Recommendations to the Nation on Reducing U.S. Oil Dependence
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Energy Security Leadership Council

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28th Commandant, United States Marine Corps

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Chairman, President and CEO, FedEx Corporation

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Statement of Purpose

The time has come for Americans to unite behind an aggressive campaign to reduce our dependence on oil and increase domestic and global energy security. To succeed, we must move beyond the narrow interests, political polarization, and short-term thinking that have prevented meaningful national progress for the last twenty years. The Energy Security Leadership Council (“Council”) believes that real progress is possible if we can come together around balanced policies that address both the supply and demand sides of the oil equation. The Council’s recommendations, which reflect the realities of global energy interdependence, constitute a comprehensive and integrated plan for achieving a safer energy future for America. We fully expect that all participants in this deeply entrenched debate will take issue with some of our solutions. Our mission is to secure the support of a bipartisan coalition that has the clarity of vision and courage of conviction needed to make hard choices.
Letter to the President, the Congress, and the American People

In offering these recommendations for reducing American oil dependence, the members of the Energy Security Leadership Council have one central goal: the enactment of public policies to significantly improve the nation's energy security.

For more than two decades, federal energy policy has been afflicted by paralysis. Although much energy legislation has been passed into law during this period, America's energy security has grown worse with each passing year. This deteriorating condition has created enormous economic and national security vulnerabilities.

Chief among the nation's formidable energy challenges is its dependence on oil, which fuels 97% of U.S. transportation needs. Since there are few readily available substitutes for oil, even a relatively minor disruption of the global oil supply has the potential to cause economic dislocation for tens of millions of Americans.

In an age characterized by instability throughout much of the oil-producing world, a supply crisis cannot be reasonably dismissed as a low-probability event. On the contrary, hostile state actors and terrorist organizations clearly intend to use oil as a potent strategic weapon to attack the United States. The threat is made ever more serious by rapidly rising global consumption.

Even in the absence of an outright supply crisis, oil dependence constrains American foreign policy by strengthening the nation's adversaries and placing enormous burdens on the U.S. military. While difficult to quantify with precision, these constraints and burdens unquestionably render the pursuit of U.S. national interests far more difficult and costly.

America must address this critical weakness. Continued government inaction presents inexcusable risks.

Improving America's energy security requires a meaningful reduction in the oil intensity of our economy and prudent expansion of secure oil supplies. By improving the fuel efficiency of the transportation fleet, increasing the availability of alternative fuel sources, and making responsible oil exploration and production more feasible, government policy can place the country in a far better position to endure the next supply crisis.

In truth, we have already proven that we can dramatically reduce oil intensity. The amount of oil needed to generate a dollar of GDP has essentially been cut in half since 1975. The result is a U.S. economy that still sees steady growth despite high oil prices such as those experienced over the last few years. Unfortunately, progress toward reduced oil intensity has slowed noticeably in the last decade. We must do better.

Political forces have often portrayed increased supply and decreased demand as mutually exclusive ambitions. In fact, both goals are indispensable components of any comprehensive policy for obtaining genuine energy security.
The policies we advocate will require many years to implement before benefits are evident. Strong and consistent leadership will be needed—not only to avoid panic during periods of high oil prices, but also to prevent complacency when costs to consumers temporarily recede.

In bringing together representatives of the business community and retired senior military officers, the Council intends to break the longstanding energy policy stalemate. We recognize that this task will be difficult. Nonetheless, we are firmly committed to seeing our recommendations through to enactment.

The following document outlines a new direction for energy policy. The suggested initiatives are aggressive while being balanced and credible. The Council calls for achievable and verifiable targets. The false hope of domestic energy independence is replaced by strategies for better managing the reality of global energy interdependence. Where the market has failed to provide solutions, government has been asked to apply workable standards capable of spurring the needed private-sector response.

The Council bears no government imprimatur. We have not been empowered by the Congress or the Administration, and we have received no public funds. The Council has been motivated by a shared belief in the pressing need for a comprehensive and realistic energy policy to reduce oil dependence and improve America’s economic and national security.

During the past five years, the American people have been shocked by the cruel realization of worst-case scenarios. Having witnessed the attacks of September 11, 2001, we know all too well the human cost of failing to address national security threats on our own terms, rather than those of our enemies.

America’s oil dependence threatens the prosperity and safety of the nation. Continued policy paralysis is unacceptable precisely because we can take action to improve our energy security. Many challenges lie ahead, but we have no doubt that the efforts of the American people will meet with success.

The time for action arrived long ago. We must not waste another moment.

General P.X. Kelley, USMC (Ret.)
28th Commandant, United States Marine Corps

Frederick W. Smith
Chairman, President and CEO
FedEx Corporation
This document outlines a comprehensive plan to reduce oil dependence. Within this framework, Primary Policy Recommendations are accompanied by Corollary Policy Recommendations of smaller but by no means inconsequential benefit. For purposes of comparison, point-in-time estimates for potential efficiency improvements and increased production figures refer to the year 2030, unless otherwise noted.
Primary Recommendations

I. REDUCE OIL CONSUMPTION
A. Significantly reform and then annually strengthen fuel efficiency standards for passenger cars and light-duty trucks.
   — Reform the Corporate Average Fuel Economy (CAFE) system in order to make it more market-, size-, and attribute-based and to allow for the application of different but increasingly stringent standards.
   — Set a target of 4% for annual increases in fuel efficiency of all passenger cars and light-duty trucks weighing up to 10,000 lbs.
   — Allow “off-ramps” if 4% is technically infeasible, unsafe, or not cost-effective for a given year.
B. Fund significant financial incentives for the domestic production and purchase of highly fuel efficient vehicles.
   — Lift the current 60,000 vehicle-per-manufacturer cap on tax incentives for the purchase of advanced technology efficient vehicles.
   — Link the tax credit to the miles-per-gallon performance of the vehicles.
   — Provide tax incentives for retooling to all manufacturers with existing U.S. facilities. 
     Projected savings: 4.3 million barrels of oil per day (mbd)

II. PROVIDE ALTERNATIVES
A. Grow the supply and demand sides of the biofuels market by creating incentives and obligations for infrastructure deployment, requiring increasing production of Flexible Fuel Vehicles (FFVs), and increasing federal assistance available for “first-mover” production of cellulosic ethanol and other promising large-volume biofuels.
   — Create obligations and provide tax credits for installing ethanol fuel pumps and related infrastructure. Limit the credit for corporate-owned and branded stations when oil prices are high.
   — Require 10% annual increases in the production of FFVs so that all major production models are compatible with rich ethanol blends by 2015.
   — Establish a competitive program employing a variety of financial tools—grants, tax credits, direct loans, and loan guarantees—for federal assistance to six or more biorefineries employing a variety of feedstocks and located in various regions of the country.
     Projected ethanol output: 30 billion gallons per year ≈ 2.0 mbd
III. EXPAND SUPPLY

A. Increase access to U.S. oil and natural gas reserves on the Outer Continental Shelf (OCS) with sharply increased and expanded environmental protections.
   — Increase access to OCS oil and natural gas reserves with appropriate third-party monitoring, increased surety bond requirements, clear penalties for environmental damages to avoid protracted litigation, stronger administration of the current leasing program, and protection of coastal vistas.
   
   Projected production: 1.0–2.0 mbd

B. Employ federal funds to accelerate the development and deployment of Enhanced Oil Recovery (EOR) techniques.
   
   Projected production: 1.0 mbd

C. Make investment access a high profile aspect of U.S. trade negotiations and diplomatic efforts with oil-producing nations.

IV. MANAGE RISKS

A. In light of military threats to the global oil infrastructure, the U.S. should, where appropriate:
   — Encourage burden sharing with U.S. allies and partners, including producing and consuming nations, in defense of global oil flows;
   — Foster formal and informal security arrangements on multilateral, regional, and bilateral bases, capitalizing on the U.S.’s unique ability to arrange international security efforts;
   — Provide diplomatic support as well as counter-terrorism training and military aid so that oil-producing nations can better assist in protecting petroleum supplies;
   — Offer assistance to producing countries in their efforts to develop attractive investment climates backed by stable civil societies; and

B. Reassess the multiple dimensions of strategic reserves policy within the U.S. and at the International Energy Agency (IEA). In addition, revise the 1974 Organization for Economic Co-operation and Development (OECD) agreement to allow China and India to join the IEA and participate in updated global strategic petroleum reserve arrangements.
Corollary Recommendations

I. REDUCE OIL CONSUMPTION

A. Extend federal subsidies for hybrid medium-duty vehicles (Classes 3–6) to 2012 and remove the cap on the number of eligible vehicles. Set and then annually increase fuel efficiency standards for medium-duty vehicles.
   — Set the standards consistent with the energy efficiency benefits of hybridization.
     Projected savings: 0.2 mbd

B. Set and then annually strengthen fuel efficiency standards for heavy-duty vehicles (Classes 7 and 8), employing federal subsidies as suitable.
     Projected savings: 0.9 mbd

C. Increase allowable weight to 97,000 lbs. gross vehicle weight for tractor-trailer trucks that have a supplementary sixth axle installed but which replicate current stopping distances and do not fundamentally alter current truck architecture. The Council also recommends that government further study the safety impacts of significantly longer and heavier tractor-trailers used in conjunction with slower speed limits. If safety can be proven, implementation could generate major efficiencies while simultaneously reducing road congestion and other non-fuel costs.
     Projected savings: will vary with extent of implementation

D. Require the Federal Aviation Administration (FAA) to implement improvements to commercial air traffic routing in order to increase safety and decrease fuel consumption.
     Projected savings: 0.4 mbd

II. PROVIDE ALTERNATIVES

A. Reform current ethanol per gallon subsidies to encourage private-sector investment in domestic ethanol and alternative biofuels production and infrastructure.
   — “Smart subsidies” will secure the industry against short-term oil price drops, minimize the cost to the U.S. Treasury, and distinguish between feedstock technologies.
   — Balance the benefits of domestic production capability with the advantages of environmentally responsible development of an international biofuels trade.
B. Grow the biodiesel market, while ensuring a biodiesel standard that mandates quality and reliability to satisfy the operational standards of users and also includes clear and consistent labeling of biodiesel blend ratios.

Projected output: 3.3 billion gallons per year = 0.2 mbd

C. Support federal investment in research, development, and commercialization of carbon sequestration technologies that can limit the adverse emissions impacts of oil shale, oil sands, and coal-to-liquids (CTL) production.

III. EXPAND SUPPLY
A. Increase access to U.S. reserves in Alaska.
   — Increase access to Alaskan reserves with appropriate third-party monitoring, increased surety bond requirements, clear penalties for environmental damages to avoid protracted litigation, and stronger administration of the current leasing program.

Projected production: 0.9 mbd

IV. MANAGE RISKS
A. Evaluate policy approaches to expand the ability of U.S. refineries to process a wider variety of crude stocks and to make U.S. refining less vulnerable to extreme weather. Work to expand total U.S. capacity or to ensure that the U.S. will have secure access to product produced overseas.
Proposal for Reducing U.S. Oil Dependence

With each passing year, the global oil trends now at work—rising consumption, reduced spare production capacity, high levels of instability in key exporting countries, and the threat of terrorism—all increase the likelihood of an energy crisis. The good news is that Americans can take meaningful steps to reduce oil dependence and improve energy security.
Proposal for Reducing U.S. Oil Dependence

Introduction

This proposal is premised on a single, fundamental proposition: safeguarding the physical and economic security of the United States requires significantly reducing our dependence on oil and improving our energy security.

Oil is the lifeblood of the American economy, providing more than 40% of all energy consumed and 97% of the energy used for transportation.¹

The Council believes that a balanced approach that addresses both the supply and demand sides of the oil equation, while retaining technology neutrality, offers the best hope for improving the energy security of a country that consumes 25% of the world’s oil but holds only 3% of global reserves.² At the same time, we recognize that measures to reduce domestic oil demand offer the greatest potential to improve America’s oil security. In a global market, the benefits of each barrel of increased domestic production are shared by all consumers in all nations through a lower equilibrium price, whereas the benefits of each barrel of reduced consumption accrue fully to those who have lessened their oil use. For these reasons, our recommendations begin with measures to reduce and displace domestic oil consumption.

We must banish the myths surrounding “foreign oil.” Calls for “energy independence” notwithstanding, oil is a fungible global commodity, which means that events affecting supply or demand anywhere will affect oil consumers everywhere. Oil, regardless of its provenance, is essentially priced in terms of quality as measured against several benchmark grades of crude. As such, a country’s exposure to world oil prices or oil price shocks is a function of the amount and types of oil it consumes and is not significantly affected by the ratio of “domestic” to “imported” product. Even if the U.S. could substitute for all foreign oil—a goal the Council believes to be impossible—American economic prosperity would still be linked to the health of a global economy dependent on international oil flows.

Oil prices may be a function of supply and demand, but the American people must also recognize that the twenty-first century global oil market is well removed from the free-market ideal. At least 75% — and by some estimates as much as 90% — of all oil and gas reserves are held by national oil companies (NOCs) that are either partially or fully controlled by governments.³ Oil markets are not only politicized, they are also distorted by the presence of large economic externalities such as military expenditures that are not factored into final pricing. Consequently, we must accept that market forces alone will not solve our oil problems. Rather, government must apply workable standards capable of spurring private-sector responses. Through this public-private partnership, we can empower ourselves to increase oil efficiency and diversify the portfolio of energy streams that fuel the U.S. economy. As we strive toward this less oil-dependent future, Americans can also make transitional improvements by increasing global oil production and improving the reliability and resiliency of the oil supply chain.

