

# Ending Oil Dependence As We Know It

## *The Case for National Action*

*By Ronald E. Minsk*

The events of September 11, 2001, and the subsequent war against terrorism have raised concerns about the nation's security to levels unseen since the Second World War. Among them is a heightened sense of energy insecurity. Americans have a renewed recognition of the potential consequences of our economy's dependence on oil, focusing on concerns about the United States'—indeed the world's—dependence on oil that flows from the Persian Gulf, where the crosscurrents of politics can turn this vulnerability into a national security and economic nightmare at a moment's notice.

Three years of volatility in global and domestic oil prices also have reminded us of the critical strategic as well as economic implications of our oil dependence. Unfortunately, the debate to date has focused primarily on America's dependence on foreign oil. This has led to specious calls for “energy independence” that miss the point about what that concept really means, as best exemplified by the dead-end debate over drilling for oil in the Arctic National Wildlife Refuge.

The real issue that we must address is the need to diminish the role of oil—regardless of its origin—in our economy. Whether we secure it from any corner of the globe market or from every nook and cranny of the United States, oil will continue to be a strategic and economic liability until we reduce our need for it. Instead of trying to address our oil dependence primarily by expanding supply, we must achieve a better balance of increasing the efficiency with which we consume oil while maintaining our supply base.

The following significant and compelling factors should point us to new policies—and accelerate the implementation of existing policies—to reduce the nation's overall reliance on oil:

- **First**, our nation's dependence on oil has figured prominently in U.S. policy toward the Middle East in general, and has helped embroil us in conflicts such as the Persian Gulf War. Moreover, oil dependence constrains our foreign policy by diminishing our ability to act freely in our strategic interest and in that of our allies. In today's conflict, the actions of nations that should be strong allies in the war on terrorism—Saudi Arabia in particular—appear to be inhibited by domestic concerns about Islamic extremism, straining relations between the world's largest oil consuming nation and its largest producing nation. In addition, many of our allies are more reliant on oil than are we; today's instability in the Persian Gulf could weaken or threaten our allies, particularly in Asia.

- **Second**, because much of the world's excess productive capacity—unused capacity that can be produced quickly when oil demand increases—resides in Persian Gulf nations, this region of the world has a disproportionate influence over our economy when oil demand is high and supplies are tight or threatened by regional or local instability.

- **Third**, the U.S. transportation sector is almost totally reliant on oil. In contrast, the electricity

and industrial sectors are diverse and can switch among fossil fuels from oil to gas to coal. This dependence gives oil both a unique and uncomfortable role in our national economic health and well-being.

- **Fourth**, oil is a significant driver of our economy. When oil is at or near its historic price average, oil costs the United States around \$150 billion per year. This compares to 2000 when the average price of \$28 per barrel added an additional \$68 billion to the nation's energy bill.<sup>1</sup> This higher price tag carries with it negative effects that go beyond a simple tax increase of an equivalent amount: The benefits from revenues associated with higher oil prices largely migrate to the treasuries of foreign countries and, with the exception of the oil producing regions in the United States, do not spur economic activity at home. To the contrary: There appears to be a correlation between sharp OPEC-inspired oil price spikes and economic recessions.<sup>2</sup>

- **Fifth**, the environmental benefits of burning less gasoline and diesel fuel would be significant. Vehicle emissions create smog as well as contribute to global climate change, and a shift to cleaner technologies will reduce the need to impose stricter regulation to improve air quality.

Although our long-term energy needs are likely to increase as our economy grows, our dependence on oil need not. To simultaneously achieve our economic and energy security goals, we need a suite of new and enhanced policies to: increase and encourage oil use efficiency and conservation; invest in technologies that offer alternatives to oil; support environmentally responsible domestic production; and encourage diversification of international productive capacity.

The path to oil independence is not yet clear, but is beginning to come slowly into focus with

hybrid vehicles already on the market and, further over the horizon, with the promise of fuel cell and hydrogen technologies. The major automobile and oil companies have already seen the wisdom of investing in these alternative technologies, but this is no time for a leisurely evolution. Reducing our dependence on oil is an urgent national priority. The right debate for Washington concerns the federal government's role in spurring this future, whether by setting higher fuel-economy standards for all vehicles, including sport utility vehicles; making well-considered investments in research and development; or spurring demand, either through the federal government's own purchasing power or by giving consumers incentives to buy into an alternative energy future.

The direction in which Congress moves as it debates our energy and oil policy will affect our economy, environment, and national security for years and decades to come. The approach to oil dependence advanced by the White House, and imbedded in House-passed legislation, provides a simplistic answer to a complex set of questions, by suggesting that it is possible for the United States simply to produce its way out of this problem. Yet the United States is a mature oil producer, with production steadily declining for over 30 years, and much of the oil remaining in the United States is generally very expensive to produce relative to other regions of the world. While new technology will allow for North American oil production to expand in remote regions economically, energy policies that ignore the basic geological fact that the United States is a mature producer, and are weighted so heavily on the development of domestic oil resources, particularly of the Arctic Refuge, are doomed to be ineffective.

