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Breaking America's Oil Addiction: A Plan to Support Sustainable Energy

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Introduction

Eliminating America's dependency on oil is one of the most important challenges facing American policymakers. For an energy transition to be smooth and effective, early commitment is critical. Changing America's energy infrastructure will require a great deal of time and money, and every day that passes without significant action makes the United States more vulnerable to future price shocks and shortages in the depleting international oil market. In a recent speech to the British Parliament, Prime Minister Tony Blair argued that the world has approximately seven years to find an appropriate solution: "If we don't get the right agreement internationally for the period after which the Kyoto protocol will expire -- that's in 2012 -- if we don't do that then I think we are in serious trouble" (Baldwin 2006). Scientific studies support Blair's concern. A BP Statistical Review of World Energy shows that the 18 major oil-producing countries have already exceeded their peak production levels. According to a 2003 study, their combined annual output is dropping by over a million barrels a day (Institute of Science in Society 2005). This group of countries now accounts for almost 29 percent of total world production. The Oil Depletion Analysis Center predicts that even additional oil-recovery projects will fail to meet demand in the coming years (Science in Society 2005). In addition to the diminishing sources of oil, other disruptions, both political and environmental, have the potential to shock the unsteady oil market. Ton Hoff, manager of the Energy Research Center of the Netherlands, notes that viable alternatives will take a few decades to develop, during which time oil prices could skyrocket, and that prudent and economic use of oil is imperative (Mudeva 2005). These overwhelming statistics, analyses, and trends should compel American leaders to take action today.

Still, while both public concern and political rhetoric escalate, few reasonable and practical policy options exist. Most recently, in his 2006 State of the Union address, President Bush proposed the Advanced Energy Initiative to replace over 75 percent of Middle Eastern oil imports by 2025 (CNN 2006). Although this seems like a large step forward, only 12 percent of America's oil imports come from Middle Eastern countries, and this will thus result in a meager 9 percent overall reduction of imports (Sandalow 2006). In addition, three of the six alternative energy programs that President Bush proposed in the initiative only address electricity issues and therefore do little to combat oil dependency (Sandalow 2006).

Thus, at this critical time for progressive reform, America's leaders are failing to adequately address the challenge. Recent events, such as Hurricane Katrina, have revealed our dependence on oil to be a serious economic concern—one that leaves Americans vulnerable to short-term disasters and dependent on foreign nations. Unless America quickly begins to eliminate its reliance on oil, it will likely continue to encounter extremely unstable prices, affected by hurricanes, strikes, and a chaotic world market (The Economist 2006). Such continued volatility would clearly wreak havoc on the American economy, affecting everything from consumer confidence to business production. Still, American policymakers seem willing to wait for disaster to strike before taking action, leaving the nation unnecessarily vulnerable to economic depression.

In addition to economic problems, the energy crisis also puts America in a tenuous political situation. James Schlesinger, former Secretary of Defense, observes that until America ends its dependence on imported oil, it will not "end dependence on the volatile Middle East, with all the political and economic consequences that flow from that reality. Instead of energy security, [America] shall have to acknowledge and to live with various degrees of insecurity" (The Economist 2006). This means relying on Iran, which holds more than 10 percent of the world's oil reserves (Bahree 2006) and Saudi Arabia, which controls 25 percent of the world's total oil (Baer 2003). Depending on turbulent authoritarian states is not only dangerous for our energy security, but it is also a dubious ethical policy. Continuing to support undemocratic regimes by purchasing oil does not coalesce with America's desire to advance freedom and democracy.

Finally, reliance on oil jeopardizes the world's natural environment. In a recent report on climate change commissioned by the British government, Prime Minister Tony Blair concluded that "global warming [is increasing] at a rate that is unsustainable" (CNN 2006). Scientists widely recognize that the use of fossil fuels, especially burning oil through the process of combustion, induces climate change. The resultant global warming has a variety of adverse effects. Experts anticipate that its influence will eventually "raise ocean levels, intensify storms, spread disease to new areas, and shift climate zones, possibly making farmlands drier and deserts wetter" (CNN 2006).