Reducing our oil dependence will not be easy. And even if we do begin to implement major improvements, continued price volatility will surely challenge our national resolve, as every temporary price

Figure 1: Top Oil Consumers†

- U.S.
- China
- Japan
- Russia
- Germany
- India
- Canada
- Brazil
- South Korea
- Mexico

Consumption, Million Barrels Per Day

Figure 2: Top Oil Producers‡

- Saudi Arabia
- Russia
- U.S.
- Iran
- Mexico
- China
- Canada
- Norway
- United Arab Emirates
- Venezuela

Production, Million Barrels Per Day

Figure 3A: U.S. Oil Demand by Sector, 2005††

- 2% Commercial
- 3% Electric Power
- 4% Residential
- 24% Industrial
- 67% Transportation

Figure 3B: Transportation Sector Demand by Mode, 2005††

- 2% Rail
- 3% Military Use
- 1% Buses
- 1% Other
- 10% Aviation
- 17% Medium & Heavy Trucks
- 29% Cars
- 33% Light Trucks

State-controlled companies (NOCs) hold most of the world’s oil and gas reserves. The six largest NOCs have ten times the reserves of the top six privately owned companies.

Figure 4: Top Oil and Gas Firms, 2005, by Proven Reserves†
decline softens the political resolve necessary to take steps that are difficult and whose payoff may be years away. Holding course through these tough times and false hopes will require far-sighted leadership.

Although many of society’s ills do not lend themselves to governmental fixes, this is not the case with oil dependence. Using existing and proven regulatory tools, government can play a critical role in fostering economical and technologically viable means for improving efficiency and increasing supply diversity. Above all else, our elected and appointed officials must establish verifiable and workable standards and then allow the market to find the best means for their attainment.

Progress will be achieved incrementally in factories and homes, atop drilling platforms and in experimental laboratories, on farms and in the skies, in “virtual” offices and new mass transit offerings, and, most important of all, on the nation’s roadways. All of these settings will require their own tracking mechanisms, but Americans should be alert to overall progress as measured by the nation’s oil intensity, that is the amount of oil required to produce a single dollar of Gross Domestic Product (GDP).

The Council recommends a goal of cutting U.S. oil intensity in half by 2030. There is a favorable precedent for this objective. Since the mid-1970s, the U.S. has trimmed oil intensity by 50%, chiefly by raising the fuel efficiency of passenger cars, virtually eliminating oil as a fuel for electric power generation, and growing less energy-demanding sectors of the economy. In other words, the U.S. now uses half as much oil to produce a dollar of GDP, in real terms, as it did just thirty years ago. Unfortunately, progress in this area has slowed in the last decade. It is time to make more rapid gains.

The absolute savings of oil in 2030 will undoubtedly represent a modest share of future forecasted global consumption. But, in terms of U.S. energy security, the relative improvement will be profound. In this safer future, America’s prosperity will be less dependent on an economic input that is vulnerable to supply volatility and yet demonstrates only a very small percentage change in quantity demanded in response to a large percentage change in price. In other words, demand is highly inelastic. Given the current inelasticity of oil demand, reduced oil intensity represents real insurance against some of the effects of sudden oil price shocks or sustained high oil prices. As a result of the halving of oil intensity since the mid-1970s, the high energy prices experienced in the summer of 2006 represented a smaller relative cost to the economy. To the extent that we can halve this intensity again through a mixture of efficiency and the production of energy alternatives, we will fashion conditions for substitution that do not exist at this time and contribute to the creation of a more elastic demand curve for oil in the future. This greater demand elasticity will strengthen national security yet further.

Oil supply shocks can be triggered by many different causes, ranging from natural disasters to terrorist assaults to politically influenced supply cut-offs. Sudden and unexpected by definition, such shocks can wreak havoc by generating massive macroeconomic adjustment costs, with output and labor usage declining until prices, wages, and interest rates belatedly adjust to the shortage of a key economic input. Even in the absence of catastrophic price shocks, though, oil dependence still takes a steady financial toll through losses in potential GDP and wealth transfers to foreign lands. In 2005, direct outlays for imported oil accounted for one-third of the country’s $800 billion current account deficit. In 2006, these outlays have gone still higher. By diverting funds away from domestic investment purposes, oil imports put a drag on U.S. economic growth and undercut the nation’s long-term competitive position.

The lack of a coherent energy strategy also undermines a pillar of the U.S. economy—the manufacturing sector. Manufacturers use fossil fuels, particularly oil and natural gas, not only as a source of heat and power, but also as raw material to make plastics and chemicals that are then used by virtually every industry and purchased by every consumer. Natural gas is a cause for particular concern. During

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6 Ibid.
the past several years, U.S. natural gas prices have hovered well above prices in other countries. The cost, price volatility, and uncertain U.S. supply of this important energy source and feedstock resource are a competitive liability for the U.S. manufacturing sector.

Although oil shocks tend to drag up the price of natural gas and natural gas liquids regardless of market fundamentals, these latter commodities differ from oil because they do not trade at a single global price. Since natural gas is far more difficult to transport than oil, American consumption has traditionally drawn almost exclusively on North American supplies with prices driven by local supply and demand. At present, only 3% of total supply is transported as liquefied natural gas (LNG), although that market is projected to grow rapidly. It is critical to understand that the development of a global natural gas market will create challenges similar to the ones we are currently facing with oil. As with oil, global natural gas reserves are concentrated in the Middle East, with the U.S. controlling only around 3% of the world total. Many of the Council’s recommendations will alleviate this situation, particularly through expanded supply of domestic natural gas, but the Council notes that baseload power generation issues must ultimately be addressed to deal with rising demand.

To improve the future balance between oil supply and demand and to enhance energy security, Americans will be called upon to dedicate substantial public and private resources. At least initially, much of this money will need to go to expand energy research, development, and demonstration (RD&D). Between 1978 and 2004, government appropriations for fundamental and applied energy RD&D fell 60% in real terms to less than $3 billion. Private sector RD&D has also failed to keep pace with the growing energy market and may be as low as 0.3% of sales compared with 12% in the pharmaceutical industry. These expenditures are not commensurate with the seriousness of the energy security challenges facing America and the world. In the Council’s view, increased RD&D spending is the prerequisite not only for energy security, but also for continued economic prosperity.

Efficiency and energy diversity must also be given priority status in all areas of transportation, agricultural, and tax policy. This has not always been the case in the past. Despite the high energy impacts of the U.S. agriculture and transportation sectors, energy security considerations have often been absent from major agriculture and transportation policy initiatives. And while energy legislation enacted into law in 1992 and 2005 included tax provisions, these generally consisted of relatively low value credits that neither significantly altered consumer behavior nor provided a reasonable basis...
for long-term business investments. If we are to achieve real progress in reducing our oil intensity, then energy issues can no longer be treated as ancillary matters during other difficult policy battles. The next major farm bill must treat support for energy crops and energy conservation as first-order goals, while the next major highway bill must adequately address strategies for increasing fuel efficiency and diversifying fuel sources. As a general rule, energy-related tax incentives must be made more comprehensive, more rational, more long term, and more investor friendly.

Perhaps most important are the military and foreign policy dimensions of oil security. The magnitude of our dependence on oil provides leverage to our strategic adversaries, makes us vulnerable to terrorist actions, exacerbates geopolitical competition, creates additional military requirements, and undermines efforts to support democratic policies worldwide. Each year the U.S. expends enormous military resources protecting the chronically vulnerable oil production and distribution network while also preparing to guarantee international access to key oil-producing regions. Americans would be well served to recognize that the current struggle for oil security gives rise to burdens that are not reflected in the retail price of gasoline.

Reduced U.S. oil dependence will help mitigate the power that major oil exporters can exert over U.S. foreign policy both directly and through their ability to coerce other importing nations. While some may argue that the various exporting nations are too diverse to forge an effective monopoly and, moreover, too dependent on petro-dollars to contemplate lasting embargoes, the fact is that America has adversaries who are ready to make economic sacrifices of their own in order to achieve goals contrary to U.S. interests. Whether or not future embargoes are probable, they are clearly not impossible, and for this reason the U.S. must prepare to deter the use of oil as a “weapon.” Our nation is at risk, and it is time for serious action.

† Kelly S. Gallagher, Ambuj Sagar, Diane Segal, Paul de Sa, and John P. Holdren, “DOE Budget Authority for Energy Research, Development, and Demonstration Database,” Energy Technology Innovation Project, John F. Kennedy School of Government, Harvard University (2006). Adapted and/or reproduced with permission.

Figure 6: U.S. DOE Authorized Budget for Energy Research, Development, and Demonstration 1978–2006†

Between 1978 and 2004, government appropriations for fundamental and applied energy RD&D fell 60% in real terms to less than $3 billion.
The document outlines a comprehensive plan to reduce oil dependence and improve energy security. Primary Policy Recommendations are accompanied by Corollary Policy Recommendations of smaller but by no means inconsequential benefit. Sections I and II put forward a menu of measures suitable for dramatically reducing oil consumption and promoting alternative energy fuels. Even if these measures are implemented with great success, the U.S. will continue to experience a significant degree of oil dependence for decades to come. Sections III and IV acknowledge this enduring dependence and outline strategies for conventional supply expansion and risk management.
Increasing transportation efficiency is the single most effective step the U.S. can take to improve its oil security. The transportation sector is responsible for nearly 70% of all the oil the country consumes. Within the transportation sector, oil—nearly 13 million barrels per day of it—accounts for 97% of delivered energy. More than 8 mbd are used to fuel the over 220 million light-duty vehicles that provide Americans with the extraordinary mobility that is so central to our way of life.

For several decades, the majority of these vehicles have been subject to government-mandated Corporate Average Fuel Economy (CAFE) standards enacted in 1975 in the aftermath of the 1973–1974 Arab oil embargo. CAFE was instrumental in helping Americans lower oil usage by the early 1980s, but its requirements for cars have remained essentially unaltered for twenty years even as the imperatives of energy security have grown more pressing and technological advances have made efficiency improvements increasingly possible. Moreover, the weaker CAFE standards for pickup-trucks and SUVs, although recently marginally raised, have encouraged a market shift toward larger vehicles that get fewer miles per gallon (mpg) than the cars they functionally displace. As a consequence, America’s light-duty vehicle fleet has the lowest average fuel “economy” in the developed world.

Thanks to an array of currently marketed or soon-to-be-available technologies, there is no reason that Americans should not be able to purchase extremely safe and fuel efficient vehicles that also maintain the performance and comfort features that consumers favor. Perhaps best known among these cutting-edge solutions are hybrid power-trains that combine electric motors and gasoline engines to boost mileage, especially in stop-and-go driving conditions. But numerous other technologies, from advanced diesel engines to light-weight, high-strength composite materials, can yield dramatic efficiency gains. With future advances in battery design, plug-in hybrids will permit many daily commutes to be completed with little or no liquid fuel input. Indeed, plug-ins not only share the hybrid’s ability to use oil more efficiently, they also promise to fundamentally redefine the boundaries of supply diversity by connecting personal transportation to an electric grid that can make use of a broad spectrum of primary energy sources. In the view of the Council, reformed and strengthened fuel efficiency standards—combined with appropriate government incentives and strict adherence to technology neutrality—are the critical components of any comprehensive plan to reduce U.S. oil dependence.

Medium and heavy trucks use considerably less oil, in aggregate, than light-duty vehicles, but at over 2 mbd their consumption still contributes substantially to U.S. oil dependence. Unlike the nation’s light-duty vehicles, however, America’s medium and heavy trucks have never been subject to government fuel efficiency standards. Since most of these trucks are operated for commercial purposes, it is often assumed that their fuel efficiency is ensured by a prevailing business-sector interest in profit maximization. In fact, because even the largest truck fleet operators are almost never in a position to compel manufacturers to design and build more fuel efficient vehicles, efficiency is not maximized. As with light-duty vehicles, various technological solutions could be employed to boost truck fuel efficiency. Reflecting on America’s experience with light-duty vehicles, the Council believes that the introduction and adoption of fuel efficiency solutions for trucks will

Policy Recommendations: Summary

1. REDUCE OIL CONSUMPTION

Increasing transportation efficiency is the single most effective step the U.S. can take to improve its oil security. The transportation sector is responsible for nearly 70% of all the oil the country consumes. Within the transportation sector, oil—nearly 13 million barrels per day of it—accounts for 97% of delivered energy. More than 8 mbd are used to fuel the over 220 million light-duty vehicles that provide Americans with the extraordinary mobility that is so central to our way of life. In 2003, the Bush Administration did set a modest increase in CAFE standards for these vehicles. For several decades, the majority of these vehicles have been subject to government-mandated Corporate Average Fuel Economy (CAFE) standards enacted in 1975 in the aftermath of the 1973–1974 Arab oil embargo. CAFE was instrumental in helping Americans lower oil usage by the early 1980s, but its requirements for cars have remained essentially unaltered for twenty years even as the imperatives of energy security have grown more pressing and technological advances have made efficiency improvements increasingly possible. Moreover, the weaker CAFE standards for pickup-trucks and SUVs, although recently marginally raised, have encouraged a market shift toward larger vehicles that get fewer miles per gallon (mpg) than the cars they functionally displace. As a consequence, America’s light-duty vehicle fleet has the lowest average fuel “economy” in the developed world.

