# U.S. Dependency on Foreign Oil: A Predictive Study on Possible National and International Solutions

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**Introduction:**

The debate concerning U.S. energy needs and consumption has been going on since the 1970s and 1980s. This debate focuses around how the U.S. consumes its resources and what solutions are out there in order to stifle the U.S. dependency on foreign oil. While the U.S. is able to produce some of its own oil, from the North Slope in Alaska and in the Gulf of Mexico, the U.S. still receives the majority of its oil from Canada (16.1%), Saudi Arabia (12.2%), Venezuela (11.7%), Mexico (11.1%) and Russia (2.3%), as well as smaller percentages from other countries (1). The United States is the largest importer of oil in the world, bringing in approximately 13.5 million barrels per day (mbd), which accounts for 63.5% of total U.S. daily consumption (2).

U.S. dependency on foreign energy resources has put this country in a precarious position, specifically in the Middle East, where we have had a military presence for many years and more recently since the early 1990s on up through the current Iraq War. As former President George W. Bush stated in his 2006 State of the Union address, "We have a serious problem: America is addicted to oil, which is often imported from unstable parts of the world." While the

(1), (2) Cohen, Ariel. Reducing U.S. Dependence on Middle Eastern Oil. 7 April 2006. http://www.heritage.org/research/features/nationalsecurity/bg1926.cfm#_ftn1

country of Iraq has become more stable in just the recent past, the Middle East as a whole remains one of the most unstable regions of the world, specifically with the country of Iran. With Iran's nuclear power aspirations and with the possibility of those aspirations being focused on nuclear weaponry, the fact that the U.S. economy and energy needs continues to be so tied to the Middle East is becoming more unreasonable while there are viable alternatives out there.

The current state of the U.S. alternative fuels ventures consist of research in the fields of wind power and solar power, among others. While these fields offer viable solutions to our country's foreign fuel dependency, the initial cost of such programs is extremely high. As far as other less known alternate fuel possibilities, they are still in the research and development stages and will cost the U.S. taxpayers billions to trillions of dollars, and the end product of all of this research is decades away. Wind energy as an energy resource has been slowly growing in the U.S. with the U.S. Department of Energy creating the Wing and Hydropower Technologies Program (3). Solar power has also been a prevalent alternative energy source for years and again, the Department of Energy is leading the way in government research with the Solar Energy Technology Program. Current programs within this DOE solar program, which will be discussed further in this paper, are photovoltaic cells, concentrating solar power technologies and low temperature solar collectors (4).

National fossil fuel resources are also a viable, and possibly less expensive, solution to the U.S. dependency on foreign oil resources. The Alaskan North Slope region contains the

(3) U.S. DOE. Wind and Hydropower Technologies Program. 2009. http://www1.eere.energy.gov/windandhydro/
(4) U.S. DOE. Solar Energy Technology Program. 2009. http://www1.eere.energy.gov/solar/

National Petroleum Reserve-Alaska as well as the Prudhoe Bay oil fields, as well as the highly contested Arctic National Wildlife Refuge (ANWR). In fiscal year 2006 the oil fields in the North Slope region produced 853,000 barrels of oil per day, this is down 6.9% from the fiscal year 2005 average of 917,000 barrels per day. The Alaska Department of Revenue anticipates that production will continue to decline over the next decade with volumes falling to 772,000 barrels per day in 2016, an average annual decline of 1.5% per year from FY 2006 to FY 2016 (5). Due to the continued decline of the oil reserves from the current North Slope drilling areas, there has been much heated debate concerning the possibility of drilling for oil in the Arctic National Wildlife Refuge. Those who are against the drilling in ANWR site the possible ecological implications as well as the displacement of indigenous species in the 19 million acre region and those who are for drilling in ANWR state that the drilling would not cause significant damage to the region's environment or the indigenous wildlife.

The United States has been dealing with its tumultuous energy usage for many decades. With it's early on allegiances in the Middle East based on the prospect of oil importation and its current realization that our dependency on foreign oil is causing serious economic and political implications, the U.S. government and private companies, are now researching alternative energy resources in order to offset our foreign dependencies. The U.S. Department of Energy, as well as private energy companies, have produced much literature in regards to this hotly debated issue. The literature concerning foreign oil dependency, national oil reserves and alternative energy sources will be covered in order to fully understand the importance of finding solutions to U.S. foreign oil dependency.