According to the Intergovernmental Panel on Climate Change (IPCC), if carbon dioxide emissions merely continue at the 2000 level without any increases, temperature levels will continue to rise for centuries. For example, Jonathan Gregory, a climatologist for the Centre for Global Atmospheric Modeling and the Hadley Centre for Climate Protection and Research, has concluded that "the Greenland ice sheet is likely to be eliminated [within 50 years] unless much more substantial reductions in emissions are made than those envisaged [and will] probably be irreversible, this side of a new ice age" (New Scientist 2004).

Considering the economic, political, and environmental implications of

American energy sources, developing a manageable, sustainable policy must be a foremost priority for American policymakers. Each day that passes without the enactment of an effective policy pushes us further down the road of no return, where market turmoil, suspect associations with Middle Eastern nations, and irreversible environmental damage await America. Still, substantive action has not been taken. President Bush's Advanced Energy Initiative proposes a 2007 increase in alternative energy spending; yet the 771 million dollars allocated to alternative energy is less than 1 percent of the federal government's annual spending on research as a whole (Lavelle 2006). Such an insufficient federal commitment leaves private companies and states to support the majority of alternative energy research and development. However, they have been unwilling to coordinate the effort needed to combat "oil addiction." Thus, the federal government must take the lead role in promoting alternative energy research and implementation.

Policy Alternative

To avoid the clear and growing harms associated with continued dependence on oil, American policymakers should institute a flat consumer gas tax. Its revenues, regulated by a modified Office of Energy Efficiency and Renewable Energy (EERE), will support research and implementation of various clean energy alternatives. This policy measure will help curb the effects of a possible oil shortage before such a crisis occurs. Furthermore, the policy will augment the EERE, a subsidiary of the Department of Energy, by adding a Commission for Institutional Partnership (CIP). The CIP will engage policymakers, leading researchers, and business executives in constructive discourse to promote alternative energy development, with the explicit goal of fostering research and project networks.

The national gasoline tax will be a flat rate of 4 cents per gallon charged to all individual consumers. Businesses are excluded from payment so as not to slow private industry production, growth, or investment. This tax will produce approximately 5 billion dollars in revenue over one year, based on the 2000 Cambridge Energy Research Associates, Inc. (CERA) estimate of 130 billion gallons of gasoline annually consumed by American drivers (Cambridge Energy Research Associates, Inc. 2000). Furthermore, the tax will yield an average cost of only 28 dollars per year to the individual driver, based on the CERA approximation of 690 gallons consumed per driver per year (Cambridge Energy Research Associates, Inc. 2000). After extensive consultation with the CIP, the EERE will determine the exact allocation of these monies. Because of the recent successes within the fuel cell and the photovoltaic cell industries, we recommend that these areas receive the bulk of the funding. However, due to the rapidly changing nature of energy technologies, the EERE should not be constrained by funding quotas

and instead have the flexibility necessary to quickly react to technological breakthroughs.

The CIP, by drawing members from the various sectors that play a role in energy policymaking, will enhance communication among government, industry, and independent researchers to an extent previously absent. Its policymakers will represent the Department of Energy, Congressional Committee on Energy and Commerce, and the Congressional Committee on Transportation and Infrastructure. The policymakers will select researchers from the relevant academic and non-academic institutions, and they will be representative of the diverse forms of alternative energy. Finally, leading American energy firms will appoint executives to the CIP. Engaging the various sectors in open dialogue will lead to a balanced, well analyzed, and consequently more effective energy plan for America.

Developing Alternative Energy Infrastructure

It is commonly held that the majority of Americans will automatically oppose any tax increases. While this may be true in most instances, the proposed gas tax is one that should actually meet widespread acceptance. First, it will only amount to approximately a 28 dollar annual cost to each American driver—based on the average of 690 gallons individually consumed per year. This, coupled with the results from a 2003 Consumer Market Research study finding that "80 percent of American consumers agree that America needs to reduce oil imports" (Alliance to Save Energy 2005), illustrates the public's awareness of and willingness to support efficient solutions to the energy crisis. Moreover, the same study, conducted by the Alliance to Save Energy, revealed that consumers recognize their duty to play a role in energy reform: "92 percent agree that business, government, and consumers have an equal responsibility to reduce energy use" (Alliance to Save Energy 2005). Along with favorable public opinion, history demonstrates that the American people are willing to accept an increase in the gas tax. Since 1982, there have been four increases, amounting to an overall quadrupling of the tax rate, none of which resulted in a public outcry (Williams 2005). Currently, the monies generated from the tax are used primarily to support the Highway Trust Fund that maintains the current transportation infrastructure (Talley 2000). Similarly, our proposal would generate funds to support transportation- only these monies would be allocated into a program that plans, supports, and constructs an infrastructure that is free from oil dependency.