Thanks to an array of currently marketed or soon-to-be-available technologies, there is no reason that Americans should not be able to purchase extremely safe and fuel efficient vehicles that also maintain the performance and comfort features that consumers favor. Perhaps best known among these cutting-edge solutions are hybrid power-trains that combine electric motors and gasoline engines to boost mileage, especially in stop-and-go driving conditions. But numerous other technologies, from advanced diesel engines to light-weight, high-strength composite materials, can yield dramatic efficiency gains. With future advances in battery design, plug-in hybrids will permit many daily commutes to be completed with little or no liquid fuel input. Indeed, plug-ins not only share the hybrid’s ability to use oil more efficiently, they also promise to fundamentally redefine the boundaries of supply diversity by connecting personal transportation to an electric grid that can make use of a broad spectrum of primary energy sources. In the view of the Council, reformed and strengthened fuel efficiency standards—combined with appropriate government incentives and strict adherence to technology neutrality—are the critical components of any comprehensive plan to reduce U.S. oil dependence.

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10 U.S. Department of Transportation (DOT), Bureau of Transportation Statistics, National Transportation Statistics 2003 (March 2004), Table 1–11.
11 In 2003, the Bush Administration did set a modest increase in CAFE standards for these vehicles.
12 EIA, AEO (2006), Table A7.
‡ DOE, Oak Ridge National Laboratory (ORNL), Stacy Davis and Susan W. Diegel, Transportation Energy Data Book: Edition 25 (2006), Tables A.1–A.15; EIA, AER (2006), Tables A1–A15; EIA, AER (2006), Tables 5.2 and 5.13c; and EIA, AEO (2006), Table An. See also AEO online supplemental Table 33. Adapted and/or reproduced with permission.
The transportation sector is expected to account for 84% of the growth in U.S. oil demand through 2030. Oil consumption by light-duty trucks and SUVs is expected to grow faster than for all other vehicles types, surging by roughly 77%.

![Figure 7: Historical and Projected U.S. Oil Demand by Sector](image)

![Figure 8: Historical and Projected Transportation Sector Demand by Mode](image)

What's in a barrel: Quantities of jet fuel, motor gasoline, distillate, residual fuel oil, natural gas liquids, and other petroleum products are often aggregated in energy statistics on the basis of a standard volume measure—a barrel with 42 U.S. gallons—and thus without regard for the differing energy contents of the various products. Where such source data were used, this report makes reference to million barrels of oil per day (mbd). Consumption and production figures are also often expressed in terms of British thermal units (Btu), a yardstick that normalizes for energy content. Barrel counts denoted in this report as million barrels per day of oil equivalent (mbd) designate consumption or production figures that were originally reported in Btu and then converted to volumes on the basis of the energy content of crude oil (approx. 5,800,000 Btu per barrel).
proceed far more rapidly and efficiently with government-mandated, technology-neutral performance standards.

While the Council has primarily focused on ground vehicles because they are the major source of oil demand, other opportunities exist to make our transportation system more fuel efficient. For example, substantial oil savings could be realized through more rationalized air traffic routing.

II. PROVIDE ALTERNATIVES

Diversifying our transportation fuel supply must be a key part of any comprehensive effort to improve U.S. energy security. Without an expanded supply of alternatives, conventional petroleum will continue to power nearly all of our motor transport. Such reliance on a single non-substitutable input creates profound economic dangers.

Corn-based ethanol is by far the most successful domestic alternative transportation fuel. Production in the United States rose from 1.4 billion gallons a year in 1995 to about 4 billion in 2005, equivalent in terms of energy content to approximately 2% of our gasoline demand. At a maximum, corn-based ethanol may be able to displace 10% of our gasoline use before corn demand outstrips supply. Facing higher feedstock costs, domestic biodiesel production is far lower at 75 million gallons annually, or only 0.2% of diesel fuel used for transportation. Despite the potential for growth in the production and use of corn-based ethanol and biodiesel, the U.S. must be realistic that these solutions have limitations and do not constitute a panacea for our energy problems.

Newer technologies are poised to dramatically raise biofuels production by shifting acreage-to-output ratios. Over the next decade, continued development and widespread deployment of cellulosic processing techniques could result in an order-of-magnitude increase in ethanol production by enabling the use of plant wastes as a feedstock. Bio-butenol is also showing promise. With adjusted fermentation processes, it may be possible to create butenol from any feedstock that can be used to create ethanol. Bio-butenol would have a greater energy density than ethanol and could be a leading biofuel contender within a decade. Over the longer term, biomass gasification technologies, combined with the well-known Fischer-Tropsch liquid fuel production process, could allow more significant displacement of diesel and also permit co-generation of electricity.

Regardless of the timeframe, substantial government incentives and RD&D spending will be required to transform biofuels promises into production realities. Ethanol sold in the U.S. currently receives a credit of $0.51 per gallon. This level of subsidy was designed to stimulate and maintain U.S. ethanol production even in the face of low oil prices. At current oil prices, $0.51 per gallon provides a sizable profit to producers using established corn-feedstock technology. The current subsidy is not tied to actual production costs and does not distinguish between feedstock technologies; as such, it is particularly ill equipped to adequately incentivize first-mover cellulosic producers. A “smart subsidy” design would decrease government payments to existing conventional corn production facilities so long as oil (and thus retail ethanol) prices are high, while remaining fully available for new construction, especially in the case of cellulosic and other alternative biofuels facilities. Smart subsidies would cushion the traditional ethanol industry against short-term oil price drops, but, by eliminating support for ethanol when it can successfully compete, these flexible incentives would free up federal funds to be used for the implementation of other energy policies. And by allowing taxpayer dollars to flow to successive waves of fledgling ventures, smart subsidies will also aide the overarching goal of energy supply diversification through long-term technology neutrality.

Biofuels are of little use without vehicles that can run on them. Extremely affordable technology can enable new cars to operate on fuel mixtures containing up to 85% ethanol. Requiring this flexible fuel

capability is a cost-effective way of creating a “real option” for greater ethanol use. However, significant investment will be required to dramatically increase the number of ethanol fueling stations and to enable ethanol to be transported through pipelines. Government can play an important role in facilitating these outlays, especially by providing tax credits to America’s family-owned service stations to aid them in installing ethanol-compatible fuel tanks and pumps.

Renewable raw materials can also serve as feedstocks for the many non-fuel substances that are currently produced from oil and natural gas. If the nation lays the proper foundations in the near term, integrated biorefineries of the future should be able to produce a wide range of compounds able to replicate the functionality of many feedstock petrochemicals, thus freeing fossil fuels for use in economic activities where viable substitutes are not forthcoming. The Biomass Program of the U.S. Department of Energy (DOE) is already supporting research to tap the potential of biorefineries, but the Council encourages enhanced government support for RD&D in this area.

Diversifying our transportation fuel supply must be a key part of any comprehensive effort to improve U.S. energy security. Without an expanded supply of alternatives, conventional petroleum will continue to power nearly all of our motor transport. Such reliance on a single non-substitutable input creates profound economic dangers….Despite the potential for growth in the production and use of corn-based ethanol and biodiesel, the U.S. must be realistic that these solutions have limitations and do not constitute a panacea for our energy problems.

Biofuels are not the only petroleum alternatives worth exploring. Unconventional oil derived from oil sands, shale rock, and liquefied coal could significantly expand the Western Hemisphere’s supply of liquid fuels, but this potential must be weighed against substantial drawbacks and trade-offs. Current technologies require major energy inputs, often supplied in the form of natural gas. But given the limited availability of natural gas in North America, such large-scale added demand could cause prices to soar for existing users. Unconventional oil production also impacts land resources and, in particular, may confront water supply limitations in the drought-plagued Rocky Mountain West where oil shale deposits are concentrated. While these are important issues, we do not believe they pose an unacceptable obstacle to development of these resources.

A much more fundamental challenge is that current oil shale and coal-to-liquid (CTL) production technologies result in as much as a doubling of carbon emissions compared with conventional oil production. Applying business investment principles, uncertainty about future carbon mitigation policies makes it difficult to justify the use of significant public expenditures on unconventional oil technologies that might not be economically viable over the long term. In view of this challenge, the Council is not in favor of directing taxpayer dollars toward deployment of these alternatives at this time. Instead, we recommend that government funds be devoted to researching, developing, and, by 2015, commercializing the carbon sequestration technologies that will likely be necessary components of sustainable large-scale unconventional oil production. Success in this endeavor and a commitment to the sharing of the results with other developed nations as well as with India and China could greatly improve the prospects for sustainable energy security in the coming century.

The world currently consumes 84 million barrels of oil per day, but demand is expected to increase by 33% by 2025 reaching 110 million barrels per day. Demand in China and India will grow by 98% over this same period. In 2025, the U.S. will remain the world’s largest oil consumer, requiring approximately 26 million barrels per day (24% more than in 2006). The world will increasingly rely on unstable, undemocratic nations to supply the oil needed to meet future demand. Over the next two decades, production is projected to decrease an average of 4% in the U.S. and other industrialized countries.

Figure 9: World Oil Demand Forecast†

Figure 10: World Oil Production Forecast‡
III. EXPAND SUPPLY

The U.S. is the third largest crude oil producer, pumping 5.4 mbd or approximately 2 billion barrels annually. After accounting for processing gains and natural gas liquids, the U.S. supplies around 10% of the world’s daily petroleum production, which is currently running almost 84 mbd. However, U.S. proved crude reserves of 29 billion barrels represent only 2.4% of the global total.

While proved reserves figures are predicated on discrete technology and oil price assumptions, estimates for total technically recoverable oil resources run much higher, ranging from just over 70 billion barrels to as many as 400 billion if one assumes that full access to the Outer Continental Shelf (OCS) and other off-limits areas can be combined with vastly improved Enhanced Oil Recovery (EOR) techniques.

Calls for “energy independence” notwithstanding, oil is a fungible global commodity, which means that events affecting supply or demand anywhere will affect oil consumers everywhere. As such, a country’s exposure to world oil prices or oil price shocks is a function of the amount and types of oil it consumes and is not significantly affected by the ratio of “domestic” to “imported” product.

Almost none of the nation’s future oil will be cheap to produce. For instance, a single deep-water development sunk as far as 20,000 feet below the surface can cost $1 billion, compared to $100 million for an operation in 100 feet of water and as little as $10 million for a deep land-based well. Even in the cheapest cases, U.S. production costs are almost certain to exceed those incurred by OPEC suppliers. Nonetheless, U.S. producers will continue to behave as “price takers,” selling their commodity at a price determined in the global market in which OPEC controls marginal production.

Whatever the true size of our oil resources, the clear point is that the United States has seen the end of “easy” domestic oil. Future domestic production will depend on new definitions of—and perspectives on—technological feasibility, economic viability, and environmental acceptance. This does not minimize the importance of increasing domestic supply. For while incremental U.S. production may not significantly affect long-term global production, it can help insulate the global economy against oil shocks, especially in tight market situations.

In addition to raising domestic production, the U.S. can work to increase global conventional oil supplies through diplomatic efforts to allow foreign investment and technology deployment in oil-producing countries. With as much as 90% of all oil reserves in the hands of state-controlled NOCs, most future production may be handicapped by political influence, suboptimal technology, and outdated reserves-management techniques. Whenever possible, U.S. diplomats and trade negotiators should encourage NOCs to provide more information transparency and to consider production partnerships with private-sector firms whose expertise could boost daily output and total recovery. In keeping with this desire to open the global oil market, the U.S. must not take a protectionist stance when foreign nations seek to invest in the U.S. energy sector unless clear national security risks can be demonstrated. Not all state-owned firms will be amenable to these arrangements, whether due to their own domestic political agendas, unjustified fears of U.S. or Western...
economic expansionism, or countervailing external geopolitical pressure, but some will welcome the chance to cooperate with the U.S., especially if overall trade access is made part of the bargain.

IV. MANAGE RISKS
Once found, oil must be pumped, stored, and delivered across thousands of miles to reach consumers. These global oil flows necessitate a huge production and transport infrastructure comprising everything from floating rigs to supertankers to neighborhood filling stations. With all its thousands of arteries and nodes carrying inherently combustible products, this network is highly vulnerable. Sadly, in our dangerous world, threats are one commodity not in short supply.

America contributes more than any other nation to protecting this global infrastructure. And while the U.S. has never shirked this responsibility, the time has come for other nations to expand their own efforts. All nations, producing and consuming, have an interest in the stability of the global oil infrastructure, and a variety of international efforts could help to ensure the smooth flow of oil. New multilateral accords (modeled for instance on the Proliferation Security Initiative designed to limit the spread of weapons of mass destruction) should play a role, but expanded reliance on existing organizations such as the Gulf Coordination Council, NATO, or ASEAN are not to be discounted. Even outside of formal arrangements, a common interest in “oil peacekeeping” offers real potential to improve regional security in areas of rising geopolitical competition by creating frameworks for pragmatic international cooperation.

As with oil transport, oil production can be disrupted on land and at sea. And while producing nations have a sovereign responsibility to defend their own territories, some security measures require multinational cooperation to be most effective. This is often especially true of counter-terrorism efforts. Where appropriate, the U.S. should provide exporting countries with diplomatic support as well as with counter-terrorism training and other military aid.

