AMERICA'S ACHILLES HEEL:
THE HIDDEN COSTS OF IMPORTED OIL
A STRATEGY FOR ENERGY INDEPENDENCE

INTRODUCTION

It would be difficult to imagine the advent of any commodity that has had the impact of oil on virtually every area of human endeavor. From transportation to medicine to agriculture to materials, petroleum-derived products have had a profound impact. Moreover, these products have been readily available at bargain-basement prices through most of our history. Indeed, the pump price of a gallon of gasoline is only a little more than half the price of a gallon of milk. Yet, the price for a gallon of gasoline a consumer pays at the pump is in fact only a fraction of the real cost of the fuel. It does not reflect the enormous burden of external costs that arise from the military, economic, environmental and health outlays directly resulting from our dependence on foreign oil. If our nation is to make rational policy decisions regarding the rising tide of imports, it is essential that decision-makers fully understand what these costs are, and how they are incurred.

THE FIRST OIL SHOCK

Gasoline lines resulting from the oil shortage.

On October 17, 1973 Americans were shocked out of their energy complacency when the Arab Organization of Petroleum Exporting Countries (AOPEC) (1) announced it would impose an embargo on oil sales to the United States and raise the price of crude oil to other customers by some 70%. To enforce this action, AOPEC further announced it would cut production by 5% from the previous month's levels and reduce production by an additional 5% each succeeding month.

Overnight, crude oil prices rose 70% to $5.28 per barrel. (2) By May of the following year the price peaked at $12.60 per barrel, more than four times the pre-embargo level. (3) Gasoline prices skyrocketed as well and filling stations were plagued with long lines of

desperate motorists panicked over short supplies. The economy soon fell into a deep recession caused in part by an 11% inflation rate. (4) Unemployment, which had been declining over the past two years shot up by more than one full percentage point by January of 1974, (5) and nearly doubled by January of 1975. (6) Over 1.2 million people lost their jobs. (7)

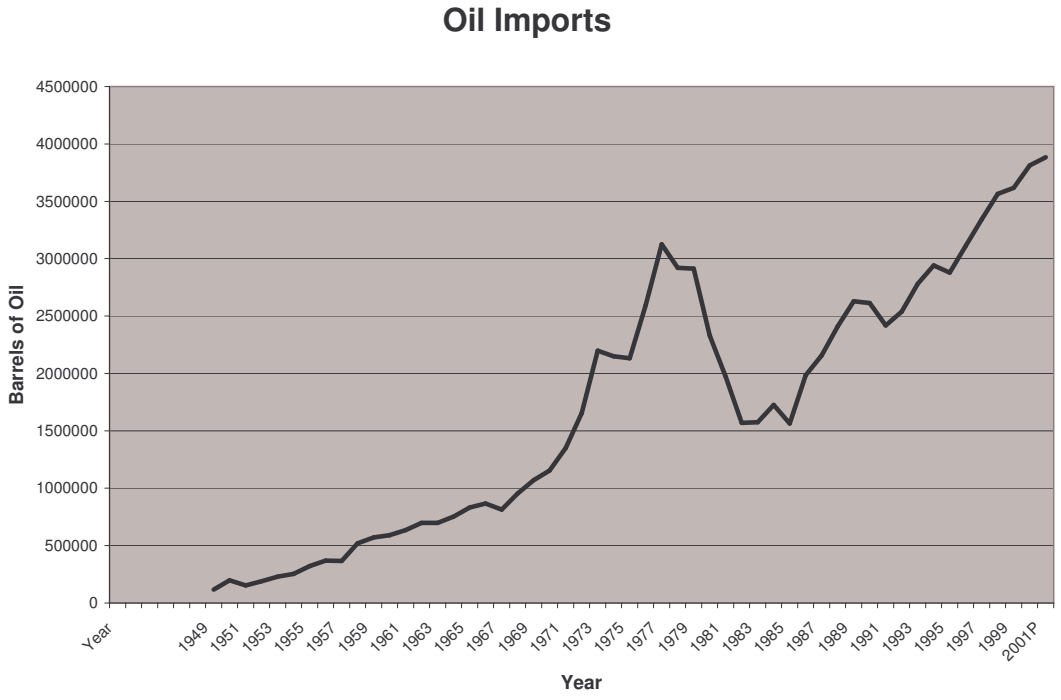
The psychological impact on the United States was incalculable.