The additional funding for energy alternatives generated by the gas tax will have far-reaching positive effects for the United States. It will address both the supply and demand sides of the oil addiction, creating a more holistic proposal than is currently available. Regarding demand, the tax will naturally curb American oil

consumption. However, the limits of policies that only tackle the demand for oil are well-noted. The continually dwindling oil supply, as well as the environmental problems already present, underscores the fact that even significant conservation is no longer a viable policy by itself. Instead, the tax will generate necessary revenue to fund an alternative energy industry. This will promote a long-term solution by creating a robust supply of sustainable energy.

Since Americans agree that oil consumption should be reduced (Alliance to Save Energy 2005), any increases in the price of gasoline would seemingly cause a decrease in consumption patterns. After the sudden price increases caused by the oil crisis of the 1970's, consumer demand dropped (Schwartz 2006). Granted, the enactment of this proposed tax will neither be as large, nor as unexpected. Nonetheless, the public most certainly will not increase consumption in response to the slightly higher cost; so, the only possibility is for consumption patterns to either stay the same or decrease. One model of potential tax-based effects, produced by Roosevelt Institution fellows Joseph Kastner and David Felix, predicts that for every $0.01 increase in the price of gas, the average American would respond by consuming one-half gallon less of gasoline annually (Kastner and Felix 2005). It appears, therefore, that consumption has an inverse relationship with gas prices. This is an anticipated benefit—to slightly decrease consumption without causing economic distress—but not the focus of this proposal. Conservation is a short-term bandage, while funding for sustainable generation and supply of alternative energy provides the long-term remedy that is necessary.

The gas tax, along with the generation of a large amount of government investment in energy alternatives, would encourage the private sector to invest in new energy sources. In a report commissioned by the U.S. Agency for International Development, A. John Armstrong and Jan Hamrin conclude that two of the main barriers to private sector development of alternative energy technologies are a perceived lack of financing and deficiency in institutional networks that support project development (Armstrong and Hamrin 2006). Therefore, any measures that promote alternative fuel technology should attempt to engage the private sector by minimizing these perceived hindrances.

According to National Renewable Energy Laboratory Director Dan Arvizu there is " very little of what I'd call robust corporate [research and development] in this business. The capital costs are too great and the risks are too high, especially when any company investing knows it will be fighting to earn a return head to head against Big Oil" (Lavelle 2006). Ostensibly, with the widely publicized goal of reducing America's dependence on oil, federal funding should not be deficient; still, under President Bush's Advanced Energy Initiative, only 289 million dollars of the proposed alternative energy funding is appropriated for fuel cell development (The White House 2006). This pales in comparison to the amount it would cost—500 billion dollars (Mintz 2002)—to change the nation's car fuel

system to one of fuel cells, not to mention other costs for eliminating other realms of dependency (industry, homes, etc.). The 5 billion dollars generated every year by the gas tax will serve as a strong stimulus for development in, as well as demonstrate the government's unwavering commitment to, the alternative energy industry.

Armstrong and Hamrin's second concern regarding development of viable institutional networks for project development is more difficult to remedy. After all, despite whatever efforts the government makes, an effective nexus of the public, private, and educational sectors cannot exist without a mutual system of cooperation. Establishing the CIP is a good faith start because it incorporates all of these sectors in an active discourse for developing collaborative, efficient policy. Hopefully, in this fashion the various sectors will begin to cultivate more organic relationships that grow into a functioning institutional network.

