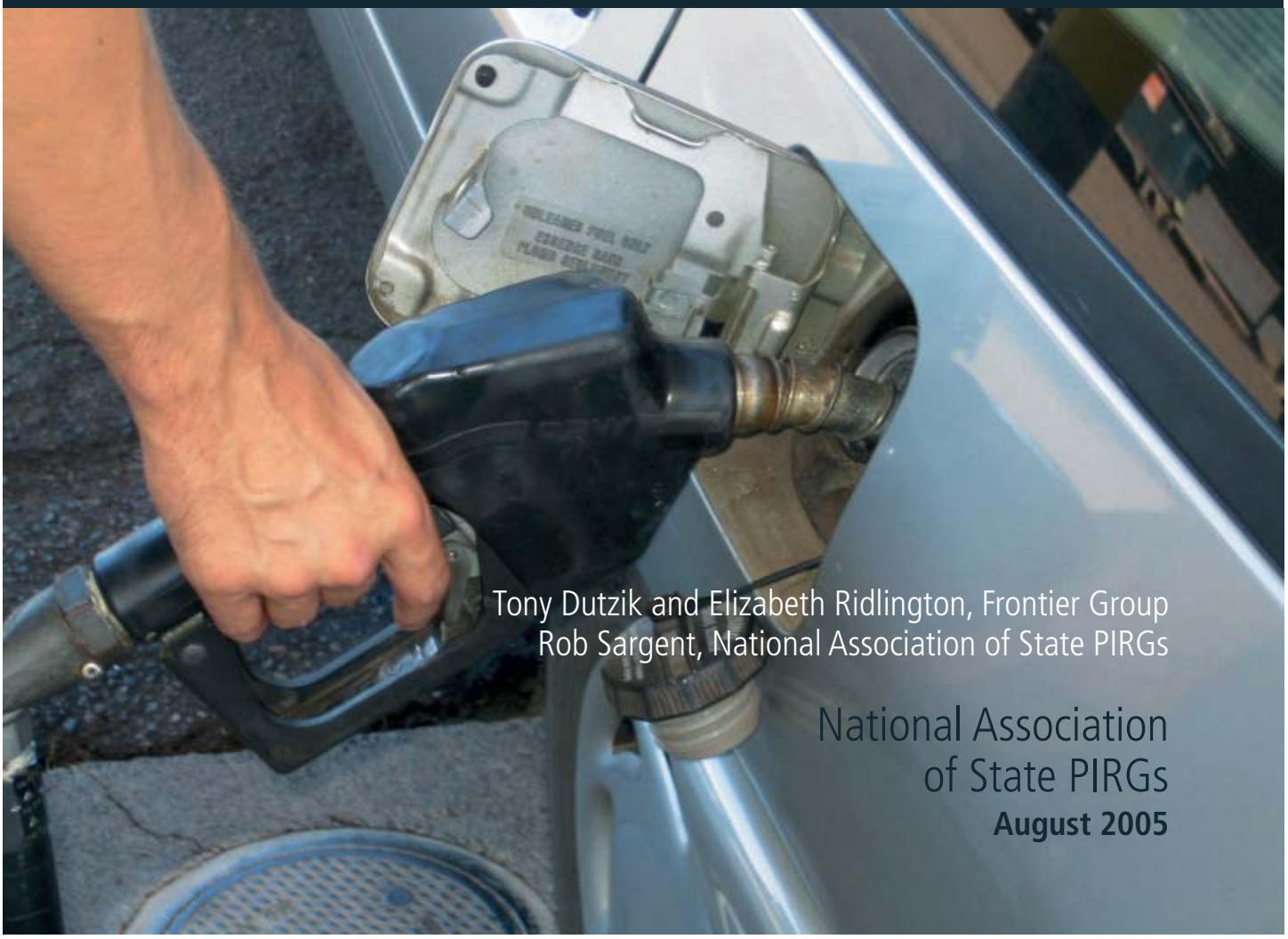
Making Sense of America's Oil Needs

A Sustainable, State-Based Response to Dwindling Oil Supplies



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August 2005

Acknowledgments

The authors thank Michael Goggin, Travis Madsen and Louisa DeHeer for their research assistance, as well as Jeremiah Baumann of Oregon State PIRG and Susan Rakov of Frontier Group for their incisive review and constructive suggestions.

The views and opinions expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided editorial review. Any factual errors are strictly the responsibility of the authors.

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Making Sense of Hydrogen: The Potential Role of Hydrogen in Achieving a Clean, Sustainable Transportation System, 2004, available at www.newenergyfuture.org.

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Executive Summary

Rising oil prices are pinching the American economy. And, if many oil industry analysts are correct, prices won't be coming back down any time soon. Indeed, it appears that the era of "cheap oil" may well be over.

The Bush administration and Congress have failed to take leadership in response to the problem. Instead, they are promoting an energy bill that heavily subsidizes oil companies already enjoying record profits and does little to increase energy efficiency or wean the U.S. economy off of our dependence on petroleum.

State governments have an important role in filling this leadership vacuum. By recognizing the oil crisis for what it is and taking appropriate actions to reduce our overreliance on petroleum, states can bolster their long-term economic and energy security.

Oil prices are rising because of increased global demand. Rising oil consumption in the U.S. over the last 20 years is a key contributor to the problem.

- The U.S. is far and away the world's leading consumer of oil, accounting for about a quarter of global consumption. America now consumes about one-third more oil than it did two decades ago.
- Since 2000, the U.S. has been a key driver of increased global demand, ranking second behind only China for consumption growth in this decade.
- Transportation is the biggest consumer of oil in the U.S., accounting for about two-thirds of our petroleum demand. Decreased vehicle fuel economy and a rapid rise in vehicle travel over the past 20 years are the main forces driving increased U.S. demand for oil.

The world is having an increasingly difficult time producing enough oil to satisfy rising demand. As a result, the U.S. faces a future of unstable fuel prices and increased dependence upon OPEC and Middle Eastern nations for oil.

- At current levels of demand growth, the world will consume as much oil in the next 26 years as it has in the past century—putting increasing strain on the ability of the world oil system to produce adequate supplies.

- Oil industry analysts increasingly believe that the world faces a "peak" in oil production sometime in the next two to three decades—and possibly within the next few years. At that time, the world will no longer be able to produce enough oil to satisfy demand, triggering a major increase in prices.
- Even without a global production peak, the U.S. will import more of its oil from Middle Eastern nations and those affiliated with OPEC. Oil production has already peaked in more than 50 nations and non-OPEC production is expected to peak within the next decade. Meanwhile, OPEC nations hold three-quarters of the world's proved reserves of petroleum.

Solving the nation's oil crisis will require aggressive action to reduce demand for petroleum. States have a wealth of short-, medium- and long-term strategies available to achieve this goal.

- In the short term, states can encourage alternatives to driving—such as the use of carpools, vanpools and transit. Many states already operate carpool and vanpool programs and the recent rise in oil prices provides an opportunity to promote those programs and increase participation. In addition, states can educate consumers on how to improve driving habits to maximize fuel economy.
- In the medium term, states should provide incentives for the purchase of more fuel-efficient vehicles, encourage the spread of advanced-technology vehicles (such as hybrid-electric cars), set global warming emission standards for cars (which would likely also reduce fuel consumption), slow the growth of sprawling development patterns that drive increased vehicle travel, promote the use of non-petroleum fuels (such as ethanol), and increase support for transit.
- In the long term, states must act to reshape communities to be less dependent upon the automobile, encourage next-generation advanced technology vehicles (such as those that operate primarily on electricity or renewably generated hydrogen), and develop their rail infrastructure to shift intercity trips and freight movement away from oil-intensive modes such as driving and air travel.

Introduction

Oil and gasoline prices have gone through the roof.