(5) Green Car Congress. Alaska North Slope Production Dropping Faster Than Anticipated. 20 March 2006. http://www.greencarcongress.com/2006/03/alaska_north_sl.html

**Literature Review:**

Much of the information out there concerning U.S. dependency on oil, foreign oil in-particular, and possible solutions to this dependency comes from the U.S. government itself. The U.S. Department of Energy's (DOE) website has information concerning different energy sources in the United States as well as potential or new energy sources which are currently being researched. The site also offers statistics on how much energy we currently use in this country and where it comes from, i.e. oil reserves, foreign oil, solar, hydro, nuclear, etc. The sources of energy which the DOE explains and goes into further depth with are bioenergy, coal, electric power, fossil fuels, fusion, geothermal, hydrogen, hydropower, natural gas, nuclear, oil, renewable, solar and wind. The DOE's website offers so much information concerning the country's energy usage that it would be impossible to include it all in this study, a few of the energy sources and environmental impacts will be highlighted however.

Currently oil accounts for 40% of the total amount of energy used in the United States and more than 99% of the fuel we use in our cars and trucks (1). The DOE's Office of Fossil Energy oversees the research and development of this nation's fossil fuel sources such as natural gas, coal and oil. This office also oversees the U.S. Petroleum Reserves, in place in case of energy emergencies such as natural disasters. Under the DOE there are geographically separated research labs throughout the United States. The mission of these labs is to make advancements in the research and development of regionally and nationally based fossil fuel reserves. Although almost two thirds of U.S. oil reserves are unable to be drilled or produced by conventional

(1) U.S. Department of Energy. Energy Sources: Oil. 2009. http://www.energy.gov/energysources/oil.htm

means, these offices are looking for ways to offset the need for oil by researching clean coal possibilities as well as natural gas reserves.

The Energy Information Administration, a sub-group of the DOE, held an energy conference in April of 2009 and for this conference they produced an informative slide show depicting how much oil the U.S. uses compared to the rest of the world, how much energy we use and how our dependency on the use of so much energy as well as our dependency on foreign energy carry serious political implications. This study also goes on to voice ways in which the U.S. government is working towards the development of other, nationally, produced energy sources as well as mentioning President Obama's American Recovery and Reinvestment Act which plans to double alternative energy production over the next three years (2). On this note, the DOE's website has extensive information on those renewable alternative energies such as solar, wind and geothermal, just to name a few.

Along with the DOE's regular website, the Energy Information Administration (EIA), the sub-group of the DOE mentioned above, provides official energy statistics from the U.S. Government along with producing Country Analysis Briefs. These products provide a wealth of information and current statistics for numerous countries around the world. Countries where the U.S. already has economic and energy ties with and countries where there are current resources the U.S. Government might be able to build a relationship with in the future. The EIA currently has Country Analysis Briefs on 41 countries (not including the United States) around the world

(2) DOE Environmental Information Administration. 2009 Energy Conference. April 2009. http://www.eia.doe.gov/conference/2009/plenary/Chu.pdf

and from each continent, minus Antarctica. Many of these briefs have been updated since 2008 and offer such information as a general background and energy statistics, oil, oil exports, natural gas, coal, electricity and maps. Each briefing is different as far as what kind of information is giving as each briefing is tailored to each country it is portraying.

This EIA website also contains information about the oil markets around the world and how they are fairing from year to year as well as having an interactive world oil price chronology. This website is extremely easy to navigate and provides a slew of information for the world's oil markets. The most recently updated briefs, as the site has them on its homepage, include Qatar, the United Arab Emirates, Saudi Arabia, Caribbean, Equatorial Guinea and Azerbaijan as well as an OPEC revenues fact sheet and the current monthly energy chronology (3).