Long-Term Energy Solutions

Although all monetary decisions will be made by the EERE, in conjunction with the CIP, certain long-term alternative energy sources—fuel cells (FCs) and solar photovoltaic (PV) cells in particular—currently show greater promise for development than others. Solutions such as these should, therefore, be more heavily funded than short-term stopgap energy sources.

Fuel cells have specific advantages as an alternative energy source. They are powered by the most prevalent element in Earth's atmosphere, hydrogen. Elemental hydrogen must be extracted from other compounds, but the sources are plentiful, including gasoline, cellulosic ethanol, solar energy, wind, biomass, and water (Energy Efficiency and Renewable Energy "Hydrogen" and U.S. Department of Energy 2005). Ideally, FCs would run primarily on renewable energies, but their versatility makes it possible for the economy to shift away slowly from fossil fuels to fuel cells. Even when FCs are powered by fossil fuels, greenhouse gas emissions would be reduced by 60 percent, compared to fossil fuel alone (Argonne National Laboratory 2004). A fuel cell running on renewable energy such as wind, solar power, biomass, and water would produce virtually no greenhouse gases or air pollution (U.S. Department of Energy 2005).

In addition, FCs can be portable or stationary; this makes FCs a very versatile and important development for the transportation industry. Finding a way to replace the fossil fuel consumed by commerce is the largest industrial challenge facing a renewable energy movement. According to a study conducted by the U.S. Department of Energy in 1999, transportation amounted to two-thirds of U.S. oil consumption and is 97 percent dependent on oil (McNutt and Johnson 1999). Not only does transportation account for the majority of oil consumption, but if an oil

shortage were to occur, the subsequent obstruction of social movement would be extremely detrimental to the economy.

Recognizing this urgent need, the government launched Project FreedomCAR in 2003. Project FreedomCAR unifies private companies Ford, General Motors, and DaimlerChrysler with the U.S. Council for Automotive Research to increase communication and cost sharing between industry and government, specifically in the area of transportation development (Fuel Cells 2000). The U.S. Fuel Cell Council anticipates full commercialization by the end of the decade (U.S. Fuel Cell Council 2004). However, such a lofty goal requires more foresight and monetary backing than is currently behind the FreedomCAR project. Energy companies must collaborate alongside the government and auto industry, and increased funding must be wisely allocated into research that seeks long-term solutions. Only through an amplified and more focused effort will the U.S. be capable of achieving its objectives.

Challenges facing America's future conversion to a fuel cell economy are primarily cost-related. The estimates vary from study to study, but the Argonne National Laboratory predicts that the cost of a complete, operable fuel cell infrastructure would be about 500 billion dollars (Mintz 2002). Alone, a 4 cent gas tax could not cover a cost this enormous, but it would encourage further alternative energy development by making a substantial commitment to progress. Also, it is widely believed that with recent technological advances, the funding problem will be easily overcome—especially due to FCs' high energy efficiency.

While a combustion-based power plant is 33 to 35 percent efficient, an FC plant can be 60 to 85 percent efficient, depending on whether or not it is used to generate heat as well as electricity (U.S. Department of Energy 2006). Recently, General Electric Hybrid Power Generation Systems tested a stationary fuel cell prototype whose cost approaches that of traditional energy sources (Department of Energy 2006). In the transportation sector, FCs are already competitive with fossil fuels on a cost per mile assessment. According to a study conducted by the National Academy of Sciences, the cost of fuel cells per mile driven should be between 27 to 62 percent less than gasoline priced at $1.80 (Rose). After fuel cells enter a stage of mass production, the price will fall substantially further, as evidenced by the current hybrid car market.

Then why not continue to focus on developing the hybrid industry? Hybrids are only an intermediate step between the problem of oil consumption and the solution of self-sustaining transportation. Even if every vehicle in 2025 was a hybrid, America would still import as much oil as it currently does (Rose). Unlike hybrids, fuel cell technology has the potential to become a comprehensive solution to America's oil problem.