In addition to facilitating the physical protection of petroleum supplies, the U.S. should also assist producers in creating attractive investment climates supported by the emergence of stable civil societies enjoying the rule of law. This reflects an emerging global understanding of how corruption fosters social and economic injustice. By creating linkages between oil production and the kinds of practices and institutions that can engender stable civil societies, the U.S. will be taking a major step toward securing energy flows; after all, as has been repeatedly demonstrated in past decades in Iran, Iraq, Venezuela, and the former Soviet Union, political upheaval and instability often result in sizable and lasting drop-offs in oil production. An added benefit of more durable polities in certain regions will be fewer pools of disgruntled people disposed to terrorist recruitment.

Defenses against physical attacks may fail, and if the right target is struck, the world could suddenly face a massive oil supply shock. The most effective short-term countermeasure to an oil supply shock is the maintenance of substantial strategic reserves and spare capacity. Strategic reserves can serve to cushion against more than terrorist attacks; as the world knows all too well, oil supplies are also vulnerable to political weapons and meteorological events.

The emergency oil stocks held under the terms of the International Energy Program (IEP), agreed to by the Organization for Economic Co-operation and Development (OECD) nations after the Arab oil embargo of 1973–1974 and coordinated by the International Energy Agency (IEA), offer some protection against a major supply disruption, albeit at the cost of reserving some 1.25 billion barrels of government-owned strategic stocks in expectation of a major supply disruption that may never occur. The U.S. Strategic Petroleum Reserve (SPR), 689 million barrels of federally owned crude oil stored in underground salt caverns along the Gulf Coast, is the largest emergency stockpile of oil in

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20 See the body of work generated by Transparency International: http://www.transparency.org/about_us.
the world.\textsuperscript{22} The IEA estimates that an additional 2.65 billion barrels in reserve stocks are held commercially within member nations.

Linked to actual physical shortages rather than to higher prices, the triggers in the IEP reflect a limited conception of how supply disruptions would manifest themselves in the global oil market.\textsuperscript{23} Despite IEA efforts to develop response mechanisms geared to price and macroeconomic data rather than to volumetric criteria, inherently political decision-making processes are likely to make it exceedingly difficult to reach consensus domestically, let alone internationally, in support of the release of emergency stocks under “pre-crisis” or “sub-crisis” conditions not explicitly defined in the IEP. A review of current U.S. and IEA policies on strategic oil stocks is long overdue and should include assessment of the following questions: (1) what is the value of adding to these stocks; (2) what are the appropriate policy signals for commercial stock holders; (3) how can taxpayers derive greater economic benefit from the holding of strategic reserves; and (4) can oil producers invest in increased commercial inventories of their own? Looking beyond the OECD, consideration must be given to integrating China, India, and other major non-OECD oil importers into updated global strategic reserve arrangements.

Before moving to treat our policy recommendations in more detail, the Council wishes to discuss the linkage between oil security and climate change. The Council was not established to address the complex questions that surround greenhouse gas emissions. Though we are focused on oil security, we believe by and large that reducing oil dependence will also yield tangible environmental benefits. Insofar as dependence is lessened through heightened efficiency or greater reliance on biofuels, the case for environmental improvement is nearly indisputable. Where conflicts exist, we feel that the probability of future restrictions on carbon emissions must be acknowledged in order to craft a viable strategy for improving our oil security on the basis of long-term business investments.
Success in improving the nation’s energy security posture will require significant public and private investment as well as unwavering political leadership over a sustained period of time. Growing pressures on the federal budget will not allow for false starts. For this reason, the Council considered the long-term viability of proposed solutions in making its recommendations to reduce oil consumption, provide alternatives, expand supply, and manage risks.
Policy Recommendations: Discussion

SECTIONS I AND II—REDUCE OIL CONSUMPTION AND PROVIDE ALTERNATIVES

Since oil is priced in an international market, even “domestic” oil is bound to cost more in the event of a serious supply disruption occurring anywhere in the world. This would be true even if domestic production could satisfy all of U.S. oil demand. In a free global economy, the best method for mitigating the economic harm of oil price shocks is to use less oil without regard for its origins and to reduce the amount of oil required to produce a single dollar of GDP.

Therefore, the Council recommends that the United States, at minimum, halve its oil intensity by 2030. To achieve this goal, the nation should simultaneously pursue these courses of action: (1) reduce oil demand, in particular by increasing the efficiency of our transportation sector; and (2) foster the development, production, and use of alternative fuels.

Ⅰ. REDUCE OIL CONSUMPTION

As currently constituted, our transportation system is fueled almost entirely by oil with no substitutes readily available in anywhere near sufficient quantities. Oil accounts for almost 97% of delivered transportation energy, and this in turn equals nearly 70% of all the oil the country uses. Advances in gasoline engine technology and the advent of hybrid electric and advanced diesel engines offer opportunities to substantially increase on-road vehicle fuel “economy”—efficiency measured in terms of distance traveled per unit of fuel—with no overall loss of safety, performance, or utility. Furthermore, this increased efficiency has the added benefit of facilitating the market penetration of renewable alternative fuels such as ethanol that have less energy content per gallon than gasoline and which therefore require higher mileage vehicles to obviate the need for more frequent fill-ups and to minimize land use. In sum, increasing the efficiency of our nation’s passenger vehicle fleet is the single most important measure we can take to reduce our oil dependence.

PRIMARY RECOMMENDATION

Significantly reform and then annually strengthen fuel efficiency standards for passenger cars and light-duty trucks weighing up to 10,000 lbs. gross vehicle weight.

Projected savings: 4.3 mbd

Discussion: In 1975, Congress authorized the Department of Transportation to set and enforce automobile efficiency standards, and the average mileage of all cars and light trucks improved by nearly 80% between 1975 and 1987.24 Absent this improvement, Americans would consume an additional 60 billion gallons per year on top of the 140 billion gallons per year we currently do use.25 At $2.50 per gallon, the efficiencies achieved between 1975 and 1987 save U.S. consumers $150 billion dollars each year in direct costs alone. Due in large part to reduced fuel consumption in the transportation sector, the “oil intensity” of our economy has declined by 50% since the 1970s.26

CAFE, our nation’s federal fuel efficiency statute for light-duty vehicles, has not been substantially updated for over thirty years. Changes announced in 2003, which affect only light-duty trucks and

26 Amory B. Lovins, E. Kyle Datta, Odd-Even Busnes, Jonathan G. Koomey, and Nathan J. Glasgow, Winning the Oil Endgame: innovation for profits, jobs, and security (Snowmass, CO: Rocky Mountain Institute, 2005), 43.
SUVs, will soon bring about modest mileage gains for the first time in over twenty years, but in terms of light-duty vehicle fuel "economy," the U.S. will continue to lag behind most other major countries, including China.27

Engine technology continues to improve every year, but manufacturers catering to the U.S. market have devoted these advances primarily to making vehicles larger and more powerful as opposed to improving their mileage. Between 1987 and 2006, average horsepower for new light-duty vehicles sold in the U.S. increased by 85%.28 Weight also increased, by nearly 30%, and acceleration times improved by over 25%. Meanwhile, the average vehicle's mileage decreased by 5%.

CAFE has not only failed to raise the fuel mileage of America's light-duty vehicle fleet for two decades, it has also disproportionately burdened the traditional Big Three automakers by requiring all manufacturers to meet the same two standards (one for cars and one for light trucks) regardless of the breadth of their product offerings.

A 2002 study by the National Academy of Sciences (NAS) indicates that feasible and emerging improvements in non-hybrid gasoline engine design can enable a 25% increase in fuel efficiency without sacrificing vehicle size, performance, or weight, while still meeting reasonable consumer criteria for cost-effectiveness.29 With advanced hybrid and diesel technologies as well as the advent of plug-in hybrid technologies, fuel efficiency gains of 100% are achievable without undermining vehicle performance or passenger protection. In fact, while the connection between efficiency and safety is complex, there is no clearly agreed upon or established causal relationship indicating that safety must suffer in order to achieve better mileage. What is clear, at least from the record of the last thirty years, is this: without mandates and standards and in the face of market imperfections, the integration of new technologies will proceed slowly and the benefits will be directed toward further improvements in performance, rather than toward increases in mpg ratings.

Consistent with President Bush's April 2006 request, the Council believes that Congress should substantially revise the existing statute, granting authority to the National Highway Traffic Safety Administration (NHTSA) to reform the CAFE system to make it more market-based and to allow the application of different but increasingly stringent standards for different kinds of vehicles.

Congress should also require steady improvements in fuel efficiency over the next 25 years by setting an aggressive annual improvement goal that must be met unless NHTSA can demonstrate that it is technically infeasible, not cost-effective, or would reduce overall fleet safety. For two decades, efforts to improve CAFE have been thwarted by assertions that obligatory mpg increases would undermine vehicle choice, safety, and domestic jobs. Congress has granted the Executive Branch authority to alter standards, but this power is highly constrained and insufficient to bring about needed reforms. The Council believes that a combination of technological advances, regulatory reform approaches, political dynamics, and investment in industrial competitiveness will make it possible to simultaneously increase fuel efficiency, improve safety, and strengthen the domestic automotive industry.

27 Ibid., 45.
29 National Research Council, Transportation Safety Board, Effectiveness and Impact of Corporate Average Fuel Economy Standards (Washington, DC, National Academy Press, 2002), especially chp. 3.
This new legislative approach can establish a responsible middle-ground between inflexible government prescriptions and policy abdication. Effectively flipping the presumption that NHTSA actions and findings must precede and justify fuel efficiency improvements, the preponderant expectation of this new approach would be in favor of steady progress to reduce oil consumption, unless it is proven that the required progress is technologically unachievable, reduces the overall safety of the passenger car fleet, or is not cost-effective when considering the combined economic and security benefits of reducing oil dependence. Given these “off-ramp” provisions, we believe the nation can set ambitious goals while protecting business from unachievable or value-destroying mandates.

To be instructive, NHTSA’s economic analysis must do a better job of valuing the long-term security benefits and avoided military costs of reduced oil dependence. Current practice fails to ascribe any benefit to improved national security. By valuing all the externalities of gasoline consumption at less than 10 cents per gallon in its fuel efficiency rulemaking, NHTSA’s cost-benefit analysis has avoided methodological ambiguity but failed to meaningfully inform the standard setting process—and dismissed many feasible fuel efficiency technologies as unacceptably expensive. But while externalities such as defense costs, future conflict over resources, and the empowering of hostile regimes are hard to quantify, they are nonetheless real and must be borne by society. The Council believes that Congress must give NHTSA explicit direction in how to more comprehensively value the benefits of reduced oil dependence. Without this policy guidance, the standard-setting process will continue to systematically undervalue the benefits of lower fuel consumption.

Reform and Strengthen Vehicle Fuel Efficiency Standards

— Authorize NHTSA to wholly revise the CAFE regulatory structure by establishing size-based and/or attribute-based standards for passenger automobile fuel efficiency (defined as distance traveled per unit of fuel), while also increasing reliance on market mechanisms such as those that allow the banking and trading of compliance credits. Instead of setting a mileage target for all cars, this method would define different targets for vehicles of many different sizes and attributes. As a result, each manufacturer would face a unique target reflective of its particular offerings and of consumer preferences.

America's light-duty vehicle fleet lags behind most other countries' fleets in average fuel "economy" (i.e., efficiency in terms of distance traveled per unit of fuel).

— Set a 4% annual target for steadily increasing standards, including enabling NHTSA to establish multi-year compliance periods.

— Authorize NHTSA to slow the pace of fuel efficiency improvement if it determines that the 4% default requirement is technologically unachievable, that it cannot be achieved without materially reducing the overall safety of the passenger car fleet, or that there is clear and convincing evidence that the default standard is not cost-effective after taking into account the total social, economic, and geopolitical value of reduced gasoline consumption to the United States.

— Maintain the existing 2003 light-duty truck rule through its full implementation in 2012, and then merge cars and trucks into a single fleet with the goal of maintaining the 4% improvement target for the combined fleet thereafter.

— Require NHTSA to provide fuel efficiency standards for all finished vehicles up to 10,000 lbs. gross vehicle weight (GVW).

Should 4% annual improvement prove too aggressive, lower rates of improvements would still produce significant oil savings.

Because turnover of the U.S. passenger vehicle fleet occurs slowly, even annual 4% improvements in new vehicle efficiency will only gradually raise overall fleet efficiency. For reference, in 2004 the median age of a car in the U.S. was 8.9 years and trending upward.30

**PRIMARY RECOMMENDATION**

Fund significant financial incentives for the domestic production and purchase of highly fuel-efficient vehicles.

**Discussion:** Congress should lift the current 60,000-per-manufacturer cap on the number of advanced technology ultra-efficient vehicles eligible for tax incentives. In light of the significant

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public benefit to be realized by accelerating the manufacture and sale of these vehicles, it is appropriate to enable more American consumers to benefit from the existing tax credit. Moreover, the tax credit must be linked to mpg improvements of the vehicle. It is worth noting that hybrid engine technologies can be employed to raise a vehicle’s power and acceleration as well as its economy of fuel usage. Only the latter utilization advances the cause of energy security. This recommendation is directly related to the 4% annual fuel efficiency improvements outlined in the previous recommendation section, since meeting the 4% standard over time will require significant market penetration of hybrids and other highly fuel efficient vehicles such as advanced diesels.