The price of a barrel of oil has increased by about 60 percent in the last year and has doubled over the last two years.[1] The average retail price of gasoline topped $2/gallon for the first time ever in May 2004 and has surpassed that level every week since March 2005.[2]

Consumers and businesses have both felt the ill effects of rising oil prices, which have contributed to a slowdown in economic growth, rising trade deficits, and economic hardship for many.

America is no stranger to oil price shocks—we've experienced them periodically over the last three decades. And compared to the oil crises of the early and late 1970s, today's oil prices seem tame: gasoline prices would have to approach $3 per gallon to equal levels in the late 1970s and early 1980s when inflation is taken into account.

But there is something different about today's oil crisis. Previous oil price spikes have generally lasted only a few months or, in the case of the 1970s energy crisis, a few years. However, oil industry analysts are increasingly concerned that today's oil crisis may be permanent.

The cause of today's oil crisis is clear: increased demand for petroleum, not only from overseas but from the United States as well. For the last two decades, the fuel economy of vehicles has been on the decline while automobile-dependent suburban development patterns have forced more people into cars for longer trips each day. Now, with oil prices on the rise, the economic bill for these broad-scale changes is coming due and it threatens to be a steep one—unless we take immediate and comprehensive action.

The most effective way out of today's oil crisis is to reduce our overreliance on petroleum. The good news is that there are many effective policy tools the states can use to achieve that goal and begin to make the necessary transition to an economy that is far more efficient in its use of oil. This paper suggests numerous short-, medium- and long-term strategies that states can begin to implement today to reduce their reliance on petroleum and thus safeguard their economic security and long-term sustainability.

Continuing "business as usual" is no longer a realistic option. With constructive leadership from Washington, D.C. lacking, the time has come for states to show the way forward.

The Current Oil Crisis: Why Are Oil Prices Rising?

The recent rise in oil prices is the result of increasing demand bumping against both natural and technological limits in the world's ability to produce and supply oil. Increasing the supply of oil—through more drilling or the expansion of refining capacity—may provide marginal, temporary relief at best. Even if supplies somehow do keep up with demand, America will be forced to import increasing amounts of oil from abroad, with most of the oil coming from unstable parts of the world. At the same time, the world's delicate oil supply/demand balance, coupled with increased concentration in the oil industry, provides new opportunities for oil companies, oil-producing countries or others to manipulate the price and availability of petroleum, intensifying economic insecurity.

1. Rising U.S. and Global Demand

As demand for a commodity increases, its price tends to increase as well. Thus, it is little surprise that rising demand for oil—both in rapidly industrializing countries such as China as well as in developed countries such as the U.S.—has helped trigger the recent rise in world oil prices.

Media coverage of the oil crisis often lays blame at the feet of China, whose path of rapid industrialization has resulted in skyrocketing energy consumption. But the U.S. also holds a large share of the responsibility.[3]

The United States is far and away the world's number one consumer of oil. With less than 5 percent of the world's population, the U.S. consumes nearly a quarter of the world's petroleum.[4] (See Fig. 1.) On a per-capita basis, the average American consumes two-thirds more oil than the average resident of Japan, two times more than the average German, and 14 times more than the average resident of China.[5]

And our consumption has been growing by leaps and bounds. In fact, American oil consumption has been increasing rapidly for the last 20 years. (See Fig. 2.) Between 1978 and 1983, Americans slashed their consumption of oil by nearly 20 percent, as energy efficiency measures implemented during the 1970s energy crisis took hold. Since 1983, however, petroleum consumption has increased by nearly one-third and is now well above 7 billion barrels per year.

Fig. 1. World Petroleum Consumption, 2004, by Country[6]

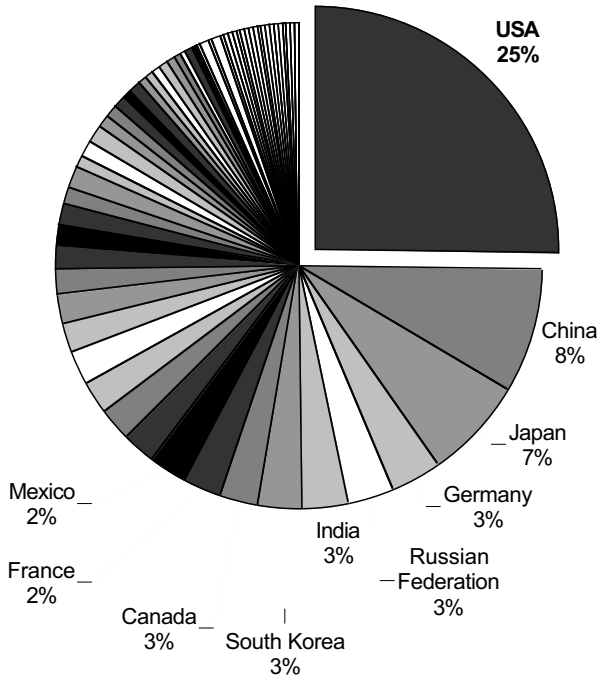


Fig. 2. U.S. Petroleum Consumption, Annual[7]

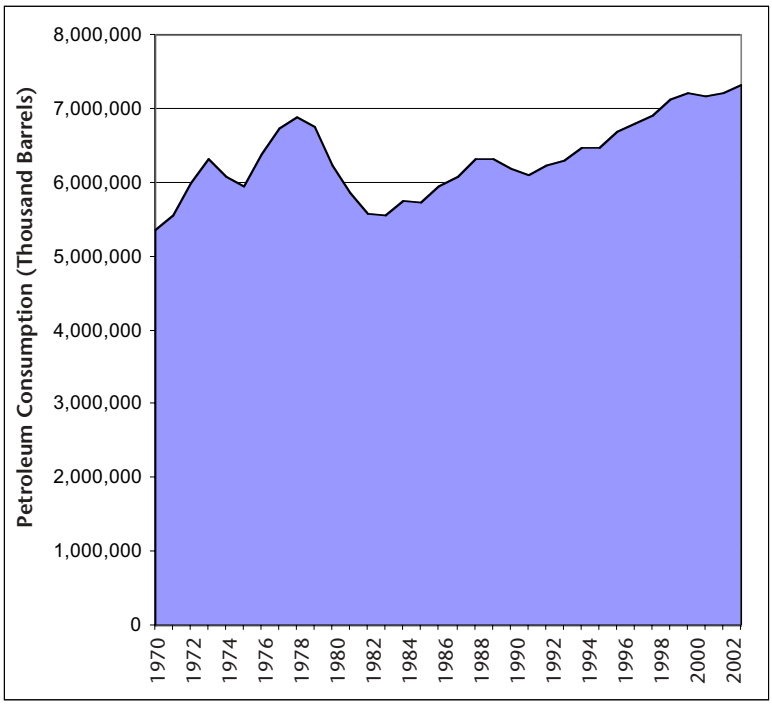
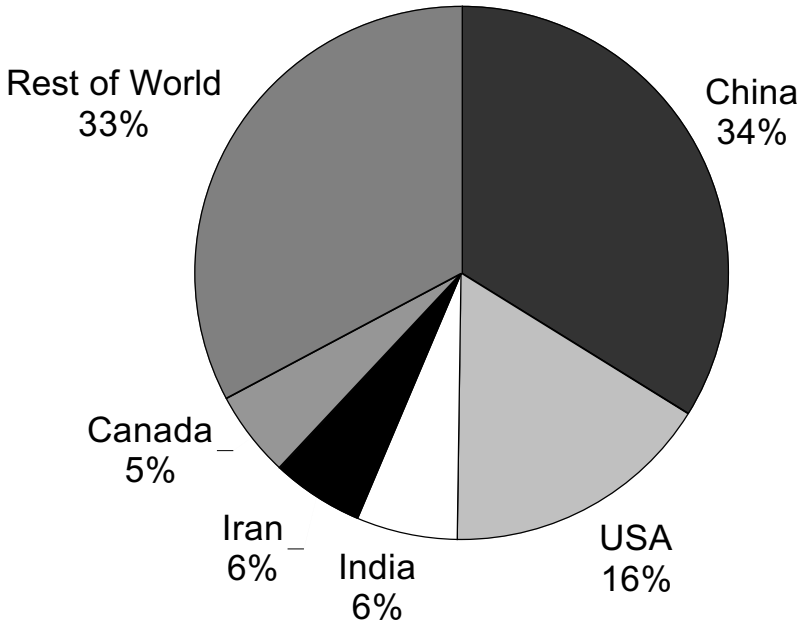


Fig. 3. Shares of World Oil Demand Growth, 2000-2004, by Country



Increasing oil consumption in the U.S. is a key driver of the jump in world oil demand that has triggered the recent oil price spike. Between 2000 and 2004, the U.S. was responsible for one-sixth of the increase in world demand for oil, ranking second behind only China in oil demand growth.[8] (See Fig. 3.)