Americans had long believed themselves immune from oil supply disruptions – and with cause. World oil supplies had been severely disrupted several times (8) with negligible impact on the U.S. economy because domestic producers were able to increase production to make up the shortfall. In two notable instances, the 1951 embargo of Iranian oil and the 1967 Suez Crisis, (9) increased U.S. production not only alleviated domestic shortfalls, but those of its allies as well.

But, 1973 was different.

Until 1947, the United States had been a net exporter of oil. (10) But beginning in 1948, America's longstanding oil self-sufficiency began to erode. By 1973, the nation was importing almost 35% of its crude oil and its "surge" capacity (the ability to quickly increase oil production from existing wells) had greatly diminished. (11)

Unaware of these statistics, the public was unprepared for what would come in the aftermath of AOPEC's move. Pundits were quick to point fingers of blame, and conjure up images of hidden conspiracies, but most missed the point. The real cause was right in front of them. Our import vulnerability was the inevitable consequence of America's love affair with the automobile.



THE ROLE OF THE TRANSPORTATION SECTOR

In 1900, there were only about 8,000 automobiles registered in the United States. (12) Five years later, that figure grew to nearly 78,000. (13) By 1925, it had risen to 17 million and by1950, more than 40 million. (14) But it was in the Post-WWII period that privately owned cars and light trucks saw their real growth. By 1970 over 108 million privately owned cars and light trucks were registered in the United States (15) and today that number has burgeoned to over 220 million, (16) making per capita vehicle ownership in the U.S. more than 47% higher than the average for the industrialized nations of Western Europe. (17)

The widespread ownership of personal vehicles by Americans has provided an unprecedented degree of mobility – and Americans make full use of it. Americans travel roughly 44% (18) more miles in their automobiles each year than do citizens of the industrialized nations in Western Europe, and more than twice the distance by citizens of Japan. (19) But this freedom of movement is not without a price.

Despite significant improvements in vehicle efficiency, increases in the number of vehicles and the number of vehicle miles traveled have negated any potential benefits. The reason is that, even though each vehicle might use less fuel per mile, there are so many more vehicles and so many more miles traveled that oil used in the transportation sector has continued to grow – and grow dramatically. This steep rise in consumption in turn has served to worsen America's oil import vulnerability. Notably, the increase occurred during a period when most other sectors of the economy dramatically reduced or substantially curtailed their dependence on petroleum products.

Between 1973 and 2001, the actual amount of oil consumed by the utility sector dropped by 76%, (20) the amount consumed in the commercial sector fell by 52% (21) and the amount consumed in the residential sector declined by 43%. (22) Although industrial oil use increased by roughly 8.5%, the increase was substantially below the 13.8% overall increase in petroleum consumption during the same period. (23)

As noted, these impressive reductions in petroleum dependence were more than offset, however, by a 46.4% increase in oil use in the transportation sector. (24)

Significantly, had the amount of oil used in the transportation sector merely remained constant, U.S. domestic oil consumption would actually have declined by some 24.3% from 1973 levels. (25) Indeed, between 1973 and 2001, the proportion of domestic petroleum consumption accounted by the transportation sector from rose from 52.3% to 67.3%. (26) During that same period, the transportation sector's share of total domestic energy use increased from 18.6% to 27.1%. (27)

To put these figures in perspective, if a substitute could be found for the petroleum used in the transportation sector, there would be no need to import oil. In fact, if necessary America could again become a net oil exporter.

The increase in transportation sector petroleum use is best understood in the context of evolving driving patterns. The total number of vehicle miles traveled (VMT) has increased an average of 3.6% annually since 1950. (28) More important, the average number of vehicle miles traveled per capita increased dramatically as well. Between 1975 and 2000 alone, the increase in VMT was 63.2%. (29) Part of this increase was the natural consequence of a dramatic increase in vehicle ownership. In 1960, more than one-fifth of all families only owned one automobile. (30) By the year 2000, less than ten percent did. (31)

It is not just the growth in vehicles and the number of miles traveled that is affecting transportation sector energy consumption. Another important change is in the make-up of the U.S. motor vehicle fleet.