These tax incentives will have a significant impact on government revenues. Currently, the most efficient hybrids are eligible for a credit of over $3,300. If this benefit is maintained, the sale of 300,000 highly efficient hybrids will have a $1 billion impact on the U.S. Treasury. Three million vehicles, a figure just under 20% of annual U.S. new light-duty vehicle sales, would raise the cost to around $10 billion. Of course, this incentive could be spread over a number of years and be tailored to assist early technology adopters. After all, as production expands, the added cost of hybrid power-trains will fall, eliminating much of the need for government incentives. Such costs are not unreasonable given the potential economic and national security benefits.

In order to “level the playing field” and enable domestic manufacturers to effectively compete in the growing market for advanced-technology vehicles, Congress should provide tax incentives for the retooling of domestic automobile parts and assembly facilities. The current lack of domestic production of advanced energy–efficient vehicle technologies presents a significant obstacle to the long–term health of the U.S. auto industry. Making the retooling incentives available to all manufacturers with existing U.S. facilities should enable them to survive World Trade Organization (WTO) scrutiny. A 2004 study conducted by the National Commission on Energy Policy (NCEP) concludes that providing $1.5 billion in tax incentives over ten years to retrofit domestic manufacturing and parts facilities would lead to a gain of nearly 60,000 domestic jobs and pay for itself through resulting increases in domestic tax receipts.31 By reforming the structure of CAFE and ensuring that domestic

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31 NCEP, Ending the Energy Stalemate, 101, Table 1–1.
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COROLARY RECOMMENDATION
Extend federal subsidies for hybrid medium-duty vehicles (Classes 3–6) to 2012 and remove the cap on the number of eligible vehicles. Set and then annually strengthen fuel efficiency standards for medium-duty vehicles (Classes 3–6).
Projected savings: 0.2 mbd

Discussion: Medium-duty vehicles, in aggregate, use far less of the nation’s fuel than do heavy trucks, but they still offer the potential for significant improvements in energy efficiency. Since they are often used in metropolitan areas in stop-and-go driving conditions, these vehicles are ideally suited to reap the efficiency benefits of hybrid power-trains that recapture braking energy and partially displace liquid fuel with electricity during periods of acceleration. DOE estimates that hybrid-electric urban delivery trucks, including package and beverage delivery trucks, could achieve mpg increases of 40% to 70% over conventional vehicles, at a cost of $8,000 per vehicle. The 21st Century Truck Roadmap outlined by DOE sets a fuel efficiency improvement goal of three times the current levels for Class 6, with a large percentage to come from hybridization. Other experts have estimated that the use of hybrids could lead to average fuel efficiency increases of 93% for Class 3–4 trucks and 71% for Class 6–7 vehicles. Work on hydraulic hybrids developed by the U.S. Environmental Protection Agency (EPA) has yielded similar results.

Reformed and strengthened fuel efficiency standards—combined with appropriate government incentives and strict adherence to technology neutrality—are the critical components of any comprehensive plan to reduce U.S. oil dependence.

The Council recommends extending the hybrid tax credit to 2012 as well as lifting the limit on the number of credits per manufacturer. The Council also recommends that fuel efficiency standards for medium-duty vehicles grow at a 4% annual improvement rate, which is consistent with the potential benefits available from hybridization and in line with the recommendation for light-duty vehicles. Since there are currently no standards for Classes 3–6, test procedures for determining baseline fuel efficiency will need to be developed. As with our proposed light-duty vehicle standards, our recommended truck standards would include “off-ramps” to allow for modifications to the required rate of fuel efficiency improvement in the case that future innovations are technologically unachievable, cannot be achieved without materially reducing the overall safety of the medium-duty fleet, or are not cost-effective.

COROLARY RECOMMENDATION
Set and then annually strengthen fuel efficiency standards for heavy-duty vehicles (Classes 7 and 8), employing federal subsidies as suitable.
Projected savings: 0.9 mbd

**Discussion:** The heaviest trucks (Classes 7 and 8, i.e., greater than 26,000 lbs. GVW) dominate truck energy use, accounting for 75% of the total energy used by all medium- and heavy-duty vehicles. Tractor-trailers are by far the largest users, since they make up the bulk of Class 8, which is itself responsible for more than three quarters of fuel consumption by all vehicles over 10,000 lbs. GVW. In the absence of standards for heavy-duty vehicles, fuel efficiency improvements have been neither broad nor sustained. In fact, while the fleet-wide mpg achievement for tractor-trailers has fluctuated, with improvements in some years, the overall record shows that incremental gains have been subsequently lost and that fleet fuel “economy” in 2003 was the same as in 1975.

A 2002 study by the National Academy of Sciences (NAS) indicates that feasible and emerging improvements in non-hybrid gasoline engine design can enable a 25% increase in fuel efficiency without sacrificing vehicle size, performance, or weight, while still meeting reasonable consumer criteria for cost-effectiveness. With advanced hybrid and diesel technologies as well as the advent of plug-in hybrid technologies, fuel efficiency gains of 100% are achievable without undermining vehicle performance or passenger protection.

A 2002 study conducted by Center for Transportation Research at Argonne National Laboratory found that it was technologically feasible to nearly double tractor trailer fuel efficiency by 2010 from 6 mpg to over 10 mpg. A supplemental analysis by NCEP examined the cost-effectiveness of technological improvements that could raise fuel efficiency for tractor trailers by 60% over current levels. Imputing a diesel price of $1.60 per gallon (a figure well below recent annual averages) and conservatively accounting for the time value of money, the NCEP found that investments in these technologies were financially viable.

The Council recommends that fuel efficiency standards for heavy-duty vehicles increase at a 4% annual improvement rate in order to double fuel efficiency, in line with the recommendations for light- and medium-duty vehicles. Since there are currently no standards for Classes 7 and 8, development of test procedures for determining baseline fuel efficiency will be necessary. It is important to recognize that some technologies for improving the fuel efficiency of heavy trucks are limited by requirements to address criteria pollutants. The Council urges greater collaboration among DOE, the U.S. Department of Transportation (DOT), and EPA in order to meet the dual goals of improved environmental quality and enhanced oil security. This improved collaboration would not be limited to trucking issues and should extend to fuel efficiency and emission standards for the light-duty fleet.

Although hybrid power-trains offer efficiency gains in stop-and-go traffic, they offer less benefit to vehicles that drive long distances at relatively constant speeds. Significant fuel efficiency improvements for the long-haul trucks that make up the bulk of Classes 7 and 8 are more likely to be achieved via conventional technologies such as aerodynamics, improved engines and tires, and auxiliary power units that make idling unnecessary. The fact that large trucks are more likely to gain efficiency through improvements that have nothing to do with hybrid power-trains underscores the need for technology neutrality in any tax incentive scheme.

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33 DOE, ORNL, Data Book, Tables 3.4, 5.2, and 5.4. See also U.S. Department of Commerce, Bureau of the Census, “2002 Vehicle Inventory and Use Survey” (2003), Table 4.
37 Test cycles are currently under development by U.S. Environmental Protection Agency only in order to allow private companies to calculate and claim tax incentive credits for purchasing hybrid trucks.
**COROLLARY RECOMMENDATION**

Increase allowable weight to 97,000 lbs. gross vehicle weight for tractor-trailer trucks that have a supplementary sixth axle installed but which replicate current stopping distances and do not fundamentally alter current truck architecture. The Council also recommends that government further study the safety impacts of significantly longer and heavier tractor-trailers used in conjunction with slower speed limits. If safety can be proven, implementation could generate major efficiencies while simultaneously reducing road congestion and other non-fuel costs.

Projected savings: will vary with extent of implementation

**Discussion:** Regulations restrict U.S. tractor-trailer lengths and weights to levels well below European (110,000 lbs.) and Canadian (138,000 lbs.) standards, with resultant impacts on fuel efficiency per load mile. While research on the safety of significantly larger and longer trucks is generally inconclusive, existing accident rates are much less likely to be affected by modest weight and dimensional changes that do not fundamentally alter basic truck architecture or lengthen stopping distances. The Council’s recommendation to increase allowable weight to 97,000 lbs. GVW for U.S. tractor-trailers that have a supplementary sixth axle installed, provided they are substantially similar in their architecture to today’s maximum load combination trucks and replicate those vehicles’ stopping distances, is intended to yield oil savings while retaining current safety levels.

Reduced speed limits could offer additional fuel savings, but there are safety concerns about lowering speeds for trucks without also imposing the same lower limits on light-duty vehicles sharing the same roadways.

Since significantly longer and heavier tractor-trailers capable of matching European and Canadian load levels along with lower speed limits could generate fuel per ton improvements of as much as 30% while simultaneously reducing road congestion and other non-fuel costs, the Council recommends that government further study the safety impacts of these changes. If safety can be proven, implementation should proceed.

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† DOE, ORNL, Data Book, Table 4.4.
**COROLLARY RECOMMENDATION**

Require the Federal Aviation Administration (FAA) to implement improvements to commercial air traffic routing in order to increase safety and decrease fuel consumption.

Projected savings: 0.4 mbd

**Discussion:** In 2005, U.S. airlines incurred $62 in added operational costs for every single minute of flight delays.\(^4^0\) The annual price tag for the whole industry amounted to $5.9 billion, with a considerable share of this figure going to cover incremental fuel costs. Improved air traffic control procedures could reduce flight delays and improve flight times, thereby decreasing aviation fuel consumption.

By doubling the number of usable altitudes between 29,000 and 41,000 feet, the Domestic Reduced Vertical Separation Minima (DRVSM) implemented in 2005 are believed to have saved 500 million gallons of jet fuel in their first year alone, equivalent to nearly 12 million barrels.\(^4^1\) That is over 2% of all the jet fuel consumed by U.S. commercial carriers. Additional savings could be achieved through rationalized routing. Area Navigation Procedures (RNAV), which allow aircraft to improve the efficiency of climbs, descents, and other movements by supplementing ground navigation information with GPS data and computer analysis, would also yield substantial efficiencies upon full implementation. Other advances with major fuel savings potential are airspace optimization programs like the one recently instituted in south Florida, better oceanic flight protocols, and state-of-the-art tools to permit flight controllers to predict conflicts and minimize the need for drastic course alterations.

Ultimately, the nation will require a Next Generation Air Transportation System (NGATS). This new infrastructure will utilize digital, satellite–based technologies to provide the capacity and efficiency necessary to keep pace with growing demand in air traffic services. Incidentally but by no means inconsequentially, NGATS might yield oil savings of as much as 0.4 mbd by 2030. The Council supports these improvements in air traffic routing.

II. PROVIDE ALTERNATIVES

Diversifying our transportation fuel supply is a critical long-term step to improving U.S. energy security. The current reliance on a non-substitutable input creates profound risks and dangers. U.S. energy security would clearly benefit if we could displace petroleum usage in favor of alternative fuels that (1) do not require a completely new infrastructure as is the case with hydrogen; (2) can be produced from ample domestic feedstocks; (3) have the potential to be less expensive to produce than gasoline; and (4) are no worse than conventional oil in terms of environmental impact.

For decades, petroleum has been the cheapest source of liquid fuels, but alternatives do exist. Fuel ethanol is the most prominent of these. Global production of conventional ethanol, chiefly derived from corn or sugar cane, has now reached more than 12 billion gallons, with Brazil, the U.S., and China accounting for nearly 80% of that total.\(^4^2\) Production in the U.S. rose from 1.4 billion gallons a year in 1995 to more than 4 billion in 2005.\(^4^3\) This impressive figure still pales in the face of annual U.S. gasoline consumption of approximately 140 billion gallons.

While corn–based ethanol is currently the most successful alternative transportation fuel in the U.S., today’s supply is equivalent to only 3% of our gasoline consumption by volume. But since a unit of ethanol contains only two-thirds the energy of an equal amount of gasoline and also requires oil to be produced,\(^4^4\) ethanol effectively displaces well under 3% of gasoline use. And even this relatively small production volume consumes approximately 15% of the corn grown in the U.S.\(^4^5\) If it were even

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\(^4^1\) Of course, not all of the 42 gallons in a barrel can be used to yield jet fuel. Discussions with John Heimlich, Chief Economist, Air Transport Association of America. See also Federal Aviation Administration (FAA), “Aerospace Forecasts FY 2005–2016,” Table 25, http://www.faa.gov/data_statistics/aviation/aerospace_forecasts/2005-2016/media/Table25.PDF.


\(^4^3\) Ibid.

\(^4^4\) The energy content of ethanol is 83,333 British thermal units (Btu) per gallon. One gallon of gasoline contains 124,000 Btu.

possible to devote the entire U.S. corn crop to ethanol, the nation could produce only 30 billion gallons of ethanol, or around 15% of current gasoline use. Corrected for energy content, these 30 billion gallons would amount to only 20.2 billion gasoline equivalent gallons (GEG).\(^4^6\)

Ethanol’s lower energy content when compared with gasoline has notable implications for driving range and, thus, consumer utility. From the consumer perspective, conversion to E85 (a mix of 85% ethanol and 15% gasoline) will necessitate more frequent trips to the service station unless vehicle manufacturers increase fuel tank size or improve fuel efficiency. From a land use perspective, a move to more efficient vehicles is critical for achieving a significant transition to biofuels on as few acres as possible.