While the DOE is trying to look inward for solutions to our energy problem and the EIA is exploring the international possibilities, the issue of our dependence on foreign oil, specifically in the Middle East, is still out there. In 2006 Ariel Cohen, PhD, wrote an article titled Reducing U.S. Dependence on Middle Eastern Oil and in this article Dr. Cohen illustrates how she believes our dependence on Middle Eastern oil is not only a national security threat but a threat to our economy, as we have recently been witness to. Dr. Cohen outlines various ways in which the U.S. government could and should go about relieving itself from the grips of the Middle Eastern governments who control our oil imports. Highlighted by Dr. Cohen are the following initial ways in which the U.S. can start to free itself from Middle Eastern oil dependency: Prepare for

(3) DOE Environmental Information Administration. Country Analysis Briefs. 2009. http://www.eia.doe.gov/emeu/cabs/index.html

contingencies in which oil-rich countries became destabilized; assist friendly Persian Gulf states in enhancing the security of their oil production facilities; diversify U.S. energy resources and oil imports to reduce dependence on Persian Gulf oil; boost efforts to roll back Iran's subversive ideological, terrorist and military threats; expand military contingency plans and prepare a rapid reaction force; diversify the energy basket by expanding domestic production of oil and gas and by lifting the bureaucratic barriers that prevent great use of nuclear energy; encourage expanded methanol and ethanol production and imports; and expand the Strategic Petroleum Reserve (4).

Dr. Cohen's assessments concerning the increasing danger of the U.S. government's dependence on oil in the Middle East are highlighted by her use of statistics and charts depicting consumers of oil versus net importers as well as highest oil production countries versus highest oil usage countries. Dr. Cohen includes an interesting statement from the late Palestinian leader Yassir Arafat, "When the North Sea oil dries up in 1991, the United States will want to buy Arab petroleum. And when the American oil fields themselves run dry and oil consumption in the United States increases, the American need for the Arabs will grow greater and greater." In her study, Cohen also highlights Iraq and how following the removal of Saddam Hussein from power the UN restrictions of oil export were lifted may have initially seemed like a good thing, the ensuing turmoil in that country have hampered foreign investment.

> ***Today, Iraq produces 800,000 to 1.3 million barrels per day less than it produced before Operation Iraqi Freedom in 2003. According to the Iraqi oil ministry, the 186 insurgent attacks on the oil industry cost the country $6.25 billion in lost revenue during 2005 and claimed the lives of 47 engineers and 91 police and security guards (Cohen 2006).***

Dr. Cohen finishes up her study by going more into depth concerning the previously

(4) Cohen, Ariel. Reducing U.S. Dependence on Middle Eastern Oil. 7 April 2006. http://www.heritage.org/research/features/nationalsecurity/bg1926.cfm

mentioned strategies for relieving the U.S. of its dependence on Middle Eastern oil and concluding by stating that "it is only a matter of time until America's energy security, including its economic health and defense capabilities, will be jeopardized by the growing political instability, terrorism, and potential warfare in the Middle East." While Dr. Cohen doesn't get into specifics about other types of resources the U.S. can turn to in order to replace our dependence on oil, she does pose some intelligent questions as well as reasons why we need to rid ourselves of being so dependent upon the unstable Middle Eastern states which control most of our imported oil.

The final piece of "literature" that I'll discuss here is the General Electric (GE) website, www.ge.com. While this isn't one article or book concerning U.S. oil dependency or one solution to the problem, GE is one major, well known company that has been putting a lot of money into the research and production of alternative energy resources. Through the GE Global Research Labs, GE has been putting a lot of time and research into alternative and renewable energy resources. Part of GE's promise to investors includes "doubling its research investment in environmentally friendly technologies to more than $1.5 billion by 2010; introducing new products and services that offer significant and measurable environmental performance advantages to its customers; reducing its greenhouse emissions (GHG) and improve its energy efficiency; GE will reduce GHG emissions by 1 percent by 2012 and the intensity of its GHG emissions 30 percent by 2008" (5). Current GE projects underway include research into wind energy, photovoltaic, fuel flexibility, geothermal and waste heat, energy storage and

(5) General Electric. GE Global Research: Energy. 2009. http://www.ge.com/research/grc_2_1_1.html

hybrid systems, cleaner coal, carbon capture, hybrid locomotive, aviation, water use and purification initiatives and energy efficiency initiatives (6).

General Electric is a huge company and while it may not operate on the micro-level, it certainly represents a greater number of smaller companies who are also researching alternative fuel sources for Americans. The U.S. Department of Energy offers broad definitions about alternative energy sources while through the GE website we are able to see how those resources can be applied to our daily lives and how we may be saving energy and money in the future.