Despite the rapid growth in oil demand from China, the U.S. remains the world's unchallenged number one oil consumer. Our dependence on petroleum leaves us uniquely exposed to oil price and supply disruptions, as well as to the many environmental and societal problems—ranging from air pollution to global warming—to which petroleum consumption contributes.

Why Is U.S. Oil Consumption Increasing?

Where is all this oil going? Increasingly into the fuel tanks of America's cars, trucks and SUVs.

America uses more oil for transportation than for anything else. About two-thirds of the oil America uses is to move people or goods from place to place, and the vast majority of that is used in personal vehicles like cars, trucks and SUVs.[9] Transportation has also been the main driver of increased oil use, responsible for 79 percent of the growth in oil consumption in the U.S. between 1985 and 2003.[10]

Vehicle travel on U.S. highways has skyrocketed in the last two decades, increasing by nearly two-thirds since 1985. The average American now drives one-third more miles each year than he or she did two decades ago.[11] The increase in vehicle travel is driven by many factors, primary among them the growth of sprawling, automobile-dependent suburbs and "exurbs" outside of many American cities.

Meanwhile, the last two decades have seen a dramatic shift in the American vehicle fleet, with increasing sales of less-efficient vehicles, such as SUVs. As recently as 1987, SUVs made up only 6 percent of

all new light-duty vehicle sales in the U.S., with passenger cars accounting for two-thirds of all sales. By 2004, SUVs accounted for more than one-quarter of all light-duty vehicle sales, while the share held by cars had shrunk to less than half.[12]

At the same time, the average fuel economy of both cars and SUVs has stagnated, as Congress has refused to increase federal Corporate Average Fuel Economy (CAFE) standards (except for a minor increase in SUV fuel economy). The combined result of these trends is that the average fuel economy of new vehicles *declined* by 6 percent between 1987 and 2004.[13] Even this figure paints a somewhat rosy picture as more and more driving now takes place under conditions—at higher speeds and in urban areas—that erode the fuel economy performance of vehicles once they are on the road.

In short, increased driving plus lower fuel economy equals higher oil consumption. And higher oil consumption in the U.S. (along with increasing consumption in other nations) has played a significant role in the recent run-up in oil prices.

America's current transportation and land-use policies—which encourage dependence on automobiles for most travel and do little to assure that those automobiles are efficient—may have appeared to be sustainable during the era of cheap oil. But with the world beginning to brush up against natural and technological limits in its ability to produce oil, the sustainability of those policies is now in serious jeopardy.

2. Limited Production Capacity

The rapid increase in global oil demand has bumped up against limitations in the amount of oil and gasoline the world can supply *at any given time*. The timeliness of production is important: even if the world held an infinite amount of oil, limitations on the ability to produce oil quickly—whether they are technological, economic, or political—could cause supplies to fall short and prices to rise.

Oil production and refining capacities that have been sufficient to supply global demand for the past several decades have now suddenly become inadequate. Often, this problem is characterized as the lack of spare production capacity—or the lack of a "cushion" of additional capacity that can be made available to serve surging demand. In 2004, spare capacity worldwide hit its lowest level in 30 years.[14] The lack of spare capacity also increases the risk of dangerous price spikes in the case of instability, sabotage, natural disaster or war. In recent years, labor strife in Venezuela, damage from Hurricane Ivan in the Gulf of Mexico, and terrorist strikes in the Middle East have set off short-term spikes in oil prices.

Limited production capacity also affects the supply of gasoline. While no new oil refineries have been built in the U.S. in 30 years, refiners have found ways to squeeze more production out of existing plants over time.[15] As a result, it has only been recently that limitations in refinery capacity have come to play a role in rising gasoline prices.

New production and refining capacity, however, cannot be brought on line overnight and are not without risks. Financially, new production and refining capacity requires large capital investments, which, given the volatile nature of energy markets, are very risky. In addition, new capacity often takes a long time to come on line: a refinery currently in the planning stages in Arizona, for example, will not be complete until 2009.[16] Refineries also pose a number of health and safety threats and present a potentially attractive target to terrorists. (For example, about one-third of U.S. oil refineries use or store hydrofluoric acid—a chemical that is severely toxic to humans and which can form a stable aerosol cloud above facilities and nearby neighborhoods if released.[17]) Finally, increasing the rate at which we pump oil from the ground only exacerbates the long-term problem: a finite supply of oil.

3. Limited Supplies

Arguments about the future of oil often focus around one question: When will we run out? Instead, we should focus on three questions: How much is left? Where is it? And what kind of oil is it?

How Much Oil Is Left?

No one knows for certain how much oil remains in the ground. But we do have some clues.

First, we know that, between the first significant drilling for petroleum in the mid-1800s and the end of 1997, the world had produced about 838 billion barrels of oil.[18] Since the end of 1997, the world has produced about another 174 billion barrels of oil, for a grand total of about 1 trillion barrels.[19]

Each year, the world consumes about another 29 billion barrels of oil, with the rate of consumption increasing at about 2 percent per year. Maintaining current levels of oil consumption would result in the world consuming as much oil in the next 34 years as it did in the previous century. At an annual rate of increase of 2 percent, we would consume the same quantity of oil in 26 years.

We also know that nations around the world currently claim "proved reserves" of about 1.1 trillion barrels of oil—or about as much as has already been consumed in modern history.[20] But, "proved reserves" is a misleading measure of future oil availability for two reasons. First, proved reserves include only those oil supplies that can be produced under current technological and economic conditions. Should prices rise or technology advance, the amount of reserves would increase. On the other hand, however, estimates of reserves are notoriously inaccurate and prone to distortion. For example, OPEC nations have an inherent incentive to overestimate their reserves, since the cartel sets its all-important production quotas for member nations based on their estimated reserves. Oil companies also face incentives to overestimate in order to enhance their perceived value to shareholders. In 2004, Royal Dutch/Shell Group announced that it had overstated its proved oil and gas reserves by 20 percent over the course of several years.[21]

The inaccuracy of proved reserves as a measure leads geologists and oil industry analysts to another measure, "recoverable oil"—that is, all the oil that exists anywhere that can ultimately be produced. Estimates of recoverable oil—including that amount that has already been produced—also vary widely, from as little as 1.85 trillion barrels to as much as 3 trillion barrels.[22] These differing estimates lead to widely varying estimates of when global production of oil will "peak," ranging from as soon as next year to as far away as the mid-2020s.[23] (See "What Is 'Peak Oil'?" below.)

What Is "Peak Oil"?

Oil production is expected to "peak" when additional supplies cannot be brought online fast enough either to replace oil wells that have been depleted or to meet increased demand. "Peak oil" does not mean that oil supplies have run out—or that they will run out in the near future. Rather, it means that once about half of the available oil has been produced, sufficient oil supplies will no longer be available to serve demand. As a result, at the time of "peak oil," market forces will bring demand down to the level that can be effectively supplied—likely through dramatically higher prices for oil.