It is imperative that Congress take a more balanced—and ultimately more effective—approach than that found in the President's energy policy or Republican-sponsored legislation. Many critical elements of such an

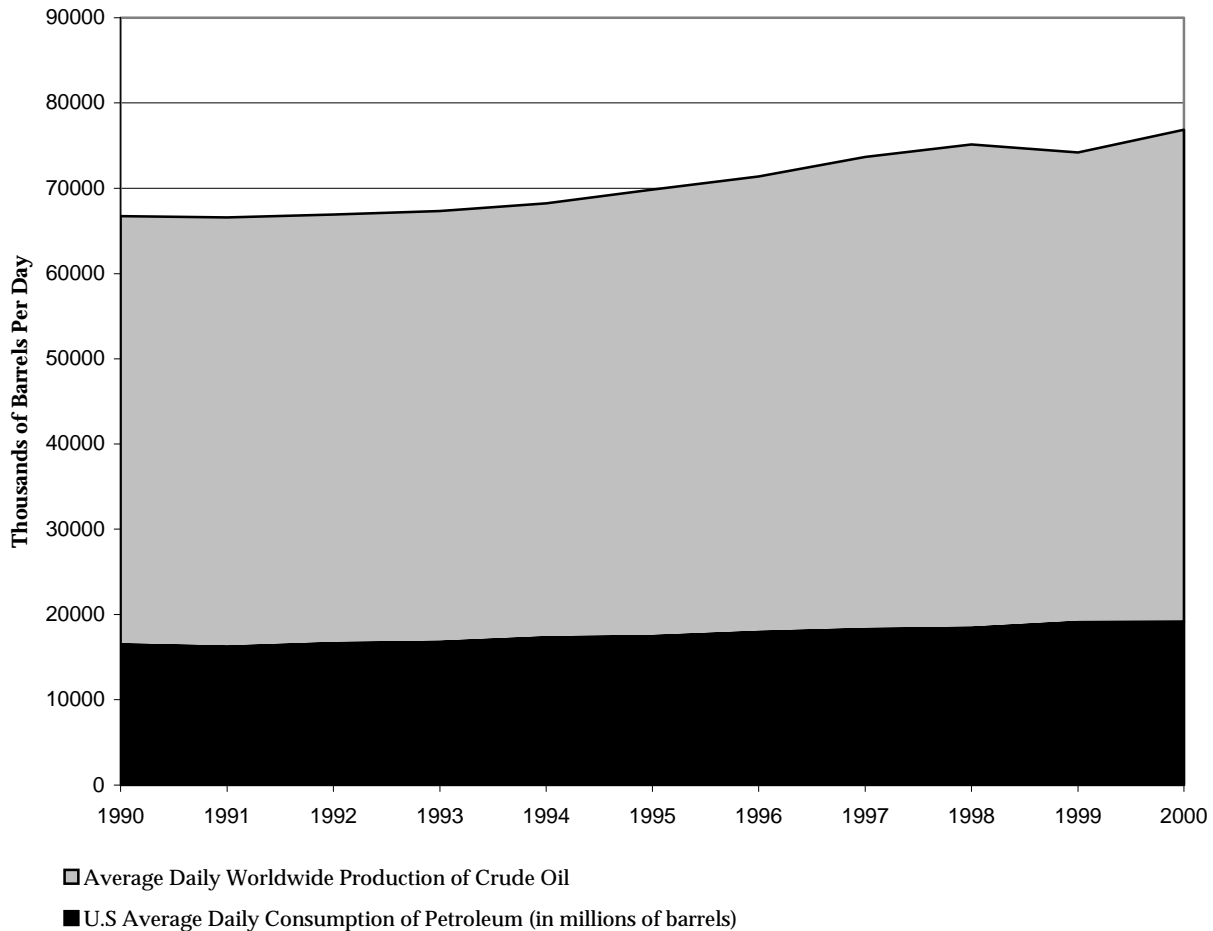
approach is found in the comprehensive bill introduced recently by Senators Tom Daschle (D-S.D.) and Jeff Bingaman (D-N.M.). Their proposal balances more carefully both the supply and demand portion of the oil equation, and contemplates a more aggressive role for the federal government in promoting technology that can move us beyond old-fashioned auto technologies. It is an approach that maintains the supplies we need to meet today's needs but seeks to lessen our dependence on oil tomorrow. More efficient engines, hybrid technology, and renewable fuels can all play

important roles in reducing our dependence on crude oil, and any responsible energy policy must recognize their integral role in our energy future.

This paper outlines the role that oil plays in our economy, and the risks to our economy from being so dependent on oil. It then examines the purported goals of increasing domestic production to achieve energy independence, and explains how such a policy fails to achieve any of its goals. A more balanced approach that immediately begins to concentrate on how to move beyond oil is a

**Table 1: Worldwide Production and U.S. Consumption of Crude Oil**

*Source: U.S. Department of Energy, Energy Information Administration*



better policy that truly enhances our national and economic security in the future.

### The Role of Oil in the Economy

Approximately two-thirds of the crude oil products used in the United States are for transportation fuels, with about two-thirds of that volume being used as gasoline.<sup>3</sup> Other transportation fuels produced from crude oil include distillate fuel (used as diesel fuel in trucks, buses, railroads, some vessels, and a few passenger autos), jet fuel, and residual fuel oil (used in tankers and other large ships). Unlike gasoline, which essentially is limited to use as a transportation fuel, distillate fuel oil is used as home heating oil, for industrial power, for electric generation, as well as for diesel-fueled vehicles. Jet fuel has limited non-transportation

use as a fuel for stationary turbine engines. Crude oil also is used to produce asphalt, chemical feedstocks, waxes, and a variety of other miscellaneous products.