**Actors & Perceptions:**

The United States is currently extremely dependent upon foreign countries for our energy needs, specifically the unstable Middle Eastern countries that control the oil reserves in the region. It is estimated that by the year 2025 the U.S. will be importing approximately 68% of our total oil (1). With so many renewable resources within our own borders why is it that the U.S. still imports so much oil, specifically from unstable, terrorist-laden nations, instead of putting that money towards more research and development of our own nationally owned resources? This study will look into that very question while also looking at those solutions such as national oil reserves, other fossil fuels found in the U.S. and renewable resources like solar and wind power. The most influential actors in this debate will be analyzed in order to properly predict future actions the U.S. may make in order to quell the country's dependency on foreign oil.

(6) General Electric. GE Global Research: Energy. 2009. http://www.ge.com/research/grc_2_1_1.html
(1) Cohen, Ariel. Reducing U.S. Dependence on Middle Eastern Oil. 7 April 2006. http://www.heritage.org/research/features/nationalsecurity/bg1926.cfm

These influential and primary actors are the U.S. Department of Energy (DOE), Organization of the Petroleum Exporting Countries (OPEC), Middle Eastern states, i.e. Iran, Iraq, Saudi Arabia, etc., Russia, South American oil producing states and private U.S.-based companies like General Electric.

**U.S. Department of Energy (DOE)**

The U.S. Department of Energy is the U.S. government's foremost authority on national energy concerns and resources. As the one main U.S. government entity in charge of all U.S. energy needs and requirements, the DOE is concerned with the U.S.'s policies regarding energy and safety in handling nuclear material. The DOE's focus is on national energy issues as well as research and development into renewable and fossil fuel energy sources versus focusing outward towards other country's resources. Among its other areas of focus are being responsible for the nation's nuclear weapons program, nuclear reactor production for the United States Navy, energy conservation, energy-related research, radioactive waste disposal and domestic energy production. The DOE also sponsors more basic and applied scientific research than any other U.S. federal agency; most of this research is funded through its system of national laboratories named the United States Department of Energy National Laboratories. The DOE has several operating units within it including the Office of Science. This office is the single largest supporter of basic research in the physical sciences in the United States, providing more than 40% of total funding. The funding goes towards the following Program Offices: Advanced Scientific Computing Research, Biological and Environmental Research, Basic Energy Sciences, Fusion Energy Sciences, High Energy Physics, Nuclear Physics, and Workforce Development for Teachers and Scientists. Other units within the DOE include the Energy Information Administration which is the official source for energy statistics from around the world for the

U.S. government, the National Nuclear Security Administration, the Office of Secure Transportation, and the Federal Regulatory Commission. The DOE also regulates the Strategic Petroleum Reserve (SPR), the largest emergency supply of petroleum in the world, with the capacity to hold up to 727 million barrels of petroleum.

While the DOE is not a platform from which the department or the government promotes one energy source over another, it does oversee all of the energy resources and potential energy resources within the United States borders. The DOE's website offers information regarding current energy and fuel sources as well as energy sources still in their infancies as well as in the research and development stages. The site also provides a great amount of information concerning the environment and how certain energy resources in this country play into how well the environment is maintained and what the DOE is doing in order to further protect the environment and the citizens of the United States from harmful energy wastes, such as nuclear wastes and radioactive wastes.

Rightly so, the U.S. Department of Energy has played a huge role and will continue to play a huge role in the development of new sources of energy for this country. On 7 May 2009, President Barack Obama unveiled a $26.4 billion budget request for the DOE for FY 2010, including $2.3 billion for the DOE Office of Energy Efficiency and Renewable Energy (EERE). The budget aims to substantially expand the use of renewable energy sources while improving energy transmission infrastructure. It also makes significant investments in hybrids and plug-in hybrids, in smart grid technologies, and in scientific research and innovation (2). As part of the recent $789 billion economic stimulus package, Congress has provided the DOE with $38.3

(2) EERE News: DOE Requests $2.3 Billion for Efficiency, Renewable Energy in FY 2010". Apps1.eere.energy.gov. 13 May 2009. http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=12509

billion for the next two years, adding about 75% to the DOE's annual budgets and most of the stimulus spending will be in the form of grants and contracts (3).

As previously mentioned, the U.S. Department of Energy focuses on energy issues within the borders of the United States; international issues of oil production, importing/exporting, issues of national security, are not part of the focus of the DOE. The next major actor is this study does however, play a large part in the above mentioned focus areas which our Department of Energy does not, the Organization of Petroleum Exporting Countries, otherwise known as OPEC.