Where Is the Remaining Oil?

Relatively little oil remains in the U.S. The bulk of the remaining oil belongs to countries that are not necessarily our allies and are politically unstable.

The vast bulk of the world's proved reserves of oil are in the OPEC nations—and specifically in the Middle East. Saudi Arabia alone accounts for 23 percent of oil reserves; Iraq and Iran combine for another 21 percent; and other Middle Eastern nations hold about 19 percent.[24] To put things in perspective, the non-Middle Eastern nation with the largest share of reserves is Venezuela with about 6 percent, and the non-OPEC nation with the largest share is Russia with 6 percent. The United States, Canada and Mexico combined hold only 5.5 percent of the world's reserves. (See Fig. 4.)

Oil production has already peaked in more than 50 countries, including the U.S., where production peaked in the early 1970s.[26] Even ExxonMobil, usually known for its optimistic forecasts, now predicts that non-OPEC oil production will peak within the next decade.[27]

Currently, the United States receives 63 percent of its oil from abroad.[28] That percentage is virtually certain to increase over time, along with the percentage of oil received from Middle Eastern nations and members of OPEC.

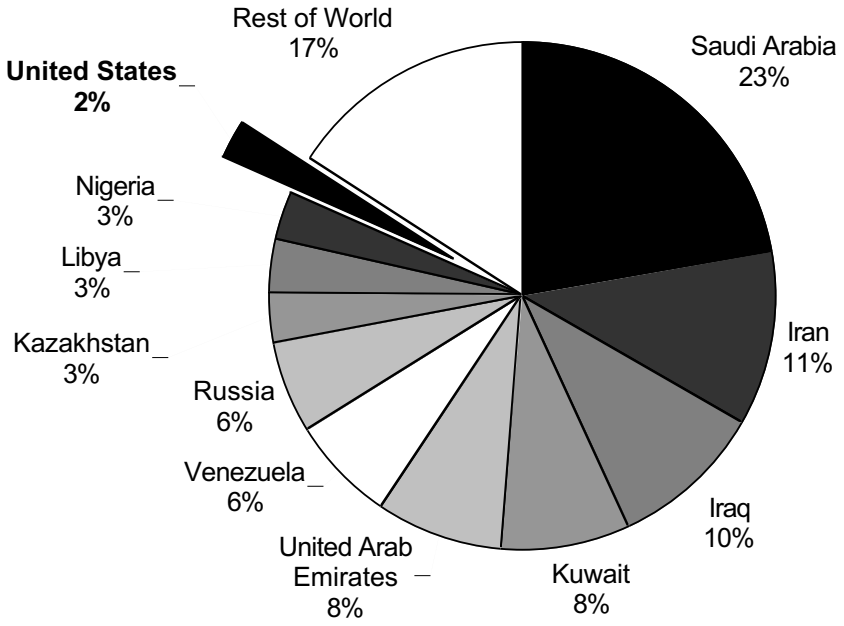
What Kind of Oil Is Left?

Even if global crude oil supplies last for the next couple of decades, the cost of producing and refining that oil is likely to increase in the years to come.

"Light sweet" crude, which is low in sulfur, is the easiest to refine into gasoline, but the countries with the largest reserves—including Saudi Arabia—produce large amounts of heavier, high-sulfur crude (along with some light crude). Thus, even if countries such as Saudi Arabia increase production to meet additional demand in the years to come, the oil they produce may be of inferior quality to much of the crude oil produced today.

Some industry analysts suggest that "unconventional oil supplies"—such as Canadian tar sands and Venezuelan heavy

Fig. 4. World Proved Petroleum Reserves[25]



oil—can emerge to replace declining conventional oil production. However, unconventional oil is often difficult to extract and expensive to refine, and extraction of the oil causes severe ecological damage. Moreover, production of oil from tar sands requires an immense amount of energy, largely from natural gas—thus exacerbating the current North American natural gas supply crunch and adding to emissions of global warming pollutants.

In sum, it is very difficult to estimate when the world will hit its oil production "peak." But it is also largely beside the point. If oil consumption continues to increase unabated, we have, at best, about two decades to prepare for a transition to an economy far less reliant on oil. And during those two decades, we will receive more of our oil from abroad, more of it from OPEC and unstable nations, and be paying a higher price for our consumption. The worst-case scenario is even grimmer, providing us with far less time to prepare and adjust.

4. Price Manipulation

Oil price increases are often met with public anger—usually directed at the major oil companies and OPEC. While this public anger is often ill-informed, and while there is little direct evidence of overt price manipulation in the current oil crisis, the potential certainly exists for many actors to inappropriately influence prices.

In a well-functioning market for a commodity such as oil, sellers will compete with each other to attract buyers by offering the lowest price possible. However, oil markets do not function perfectly, or even very well, for several reasons.

First, oil markets are notorious for their lack of transparency. On any given day, it is impossible to know accurately how much oil is being produced around the world, how much is being consumed, and how much petroleum can be legitimately banked as "proved reserves." As a result, buyers must often simply guess at the supply and demand situation based on the scraps of information available, leading to erratic market behavior and providing individuals with the opportunity to manipulate prices through the spread of false information.

Second, oil production is controlled by relatively few countries and companies. The Organization of Petroleum Exporting Countries (OPEC), of which Saudi Arabia, Iran, Libya, Nigeria, and seven other countries are members, controls approximately 40 percent of world oil production (and a larger share of proved reserves).[29] OPEC coordinates the oil production of its members, establishing price and volume targets. Though the member countries have an incentive to keep the price of oil from rising too high (lest consumers decide to wholeheartedly pursue alternative energy sources), the cartel also has a financial incentive to maintain prices at the highest level that can be sustained over the long term.

A similar concentration of control exists with in the U.S. oil industry—and that concentration is accelerating. A decade ago, the five largest oil companies in the U.S. controlled 34 percent of domestic crude oil production, 33 percent of domestic refinery capacity, and 27 percent of the retail market—amounting to immense power in the marketplace. But today, the five largest firms control about half of domestic oil production and refinery capacity, as well as 62 percent of the retail gasoline market.[30] The five companies—ExxonMobil, ChevronTexaco, ConocoPhillips, BP, and Royal Dutch/Shell—earned profits of $60 billion in 2003.[31] In 2004, profits for the world's 10 largest oil companies were $100 billion.[32] Fewer companies controlling the U.S. market means that each company has less need to reduce prices to attract customers.

Indeed, the market is so tightly controlled that companies have been able to engage in anticompetitive action to intentionally

increase prices. For example, in March 2001, the U.S. Federal Trade Commission found that oil companies had withheld gasoline supplies in a deliberate move to increase prices and boost profits.[33] This action was not illegal because the firms did not coordinate their action, but market consolidation made it possible.

Finally, there are new players in oil markets with their own motivations and opportunities to manipulate prices. Some have suggested that speculation in oil prices by hedge funds—unregulated funds that generally seek high returns (often at high risk)—has helped to drive up prices. Such speculative investing adds to the volatility of oil markets and makes it at least theoretically possible for large investors to manipulate prices through the inflows and outflows of investments.

In sum, there are many actors with the means, motive and opportunity to manipulate oil prices. The current oil price shock may be caused by more basic dynamics of supply and demand, but as markets tighten and control over the industry continues to consolidate, the opportunity and potential rewards of manipulation will only grow.

The Long-Term Oil Outlook

The current oil crisis is a long-term problem with deep-seated roots in our patterns of petroleum consumption. The long-term nature of the problem is often masked by the short-term volatility of oil markets, which often experience dramatic swings in prices from day to day, and even from hour to hour.

By most indications, however, the world is heading into a prolonged period of higher oil prices and constrained supplies. In this section, we will look at the likely future of world oil supply and demand and how those factors are likely to influence oil prices in the years to come.