Since 1991, U.S. consumption of petroleum products has increased 17 percent, from 16.71 million barrels per day to 19.13 million barrels per day in 2000,<sup>4</sup> representing about 25 percent of the 76 million barrels a day produced worldwide.<sup>5</sup> Much of the increased demand over the past decade is directly attributable to the growing demand for transportation fuels and the energy needs of a growing economy.

Our relatively high rate of consumption contrasts sharply with the fact that we produce only about 8 million barrels of petroleum a day and hold less than 3 percent of the proven petroleum reserves in world.<sup>6</sup> Moreover, our domestic production has declined steadily since

**Table 2: Imports from Persian Gulf & From OPEC as Percentage of Total Imports**

Source: U.S. Department of Energy, Energy Information Administration



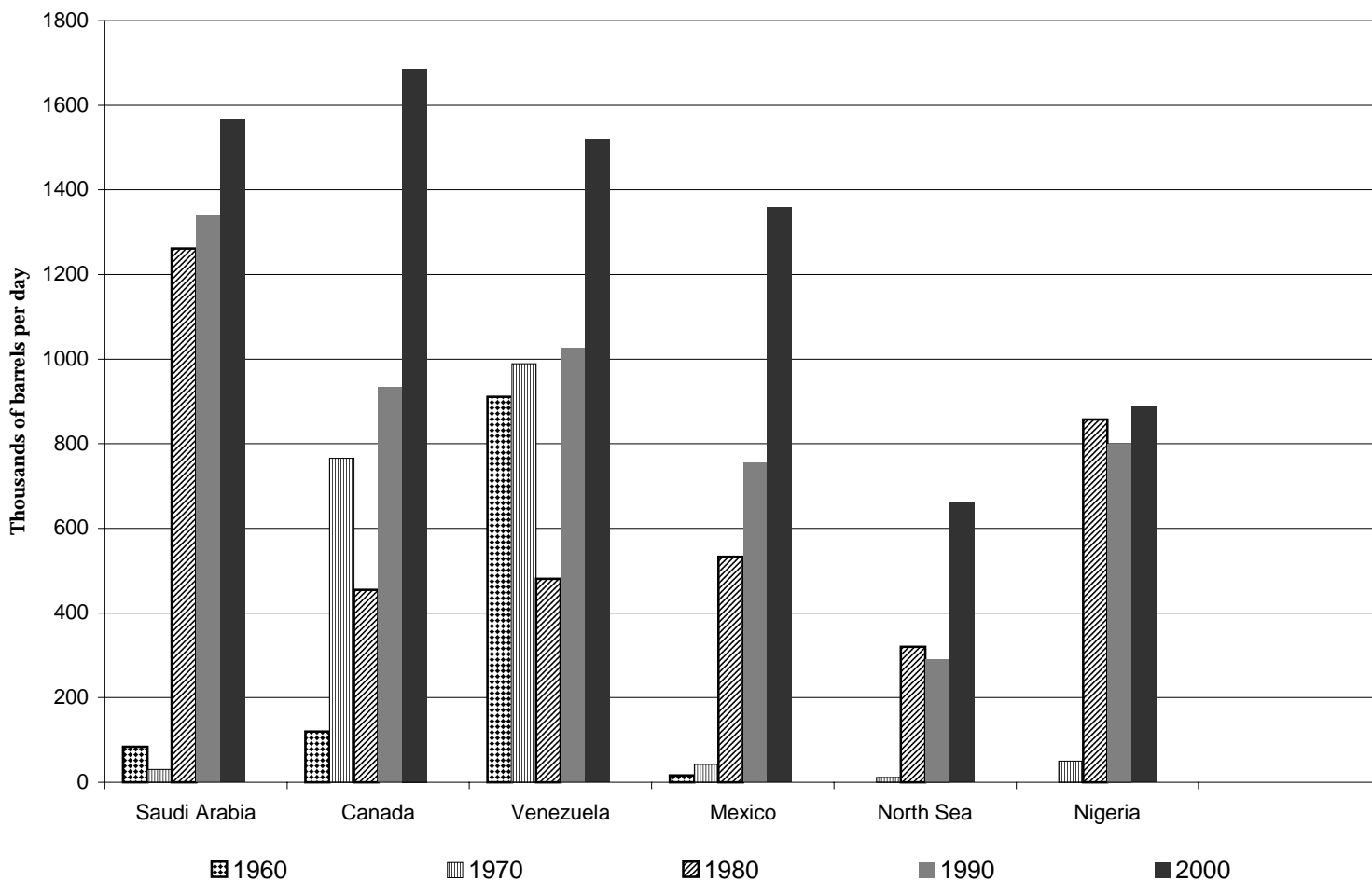
peaking in 1970 (except for a 1978 bump in production when Alaskan oil fields came on line), and its rate of decline has been relatively unaffected by the rise and fall of oil prices or government policies and initiatives over the past two decades.<sup>7</sup> This decline reflects the basic geological fact that we are a mature oil producer, and that other countries with significantly larger reserves than the United States can produce oil at a much lower cost than we can.