THE GROWTH OF LIGHT TRUCK OWNERSHIP

Since the initial introduction of automobile emission control equipment, no trend has had a larger effect on transportation sector energy efficiency than the dramatic increase in the use of light trucks as personal vehicles. In 1978, light trucks accounted for just 9.8% of the total vehicle fleet. (32) By 2001, however, light trucks constituted 46.7% of personal vehicles (33) – this due primarily to the growing popularity of Sport Utility Vehicles and Minivans among suburban households. Over time, these light trucks have largely replaced the traditional station wagon as a second vehicle for suburban families. It is particularly noteworthy that, as of 2001, Sport Utility Vehicles became the leading choice among female new vehicle purchasers – the market segment that most generally guides buying decisions related to "family" transportation. (34)

The effect of this shift in the makeup of the vehicle fleet cannot be overestimated. Whereas the average fuel economy of passenger cars was 28.6 mpg in 2001, (35) the average for light trucks was only 20.9 mpg. (36) As a result, the combined fuel economy of the U.S. domestic fleet is only 24.4 mpg (37), 14.7% less (38) than the average for passenger cars alone.

The increasing proportion of the motor vehicle fleet accounted for by light trucks has significant implications for energy consumption – especially if the per capita ownership of motor vehicles in the United States continues to increase – and persistent trends in population movement suggest that it will.

THE IMPACT OF CHANGING DEMOGRAPHICS

Many factors contributed to the growth of automobile use. Among the most significant was urban sprawl, i.e. the movement of populations out of central cities to suburbs – a trend that has continued since the end of World War II. As the population has dispersed, commuting distances have increased. Indeed, in the dozen years between 1983 and 1995 alone, commute distances grew by 36.4%. (39) In addition the time required for an average commute also increased. The movement away from central cities, however, is not the only significant demographic change to take place.

Another important trend has been the concentration of America's population in coastal areas. Although coastal areas comprise just 17% of the total U.S. land area (40) they hold 53% of the nation's population. (41) The population of these areas is currently increasing by 3,600 people per day (42) and is projected to increase by 27 million over the next dozen years. (43) This movement has created an imbalance in population densities with high concentrations on both coasts and large relatively thinly populated regions in the balance of the country. Yet, even in coastal areas, much of the population lives in relatively small communities where dependence on the automobile for transportation is the only viable option. In addition, compared with much of the world, the United States is not densely populated. Its average of 74 persons per square mile (44) remains far below Europe's 429 per square mile (45) or Asia's 300. (46) As a result, many people view automobile ownership as a necessity.

The dramatic rise in per capita income, which, for example, more than doubled in real terms between 1967 and 2000, has served to greatly facilitate the rise in automobile ownership. (47) The contribution of two-income families to this increase – which also creates an additional commuter in the family unit – has further sparked the growth of vehicle ownership.

The impact of these changes on energy use is clear. While the fuel efficiency of the U.S. passenger car fleet more than doubled between 1974 and 2001, (48) rising from an average of 12.9 mpg to 28.6 mpg, the benefits of this improvement were largely offset. (49) The savings in fuel consumption simply could not keep pace with burgeoning demand resulting from the higher number of miles traveled and the increased number of cars on the road.

IMPORT DEPENDENCE AND DEFENSE: HIDDEN COSTS, HIDDEN DANGERS

In an ideal world, energy supplies would be secure, clean and affordable. If this were the case, the rising tide of imports would give little concern. The world, however, remains a very dangerous place. Competition over scarce energy supplies contributes to that danger and access to energy supplies is a critical element in our capability to respond to it.

Many believed that the collapse of the Soviet Empire and the end of nearly half a century of geopolitical stalemate would dramatically end the prospects of conflict around the world. Although this dramatic event did greatly reduce the likelihood of a global thermonuclear conflagration, it did little to enhance international stability. The threat of a superpower confrontation was quickly replaced with the onset of myriad smaller conflicts in geographically diverse locations and at varying degrees of intensity. Moreover, in the new threat environment, these conflicts could arise with little warning – at times requiring troop deployments within a matter of days, or even hours.

In FM-100, the U.S. Army Statement of Doctrine, this change was acknowledged:

> *"…The global realities of today are in a period of significant change. Army forces may find themselves called upon to fight under conditions of rapid force projection, that can build to major sustained operations in war and peace or that can terminate quickly only to lead to other commitments elsewhere."* (50)

One inherent consequence of the new threat environment is that energy, and in particular refined petroleum products, while always an important military commodity, have taken on an even greater significance.