While corn-based ethanol is currently the most successful alternative transportation fuel in the U.S., today’s supply is equivalent to only 3% of our gasoline consumption by volume…. And even this relatively small production volume consumes approximately 15% of the corn grown in the U.S.

A greater role for biofuels is likely when we can produce them from both dedicated energy crops and various waste products such as those generated in the agriculture and forest products industries. Chemically identical to corn ethanol, “cellulosic” ethanol is capable of utilizing much of the current liquid fuel infrastructure. But cellulosic ethanol clearly has the potential to dominate its corn-based equivalent because it can make use of a far larger domestic feedstock supply, which in turn has significant implications for its price competitiveness vis-à-vis gasoline. Furthermore, by mobilizing diverse feedstocks, cellulosic ethanol offers the protection of biodiversity against pestilence that could catastrophically attack a single crop such as corn.

Cellulosic ethanol’s superior potential to reduce oil dependence is a function not only of a greater absolute supply of suitable feedstocks, but also of its more favorable fossil fuel balance per unit of production. Growing and processing corn ethanol requires a considerable input of fossil fuels. In fact, even though the input-to-output ratio has steadily improved over the last few decades, each British
thermal unit (Btu) of corn ethanol still consumes 0.74 Btu of fossil fuels, chiefly in the form of petroleum-based fertilizers and natural gas for processing. In comparison, each Btu of gasoline actually requires 1.23 Btu of petroleum, because some energy is used in processing. By capitalizing on feedstocks that can be grown with minimal use of fertilizers and which can also cost-effectively supply processing energy, cellulosic production will possess a far more favorable fossil fuel balance than corn ethanol, let alone traditional gasoline. Ideally, nearly all the carbon released through combustion of these fuels would be offset by carbon removed from the atmosphere through feedstock growth. Even greater progress may be made in the area of bio-butenol, which offers the same life-cycle energy balance promise as cellulosic ethanol, but with greater energy density, thus, potentially, greater attractiveness to consumers.

As with all new technologies, the capital costs associated with production facilities for cellulosic ethanol and other large-volume emerging biofuels can be barriers to investment. The recommendations that follow are intended to lower those costs by expanding the market for all ethanol; for cellulosic ethanol and other large-volume emerging biofuels, they also call for offsetting some private spending with public spending. With effective public policies, annual domestic biofuels production should be able to reach 30 billion gallons by 2030, divided in nearly equal amounts between corn-based and cellulosic production. Even larger production totals may be possible, but given that no commercial-scale production facility for cellulosic ethanol has yet to be opened anywhere in the world and that other biofuels technologies are even further away from commercialization, the Council deems a 30 billion gallon target to be prudent.

**PRIMARY RECOMMENDATION**

Grow the supply and demand sides of the biofuels market by

- Creating incentives and obligations for infrastructure deployment;
- Requiring increasing production of Flexible Fuel Vehicles (FFVs); and
- Increasing federal assistance available for “first-mover” production of cellulosic ethanol and other promising large-volume biofuels.

Projected biofuels output: 30 billion gallons per year ≈ 2.0 mbd

**Infrastructure:** The cost of installing ethanol fuel pumps and related infrastructure is substantial, perhaps as much as $100 million to achieve 10 billion gallons per year in sales. The Energy Policy Act of 2005 (EPAct05) provides a 30% tax credit for the installation of alternative fuel vehicle refueling stations. This credit, available to both branded and unbranded stations, is set to sunset in 2009 for E85 and other non-hydrogen-related facilities. This tax credit should be extended in duration and, at least for corporate-owned branded stations, made counter-cyclical to oil prices (i.e., it should decrease when oil prices are high and increase when oil prices are low). At low oil prices, this tax policy will incentivize all station owners to install E85 fueling stations. As oil prices rise, E85 has the potential to be cheaper than petroleum-based fuels, at which point consumers would naturally demand it for their FFVs. In this scenario, business owners with available investment capital would have every reason to meet consumer demand by installing E85 fuel pumps. Only small business owners lacking adequate capital would rightly qualify for credits in this situation.

Over the next decade, companies selling gasoline in the U.S. through wholly owned or branded stations should be required to provide pumps that dispense E85 fuel at an increasing percentage of all of their stations. The Council recommends that the regulatory requirement should grow from 5% of stations in 2007 to 50% in 2016 and also include a minimum required percentage for each state. To retain market flexibility while ensuring geographic dispersion of E85 infrastructure, the regulations
should allow companies to earn and sell credits if they exceed the overall percentage requirements but prohibit the use of purchased credits to circumvent geographic distribution requirements.

**FFVs:** Growth in ethanol production will be nearly pointless without the availability of FFVs that can run on rich ethanol blends. New vehicles can be designed to run on E85 for a modest cost (roughly $100 per vehicle), but at most 4% of the vehicles sold in U.S. in 2005 have this flexible fuel potential. The vehicle industry should be required to steadily increase the production of FFVs by 10% per year so that all major production models are ethanol capable by 2015.

Ethanol’s lower energy content when compared with gasoline has notable implications for driving range and, thus, consumer utility. From the consumer perspective, conversion to E85 will necessitate more frequent trips to the service station unless vehicle manufacturers increase fuel tank size or improve fuel efficiency.

Under current legislation, manufacturers are induced to produce a limited number of FFVs because they receive extra CAFE credit for such vehicles. Put simply, the government allows mileage numbers for FFVs to be inflated beyond actual attainments, and this numerical boost can then be used to increase the overall mpg rating of a manufacturer’s fleet. In principle, this loophole is justified by the benefits to be derived from diversifying the U.S. fuel supply. Unfortunately, manufacturers receive their extra credit regardless of whether the FFVs they produce are ever fueled with E85 ethanol. Indeed, even the government concedes that many FFV purchasers are not even aware of their vehicles’ flex-fuel capabilities. The result of this legislative loophole is that manufactures can produce fleets that fall below CAFE mandates without any real-world expectation of a jump in ethanol demand or any consequent reduction in the nation’s oil dependence. The Council is proposing mandates that would require increased FFV production and render the current incentives unnecessary.

**Increased federal assistance for “first-mover” biofuels facilities:** EPAct05 authorizes loan guarantees and reverse auction procedures designed to foster the construction of commercial-scale cellulosic ethanol facilities. Bidders for federal assistance win a reverse auction by proposing the project or projects that provide the greatest return on taxpayer investment for the benefits obtained. Winners may be seeking the lowest level of federal assistance among the competitors for funding, or they may be proposing the best value even if that requires a higher level of assistance. Under current guidance, however, DOE intends to guarantee only $2 billion in loans across a wide variety of advanced technologies—and that funding is itself subject to appropriations authority.

Since loan guarantees are a particularly cost-effective way to spur commercial deployment of biorefineries, Congress should ensure that DOE has sufficient funds and authority to guarantee loans on six or more biorefineries employing a variety of feedstocks and located in various regions of the country. Investment tax credits that are consistent with reasonable return-on-investment timeframes, direct loans and grants, and government purchase agreements would also be appropriate, separately or in combination, to spur the development of these commercial facilities. Congress should enact legislation that directs DOE to establish a competitive program making use of any or all of these financial tools.


COROLLARY RECOMMENDATION
Reform current ethanol per gallon subsidies to encourage private-sector investment in domestic ethanol and alternative biofuels production and infrastructure. “Smart subsidies” will cushion the industry against short-term oil price drops, minimize the cost to the U.S. Treasury, and distinguish between feedstock and fuel technologies. Balance the benefits of domestic production capability with the advantages of environmentally responsible development of an international biofuels trade.

Discussion: Billions of dollars in investment capital must be directed to biofuels production and infrastructure over the next two decades if we are to achieve the goal of 30 billion gallons of ethanol production by 2030. The perception that oil-producing nations can eliminate potential competition by temporarily reducing the global price for oil is an obstacle to large scale private investment. The opportunity exists to modify the current tax credit in a manner that guards against foreign price manipulation, better targets the credit toward new domestic investment, and significantly improves the value of the program for the American taxpayer.

At present, there is a $0.51 per gallon subsidy for ethanol production. When oil is selling for more than $45 dollars per barrel, however, established corn ethanol producers do not require any subsidy to sell their product profitably. The Council recommends instead the use of “smart subsidies” that would prevent such needless use of taxpayer dollars and more effectively contribute to real expansion of U.S. ethanol production capability. For existing conventional corn production facilities, these redesigned subsidies would fluctuate counter-cyclically to oil prices with an inflection point around $45 per barrel of oil. To foster incremental production capacity, subsidies would be linked to a higher inflection point for new corn ethanol plants and remain fully in place for nontraditional facilities. All in all, this subsidy arrangement would save taxpayer dollars while fostering the ethanol industry, especially in the face of market manipulations that could temporarily depress oil prices below the $45 level.

There is currently a $0.54 per gallon tariff on ethanol imported into the U.S. The original purpose of this policy was to deprive ethanol produced overseas from the subsidy that all ethanol receives when sold in the U.S. As U.S. ethanol subsidies are modified, the tariff on imported ethanol should also be reduced or eliminated. Ultimately, a developed international system of trade in ethanol from different producing countries will be essential if we are to rely on ethanol as a significant component of our fuel supply. Access to international production would provide valuable insurance against unexpected output declines in specific regions due to drought or disease.

COROLLARY RECOMMENDATION
Grow the biodiesel market, while ensuring a biodiesel standard that mandates quality and reliability to satisfy the operational standards of users and also includes clear and consistent labeling of biodiesel blend ratios.
Projected biodiesel output: 3.3 billion gallons per year ≈ 0.2 mbd

Discussion: Although test data on the operating effects of biodiesel continue to be refined, many engine manufacturers and industry experts currently restrict their biodiesel recommendations to blends of 5% biodiesel or lower in order to avoid operational limitations and long-term negative effects on equipment. If it is to displace conventional diesel consumption within key user groups, on-road
biodiesel (at least that supplied for highway use) must be capable of satisfying trucking industry quality standards. A national policy must also require clear and consistent labeling of biodiesel blend ratios. Proper labeling would allow truckers to avoid using blends associated with poor performance in cold weather or the degradation of fuel, engine, or emissions systems.

The Council recommends that the country focus on the widespread implementation of a 5% biodiesel blend ratio. Even under aggressive growth projections, the domestic biodiesel industry is not expected to be able to supply 5% of total transportation diesel consumption. A 5% blend would allow for broad distribution of the nation’s limited biodiesel production.

Government must facilitate R&D to investigate the potential for expanding biodiesel production beyond 5% using improved feedstocks and processes. Recognizing the economic benefits of global trade, the Council encourages efforts to explore international opportunities for biodiesel production while urging acute awareness of the environmental concerns that surround expanded feedstock production in tropical forest regions.

**COROLARY RECOMMENDATION**

Support federal investment in research, development, and commercialization of carbon sequestration technologies that can limit the adverse emissions impacts of oil shale, oil sands, and coal-to-liquids (CTL) production.

**Discussion:** U.S. oil shale deposits, concentrated on federal lands in Utah, Colorado, and Wyoming, are estimated to contain recoverable oil in amounts from 500 billion to over 1 trillion barrels. At current oil prices, some unconventional oil can be economically produced from shale. The economic viability of unconventional production using America’s vast coal supplies is more certain. Oil sands in western Canada are already yielding nearly 1 mbd of heavy crude and production yields are expected to grow dramatically in the coming years.

U.S. energy security would clearly benefit if we could displace petroleum usage in favor of alternative fuels that (1) do not require a completely new infrastructure as is the case with hydrogen; (2) can be produced from ample domestic feedstocks; (3) have the potential to be less expensive to produce than gasoline; and (4) are no worse than conventional oil in terms of environmental impact.

The federal government encouraged the development of unconventional domestic resources following the oil interruptions and price shocks of 1973–1974 through a guaranteed price floor and a production tax credit. In the early 1980s, these projects began to close and the last ceased operations in 1992. The aura of failure surrounding these efforts must be addressed and overcome if substantial new development is to occur.

With approximately 250 years of coal reserves, the U.S. could displace substantial amounts of conventional petroleum with liquid fuel derived from coal. Public and private R&D efforts have produced advances in gasification, in particular through work on clean coal power systems. Nevertheless, no

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49 Estimates vary widely, but, for an overview, see CRS Report for Congress no. RL33359, Anthony Andrews, “Oil Shale: history, incentives, and policy” (13 April 2006).
large, integrated facility has yet been built using advanced technologies, and CTL shares many of the same market barriers that confront oil shale: high capital costs, market uncertainty about future oil prices, and significant criteria pollutant and greenhouse gas emission concerns. Unconventional oil production affects landscapes, water usage, and requires significant fossil fuel inputs, often in the form of natural gas. Large-scale production would likely increase the upward pricing pressure on natural gas, further burdening the many residential and industrial users who rely on this fuel. This could further damage U.S.-based chemicals and fertilizer production and have the effect of canceling out jobs created in the unconventional fuels sector. These concerns are important, but the Council does not believe they pose an unacceptable obstacle to development of these resources.

Current oil shale and CTL production technologies result in as much as a doubling of carbon emissions compared with conventional oil production. Let us reiterate: uncertainty about future carbon mitigation policies makes it difficult to justify the use of significant public resources on unconventional oil investments that might not be economically viable over the long term. While the Council does not advocate restrictions on the use of private funds to pursue unconventional oil alternatives, we are not in favor of devoting public funds to widespread deployment in the absence of a clear policy on carbon mitigation and greater confidence in technologies to address carbon emissions. To avoid stranding valuable capital, government funds should currently be devoted to researching developing, and, by 2015, commercializing carbon sequestration technologies that are likely to be necessary components of sustainable unconventional oil production. The results of this effort should be shared with other developed nations as well as with India and China.