To mitigate the perceived risks associated with dependence on Persian Gulf oil that became so evident in the 1970s and early 1980s, we have diversified our oil suppliers and

reduced our dependence on oil from the Persian Gulf over the past two decades. From 1973 to 1977, the percentage of our imports from the Persian Gulf rose from 9.9 percent to 27.8 percent; by 1998, the level had fallen to 19.9 percent of imports, although it rose to 22.3 percent in 2000.<sup>8</sup> And although current foreign oil imports to the United States account for approximately 58 percent of our total petroleum supply,<sup>9</sup> we have also increased the geographic diversity of our oil suppliers. Today, the six primary oil exporters to the United States are Saudi Arabia, Venezuela, Mexico, Canada, Nigeria, and the North Sea (Norway and the United Kingdom).<sup>10</sup> If we consider imports

**Table 3: Volume of Imports from Key Suppliers**

*Source: U.S. Department of Energy, Energy Information Administration*



from Canada, Mexico, Venezuela, and other smaller producing countries, and add domestic production, nearly 75 percent of the petroleum that we consume comes from the Western Hemisphere.<sup>11</sup>

At the same time that we have reduced our dependence on imports from less secure regions of the world, we have also—until recently—increased the efficiency with which we consume oil, and have done so without sacrificing our standard of living. Between 1970 and 2000, the United States doubled the size of its economy while cutting its use of oil by half per unit of economic output. Specifically, between 1970 and 1998 we reduced our consumption of oil per dollar of GDP by nearly 50 percent, from nearly 15 barrels per \$10,000 of GDP to 8 barrels per \$10,000 of GDP, while the economy grew from \$3.5 trillion to over \$8 trillion.<sup>12</sup> In other words, we demonstrated that if the incentives are in place, we can increase efficiency while still improving significantly our standard of living.

### ***The Risks of Oil Dependence***

Even with diversified suppliers and more efficient use, our dependency on oil is an increasingly problematic element of our national and economic security goals. Over the past two years we have witnessed the two most critical ways in which our dependence on oil affects the nation. During late 1999 and through 2000, the price of oil rose from the mid-teens to a peak of almost \$38 per barrel (with a similar rise in the price of gasoline and natural gas), raising concern about the effect of higher energy prices on the rest of the economy.

Then, just months after oil prices retreated into the more familiar \$18 to \$24 per barrel price range, the tragic events of Sept. 11 once again focused our attention on the relationship between our energy policy and our national security. It is widely acknowledged that our reliance on Saudi oil and Saudi Arabia's role in

the world oil market has prevented us from demanding or receiving full cooperation from Saudi Arabia during this time. Although Saudi Arabia has assured the United States that it will maintain stable oil supplies either independently or in concert with its OPEC partners, our reliance on this assurance constrains our foreign policy and ultimately undermines our national security strategy. And even though other oil exporting governments have committed to maintain stable oil supplies, those commitments also constrain the manner in which we conduct our foreign policy. Finally, growing concerns about Saudi Arabia's ability to deliver on its assurances about oil market stability must be considered in the context of the decades-old conflict with Iran and ongoing questions about the reliability of Iraqi oil production and its use as a weapon to further Iraq's geopolitical motives. These three countries represent 18 percent of world production, 46 percent of world reserves, and a significant portion of its readily available excess production capacity.<sup>13</sup>

These concerns have rekindled the debate about the appropriate U.S. policy regarding our nation's use and importation of oil. Should we produce more oil at home in order to import less, or should we constrain the growth in our consumption, with a goal of reducing it in the future?

### ***How Do We Best Mitigate the Risks of Oil Dependence?***

There are three often-cited reasons for seeking to reduce our reliance on imported oil against which the effectiveness of policies designed to enhance our energy security should be measured: 1) to protect the economy and consumers from the dislocations associated with significant price volatility; 2) to provide insurance against short-term supply disruptions; and 3) to ensure greater latitude in the exercise of foreign policy. What remains

largely unexamined is the effectiveness of policies that would promote drilling in the Arctic Refuge or in other environmentally sensitive domestic producing regions as the central means of addressing these fundamental objectives.

There are general benefits associated with adequate supplies and with preservation of a domestic resource base. However, a careful examination of the purported benefits of increasing domestic production in the manner proposed in the President's energy policy or in House-passed legislation suggests that they would *not* address these three fundamental reasons for seeking to reduce our dependence on foreign oil in the first place, and therefore ought not be pursued, particularly as the centerpiece of a national energy strategy.

**Price Spikes:** Increased domestic production will not insulate us from price spikes. Oil is a fungible commodity traded around the world. When it is adjusted for quality and transportation costs, there is essentially a single global price for oil. Even if the United States produced 100 percent of the oil it consumed, the price would be subject to volatility based on the output of other producers, including OPEC countries, as well as the demand from oil consuming nations. This is best illustrated by the fact that oil (and gasoline) prices in both Norway and the United Kingdom, two free market economies that are net exporters of oil,<sup>14</sup> rose significantly between the summer of 1999 and the winter of 2000-2001. (Recall the refinery blockades in England to protest the rise of oil prices.) Accordingly, increasing domestic oil production—or even achieving oil independence—cannot protect our economy from oil price volatility.

Moreover, the amount of oil anticipated from opening the Arctic Refuge to oil production—the policy centerpiece of those who advocate increased domestic production as a means to increase energy security—is

insufficient to meaningfully affect the world price of oil, and any effect could be reversed by OPEC if it chose to do so and was functioning cohesively. According to the U.S. Geological Survey, drilling for oil in the Arctic Refuge would likely yield an additional 1.3 million barrels per day in the 13th year after approval to develop the region was granted.<sup>15</sup> Department of Energy forecasts indicate that this amount of oil would represent roughly 5 percent of our domestic oil consumption and just a little over 1 percent of the world's daily oil consumption.<sup>16</sup> It is unlikely that this small amount of oil would significantly alter the world price of oil or enhance our energy security.