The Long-Term Supply Outlook

As noted above, there is a great deal of uncertainty about how much oil remains in the ground and how much of it can ultimately be produced and delivered for use. Recent signs, both from the oil industry itself and many oil industry analysts, suggest that the world may run into problems meeting growing demand for oil sooner rather than later.

In order for oil to be produced, it must first be discovered. However, discovery of new oil fields peaked in the 1960s and has trailed production from existing fields since the late 1980s. Currently, the world consumes about 4 barrels of oil for every barrel discovered.[39] Meanwhile, we continue to get by on oil produced from fields discovered long ago: 80 percent of current production is from fields discovered before 1970.[40]

The oil industry itself reports similarly bleak figures. In 2004, Shell Oil reported discoveries equal to only 15 to 25 percent of its production for the year and BP replaced only 89 percent of its production.[41] At a time when one would expect investments in exploration to be expanding dramatically (given today's high oil prices), major oil companies find themselves unable to make profitable investments in exploration. The world's 10 largest oil companies found only $4 billion worth of oil in 2003, despite spending $8 billion on exploration. Since 2001, companies have found less oil than they did in the late 1990s and the discoveries have been so insignificant that they have not paid for themselves. Despite higher prices in 2003, OPEC

A Gloomy Future? Oil Industry Analysts' Grim Outlook for Future Oil Supplies

A growing chorus of oil industry analysts is warning that oil supplies may not be able to keep up with increased demand in the years to come.

- **Douglas-Westwood** (independent energy industry analyst) – "[K]nown and yet-to-find reserves and resources may not satisfy even the present level of demand beyond 2020 ... a modest 1% growth in global economic activity increases demand such that a production peak could occur as early as 2016."[34]
- **A.M. Samsam Bakhtiari** (National Iranian Oil Co.) – "Simulations of the World Oil Production Capacity model suggest that global oil production will peak ... well before the end of the decade, likely by 2006-07."[35]
- **Matthew R. Simmons** (Simmons and Co. International, energy industry investment bankers) – "On a sustainable basis, Saudi Arabia could have already passed peak output ... If so, the world's supply (on a sustained basis) has peaked."[36]
- **International Energy Agency** – "More and more oil will come from fewer and fewer countries, primarily the Middle Eastern members of OPEC. The dependence of all importing countries on those suppliers will grow."[37]
- **ExxonMobil** – "Non-OPEC production is expected to peak in the next 10 years or so."[38]

member countries drilled 6.5 percent fewer wells than a year earlier.[42]

Barring a surge in new discoveries, the world would increasingly need to eat into its oil reserves and rely upon better extraction technology, increased development of hard-to-reach and environmentally sensitive oil supplies (such as those in deep offshore waters or off America's coasts), as well as unconventional resources if demand continues to increase.

The Future of Petroleum Demand

The other possible resolution to the oil crisis is for the world to significantly curtail its demand for petroleum. Demand reduction can occur in one of two ways. Governments can endeavor to bring about significant reductions in demand through policies that encourage more energy efficient technologies, restructure economies to become more energy efficient (for example, by prioritizing compact development and transit use over sprawling development and highway construction), and encourage the substitution of alternative fuels for increasingly scarce and costly petroleum. The other option is "demand destruction" in which dramatically higher prices force reductions in demand by putting an ever-tighter squeeze on businesses and individual consumers.

The main problem with relying on demand destruction as a strategy is that no one knows how high prices will need to go in order to "destroy" enough demand to bring the system back into balance. Current oil prices—which are already very high in historical terms—have not been high

enough to do the job. In the United States, for example, the Energy Information Administration projects that motor gasoline consumption will *increase* by 1.6 percent in 2005 and 2006 (about the same rate as in 2004) despite dramatically higher gasoline prices. And worldwide oil demand growth is expected to increase by 2.5 percent in 2005 and 2006, despite higher crude oil prices.[43] While higher oil prices have influenced consumer choices somewhat (sales of inefficient full-size SUVs declined by 19 percent in the first four months of 2005), the transition has been slow to occur—SUVs and other light trucks, for example, still outsell cars in the U.S.[44] Therefore, it is likely that oil prices will need to go much higher in order to significantly dampen demand—and the economic repercussions of such a rise in price are likely to be severe.

By contrast, a strategy aimed at improving the energy efficiency of the entire economy and encouraging the use of appropriate non-petroleum fuels can begin to lay the groundwork for a transition to an economy far less dependent on petroleum. In the short term, such measures can reduce the rate of growth in oil demand (thus helping to stabilize prices). And in many cases, efficiency efforts can even save consumers money. For example, a 2002 study by the National Academy of Sciences found that cars could achieve 12 to 27 percent better fuel economy and light trucks could achieve 25 to 42 percent better fuel economy at *no net cost to the consumer*. That is, the consumer's savings in fuel costs

Short-Term Factors and Temporary Spikes

Long-term trends in oil markets are often masked by volatile, short-term fluctuations in oil prices, which often include dramatic spikes followed by equally dramatic crashes. At a time when there is little spare oil production capacity anywhere in the world, this type of short-term volatility becomes far more prevalent.

Among the most important potential triggers of price spikes are security concerns and the threat of terrorism. Political upheaval in nations such as Venezuela, Nigeria and Russia has already set off price spikes within just the past few years—and the risk posed by disruptions in top oil-producing nations such as Saudi Arabia is even greater. The "security risk premium"—caused both by increased real expenditures for security, insurance by oil companies, and the risk of major terror incidents—may add anywhere from $4 to $13 dollars a barrel to the price of crude oil.[46]

Natural disasters—such as Hurricane Ivan, which disrupted production of oil in the Gulf of Mexico in 2004—can also trigger temporary price spikes, as can accidents and malfunctions at major oil refineries. In addition, temporary price spikes can result from rapid increases in demand for oil—as has recently been the case in China—or from manipulation of prices.

These types of disruptions have less effect on global oil prices if petroleum—and the means to extract, refine and deliver it—is plentiful in relation to underlying demand. As a result, with the supply/demand balance in oil markets continuing to tighten, short-term price spikes are likely to become increasingly frequent and severe in the years to come.

would pay for the additional cost of the more-efficient vehicle over the vehicle's lifetime. And these figures are likely conservative—the NAS study was based on assumed gasoline prices of $1.50 per gallon; the amount of cost-effective efficiency improvements is likely far higher than that identified by NAS.[45]

In the long run, a strategy built on energy efficiency and clean non-petroleum fuels would insulate the economy against future spikes in oil prices while also reducing the myriad other environmental, social and economic consequences of our over-reliance on oil.

Achieving this result in the long run requires action now. For example, the inefficient vehicles sold today will remain on the road for 10 to 15 years. Automobile-dependent development patterns and infrastructure will take even longer to change. Thus, states that want to achieve a less petroleum-reliant economy a decade from now, when petroleum supplies are likely to be even tighter than they are today, need to begin to plan for that future immediately.

Reducing America's Overdependence on Petroleum

The single most effective thing that states can do to reduce the impact of high oil prices on their economies is to promote policies that reduce the demand for oil and to lay the groundwork for a transition to a less oil-intensive economy for the future.

Short-Term Strategies

Short of the type of emergency conservation measures implemented in the 1970s (such as gasoline rationing and speed limit reductions), states have limited ability to influence petroleum demand in the short run, due to the long time lag involved in changing the automobile fleet or transportation and land use patterns. Nonetheless, there are several things states can do in the short term to achieve modest, yet important, reductions in petroleum demand.

The main tool in states' short-term arsenal is to ***promote alternatives to driving***. Reducing single-passenger driving—particularly during peak periods—has a double energy-saving benefit, not only reducing the number of miles driven but also reducing the congested, stop-and-go driving that erodes vehicle fuel economy.