Some salient facts illustrate this point:

- A contemporary U.S. Army Armored Infantry Division comprised of 17,500 soldiers uses roughly twice the fuel of two World War II field armies which, taken together, would comprise nearly 200,000 troops. (51)

- During Operation Desert Storm, the 582,000 U.S. forces that participated consumed more than 450,000 barrels of refined petroleum products per day – more than four times the amount used daily by the entire 2 million man Allied Expeditionary Force that liberated Europe in World War II. (52)

- During Operation Iraqi Freedom, one of the principal immediate goals was to secure that nation's oil fields.

But even these facts do not tell the whole story.

Two important changes have also taken place within the national defense establishment since the fall of the Soviet Union. The first of these has been the reduction of troop strengths overseas and the closing of overseas bases. Throughout the Cold War period, the U.S. military maintained substantial "forward positioned" forces at bases in Europe and the Far East. As the overall size of the military has decreased, so, too, has its forward posture. Bases in the Philippine Islands were closed and force levels throughout the rest of the world were reduced.

In addition, the military has come increasingly to rely on National Guard and Reserve components to "round out" active duty divisions. Today 48.3% (53) of America's military forces are in either Guard or Reserve units. Moreover, many comprise key functions such as chemical, biological and nuclear decontamination, medical services and civil engineering. As a consequence, they are not merely "weekend warriors" but rather integral elements of any sustained military operation. This new reality was underscored during Operation Iraqi Freedom. But, because Guard and Reserve units are by definition based in the Continental United States, or "CONUS" in military parlance, this shift in force structure further diminishes the military's forward posture. This means that there will be additional fuel requirements to transport these forces and their equipment and materiel to the theater of operations. During the first Gulf War an average of 2,400 tons

of materiel were airlifted to the theater of operations daily. (54) In future conflicts the greater dependence on forces stationed in the United States are likely to greatly increase this figure. Indeed, FM-100 emphasizes *"…The CONUS base is the strategic foundation for the logistical system…"* (55)

The energy implications of this new strategic doctrine are evident in the fact that the Department of Defense accounts for nearly 91% of all petroleum consumed by the federal government. (56) Peacetime use alone is more than 277,000 barrels per day. (57) The question is what will be the source of fuel to transport these troops?

During both World War I and World War II, the United States was the world's largest oil producer, and as such was able to provide not only for its own needs, but for over eighty percent of its ally's needs as well. (58) During Operation Desert Shield/Desert Storm, the first Persian Gulf War, surge production by Saudi Arabia (59) helped offset the loss of Kuwaiti and Iraqi oil. In the future, however, domestic production would not be able to make up any substantial loss of foreign oil, and there is no assurance that overseas producers would be willing to increase their output. Therefore, as long as America remains heavily dependent on imported crude, its national security remains jeopardized. Since the bulk of U.S. petroleum use today lies in the domestic transportation sector, the answer to the question of how to address our energy vulnerability must be found there.

ECONOMIC IMPACTS

It is not just in relation to the defense sector, however, that America's import dependence imposes hidden costs and dangers. In addition to the implications for national defense, America's chronic reliance on imported crude oil and refined petroleum products also has had significant negative economic consequences for the domestic economy.

Even in the absence of a specific supply disruption, the economic penalty is substantial. Paying for imports diverts billions of dollars from domestic investment and leaves U.S. financial markets subject to the whims of a foreign cartel. The volatility of oil prices resulting from foreign control of supplies creates uncertainties that hinder business planning. Federal, state and local government tax coffers are deprived of revenues that otherwise would have been generated by domestic economic activity. In essence, petroleum imports constitute a hidden tax on every American.

What makes reducing the burden of oil import costs even more important is that if we could eliminate the need for foreign oil, and we could generate almost $160 billion in new economic activity in the U.S. economy each year – far more than any economic stimulus plan ever considered by policymakers. (60)

When oil supply disruptions do occur, the economic impact is devastating. The combined economic effects of the 1973 and 1979 oil supply disruptions cost the U.S. economy between almost $2.3 and $2.5 Trillion. (61) Even the relatively short-term price spike that accompanied the first Persian Gulf War cost Americans $39 billion in higher prices alone. (62)

ENVIRONMENTAL CONSEQUENCES

It would be difficult to overstate the negative impact of transportation sector petroleum use on the environment. Vehicular emissions are the largest source of air pollution in the United States. (63) Automobile exhausts contribute 50% or more of smog precursors in many areas, (64) 28% of particulate emissions (65) and from 60% to 90% of air pollution in major cities. (66) Further, automobile pollution imposes a variety of direct and indirect costs on state and local governments. Areas that fail to comply with the National Ambient Air Quality Standards must implement programs such as vehicle emission testing that can be costly for both government and consumers. Restrictions can be imposed on economic activity that leads businesses to move to other locales. Higher priced fuels may be required increasing vehicle operating costs for both businesses and individual consumers.

