the Department of Defense, the Department of Justice, the Council on Environmental Quality, and the Commodity Future Trading Commission.

In addition, important decision- and policy-making authority on energy-related issues exists outside the Executive Branch in Congress, in state legislatures, and within state utility regulatory commissions. To pursue America's broader energy security objectives more effectively this diffuse network of decision makers, all of whom operate in a complex environment, oftentimes with unclear or unaligned goals, must be better coordinated strategically.

Recent efforts at DOE to initiate a Quadrennial Technology Review (QTR) and Quadrennial Energy Review (QER) may provide an opportunity to make immediate progress in this direction. The DOE effort responds to a recent report issued by the President's Council of Advisors on Science and Technology (PCAST) that called for a coherent multi-year planning effort conducted through a government-wide review of energy policies and programs.[8] Recognizing the scope and challenge of this task, PCAST recommended beginning with a more limited review focused on DOE activities. When DOE's QTR/QER assessments are completed, they will likely provide much needed strategic guidance to government decision makers.

More broadly, improved coordination of government efforts in the future must be accompanied by increased accountability and by the responsibility to track and report identified metrics, assess progress against defined goals and milestones, and make course corrections as appropriate. The Omnibus Trade and Competitiveness Act of 1988 provides a useful example in this regard. Section 3005 of that Act establishes reporting requirements under which the Secretary of the Treasury must provide Congress with a semiannual report on international economic and exchange rate policies, including the currency practices of America's major trading partners.[9]

F. Conclusion

As President Obama said on March 30, "We've been down this road before." Each time, we pledged to chart a new course, each time we said this time would be different.

It's time to ask why we've had such poor success in living up to the grand rhetoric of 30-plus years of Presidential speeches. The contours of America's core energy security challenge are well understood and haven't changed much in a generation. Moreover there is wide bi-partisan agreement about the sources of the problem, about the desirability of the goals, and about many if not all of the policy options for getting there. No doubt part of the problem has been our tendency to focus on issues (such as oil imports) that only indirectly relate to the problem we're trying to solve (usually high oil prices). Another has been the tendency of politicians to get bogged down in irrelevant debates—such as the current argument about whether oil companies have a right to complain about federal permitting delays when they aren't drilling all their existing leases—or to be side-tracked by short-term gimmicks like gas tax holidays.

[8] PCAST report to the President on Accelerating the Pace of Change in Energy Technologies through an Integrated Federal Energy Policy. http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-energy-pres-final.pdf

[9] U.S. Department of the Treasury, "Semiannual Report on International Exchange Rate Policies," http://www.treasury.gov/resource-center/international/exchange-rate-policies/Pages/index.aspx.

But perhaps a most important reason we haven't been more successful is because the problem is harder than we've been willing to admit. There's little we can do to control events in other countries, even less we can do about the geographic distribution of petroleum resources, and no way to excuse ourselves from the inexorable logic of a world oil market that is continually responding to global patterns of supply and demand. In this context our only option is to develop petroleum alternatives and begin the process of transitioning our transportation system away from oil. The task is one that requires sustained attention and a focused commitment of resources and political will, probably over a several decades. It's made harder by the fact that our existing oil-based transportation system works pretty well, most of the time. It's also made harder by the fact that our political system generally does a poor job translating short-term crises into long-term solutions.

This paper argues for a new focus on measurable goals and metrics, in large part because hard numbers can be more useful than rhetorical proclamations for keeping policies, programs, and institutions on track and accountable through multiple election cycles. Hard numbers may also help us approach this multi-dimensional problem with the combination of sophistication and pragmatism it requires. This time will only be different if we take a fresh look at the things we can't change and the things we can, and muster the political maturity to be honest about the difference.