Ridesharing—either through carpooling or the use of vanpools—is one alternative that can be expanded quickly and at limited cost. Carpooling played a major role in responding to the energy crises of the 1970s, but has declined precipitously over the past two decades—in 1980, about 19.7 percent of all work trips were in carpools; by 1990, the percentage had declined to 13.4, and the figure has not rebounded since.[47]

Many states and metropolitan areas offer free rideshare matching services to help commuters set up carpools and vanpools in their areas. Other ridesharing services—such as vanpools—are offered by some metropolitan transit agencies. Transit, walking, biking and other transportation alternatives can reduce oil consumption and save consumers money. Higher oil prices provide a perfect opportunity for states to promote such alternatives through public and employer education efforts—or to create new ridesharing services where they do not currently exist.

One tool to reduce oil consumption that was not widely available 20 years ago is to ***encourage telecommuting***. An estimated 28 million Americans relied on telecommuting at some point in 2001 and telecommuting

even once a week can significantly reduce gasoline consumption for travel.[48] States can encourage telecommuting by providing assistance to employers. Connecticut, for example, helps employers create telecommute pilot programs, evaluate costs and benefits, and train managers and staff.[49] State agencies can also expand their own use of telecommuting.

States can also help educate the public and companies about ways to ***improve fuel economy in their current driving***. Observing posted speed limits, driving less aggressively, avoiding unnecessary idling, maintaining proper tire inflation, and conducting proper maintenance can significantly improve fuel economy. For example, vehicle fuel economy drops by approximately 17 percent for a vehicle traveling 70 miles per hour versus 55 miles per hour.[50] Along with public education campaigns, more vigorous enforcement of speed limits could also encourage more fuel-efficient driving patterns.

In regions such as the Northeast where oil is used in home heating, states should maintain, expand and ***promote weatherization and other energy efficiency programs*** that can significantly reduce heating oil consumption. Energy efficiency improvements can ease consumers' exposure to higher oil prices this winter and in years to come.

Such small-scale changes may seem ineffectual in the face of a massive problem such as petroleum overdependence, but they can make a difference—especially by easing the upward pressure caused by rising demand on oil prices. A recent study by the International Energy Agency (IEA) estimated that reducing highway travel by 10 percent or having one-quarter of all potential telecommuters work from home twice a week could each reduce total oil consumption by 1 percent in the U.S. and Canada. That may not seem like much, but the IEA also concluded that "a reduction in IEA transport fuel demand of even a few percent could have a substantial dampening effect on surging world oil prices."[51]

Finally, states do need to be prepared to consider emergency measures in the event of a severe disruption of oil supplies or dramatic increase in prices. The IEA has stated that even a minor disruption in oil supplies could cause a significant price shock and has advised its member countries on emergency conservation measures they could put in place in such an event. Among the measures whose effects were studied by the IEA were driving restrictions, reduced public transit fares, speed limit reductions, the shifting of existing highway lanes to carpool-only lanes, and major efforts to promote telecommuting. [52] These measures may not be necessary now, but states should have them in their "back pocket" for use if a major supply crisis develops.

Medium-Term Strategies

States also should begin to adopt policies that can reduce fuel consumption in the medium-term—within the next three to five years.

States have a variety of options to encourage the purchase of more fuel-efficient or advanced technology vehicles. Under federal law, states may not impose their own standards for automobile fuel economy. But states do have several tools to encourage improved fuel efficiency in vehicles.

One potentially powerful tool is for states to ***provide financial incentives*** for the purchase of more fuel-efficient vehicles. Some states already provide tax incentives for the purchase of hybrid or other alternative fuel vehicles. Another, more comprehensive option is to provide incentives that are financed through the assessment of fees on the purchase of gas guzzlers, rather than through general tax revenue. Several states, including Connecticut, have considered systems that would vary the percentage of the state automobile sales tax based on vehicle efficiency. One recent study found that a combination fee/rebate—or "feebate"—of $500 for every 0.01 gallon/mile of fuel economy would improve

Reacting to Rising Oil Prices: Examples from the 1970s

The twin oil shocks of the 1970s caused dramatic economic dislocation in the form of higher inflation, fuel rationing and other problems. The nation eventually recovered from the oil crises—slashing consumption in the face of higher prices. And it did so as the result of government public policy leadership.

The reaction to the oil crises of the 1970s was broad and multi-faceted. Not every response worked—for example, the large federal investment in synthetic fuels. Nor was every response politically popular—the federal 55-mile-per-hour speed limit implemented by President Nixon succeeded in reducing fuel consumption but was widely resented by drivers.

Perhaps the most important public policy step, however, was the enactment of federal corporate average fuel economy (CAFE) standards, which took effect in 1975. The CAFE standards required a gradual increase in fuel economy during the 1970s and 1980s, topping out at an average fuel economy for new cars of 27.5 miles per gallon (mpg) by 1990 and 20.7 mpg for light trucks by 1996.[53] (The National Highway Traffic Safety Administration has begun to phase in a modest increase in the light truck standard to 22.2 mpg, to be fully achieved by model year 2007.)

In the decade-and-a-half following enactment of the CAFE standards, the "real world" fuel economy of passenger cars nearly doubled—from 13.4 mpg in 1975 to 24.0 mpg in 1988. Similarly, light trucks experienced an increase in real-world fuel economy from 11.8 mpg in 1975 to 18.3 mpg in 1987.[54]

These changes took time to filter their way through the automobile fleet. In 1978, transportation-sector consumption of gasoline hit a then-record of 7.3 million barrels per day. But improving fuel economy soon brought about a decline in gasoline use, with consumption dropping by 12 percent between 1978 and 1982. In fact, transportation consumption of gasoline did not surpass its 1978 level again until 1993—despite a nearly 50 percent increase in vehicle travel over that time period.[55]

Unfortunately, since the early 1990s, the federal government has not increased CAFE standards commensurate with the development of efficiency technology. At the same time, automakers promoted a shift from cars to less-efficient SUVs and light trucks. As a result, the real-world fuel economy of the average new vehicle is 20.8 mpg—down 6 percent from the fuel economy peak in 1987.[56] From 1993 to 2003, U.S. transportation gasoline consumption increased by 19 percent to a record 8.8 million barrels per day.[57] This continued increase in U.S. gasoline consumption has made the nation more vulnerable to oil price spikes.

With federal officials continuing to refuse to consider an increase in CAFE standards, it is up to states to devise policies that can encourage better automobile fuel economy.

the fuel economy of new vehicles by 16 percent.[58] (An improvement of 0.01 gallon/mile in fuel economy translates to improving the fuel economy of a 20 MPG car to 25 MPG.)

States should also adopt policies that bring ***advanced-technology vehicles*** to their consumers. California's low-emission vehicle standards—which include newly adopted limits on emissions of global warming gases—will increase the prevalence of hybrid-electric and advanced gasoline vehicles, and eventually encourage the deployment of hydrogen fuel cell or fully electric vehicles as well. The California standards are not fuel economy standards—rather, they are designed to reduce emissions of health-threatening pollutants and pollutants that contribute to global warming. However, many of the technologies encouraged by the standards are likely to use less petroleum. At least seven states have adopted part or all of the California standards and other states should follow suit.

State and local governments have the power to lead by example through government ***fleet purchases of low-carbon vehicles***. States such as Iowa have required that any new state vehicle purchased after 2010 be either an alternative fuel vehicle or a hybrid (wherever possible). New York State has switched about 17 percent of its state fleet to run on compressed natural gas, saving about 1.6 million gallons of gasoline over the past four years.[59] Other states have set fuel economy targets for state vehicles or have limited the purchase of inefficient SUVs for non-essential purposes. States can make an additional difference by providing incentives for local and county governments as well as state-affiliated institutions (such as universities) to purchase alternative fuel vehicles as well.