There are essentially two possible OPEC responses to U.S. production in the Arctic Refuge. First, OPEC, through its price band, has articulated its policy of producing for a target price and not a target volume. But, the amount of oil from the Arctic Refuge is sufficiently small (1.3 million barrels a day at peak versus over 25 million barrels a day produced today by OPEC) that OPEC could reduce production by a corresponding amount and maintain its desired price level, without threatening meaningfully the individual market share of any of its eleven members. In other words, while it is theoretically true that oil production from the Refuge could slightly lower prices by increasing world supplies, it is reasonable to conclude that OPEC would simply choose to negate that impact by reducing production by a corresponding amount. The Arctic Refuge oil could simply end up replacing OPEC oil on the world market. In the alternative, OPEC could choose not to reduce production and allow the price of oil to fall, albeit not that much. In the event of lower oil prices, however, the first producers to leave the market are the highest cost producers, which tend to be the marginal producers in the United States. We saw this occur during 1998 and 1999, when production from domestic marginal wells fell significantly in response to low prices.

Either OPEC response effectively creates a “Drain America First” energy policy. If OPEC chooses to reduce production, oil from the Arctic Refuge will replace OPEC oil on the world market, and prices will not fall. We will see no savings from lower prices, but will be depleting our oil instead of theirs. If, on the other hand, OPEC chooses not to reduce production and prices do fall, the producers most likely to be harmed and forced to reduce production are the high-cost marginal producers in Texas, Oklahoma, New Mexico, and elsewhere in the continental United States. In this instance, although we may see minimal savings from lower prices, we simply would be replacing oil from the Arctic Refuge with oil from other domestic marginal producers.

Further, oil is not a renewable resource. Even if we produce oil in the Arctic Refuge, once that oil is gone we will be in the same position that we are in today. We will have gained little in the short term, as demonstrated above, and will not have enhanced our energy security in the long term, because we will have depleted the oil in the Arctic Reserve. In contrast, if we were instead to focus on continuing to increase the energy efficiency of the economy, we would have some, albeit small, gains in the short term, which would grow over time as we continually became more efficient. And those technology gains would be permanent, unlike the ability to produce oil in the Arctic Refuge. It would therefore appear to enhance our energy security to decide not to develop the Arctic Refuge and Drain America First, because it offers us little gain in the short term, while the oil’s continued presence would at a minimum leave us with a greater range of options with respect to our future energy policy.

**Supply Interruptions:** Increasing domestic oil production also is unlikely to meaningfully protect the United States against a coordinated decision by OPEC or any subgroup of OPEC producers to interrupt oil exports. To the extent

that we systematically increase domestic production, other producers could adjust their production levels to account for the increase. But whether or not other producers adjust production in response to new domestic production, the increase would simply be worked into the new baseline level of worldwide production, effectively becoming the new norm. The economic effect of any subsequent supply interruptions would simply be measured from that new norm.

Moreover, the likelihood of a coordinated interruption of oil exports is much smaller than it was 25 years ago. Over the past two and a half decades, many of the exporting governments have become increasingly reliant on oil revenues to support their own domestic budgets.<sup>17</sup> That reliance, however, undermines their ability to interrupt exports, as doing so also interrupts their revenue stream. At the same time, the United States has worked to reduce the perceived risk of a coordinated effort to interrupt oil supplies by reducing our reliance on imports from the Persian Gulf, those that are at the greatest risk. Today, imports from the Persian Gulf represent only 23 percent of all imports and about 13 percent of our consumption.<sup>18</sup> Even if all imports from the entire region and other OPEC members (excluding Venezuela) were interrupted, our Strategic Petroleum Reserve (SPR) could replace the loss for several months. The current volume of crude oil in the SPR represents about 45 days of crude oil imports from all nations (including Canada and Mexico), but about 105 days of crude oil imports from OPEC producers, and about 220 days of imports from the Persian Gulf.<sup>19</sup> And to the extent that we believe that the SPR is an effective tool against unexpected short-term supply interruptions, we can expand the size of the SPR. In fact, President Bush has already announced he will expand the size of the SPR by continuing the Clinton administration program of accepting oil for deposit into the SPR in lieu of cash as royalty

payments from companies that produce oil in the Gulf of Mexico.

**Latitude in Foreign Policy:** It is difficult to understand precisely how the United States would achieve total domestic oil independence in a global economy that is increasingly reliant on free trade as a guiding principle. The United States is the world's main proponent of market-driven domestic and international economic policies. A policy of oil self-sufficiency in a world where oil is a freely traded commodity in global markets would necessarily threaten this principle, and would—in the highly unlikely scenario it could be achieved—undoubtedly bring with it its own set of new, different, and significant constraints on our foreign policy.