Along with FCs, solar energy also shows great promise, particularly as a stationary energy source. The sun is unquestionably Earth's most prevalent and

consistent provider of energy, but the challenge is to convert this energy into electrical power efficiently. Great progress has recently been made in the field of solar photovoltaic cells—the most promising form of solar energy conversion. Grid-connected photovoltaic energy is the fastest growing energy technology in the world, increasing by 60 percent from 2000 to 2004 (Martinot 2005). Since the introduction of silicon, Earth's second most abundant element, in the construction of PV cells, the cells' efficiency has increased from the initial 1 to 2 percent of selenium cells to between 5 and 15 percent efficiency with the current silicon cell (The Solarserver 2006). Researchers are still seeking ways to make silicon cells more cost-effective and more efficient, hoping to achieve the current maximum efficiency of silicon cells, calculated to be about 28 percent (The Solarserver 2006).

Although costly, the price of solar power has decreased by 90 percent in the last decade (Solar Industries Energy Association 2005). Already, PV is cost-competitive for remote areas, but for on-the-grid power, it is still 2 to 5 times more expensive than traditional sources of electricity (Solarbuzz 2006). On average, the current cost of a PV system yields long-term energy savings that equalize the purchase price after 15 to 30 years (Department of Energy 2006). Nonetheless, this is difficult for an average American to afford, despite the fact that the price is offset by multiple advantages such as low maintenance, potential for expansion, environmental cleanliness, immunity from power shortages, and independence from fluctuating oil prices (Department of Energy 2006). Taking into account these benefits, in 2005, Congress passed federal tax credits for individuals who purchase solar energy systems—a supplement to state programs already at work. Currently, 12 states grant rebates to solar customers, and 30 have programs that allow solar energy users to sell back their excess energy (Janofsky 2006). In sum, both leading researchers and policymakers are working to make the goal of cost-efficient PV cells a reality.

In addition to these potential advantages, PV cells increase a power grid's reliability because there is less need for transmission and distribution with on-site generation. California, largely due to recent blackouts, has embraced PV technology. The California Solar Initiative is a 10-year, 2.9 billion dollar program that focuses on providing rebates in an effort to make it more affordable for Californians to purchase solar energy (Department of Energy 2006). As a result, Solargenix, a private energy company, is now building a 64-megawatt solar thermal plant in Nevada; it will be the largest built since 1992. In addition, International Automated Systems, Inc. is planning a 100-megawatt power plant that incorporates groundbreaking technology: thin-film solar panels and steam-powered turbines that are expected to significantly lower the cost of solar energy to a competitive level (InterNational Automated Systems, Inc., 2005). Clearly, private industries are making progress with PV cells; nevertheless, they would most certainly benefit from heightened collaboration with the federal government in an effort to raise

consumer demand.

The national government's 2007 proposed budget allocates 148 million dollars to solar energy development, expecting technological advancements to make solar energy competitive by 2010 (Solar Industries Energy Association 2006). Although increased funding is a step in the right direction, the United States should look to Japan for an example of how to move an economy away from oil consumption without hindering economic growth. Since 1973, Japan's GDP has doubled, while its oil consumption has decreased by 16 percent due to a strong financial commitment to alternative energy and the promotion of conservation (Yamamoto 2006). Currently, Japan generates 48 percent of the world's solar power, compared to only 15 percent from the United States (Yamamoto 2006). By providing subsidies and incentives, Japan has enticed the majority of PV companies to locate in Japan. This large home market and the subsequent fall in price level has allowed the government to decrease subsidies from 50 percent in 1994 to 3 percent in 2005, while the number of systems steadily increased from 539 to 70,000 in the same time period (O'Brian 2006).

Ultimately, FCs and PV cells appear to be the most promising in terms of real solutions to America's oil addiction. Revenues from the gas tax should thus be prioritized for research and development of these two alternative energy sources. Furthermore, the significant progress already underway in these industries, while having only minimal federal support, implies that with stronger federal collaboration and backing, sustainable alternative energy could become a reality sooner rather than later. As evidenced by the efficiency of FCs and PV cells, the technology for alternative energy already exists. Science and industry must simply research and develop the products further to make them more affordable and sustainable for all Americans. Thus, a financial commitment that aims to establish an effective infrastructure is the necessary next step. As the government commits greater funds, private industry can also be expected to increase its investment. With such a growing dedication to alternative energy, the addiction to oil can be eliminated more rapidly than once believed.