Public health also is affected by mobile source pollution. One area of particular concern is asthma, which is growing at an alarming rate. According to the Centers for Disease Control, the incidence of asthma has increased from 6.8 million in 1980 to 31.3 million today – 460 percent. (67) Moreover, the incidence of asthma in children may be as high as 6.9 percent among children under 18 years of age. (68) Mobil source pollution is suspected as contributing to this rise.

The periodic "pollution alerts" common in many cities during the summer months are another clear indication of the dangers mobile source pollution poses to public health. Significantly, these warnings often contain specific restrictions for older citizens – those dependent on Medicare and Medicaid for health care. The increased costs resulting from pollution-related illness contribute to the burden of maintaining these programs.

FINDING A SOLUTION

Over the past few decades, leaders in government, business and the academic community have gradually come to recognize the danger that America's undue reliance on petroleum for transportation presents. Still, until recently, a solution for the problem remained elusive.

In his 2003 State of the Union message, President Bush proposed a bold answer to America's energy dilemma: the development of a hydrogen fuel cell powered vehicle. Once in widespread use, hydrogen fuel cells could provide a virtually limitless source of power to meet America's transportation needs. Moreover, such a change also would reap enormous environmental benefits, eliminating a leading source of pollution and dramatically enhancing national security.

Accomplishing such a fundamental change in the transportation sector, however, will not be an easy task. A source of hydrogen must be identified. Fuel cell technology must be refined. An infrastructure for the production and delivery of hydrogen fuel must be put in place, and the public must be introduced to the notion of using a gaseous fuel. Achieving

these objectives may seem a daunting task, but it is not insurmountable. Moreover, given the enormous benefits that will be derived, it is well worth the effort.

While it will take time to resolve the technical and institutional issues related to a shift to a hydrogen fuel cell economy in the transportation sector, it is not necessary to maintain the status quo. Indeed, the process of making the transition itself presents an opportunity to make great strides in enhancing America's military and economic security and its environmental quality in the near term. The key is to implement a strategy that uses the transition period to expedite the development of the institutional and infrastructure capabilities that will ensure the nation is capable of switching to hydrogen fuel cells when the technology is fully developed. The marriage of two readily available technologies provides the basis for such a strategy.

The first of these is the development of so-called "hybrid electric" vehicles. These vehicles represent a test bed for all of the peripheral components that will eventually be necessary to manufacture a hydrogen fuel cell vehicle. The fundamental difference between these hybrids and an automobile powered by a hydrogen fuel cell is the engine. In addition, as the number of hybrids manufactured grows, so, too, will the manufacturing base for the components used in electric vehicles. This will ensure that when the time comes to introduce hydrogen fuel cell vehicles, American industry will have the capability to build them.

The second existing technology is the use of natural gas as a vehicle fuel. Worldwide, millions of vehicles powered by natural gas already exist, so there is a vast base of experience in using it as a vehicular fuel. Further, because it is a gaseous fuel, over time, the infrastructure initially developed to deliver natural gas for vehicular use can be adapted to deliver hydrogen at relatively little cost. Also, using natural gas as a fuel will help develop public confidence in the use of gaseous fuels in their vehicles.

But this strategy does more than provide for a smooth transition to hydrogen. It also will yield substantial environmental, economic and security benefits on its own.

Since natural gas is the cleanest burning of all fossil fuels, wider use of natural gas will significantly reduce mobile source pollution. Also, the United States holds substantial natural gas resources so it largely will be a domestically based fuel. Finally, the development and manufacture of the technologies associated with fueling facilities, electric components and other elements of hybrid and hydrogen vehicles will create new domestic employment and export opportunities.

In short, the nexus of these two existing technologies represents an ideal opportunity to accomplish the transition to the fuel cell and to obtain substantial benefits while so doing.

Not the least of these benefits will be to enhance the ability of America's Armed Forces to implement their new strategic doctrine of Rapid Decisive Operations.

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