States can also reduce petroleum dependence by enacting a ***renewable fuels standard***. Such a standard would require that gasoline and diesel fuel include a small but increasing portion of renewable fuel, such as ethanol or biodiesel. Minnesota will soon begin to require that biodiesel make up a small portion of diesel fuel sold in the state and many states—such as California, Connecticut, New York and several Midwestern states—now use ethanol as an oxygenate in gasoline. States adopting renewable fuels standards—particularly those that include ethanol—must also ensure that the standards do not adversely affect air quality.

In addition, states can take action to ***require that replacement tires be as fuel-efficient as tires that come on new vehicles***. Most automobile manufacturers include high-efficiency, low-rolling resistance tires on their new vehicles in order to meet federal corporate average fuel economy standards. But these tires are generally not available as replacements, causing the fuel economy of vehicles to drop once they are in use. Requiring the sale of high-efficiency tires could improve fuel economy by 3 percent for vehicles using replacement tires, without compromising safety or tire longevity and at a net economic benefit to the consumer.[60] California plans to require the sale of high-efficiency tires in July 2008 and other states could follow suit.

Improving the fuel efficiency of vehicles is only one side of the oil-saving coin—reducing the amount of miles driven is a key factor as well. One of the most important things states can do in the medium-term is to prevent things from getting worse—that is, to prevent the expansion of automobile dependency. States should use the tools they have available to ***promote the development of more compact communities and prevent new sprawling, automobile-dependent development***. Research has shown that individuals who live in densely populated neighborhoods are more likely to walk or use a bicycle to engage in shopping, recreation or other opportunities—as opposed to needing to drive to complete routine errands.[61] Such communities must become the norm, rather than the exception, in an era with less access to cheap oil.

Planning and zoning laws vary a great

deal from state to state—in some states, local governments have virtually complete control over local planning and zoning, while in others all plans must conform to a master state plan. Regardless of which level of government has jurisdiction, however, there are a number of tools that can be used to promote less oil-intensive forms of development. Among them are:

- Ending practices that channel state infrastructure funding (such as funding for road, water and sewer construction) to sprawling new development at the expense of existing communities.
- Adopting policies such as urban growth boundaries and municipal service boundaries that set geographic limits on suburban growth.
- Zoning residential areas in ways that allow for housing on smaller lots, interconnected streets, and safe and convenient pedestrian and bicycle travel.
- Zoning commercial areas in ways that allow for mixed uses in downtown areas (such as residential apartments above shops) and that reduce the amount of area devoted to parking.

A second key is to ***focus state highway spending on repairs and safety improvements on existing highways rather than expansion of the highway network***. Road congestion is a prodigious waster of oil, but the most frequently proposed "cure"—highway expansion—often makes things worse. Expanding or extending highways often leads to a phenomenon known as "induced travel," in which new development springs up in formerly hard-to-reach areas, increasing overall vehicle travel and, eventually, triggering new congestion.[62] States would be better served by adopting "fix it first" policies that prioritize repairing existing infrastructure. States can also prioritize projects that eliminate traffic bottlenecks and safety hazards, thus reducing delays that can cause motorists to waste fuel while snarled in traffic.

In addition, states must ***prioritize improvements in public transit***. A number of cities—including Dallas, Denver, St. Louis and Salt Lake City—have added new light rail systems in the last decade or so, most of which have been very successful in attracting those who would otherwise drive to take transit instead. States should continue to identify opportunities to expand their transit networks while also making sure that sufficient funding exists to maintain existing levels of service and to keep fares low.

Many states continue to operate under antiquated transportation planning and funding schemes that prioritize highway funding at the expense of transit and other alternatives. In particular, states must ***incorporate transportation demand management*** in a meaningful way in their transportation planning processes. Transportation demand management aims to improve the overall efficiency of the transportation system—often by reducing single-passenger driving. Commute-trip reduction programs—in which employers encourage the use of transit, carpooling and other transportation options for the trip to and from work—are among the demand management strategies that have been used successfully in some areas, most notably in Washington State. State transportation departments should treat demand management on a par with capacity expansion in their transportation planning efforts and provide demand management efforts with sufficient resources.

Finally, states should consider ***new ways of allocating the costs of driving*** and/or ***new strategies to raise revenue for oil conservation***. Several states have considered encouraging insurers to charge for automobile insurance by the mile, rather than at a flat rate. Cents-per-mile insurance would act as a disincentive for unnecessary driving and may even save many consumers money by reducing the number of accidents. In addition, states in which oil is used as a

heating fuel may wish to assess energy efficiency surcharges on heating oil, which would then be put into a fund to improve energy efficiency. Such a system has been used effectively in many states to fund programs that save electricity and natural gas. The surcharge could be expanded to cover transportation uses of oil as well.

The medium-term strategies listed above hold the potential to stabilize—and perhaps even reduce—oil consumption over the next decade. But even today's levels of oil consumption are likely to be unsustainable in the long run. As a result, states will have to consider strategies that can substantially reduce America's reliance on petroleum over the next several decades.

Long-Term Strategies

While many of the above strategies could begin to yield fruit within the next three to five years, weaning our economy off of petroleum is a long-term endeavor. States must begin to think seriously about long-term strategies to reduce dependence on oil.

As noted above, any significant reduction in our dependence on oil will require us to ***reshape our communities*** in fundamental ways. Suburban and exurban sprawl will have to be replaced with forms of development that require less dependence on the automobile. A key challenge will be how to retrofit existing suburbs and exurbs to provide more transportation options. A number of cities across the country have begun to move in this direction—converting abandoned malls in inner-ring suburbs into vibrant, mixed-use developments that can often be reached by public transit. Expanding walking and bicycling opportunities, as well as using new tools—such as shuttle bus services—to expand the reach of transit into low-density suburbs can also reduce automobile dependency and use. The redevelopment and revitalization of existing downtowns and aging cities must also be a key part of the strategy.

In addition to expanding transit opportunities in the near-term, states must also begin to rethink their transportation plans for ***regional and inter-city travel***. Rising oil prices have already begun to impact the airline industry, for example, as well as trucking companies. By contrast, rail travel is generally a far more energy-efficient way of moving people and freight than either air travel or trucks. States must begin work on long-range plans to expand passenger and freight rail capacity and service, including high-speed passenger rail of the type that moves millions of passengers in Europe and Japan.

States should ***encourage the development of highly efficient and alternative fuel vehicles***. A number of new automobile technologies—such as "plug-in" hybrids that rely on electric power for most urban driving and hydrogen fuel-cell vehicles—are in development that could dramatically reduce gasoline consumption. States should use their purchasing and regulatory powers to encourage the development of these vehicles, but should be wary about promoting vehicles—such as fuel-cell vehicles that run on hydrogen derived from coal or nuclear fuels—that replace our dependence on oil at the expense of public health and safety.

Finally, while states cannot afford to wait for the federal government to take action, adoption of ***stronger federal corporate average fuel economy (CAFE) standards*** would be among the most effective steps America could take to reduce petroleum consumption. States should urge federal officials to increase CAFE standards to at least 40 miles per gallon over time.

Notes

1. U.S. Department of Energy, Energy Information Administration, *Weekly World and U.S. Spot Oil Prices*, updated 29 June 2005. Based on U.S. spot oil price for week of June 24, 2005 compared to corresponding weeks in 2004 and 2003.

2. U.S. Department of Energy, Energy Information Administration, *U.S. All Grades All Formulations Retail Gasoline Prices*, updated 11 May 2005. Based on average retail gasoline price for all grades.

3. U.S. Department of Energy, *International Energy Outlook 2004*, January 2004.

4. "Less than 5 percent" based on U.S. Census Bureau, U.S. and World Population Clocks, downloaded from www.census.gov/main/www/popclock.html, 30 June 2005.

5. Based on BP, *BP Statistical Review of World Energy 2005*, 14 June 2005 and population estimates from U.S. Central Intelligence Agency, *CIA World Factbook*, downloaded from www.cia.gov/cia/publications/factbook/, 24 June 2005.