Economic, Political, and Environmental Benefits

Clearly, the transformation to alternative energy sources will generate multiple advantages—economic, political, and environmental to name a few. Such benefits will result from ameliorating the problems inherent in America's oil-based energy system.

Economic

Economically, a shift to alternative energy will pave the way for the construction of an entirely new American industry. At a time when the economy is globalizing at an increasingly rapid pace, such a development could help maintain the nation's position of prominence within the world. After all, it is America's "ability to constantly innovate new products, services, and companies that has been the source of [its] horn of plenty…for the last two centuries (Friedman 2005." With the ubiquitous necessity of the energy industry, the prospects for economic sustenance that American innovation offers are massive, to say the least.

Concurrent with the rise of the new industry, investing in alternative energy will also provide new jobs for Americans. In a recent study by UC Berkeley researchers, investing in renewable energy "would produce more American jobs than a comparable investment in the fossil fuel energy sources in place today" (Sanders 2004). Accordingly, a model of implementing certain Apollo Alliance energy projects in Ohio was predicted to create 130,000 new jobs for that state alone (Rothstein 2004). Within a globalizing world, secure jobs for Americans are likely to be at a premium. Therefore, maximizing job creation in government spending efforts is a wise policy.

The transition from jobs within the current oil-based market to jobs in a new alternative energy industry should be fairly smooth. Because small alternative energy companies already possess the industry skills and training techniques, larger energy companies can partner with them to provide a framework for energy transition. In Michigan, an effective transition of auto-workers into a newly created and well-funded solar energy industry highlights such a conversion (Bodipo-Memba 2006).

Along with placing the American economy in a position to succeed well into the future, a commitment to alternative energy would protect the economy from the short-term crises highlighted previously. Such calamities could be approaching soon, and with the tenuous political state of Iran, oil exportation could take a significant hit. Whereas Iran, for its own economic considerations, may not withhold its 10 percent of the world's reserves, it "could threaten to disrupt oil shipped from the Persian Gulf through the Straits of Hormuz, a key chokepoint through which oil from Saudi Arabia, Kuwait, and Iraq also passes" (Bahree 2006). Such a scenario could pose significant economic consequences. Consider, for example, the effect of Hurricane Katrina in the United States: the resultant energy dilemma led gas prices to skyrocket to over 3 dollars per gallon (Foertsch and Rector 2005). At that point, it was unrealistic to expect that consumers—especially lower-income consumers for whom gasoline purchases take up a relatively high percentage of their budget—would continue consuming gasoline at the same level

as before the price increase (Behravesh 2006). Hence, after another prolonged and potentially more substantial oil shortage, the increased energy costs and decreased non-energy consumer spending could reach alarming amounts. Logically, the most reliable protection from such results is greater energy security through alternative technologies.

Finally, switching to renewable energy sources simply saves money. While research, development, and production costs may rise in the short-term, long-term benefits will overcome such costs. For instance, current fuel cell prototypes being developed by the Department of Energy's Solid State Energy Conversion Alliance (SECA) are projected to save the nation more than 50 billion dollars by 2025 through greater efficiency and lower fuel costs (National Energy Technology Laboratory 2006). To achieve these economic gains, however, strong commitment is required not only by private industries, but also by the government. In such a fashion, the initial losses can be weathered with prescient foresight of the advantages to come.

Political

In addition to the economic advantages to be gained, a switch to alternative energy puts America in a more stable political position worldwide. As long as America is addicted to oil, it will remain dependent on rogue states like Saudi Arabia and Iran, as well as other suspect states such as Venezuela. Energy reform would, therefore, be justified even if enacted solely to dissociate the United States from these dubious countries.

Besides promoting American political security, a national commitment to reduce oil dependency would also act as a strong impetus for change, potentially in the form of transition to democracy, in nations like Venezuela, Nigeria, Saudi Arabia, and Iran. Thomas Friedman notes that "as long as the monarchs and dictators who run these oil states can get rich by drilling their natural resources…they can stay in office forever" (Friedman 2005). The logical outcome from such existing situations is the monopolization of power, which diametrically opposes a progressive advancement toward democracy. Without bringing down the price of oil, which can be instigated by reducing American dependence, Friedman argues that "aspirations for reform in all these areas will be stillborn" (Friedman 2005).