Further, we also should not overlook the effect global over-reliance on Persian Gulf oil and productive capacity has on our trading partners, our strategic allies, and the worldwide economy. Even if the United States were to achieve complete oil independence (which is a highly unlikely scenario at current rates of domestic oil consumption and the high costs of domestic production), our key economic and strategic allies, particularly in Asia, have relatively few indigenous oil resources and would remain susceptible to the vagaries of Persian Gulf oil exports.<sup>20</sup> European dependence on Persian Gulf oil is already at 40 percent and expected to rise as North Sea fields are depleted.<sup>21</sup> This will likely further increase the geopolitical influence of the Gulf region. As we have learned over the past few years, in an era of increased trade, economic trouble abroad can lead to economic trouble at home. And as we have learned post-Sept. 11, the value of strategic alliances cannot be overestimated. It is clear that the economic stability and strategic support of our allies is key to our own national, economic, and energy security.

Finally, in considering policies that will shape our energy future, it also is important to understand some of the factors that give OPEC

power so that we do not waste effort in pursuit of policies that will not succeed. OPEC's role in world oil markets derives not simply from the volume of oil that it produces, or the fact that it is a low-cost producer. Its real power comes from its ability *and* willingness to adjust quickly its volume of production either up or down in order to affect short-term to intermediate-term oil supplies. Although OPEC may be reluctant to cut production when economies are weak and demand is sagging for fear of losing market share, its willingness and ability to manage carefully production volumes during periods of strong economic growth when demand for oil is strong—and the effect of that policy—was demonstrated in 1999 and 2000.

Understanding the source of OPEC's power demonstrates that enhanced energy security would not come simply from importing a smaller percentage of the oil we consume. Instead it could come from maintaining spare productive capacity that could be used in the event of a coordinated supply interruption. Yet we will never be able to match OPEC's ability (largely the Saudi's) to quickly and easily adjust production volumes. Whereas the United States has 21 billion barrels of reserves, the Saudis alone have more than 260 billion. And while we have already produced much of the inexpensive and easy to produce oil, the Saudi's have not. It is relatively easy for the Saudis, for instance, to maintain spare production capacity when they know where the oil is and it can be produced for less than one and a half dollars per barrel.<sup>22</sup>

In effect, the maintenance of spare productive capacity is the goal of the SPR. The fundamental limitation of the SPR is its size. As noted above, President Bush has already announced that he will continue a Clinton administration program to expand the size of the SPR. And although the SPR is reasonably sized in order to respond to an unexpected short-term supply interruption (whether the result of a coordinated decision by producers or a technical or logistical problem), it is not

sufficiently large to provide a long-term counterweight to OPEC's market power, which, as noted above, derives from the size of their reserves and their willingness to use them. The development and maintenance of such spare production capacity in the United States beyond the SPR, however, would be extraordinarily expensive or would require policies and legislation that are contrary to free market principles. Further, it is most likely impossible given the level of economically and technically recoverable oil reserves in the United States. Reliance on the SPR also raises complicated issues regarding the appropriate times to use it. In other words, although the SPR offers us some degree of enhanced energy security as a tool to respond to a limited set of short-term events, it is not without serious limitations regarding both its size and use, particularly as a tool to fight higher oil prices.

## **Conclusion**

The oil markets have changed significantly since the 1970s, but it appears that the Republican approach to energy policy fails to recognize that change. Not only does the cost of oil represent a much smaller share of our economy than it did 30 years ago, but the oil markets are much more flexible and sophisticated. Oil is produced in a more diverse range of countries and regions, and is transported with greater flexibility. And more oil is traded around the world, at market prices, than in the past, while better (albeit still very imperfect) information enables participants in the markets to use newly developed futures markets help mitigate the risks of volatile prices. At the same time, we have a better understanding, based on the performance of the domestic industry over the past several decades, that we live in a mature producing nation, with high production costs. Moreover, we understand the basic immutable geological facts that other nations possess significantly greater petroleum reserves than we do, and that

fact affects our ability to have complete control over our energy future, so long as we are so dependent on oil.

Given this understanding of 21st century oil markets, and the mistaken notion that we can produce our way toward energy independence, it is clear that the true road to oil independence is not found in reducing our reliance on imported oil but is instead found in reducing the nation's reliance on oil—period. Because increased domestic production cannot insulate the United States from either oil price volatility or coordinated supply interruptions, we must plan an energy future that is not focused on reducing our reliance on imported oil, but that is focused on reducing our reliance on *all* oil. So long as we allow our economy to remain so overwhelmingly reliant on oil—imported or domestic—our economic and energy destiny will remain outside of our ultimate control.

It is therefore time to move beyond a discussion of increasing our security by increasing domestic oil production. While we must maintain our domestic production, our energy policy must accept the inevitable geological fact that our resource base is a declining one, because we have been depleting it for over 100 years. Instead of simply looking for more places to drill, we must take steps as a nation to reduce our overall dependence on oil from all sources, in order to protect our nation's physical security and its economy. Even if we were to open the Arctic Refuge for exploration, at some point in the not-too-distant future we will be forced to turn to efficiency and alternative fuels, as declining petroleum stocks lead to higher petroleum prices. The real question is whether we begin making this adjustment of our own volition and on our own timetable, or we will let the Saudi's and their OPEC partners force the decision upon us through their ability to affect the price of oil. Importantly, we can reduce our dependence on oil without sacrificing our standard of living, just as we have done over the past 30 years; but

our ability to make such a change smoothly will be enhanced if it is the result of our own decisions instead of decisions made elsewhere and forced upon us.