6. BP, *BP Statistical Review of World Energy 2005*, 14 June 2005.

7. U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2003*, 7 September 2004.

8. See note 6.

9. U.S. Department of Energy, Energy Information Administration, *Petroleum Quick Stats, Data for 2003*, downloaded from www.eia.doe.gov/neic/quickfacts/quickoil.html, 5 May 2005.

10. See note 7.

11. Based on vehicle travel estimates from U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* series of reports, Summary through 1995 and 2003 edition; and population estimates from U.S. Census Bureau, *Intercensal Estimates of the Total Resident Population of States:1980 to 1990*, August 1996 and U.S. Census Bureau, *Annual Estimates of Population Change for the United States and States and for Puerto Rico and Rankings: July 1, 2002 to July 1, 2003*, January 2005.

12. U.S. Environmental Protection Agency, *Light-Duty Automotive Technology and Fuel Economy Trends, 1975 Through 2004*, April 2004.

13. Ibid.

14. Guy Caruso, Administrator, U.S. Energy Information Administration, *U.S. Energy Markets: Short-Term and Mid-Term*, PowerPoint presentation to Louisiana State University Center for Energy Studies, 13 April 2005.

15. Joanne Shore, John Hackworth, U.S. Energy Information Administration, *Challenging Times for Making Refinery Capacity Decisions*, PowerPoint presentation to National Petrochemical and Refiners Association Annual Meeting, March 2004.

16. Jad Mouawad, "No New Refineries in 29 Years? There Might Well Be a Reason," *New York Times*, 9 May 2005.

17. U.S. PIRG Education Fund, *Needless Risk: Oil Refineries and Hazard Reduction*, October 2003.

18. L.F. Ivanhoe, M. King Hubbert Center for Petroleum Supply Studies, *Hubbert Center Newsletter*, "World Oil Supplies—Production, Reserves and EOR," January 2000.

19. U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, May 2005, Table 11.3.

20. See note 6

21. Beth Gardiner, "Shell Cuts Oil Reserves for Fourth Time," *Seattle Times*, 25 May 2004.

22. John Vidal, "The End of Oil is Closer than You Think," *The Guardian*, 21 April 2005.

23. Robert L. Hirsch, Roger Bezdek, Robert Wendling, *Peaking of World Oil Production: Impacts, Mitigation & Risk Management*, February 2005.

24. See note 6.

25. Ibid.

26. David R. Francis, "Has Global Oil Production Peaked?" *Christian Science Monitor*, 29 January 2004.

27. ExxonMobil, *ExxonMobil's 2004 Energy Outlook*, downloaded from www2.exxonmobil.com/Corporate/Citizenship/Corp_citizenship_energy_outlook.asp, 8 June 2005.

28. Public Citizen, *Mergers, Manipulation and Mirages: How Oil Companies Keep Gasoline Prices High, and Why the Energy Bill Doesn't Help*, March 2004.

29. U.S. Department of Energy, Energy Information Administration, *Country Analysis Briefs: OPEC*, 26 November 2004.

30. See note 28.

31. Ibid.

32. See note 16.

33. See note 30.

34. Douglas-Westwood Limited, *The World Oil Supply Report, 2004-2050 (3rd edition)*, summary, downloaded from www.dw-1.com/oilsupplyproduct.php, 8 June 2005.

35. A.M. Samsam Bakhtiari, "World Oil Production Capacity Model Suggests Output Peak by 2006-07," *Oil & Gas Journal*, 26 April 2004.

36. Matthew R. Simmons, *Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy*, PowerPoint presentation to the Boston Committee on Foreign Relations, 12 April 2005.

37. International Energy Agency, *IEA Director Releases Latest World Energy Outlook, Says Current Energy Trends "Call For Urgent and Decisive Policy Responses,"* press release, 26 October 2004.

38. See note 27.

39. Colin Campbell, "Industry Urged to Watch for Regular Oil Production Peaks, Depletion Signals," *Oil & Gas Journal*, 14 July 2003.

40. See note 22.

41. Ibid.

42. Carola Hoyos, "OPEC Exploration Declining Despite Rising Prices," *Financial Times*, 25 August 2004.

43. U.S. Department of Energy, Energy Information Administration, *Short-Term Energy Outlook—June 2005*, 7 June 2005.

44. "Sales of full-size SUVs …" from Green Car Congress, *Sales of Full-Size SUVs in U.S. Down 19% in First 4 Months of 2005*, 3 May 2005.

45. National Research Council, Transportation Research Board, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards*, National Academies Press, 2002, 67.

46. John Schoen, "Oil Prices Include a Growing Risk Premium," *MSNBC*, 12 May 2004.

47. Erik Ferguson, Recent Nationwide Declines in Carpooling, 1990 *Nationwide Personal Transportation Survey: Travel Mode Special Reports*, US Department of Transportation Federal Highway Administration, December 1994, Chapter 2. "Has not rebounded since" from Pat S. Hu, Timothy R. Reuscher, U.S. Department of Transportation, Federal Highway Administration, *Summary of Travel Trends: 2001 National Household Travel Survey*, December 2004.

48. "28 million Americans" from International Telework Association and Council, *Telework Facts and Figures*, downloaded from www.telecommute.org/resources/abouttelework.htm, 24 May 2005.

49. Telecommute Connecticut, *Telecommute CT! Services*, downloaded from www.telecommutect.com/services/default.asp, 24 May 2005.

50. U.S. Department of Energy, Energy Efficiency and Renewable Energy, FreedomCar and Vehicle Technologies Program, *Fact of the Week: Speed Versus Fuel Economy: Slow Down to Get More Miles to the Gallon*,, downloaded from www.eere.energy.gov/vehiclesandfuels/facts/favorites/fcvt_fotw222.shtml, 29 June 2005.

51. International Energy Agency, *Saving Oil in a Hurry: Measures for Rapid Demand Restraint in Transport*, [Draft], 28 February 2005.

52. Ibid.

53. Stacy C. Davis, Susan W. Deigel, Center for Transportation Analysis, Oak Ridge National Laboratory, *Transportation Energy Data Book: Edition 22*, September 2002, Chapter 7. The federal government has approved a slight increase in light truck CAFE standards to take effect for the 2005 model year.

54. See note 12, Appendix C. The federal law that established CAFE standards also established the means for testing of vehicles to determine compliance with the standards. It has long been recognized that these testing methods overstate the "real world" fuel economy of vehicles. EPA has begun to include adjusted figures in its reporting of fuel economy trends and, in its 2004 report, included an estimate of real-world vehicle mileage based on increases in the percentage of urban driving.

55. U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 2003*, 7 September 2004 and U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1995*.

56. See note 12.

57. See note 7.

58. David L. Greene, Philip Patterson, Margaret Singh, Jia Li, "Feebates, Rebates, and Gas-Guzzler Taxes: Study of Incentives for Increased Fuel Economy," *Energy Policy*, 33 (2005) 757-775, April 2005.

59. U.S. Department of Energy, Energy Efficiency and Renewable Energy, "New York State Finds Avenues to Alternative Fuel Success," *EPAct Fleet Information and Regulations: State and Alternative Fuel Provider Rule Newsletter*, February 2005

60 California Energy Commission, *California State Fuel-Efficient Tire Report: Volume 2*, January 2003.

61. See Jayanthi Rajamani, Chandra Bhat, et al., *Assessing the Impact of Urban Fo*rm *Measures in Nonwork Trip Mode Choice After Controlling for Demographic and Level-of-Service Effects*, presented at 2003 Annual Meeting of Transportation Research Board, 15 January 2003 and other studies.

62. For more information on induced travel, see Robert Noland, *Induced Travel Bibliography*, September 2003 at www.vtpi.org/induced_bib.htm.

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