Additionally, America stands to gain political capital from Europe and the rest of the world through a shift to cleaner, renewable energy. When the Bush administration rejected the Kyoto Protocol in 2001, they assumed that other nations would follow suit; such was not the case, however. In fact, that deviance highlights the growing disapproval with which the international community views

America, her moral authority, and her environmental stewardship (Purvis 2004). With anti-Americanism on the rise from the Iraq war as well, the United States would be well served to adopt an agenda that better aligns with the goals of Kyoto—even if it does not ratify the Protocol. Therefore, alternative energy policies would afford America some much-needed political approval from the world.

Environmental

One last area that will profit from a national shift toward renewable energy is the environment. A recent satellite study of the Greenland ice cap found that it is "melting far faster than scientists had feared - twice as much ice is going into the sea as it was five years ago," with implications "for rising sea levels and climate change [that] could be dramatic" (Hansen 2006). As a result, Jim Hansen, a leading NASA climate scientist, is calling for swift cutbacks in greenhouse gas emissions (Hansen 2006). Carbon dioxide is the dominant greenhouse gas causing global warming, and fossil fuels are the primary source of carbon emissions. In addition, America's carbon emissions account for about 25 percent of the world's total—more than twice the amount of China, the world's next largest polluter (Environmental Defense 2002). Over one-third of those emissions are transportation related, and if America's cars and light trucks, which run almost exclusively on oil, were aggregated, they would be fifth on the list of nations with the highest carbon emissions (Environmental Defense 2002). A shift to a renewable energy-based economy would signal a strong commitment to curbing extant climate problems.

Eliminating American dependence on oil would also substantially improve the nation's air quality. Most air toxins originate from man-made sources, almost all of which operate primarily on gasoline—"mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants)" (U.S. Environmental Protection Agency 2005). Mobile sources are particularly problematic. Carbon monoxide, which is one of the major air pollutants, has approximately 60 percent of its emissions from motor vehicles nationwide—with that number ballooning to as high as 95 percent in some major cities (Clean Air Trust 1999). In addition, EPA estimate models suggest that cars, trucks, and buses "account for as much as half of all cancers attributed to outdoor sources of air toxics" (U.S. Environmental Protection Agency 2004). Clearly, oil usage, in its various forms, has contributed to America's deteriorating air quality.

Of course, the advantages of alternative energy technologies are not limited to the economic, political, and environmental realms. These are, however, some of the major rewards available for the nation, underscoring the far-reaching

benefits of breaking America's oil addiction.

Conclusions

The time for action to promote a sustainable energy policy is now. As the various scientific and political leaders worldwide have emphasized, consequences for passivity or inaction are dire. Therefore, the United States must commence a large-scale, national effort to eliminate its oil addiction. In this way—and only in this way—will the necessary funding, institutional networks, and political ethos for change be realized.

In fact, energy reform can be a politically advantageous issue for Congressmen to adopt. The American public has demonstrated that it desires substantive change now. Through thoughtful explanation of and education regarding proposed reform measures, elected officials could capitalize on the current public sentiment.

The volatile and increasing price of gasoline has been a public concern, but current policy proposals, like tax reductions and rebates, do nothing to fix the long-term problem. The instability of many oil-rich nations, as well as the double-edged problem of decreasing supply and increasing demand of oil, forecasts an American future that is full of supply disruptions and rising prices. The best way to address the problem is to invest in viable alternative energy options.

Of course, sustainable energy is not easy to develop. As explained, developing a fuel cell or PV infrastructure is an extensive undertaking. For this reason, it is even more crucial to begin vigorously developing oil alternatives now. The more progress America makes before a calamity, the better prepared the nation will be to handle it. Additionally, the conservation incentive offered by the gas tax would serve as a meaningful bandage in alternative energy's stead. Such a comprehensive effort seems to be the most effective possibility for combating the energy crisis.

No matter what the rationale, however, one truth is evident: change is necessary. Not only does the American public demand it, but the nation's economic, political, and environmental future also depends on it.

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