As Congress debates our energy future, it is critical to develop a balanced approach which recognizes the economic and national security costs of maintaining our dependence on oil and takes important steps to move us toward the

inevitable future, in which new technologies and fuels will reduce our reliance on crude oil. Consumption patterns make it clear we must focus above all else on the transportation sector. The sooner Congress directs our nation toward its inevitable path, the sooner we will enhance both our economic strength and national security.

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## Endnotes

<sup>1</sup> The average refiner acquisition cost of crude oil between 1986 and 2000 was \$20.62 in 1999 dollars. *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.19, available at [www.eia.doe.gov/emeu/aer/txt/tab0519.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0519.htm). 1996 dollars inflated to 1999 dollars using inflator of 1.0477. *Economic Report of the President*, January, 2001, The Council of Economic Advisers, Table B-3, available at [www.access.gpo.gov/usbudget/fy2002/sheets/b3.xls](http://www.access.gpo.gov/usbudget/fy2002/sheets/b3.xls).

<sup>2</sup> The 1974-75 recession was preceded by a price spike, as the nominal price of oil rose from an average of \$4.15 in 1973 to \$9.07 in 1974. The 1980-82 recession was preceded by a price spike between 1978 and 1981, with the average nominal price of \$12.46 in 1978 rising to \$17.72 in 1979, \$28.07 in 1980, and \$35.24 in 1981. The 1990-91 recession was preceded by a price spike in 1990, when the price rose from \$21.58 in 1989 to \$25.68 in 1990. The 2001 recession was preceded by a price spike in 2000 when the price rose from \$17.52 in 1999 to \$28.23 in 2000. *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.19, available at [www.eia.doe.gov/emeu/aer/txt/tab0519.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0519.htm).

<sup>3</sup> The U.S. economy consumed about 19.13 million barrels a day of petroleum in 2000, of which 12.99 million barrels (68 percent) were refined into transportation fuels, and of which 8.26 million barrels a day (64 percent of 12.99 million barrels) were refined into motor gasoline. Source: *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.12c, available at [www.eia.doe.gov/emeu/aer/txt/tab0512c.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0512c.htm).

<sup>4</sup> *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.1, available at [www.eia.doe.gov/emeu/aer/txt/tab05012c.htm](http://www.eia.doe.gov/emeu/aer/txt/tab05012c.htm).

<sup>5</sup> Average worldwide production during 2001 (through September) was 76,839,000 barrels per day. Average worldwide production during 2000 was 76,858,000 barrels per day. *World Oil Supply, 1990-Present*, Department of Energy, Energy Information Administration, available at [www.eia.doe.gov/emeu/ipsr/t14.txt](http://www.eia.doe.gov/emeu/ipsr/t14.txt).

<sup>6</sup> Daily domestic production of crude oil and natural gas plant liquids, which are petroleum inputs into the refinery process, are about eight million barrels per day. *Crude Oil and Petroleum Products Overview*, Department of Energy, Energy Information Administration, available at [www.eia.doe.gov/pub/oil\\_gas/petroleum/data\\_publications/petroleum\\_supply\\_monthly/current/pdf/stable1.pdf](http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/petroleum_supply_monthly/current/pdf/stable1.pdf). The United States had 21.765 billion barrels of crude reserves as of December 31, 1999. *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves 1999 Annual Report*, Department of Energy, Energy Information Administration, page 19, available at [www.eia.doe.gov/pub/oil\\_gas/natural\\_gas/data\\_publications/crude\\_oil\\_natural\\_gas\\_reserves/current/pdf/ch3.pdf](http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/crude_oil_natural_gas_reserves/current/pdf/ch3.pdf). DOE reports that the Oil and Gas Journal estimates worldwide reserves on January 1, 2000 at 1,018 billion barrels of crude oil. *World Crude Oil and Natural Gas Reserves, January 1, 2000*, Department of Energy, Energy Information Administration, available at [www.eia.doe.gov/emeu/iea/table81.html](http://www.eia.doe.gov/emeu/iea/table81.html).

<sup>7</sup> See annual domestic production of crude oil and natural gas liquids as reported in *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.1, available at [www.eia.doe.gov/emeu/aer/txt/tab0501.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0501.htm).

<sup>8</sup> Petroleum Imports by Country of Origin, 1960-2000, *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.4, available at [www.eia.doe.gov/emeu/aer/txt/tab0504.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0504.htm).

<sup>9</sup> Total imports in 2000 were about 11.093 million barrels a day. Source: *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.4, available at [www.eia.doe.gov/emeu/aer/txt/tab0504.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0504.htm). The U.S. economy consumed about 19.13 million barrels a day of petroleum. *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.12c, available at [www.eia.doe.gov/emeu/aer/txt/tab0512c.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0512c.htm).

<sup>10</sup> Petroleum Imports by Country of Origin, 1960-2000, *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.4, available at [www.eia.doe.gov/emeu/aer/txt/tab0504.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0504.htm).

<sup>11</sup> Imports of Crude Oil and Petroleum Products into the United States by Country of Origin [www.eia.doe.gov/pub/oil\\_gas/petroleum/data\\_publications/petroleum\\_supply\\_annual/psa\\_volume1/current/txt/table\\_21.txt](http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/petroleum_supply_annual/psa_volume1/current/txt/table_21.txt).

<sup>12</sup> Computed from GDP data reported by the Department of Commerce, Bureau of Economic Analysis at [www.bea.doc.gov/bea/dn/gdplev.xls](http://www.bea.doc.gov/bea/dn/gdplev.xls) and from oil consumption data reported by the Department of Energy, Energy Information Administration, at [www.eia.doe.gov/emeu/aer/txt/tab0103.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0103.htm).