SECTIONS III AND IV—EXPAND SUPPLY AND MANAGE RISKS

In the global market, disruptions in global supply anywhere will increase the price of oil everywhere. Moreover, as long as even parts of the interconnected and interdependent world economy continue to rely on oil, U.S. economic interests will remain vulnerable to oil price shocks. Rejecting calls for “energy independence” as unrealistic, the Council believes in the need to manage energy interdependence and increase energy security. Increased supply and improved risk management strategies can help us reach these goals.

III. EXPAND SUPPLY

The U.S. plays a critical role in global petroleum production. We are currently the third largest oil producer in the world after Saudi Arabia and Russia and over the last century have produced more oil than any other nation. Nevertheless, as the world’s largest consumer of oil by far, the U.S. cannot ask other nations to invest in global supply expansion unless we continue to shoulder our share of the production burden.

PRIMARY RECOMMENDATION

Increase access to U.S. oil and natural gas reserves on the Outer Continental Shelf (OCS) with sharply increased and expanded environmental protections.

Projected increase in OCS oil production: 1.0 to 2.0 mbd

Discussion: Since the late 1990s, more than a fifth of U.S. oil production has come from the OCS. By 2003, the OCS share had topped 27% of domestic production. This offshore recovery has been instrumental in replacing the declines in production from older, land-based U.S. wells. The OCS accounts for an ever larger portion of U.S. natural gas production. As a matter of course, increased OCS oil exploration will expand the natural gas resource base.50 The federal government

50 DOI, MMS, “Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation’s Outer Continental Shelf” (February 2006), 3.
is responsible for leasing this offshore territory, assuring environmental protection, and collecting payments for exploration rights and, in those cases where oil and gas production result, royalties as well.

To be sure, increased U.S. production on the OCS will not fundamentally shift the global distribution of oil resources, the preponderance of which will remain in the Middle East and under OPEC control. But by boosting production domestically, the U.S. can improve the flexibility and resiliency of the global oil market, especially in an increasingly tight market where spare production capacity is concentrated in a handful of countries.

Accurately estimating Undiscovered Technically Recoverable Resources (UTRR) is a notoriously difficult exercise, but the Minerals Management Service (MMS), the bureau within the Department of the Interior responsible for offshore leasing, puts the UTRR figure for OCS oil and gas at 76 billion barrels and 406 trillion cubic feet (tcf), respectively.\textsuperscript{51} Technological feasibility aside, recovery of these resources is substantially restricted by government policies that currently prohibit leasing and even pre-leasing activity in all OCS territories except the central and western Gulf of Mexico and in some areas off Alaska.

\begin{itemize}
\item [\textbf{U.S. production costs are almost certain to exceed those incurred by OPEC suppliers. Nonetheless, U.S. producers will continue to behave as “price takers,” selling their commodity at a price determined in the global market in which OPEC controls marginal production.}]
\end{itemize}

The legal framework blocking expanded OCS exploration and production has developed over decades. The Coastal Zones Management Act of 1972 gives the states considerable power to object to federal actions that conflict with approved coastal management plans. In addition, beginning in 1982, Congress began progressively removing certain OCS tracts from leasing consideration by means of recurring annual moratoria inserted in appropriation bills. In 1990, President George H.W. Bush issued a presidential directive enacting a blanket prohibition through 2000 on leasing and pre-leasing activities off most of the Pacific and North Atlantic coasts and in the eastern Gulf of Mexico. The Clinton Administration extended this executive moratorium through 2012. Even outside of the moratoria areas, leasing has at times been severely constrained by stiff opposition. For example, during its proposal phase, Lease Sale 181 in the eastern Gulf of Mexico was sharply challenged for including areas only 16 miles from the coast of Florida. As a result, the lease area was trimmed from 5.9 million acres to only 1.5 million, with none closer than 100 miles to the Florida Coast.\textsuperscript{52}

The dominant rationale for the congressional and executive moratoria is the need to prevent activities that could harm the environment, land asset values, and tourism. The Council is entirely supportive of stringent environmental standards to protect the natural resources of the OCS and adjacent state lands. Where we take issue with the moratoria, however, is in the wholesale protection they presume to offer. As all purchasers of insurance know, total coverage tends to be exceedingly expensive. As a result, most policy holders, even extremely risk averse ones, choose to accept some risk, for instance in the form of a deductible. In most cases, government also chooses to manage, rather than to eliminate, risk.\textsuperscript{53}

\begin{itemize}
\item [\textsuperscript{51} DOE, EIA, “Overview of U.S. Legislation and Regulations Affecting Offshore Natural Gas and Oil Activity” (September 2005), 3.]
\item [\textsuperscript{53} David A. Moss, When All Else Fails: government as the ultimate risk manager (Cambridge, MA: Harvard University Press, 2004).]
\end{itemize}
In those areas where oil exploration and production have been allowed, a risk management approach seems to have proven effective. According to MMS, offshore operators produced 7 billion barrels of oil from 1985 to 2001 with a spill rate of only .001%. More recently, 3,050 of the Gulf’s 4,000 platforms and 22,000 miles of Gulf pipelines were in the direct path of either Hurricane Katrina or Hurricane Rita. Despite the destruction of 115 platforms, damage to 52 other platforms and 535 pipeline segments, and the near total shut-down of the Gulf’s offshore oil and gas production, there were no major oil spills attributed to either storm. Where failures have occurred, as in the Alaska pipeline leaks revealed in August 2006, the system for ensuring accountability has functioned well, confronting the responsible parties with civil and potential criminal penalties and causing the Pipeline and Hazardous Materials Safety Administration (PHMSA) within DOT to issue a draft rule to redress a regulatory gap that currently exempts from inspections pipelines that are low pressure and not near water.

This environmental safety record has been achieved on the basis of existing federal and state laws that hold oil and gas producers liable for environmental damages. Of course, the blanket moratoria applied to most of the OCS aim for perfect environmental protection, but they do so at the cost of reduced energy security for the nation. Moreover, by focusing public concern on offshore “upstream” production activities that have an exemplary safety record, the moratoria distract attention from the environmental security risks of “downstream” elements such as the numerous vulnerable tankers that bring oil to the U.S. every year.

The Council believes that it is sensible to increase access to exploration and production on the OCS so long as government and the oil and gas industry are willing to strengthen the legal and financial penalties that can be imposed on those who damage the environment. In terms of specific suggestions for improvements, the Council recommends:

1. increasing the size of surety bond requirements;

2. creating a new federal entity (modeled on the Office of Federal Inspector for the Alaska Gas Pipeline) to be responsible for overseeing environmental laws with respect to drilling, production, and transportation;

3. establishing/strengthening Citizens’ Advisory Groups, equipped with financial autonomy, to advise the oversight entity;

4. specifying stricter liability provisions to reduce the likelihood of protracted litigation;

5. expanding environmental safeguards to protect against harmful environmental damages associated with initial exploration and drilling, recognizing that current regulations, such as those enacted in the Oil Pollution Act of 1990 and EPA’s Spill Prevention, Control, and Countermeasure regulation, focus principally on providing safeguards during development and production phases;

6. strengthening the administration of the leasing program through the Department of the Interior, employing an ecosystem focus sensitive to cumulative impacts, to result in no significant adverse effect on fish and wildlife, their habitats, subsistence resources, or the environment, with seasonal limits to protect breeding, spawning, and wildlife migration patterns and, where appropriate, requiring the approval of plans by the U.S. Army Corps of Engineers, EPA, and the U.S. Fish and Wildlife Service; and

7. protecting coastal vistas using provable line-of-sight calculations to measure the actual impact of offshore production facilities.

The enhanced safeguards proposed by the Council should not be viewed or misrepresented by either side of the debate as unconquerable obstacles to expanded production. To the contrary, we are convinced that such measures are essential to making additional domestic supply a far more practical and likely proposition, precisely because they address the legitimate needs of preserving the natural environment and building public confidence. The Council strongly believes that producers will be able to comply with these safeguards without undermining the economic viability of the discussed production areas. In sum, this primary recommendation offers an achievable path to increased U.S. production of oil and thus toward the goal of improving the nation’s overall energy security.

In 2006, the U.S. House of Representatives and the U.S. Senate both approved significantly different versions of draft legislation to facilitate drilling on the OCS. The separate bills had not been reconciled in the Conference Committee prior to Congress adjourning for the mid-term elections. The Council urges the House of Representatives and Senate to resolve their differences with the goal of producing legislation that will enable greater access to the significant oil and gas resources on the OCS in conjunction with strengthened environmental protections.

## PRIMARY RECOMMENDATION

**Employ federal funds to accelerate the development and deployment of Enhanced Oil Recovery (EOR) techniques.**

Projected increase in EOR production: at least 1.0 mbd

### Discussion: Typically, only about 10% of the oil in a reservoir flows “naturally” to the surface.\(^{57}\)

Injections or re-injections of water and gases, typically referred to as “secondary recovery” (even though the methods are now typically employed from the beginning of drilling), can yield a further 20% to 40% of a site’s oil, but this still leaves nearly half of the theoretical total in the ground. Increasing demand for oil has ushered in a wave of more advanced technologies that can help to release the remaining oil. Known as “tertiary” or enhanced oil recovery (EOR), these techniques can take many forms, including chemical flooding, miscible displacement via gas (usually CO\(_2\)), and thermal recovery. Economically viable EOR accounted for only around 650,000 barrels of daily U.S. production in 2004, mostly in California and Texas, but market forces should lead to a sizable increase in coming years.\(^{58}\)

EOR using CO\(_2\) flooding has attracted considerable attention because of its potential to simultaneously sequester carbon and increase oil recovery. Advanced EOR using CO\(_2\) injections could push U.S. reservoir recovery rates from 30% to 60% within a generation. In the Basin region of Texas and New Mexico, this could yield 1 billion barrels of incremental production.\(^{59}\) Full-scale implementation of EOR using CO\(_2\) will require major infrastructure investments to capture and transport the gas to oil production areas. It is important for the government to assist in lowering the risks inherent in applying new technology to complex oil reservoirs by conducting research and piloting tests and field demonstrations of CO\(_2\) – EOR in geologically challenging fields.

## PRIMARY RECOMMENDATION

**Make investment access a high profile aspect of U.S. trade negotiations and diplomatic efforts with oil-producing nations.**

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Discussion: As much as 90% of the world’s conventional oil reserves are currently held by state-owned production companies. Aside from the political instability of many oil-rich nations, state-controlled production is often inefficient, relying on outdated technology and reserves-management techniques. To enhance the global market’s ability to respond to price signals and to increase the reliability of global production, access to U.S. markets and global trade organizations should be contingent upon the granting of reciprocal access to foreign investment in energy production. Such access should then be protected by appropriate laws, regulations, and judicial systems that preserve the sanctity of contracts. In keeping with this reciprocity requirement, the U.S. must not take a protectionist stance when foreign nations seek to invest in U.S. oil companies, unless clear national security risks can be demonstrated.

COROLLARY RECOMMENDATION
Increase access to U.S. reserves in Alaska
Projected increase in Alaskan production: 0.9 mbd

Discussion: Expanded Alaskan production could also boost U.S. output, though by significantly smaller amounts than widespread OCS production. Alaska ranks third among U.S. states in crude oil reserves and crude oil production, accounting for 17% of current production. According to the Energy Information Administration (EIA) of DOE, opening of the Arctic National Wildlife Refuge (ANWR) to exploration and production could add perhaps 900,000 barrels of crude to domestic daily output at the peak point in the recovery life-cycle. If produced, this oil would extend the productive life of the Trans-Alaska Pipeline System (TAPS). Oil should begin to flow into TAPS between 5 and 10 years after drilling begins. By way of reference, TAPS was initially authorized in 1973, construction began in 1974, and Prudhoe Bay oil was flowing through it in 1979.

Increased U.S. production on the OCS will not fundamentally shift the global distribution of oil resources, the preponderance of which will remain in the Middle East and under OPEC control. But by boosting production domestically, the U.S. can improve the flexibility and resiliency of the global oil market, especially in an increasingly tight market where spare production capacity is concentrated in a handful of countries.

The United States Geological Survey (USGS) estimates mean resource reserves for the entire ANWR area, including Native Lands within the refuge and state-controlled offshore territory, at 10.3 billion barrels of oil. Most of this oil is concentrated within and along a coast strip known as the “1002 Area” that was reserved for future production in the legislation that created ANWR. The mean estimate for the 1002 Area is 7.7 billion barrels. By definition, reserves only include oil that is recoverable at a given price. The USGS estimates that at least 73% of 10.3 billion barrels should be recoverable at oil prices above $30 per barrel (in 2003 dollars). At $55, the recoverable amount is estimated to top 90%.

The mean resource estimate for ANWR is less than half the current mean estimate for the Prudhoe Bay, an area that is now believed to have contained 14 billion barrels. In absolute size, ANWR’s potential is closer to that of the National Petroleum Reserve — Alaska (NPRA). Already undergoing

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61 DOE, EIA, Office of Analysis and Forecasting, “Analysis of Oil and Gas Production in the Arctic National Wildlife Refuge” (March 2004), 7.
leasing and exploration, NPRA is estimated to hold 9.3 billion barrels, albeit ones that are more dispersed and thus more expensive to recover than those in ANWR. However, at the oil prices seen over last 2 years, total recoverable amounts from NPRA could match if not exceed those in ANWR. With at least 40 tcf of natural gas, NPRA is also estimated to hold several times as much natural gas as ANWR.