<sup>13</sup> Worldwide production in first nine months of 2001 averaged 76,839 thousand barrels a day, including 8.160 million in Saudi Arabia, 2.380 million in Iraq, and 3.790 million in Iran. Worldwide reserves are estimated to be 1,016.8 billion barrels, with 263.5 billion in Saudi Arabia, 112.5 billion in Iraq, and 89.7 billion in Iran. Department of Energy, Energy Information Administration, [www.eia.doe.gov/emeu/ipsr/t14.txt](http://www.eia.doe.gov/emeu/ipsr/t14.txt) (production data) [www.eia.doe.gov/emeu/iea/table81.html](http://www.eia.doe.gov/emeu/iea/table81.html) (reserves data).

<sup>14</sup> Department of Energy, Energy Information Administration Country Analysis Briefs available at [www.eia.doe.gov/emeu/cabs/uk.html](http://www.eia.doe.gov/emeu/cabs/uk.html) (United Kingdom) and [www.eia.doe.gov/emeu/cabs/norway.html](http://www.eia.doe.gov/emeu/cabs/norway.html) (Norway).

<sup>15</sup> Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge: Updated Assessment, United States Geological Survey, Report #SR/O&G/2000-02, February, 2000, Chapter 2, available at [www.eia.doe.gov/pub/oil\\_gas/petroleum/analysis\\_publications/arctic\\_national\\_wildlife\\_refuge/html/analysisdiscussion.html#table%203](http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/arctic_national_wildlife_refuge/html/analysisdiscussion.html#table%203).

<sup>16</sup> DOE forecasts total supply of petroleum products to the U.S. economy in 2015 to be 25.01 million barrels per day. Source: Petroleum Supply and Disposition Balance, Annual Energy Outlook, 2002 Reference Case Forecast, Table A-1, available at [www.eia.doe.gov/oiaf/aeo/pdf/appa.pdf](http://www.eia.doe.gov/oiaf/aeo/pdf/appa.pdf). DOE forecasts total supply of petroleum products to the worldwide economy in 2015 to be 106.42 million barrels per day. Source: International Petroleum Supply and Disposition Summary, Petroleum Supply and Disposition Balance, Annual Energy Outlook, 2002 Reference Case Forecast, Table A-21, available at [www.eia.doe.gov/oiaf/aeo/pdf/appa.pdf](http://www.eia.doe.gov/oiaf/aeo/pdf/appa.pdf).

<sup>17</sup> See OPEC Cutback May Help Prices, Erode its Clout, *Wall Street Journal*, December 31, 2001, page A3; Mexico to Trim Oil Output by 100,000 Barrels a Day, *Los Angeles Times*, January 2, 2001; Falling Oil Revenue to Hit Indonesian Budget, *Indian Economic Express*, November 28, 1998, available at [www.indian-express.com/fe/daily/19981128/33255154.html](http://www.indian-express.com/fe/daily/19981128/33255154.html); Hard Time Ahead for Nigerian Economy, British Broadcasting System report, January 1, 1999, available at [lists.essential.org/1998/shell-nigeria-action/msg00816.html](http://lists.essential.org/1998/shell-nigeria-action/msg00816.html); Saudi Arabia Approves 2002 Budget Deficit, Highlighting Vulnerability To Oil

Price Movements, *Middle East Economic Survey*, Volume XLIV, No. 51, December 17, 2001, available at [www.mees.com/news/a44n51b01.htm](http://www.mees.com/news/a44n51b01.htm).

<sup>18</sup> Petroleum Imports by Country of Origin, 1960-2000, *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.4, available at [www.eia.doe.gov/emeu/aer/txt/tab0504.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0504.htm).

<sup>19</sup> Petroleum Imports by Country of Origin, 1960-2000, *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.4, available at [www.eia.doe.gov/emeu/aer/txt/tab0504.htm](http://www.eia.doe.gov/emeu/aer/txt/tab0504.htm). (import data) and Strategic Petroleum Reserve, 1977-2000, *Annual Energy Review*, Department of Energy, Energy Information Administration, Table 5.15, available at <http://www.eia.doe.gov/emeu/aer/txt/tab0515.htm> (SPR data).

<sup>20</sup> The European approach to Middle East policy has at times reflected their pattern of dependence on Persian Gulf oil and business opportunities, with, for instance, France and Germany taking a more conciliatory approach to Iraq than the United States.

<sup>21</sup> Department of Energy, Energy Information Administration, *Energy Situation Analysis Report*, January 8, 2002, available at [www.eia.doe.gov/emeu/security/esar/esar.html#oil](http://www.eia.doe.gov/emeu/security/esar/esar.html#oil).

<sup>22</sup> Speech by Saudi Minister of Petroleum and Mineral Resources, Ali I. Al-Naimi, Saudi Oil Policy: Stability With Strength, delivered on October 20, 1999 at Houston, Texas, reported at [www.saudiembassy.net/press\\_release/99\\_spa/houston99.html](http://www.saudiembassy.net/press_release/99_spa/houston99.html). Department of Energy, Energy Information Administration, *International Energy Outlook 2001, World Oil Markets*, available at [www.eia.doe.gov/oiaf/ieo/oil.html](http://www.eia.doe.gov/oiaf/ieo/oil.html).