Political symbolism and the ideological battle surrounding the issue of ANWR have unfortunately blocked the advancement of a sound national production policy that could reduce our oil dependence and improve our energy security. This impasse is not acceptable given the size and nature of the energy threat facing the country.

The Council is convinced of the merit of its corollary recommendation to increase environmentally responsible production in Alaska. For a limited period of time, this incremental output would improve U.S. energy security. Nevertheless, the value of this recommendation must be measured against the greater and more enduring benefits that can be achieved through implementation of our primary recommendations, including significantly reforming and strengthening fuel efficiency of passenger cars and light-duty trucks (projected to save 4.3 mbd by 2030 and trending upward thereafter) and increasing access to U.S. reserves on the OCS (projected to supply an additional 1.0 to 2.0 million mbd over an extended period).

The oil industry has indicated on numerous occasions that it has the technological capability and commitment needed to develop ANWR without the negative impacts that have been the focus of opposition. As a result of technological advances that have been achieved over the last 30 years, production infrastructures require a far smaller land “footprint” than was once the case. Indeed, at 2,000 acres, the most commonly proposed ANWR infrastructure would be only 40% as extensive as the Prudhoe Bay development. We believe a system of stringent oversight and clear penalties should be established in order to enable production to proceed while holding companies and shareholders accountable for any damage that does occur, regardless of the reason. This system should be designed to discourage exploration by any entity that is not supremely confident in its ability to proceed in an environmentally responsible manner. As discussed in the OCS section, the Council supports a series of safeguards, including strengthened and reformed surety bond requirements, improved agency and third-party oversight arrangements, tightened administration of the leasing program, specified liability impacts, and extension of the provisions of the Oil Pollution Act of 1990 to include all exploration and development activities.

Instability in major oil-producing countries, an uncertain investment environment, the threat of terrorism, a decrease in spare capacity, and high demand growth are straining the global oil supply system, causing high and volatile prices, and creating very real economic and national security vulnerabilities for the United States.

1. **Port of Valdez and Trans-Alaska Pipeline**
The Trans-Alaska pipeline accounts for roughly 20 percent of U.S. crude oil production. Sabotage a serious concern.

2. **United States: 8.2 mbd**
World’s largest consumer, accounting for 25 percent of global demand despite having only 3 percent of world reserves. Consumption expected to grow 24 percent by 2025.

3. **Gulf of Mexico: 1.5 mbd**
Infrastructure inherently vulnerable to natural disasters. In 2004 and 2005, hurricanes were responsible for single greatest losses of energy output.

4. **Venezuela: 2.9 mbd**
President Chavez frequently threatens to “cut off the oil,” noting economic consequences for U.S. In late-2002 and early-2003, labor strikes and general unrest reduced output by more than 60 percent.

mbd—million barrels per day; b/d—barrels per day. Figures represent a country or region’s production in 2004. This map depicts only some of the widespread instability in the global oil market.
5. **Turkish Straits**
More than 3.1 mbd flow through this chokepoint en route to Mediterranean Sea and world markets. One of world’s busiest shipping lanes and only a half-mile wide at its narrowest point.

6. **Caspian Sea and the Caucasus: 1.8 mbd**
Ethnic conflicts, frequent unrest, and rampant corruption threaten export growth.

7. **Nigeria: 2.3 mbd**
Ongoing political instability, including militant attacks on oil infrastructure, has reduced output.

8. **Chad: 200,000 b/d**
President threatened to shut down production in dispute with World Bank. Government under attack from rebels.

9. **Sudan: 300,000 b/d**
Violence threatens investment. China has resisted or blocked U.N. sanctions.

10. **Russia: 9.3 mbd**
Uncertainty remains in wake of Yukos affair and other recentralization efforts. World’s second largest producer.

11. **Strait of Hormuz**
17 mbd, roughly 20 percent of the world’s total supply flows through the Strait of Hormuz. If blocked, only a small portion could be transported along alternate routes.

12. **China: 3.6 mbd**
Rapidly growing demand due to economic development; recently became world’s second largest consumer. Efforts to secure supplies will only intensify.

13. **Strait of Malacca**
Carries 11.7 mbd between Persian Gulf and key developing markets in East Asia. Narrowness makes navigation difficult; piracy a regular occurrence.

14. **Iraq: 2 mbd**
Terrorists frequently target oil facilities. Currently producing well below pre-Gulf War capacity.

15. **Iran: 4.1 mbd**
Fears persist over nuclear showdown with West.

16. **Saudi Arabia: 10.5 mbd**
Rife with terrorist threats and political tensions; current spare production capacity much lower than in past.
In light of military threats to the global oil infrastructure, the U.S. should, where appropriate:

— Encourage burden sharing with U.S. allies and partners, including producing and consuming nations, in defense of global oil flows;

— Foster formal and informal security arrangements on multilateral, regional, and bilateral bases, capitalizing on the U.S.’s unique ability to arrange international security efforts;

— Provide diplomatic support as well as counter-terrorism training and military aid so that oil-producing nations can better assist in protecting petroleum supplies; and

— Offer assistance to producing countries in their efforts to develop attractive investment climates backed by stable civil societies.

Discussion: The vast network of oil production and transport infrastructure is highly vulnerable to terrorist attack. Al-Qaeda has targeted and continues to target oil infrastructure as a way of “bleeding” the U.S. economy. All involved nations need to expand efforts to secure global oil production and transport. Shipping lanes and large facilities are of particular concern. Roughly 90% of Middle East oil exports pass through the Strait of Hormuz (17 mbd), Bab el Mandeb (3.0 mbd), or the Suez Canal/Sumed Pipeline (3.8 mbd). Another 11.7 mbd pass through the Strait of Malacca and 3.1 mbd through the Turkish Straits. All of these passageways are vulnerable to accidents, piracy, and terrorism. Since alternative routes are lacking, the effect of a major blockage at one of these points could be devastating.

The U.S. contributes more than any other nation to protecting this global infrastructure. And while the U.S. has never shirked this responsibility, the time has come for other nations to expand their own efforts. At a minimum, the President should consider global oil infrastructure protection as a key international security role to be supported by multilateral, regional, and bilateral arrangements. Multinational initiatives similar to the Proliferation Security Initiative could be utilized, as could expanded efforts with existing organizations such as the Gulf Coordination Council, NATO, or ASEAN. Outside of formal arrangements, shared interest in international “oil peacekeeping” can serve to provide channels for pragmatic cooperation among countries in geopolitical competition. Developing nations, especially growing oil importers such as China and India, should also share in the framing of new security plans.

Producing nations have a sovereign responsibility to protect their territories. But many security tasks, especially counter-terrorism, benefit tremendously from multilateral approaches. Where appropriate, the U.S. should provide these countries diplomatic support as well as counter-terrorism training and other military aid to enable them to better assist in protecting petroleum supplies. In addition to these strategies for increasing the physical security of production assets, the U.S. should seek ways to help producing countries create more attractive investment climates backed by stable civil societies.
**PRIMARY RECOMMENDATION**
Reassess the multiple dimensions of strategic reserves policy within the U.S. and at the International Energy Agency (IEA). In addition, revise the 1974 Organization for Economic Co-operation and Development (OECD) agreement to allow China and India to join the IEA and participate in updated global strategic petroleum reserve arrangements.

**Discussion:** The International Energy Agency’s (IEA) International Energy Program (IEP) is a 26-nation network of collaborative research and exchanges on energy policy that includes mechanisms for coordinating responses to major oil supply disruptions.66 The IEP requires member nations to maintain emergency oil stocks—to be held either commercially or by governments—sufficient to replace the oil they would import during a period of 90 days. Members are also obligated to restrain demand by 7% in the event of an extant or expected supply disruption equal to at least 7% of normal supply for the entire membership community. The requirement for demand reduction can be netted against a nation’s emergency stocks if those stocks are maintained at a level over and above the 90-day requirement. Emergency allocation plans to distribute available oil through the membership community are another major element of the IEP. Since 1975, the IEA has also developed a body of “flexible response” measures designed for use in “pre-crisis” and “sub-crisis” situations that threaten macroeconomic harm even if they do not reach the 7% trigger or other, higher volumetric triggers.67

The strategic stockpile maintained by the U.S. government, the SPR, has a design capacity of over 727 million barrels,68 which equates to approximately 60 days of coverage given a daily U.S. import requirement of 12 mbd. Since the drawdown capacity of the SPR is not expected to exceed 4.4 mbd, these stocks would in fact require more than 60 days to deplete. Actual SPR storage is just under full capacity, at 689 million barrels. Excess commercial stocks held in the U.S. add perhaps another 90 days of import coverage, at least in theory; in actuality, the nation’s oil infrastructure could not be drawn down to zero without suffering damage.

The capacity of international strategic reserves has increased over the last twenty years, but not in line with the rise in OECD oil consumption, let alone the surge in overall global oil demand.69 EPAct 2005 authorized the government to expand the SPR to the 1 billion barrels originally envisioned in 1975, but at the current fill rate of 78,000 barrels per day, the new capacity will not be filled until 2015.70 By that time, U.S. imports will have grown sufficiently to negate the ability of the expansion to provide any additional days of import replacement coverage.

While all nations potentially benefit from the existence of strategic stocks, several major oil-consuming nations—notably China and India—do not participate in the IEA’s global network of emergency oil stocks. In the U.S., as in the entire OECD, it has proven difficult to reach consensus as to when it is appropriate to release strategic reserves. These shortcomings have raised questions as to the value of storing millions of barrels of strategic stocks. It would be highly desirable to reassess the multiple dimensions of strategic reserves policy within the U.S. and at the IEA, discussing in particular the relation between strategic and commercial stocks, the potential value to taxpayers of strategic call options for private storage of liquid stocks, public-private swaps of different quality oils, the relevance of the present IEA stock release triggers, and the extent to which the release decision-making process can be de-politicized or, at least, rendered less political.

Political upheavals and instability often result in sizable and lasting drop-offs in oil production.

COROLLARY RECOMMENDATION
Evaluate policy approaches to expand the ability of U.S. refineries to process a wider variety of crude stocks and to make U.S. refining less vulnerable to extreme weather. Work to expand total U.S. capacity or to ensure that the U.S. will have secure access to product produced overseas.

Discussion: Demand for lighter crude has been outstripping supplies. At the same time, capacity to refine heavy crude has not kept pace with a crude supply increasingly weighted toward heavy and sour grades. This set of circumstances has contributed to the widening price gap between light and heavy crude. Adding appropriate refinery capacity would allow better use of heavy oil, not only in the U.S., but also in the expanding Asian oil marketplace. In turn, this would ease upward pricing pressure on light crude.

Care should be taken to avoid adding to the over-concentration of U.S. refinery capacity in areas that have proven to be highly vulnerable to natural disasters. At the time of peak impact, Hurricanes Katrina and Rita knocked out one-third of U.S. refinery capacity.

Since the 1990s, refinery expansions at existing U.S. sites increased overall output by 1.5% per year without any “greenfield” construction. Just to keep pace with expanding demand over the next two decades, U.S. refineries will probably need to sustain output increases of 1.8% per year. This may not be possible, especially if new refinery construction in the U.S. remains economically unattractive (at least in comparison with more favorable prospects in Asia). However, it may be perfectly acceptable for the U.S. to rely on expanded overseas refinery capacity if that expansion takes places in the Western Hemisphere and is combined with efforts to strengthen regional oil security in the Caribbean Basin and the rest of Central and South America.

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72 CRS Report for Congress no. RS22233, Robert L. Bamberger and Lawrence Kumins, “Oil and gas: supply issues after Katrina and Rita” (3 October 2005), 1.
Conclusion

With each passing year, the global oil trends now at work—rising consumption, reduced spare production capacity, politicized capital investment strategies, and high levels of instability in key exporting countries—all increase the likelihood of an oil crisis. The odds in favor of a crisis are further heightened by the rise of terrorist movements expressly committed to targeting critical elements of the world’s vulnerable oil production and delivery infrastructure.

Many of the solutions we have put forth for consideration will require decades to mature. Market forces alone will not sustain their development, especially if the world experiences a temporary return of lower oil prices. Instead, government engagement will be necessary to align private interests in the service of the nation. We are confident that Americans will support a bipartisan and open-minded campaign for increased energy security. Let the campaign to reduce oil dependence be the first test of this patriotic belief.
Securing America’s Future Energy (SAFE) is a nonpartisan, not-for-profit organization committed to reducing America’s dependence on oil and improving U.S. energy security in order to bolster national security and strengthen the economy. SAFE has an action-oriented strategy addressing politics and advocacy, business and technology, and media and public education.

The Energy Security Leadership Council, a project of SAFE, is an intensive effort by a collection of prominent business leaders and retired senior military officers to build support for a comprehensive, long-term policy to reduce U.S. oil dependence and improve energy security. Members of the Council are united in the belief that a fundamental shift in energy policy can prevent an unprecedented economic and national security calamity. In bringing together representatives of the business community and retired senior military officers, the Council is focused on breaking the longstanding energy policy stalemate.
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