**Organization of Petroleum Exporting Countries (OPEC)**

The member countries of OPEC form a 12 country cartel whose headquarters has been located in Vienne, Austria since 1965. The member countries include Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates and Venezuela. According to its statutes, one of the principal goals is the determination of the best means for safeguarding the cartel's interests, individually and collectively. It also pursues ways and means of ensuring the stabilization of prices in international oil markets with a view to eliminating harmful and unnecessary fluctuations; giving due regard at all times to the interests of the producing nations and to the necessity of securing a steady income to the producing countries; an efficient and regular supply of petroleum to consuming nations, and a fair return on their capital to those investing in the petroleum industry (4).

(3) Alvarez, Robert. Is the Energy Department Ready to Reboot the Country? Institute for Policy Studies. 27 March 2009. http://www.ips-dc.org/articles/is_the_energy_department_ready_to_reboot_the_country
(4) Chapter I, Article 2 of The Statute of the organization of the Petroleum Exporting Countries (as amended)

The members of OPEC have long used oil as a political weapon, starting in 1973 when the Arab member nations of OPEC implemented oil embargoes during the Yom Kippur War, beginning the 1973 oil crisis (5). Due to its control over much of the world's oil reserves, OPEC member nations have largely been able to determine the market price of oil, effectively being able to change their consumer's country's economies one way or the other. Their influence has gone down quite a bit since the 1970s though due to other oil reserves being discovered and developed in non-OPEC nations. Such oil reserves include those in Prudhoe Bay, Alaska, the North Sea, Canada, and the Gulf of Mexico. The end of the Cold War also played a part when Russia was opened to the world economy and brought with it its oil fields. Although the influence of OPEC nations on the market price of oil has gone down as of April 2009, OPEC nations still accounted for two-thirds of the world's oil reserves and 33.3% of the world's oil production (6).

Between April and September of 2009 the U.S. imported 861,208 barrels of oil from OPEC member nations, of that number 301,691 barrels of oil were imported from Middle Eastern OPEC member nations. These numbers represent 40% and 14% of the U.S.' total imported oil between that time period (7). They are staggering numbers considering that much of the U.S.' current imported oil comes from highly unstable regions of the world. That OPEC member nations, specifically the ones located in hostile areas such as the Middle East, have this much control over our nation's economy, through the rise and fall of the price of oil, puts us and

(5) Hammes, David and Wills, Douglas. "Black Gold: The End of Bretton Woods and the Oil-Price Shocks of the 1970s." The Independence Review, v. IX, n. 4. 2005.
(6) British Petroleum. Table of World Oil Production.
http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/publications/energy_reviews_2006/STAGING/local_assets/downloads/pdf/table_of_world_oil_production_2006.pdf
(7) Energy Information Administration (EIA). U.S. Imports by Country of Origin. 2009.
http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_m.htm

keeps us in a very precarious position when it comes to world politics. If OPEC member nations decide to play the "oil as a weapon" card as they did in 1973 during the Yom Kippur War, the U.S.' economy may very well be thrust into yet another recession, or kept in the current one.

The continued dependency which the United States has on oil provided by OPEC member nations, specifically in unstable regions of the world, i.e. the Middle East, Venezuela, etc., is astonishing given the fact that our country has been embroiled in a war for the past six years in one of those very countries.

**Russia**

Since the 1980s Russia has been extracting and exporting crude and refined oil to European nations as well as the U.S. In the mid-1980s their oil exportation rates were hovering somewhere around 12.5 million barrels per day (bbl/d) however when the fall of the Soviet Empire occurred around 1988/1989, oil exportation rates were cut in half to about 6 million bbl/d (8). Since about 1998 Russia's oil extraction, refinement and exportation has slowly been rising to a point now where Russia exports approximately 9 million bbl/d in oil. Currently, "Russia holds the world's largest natural gas reserves, the second largest coal reserves and the eighth largest oil reserves. Russia is also the world's largest exporter of natural gas, the second largest oil exporter and the third largest energy consumer" (9). While Russia only consumes about 19% of its own oil and 55% of its own natural gas, in 2007 it's exported oil to the United States was up to 400,000 bbl/d.

(8) Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Oil.html
(9) Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Background.html

According to a 2008 survey by the Oil and Gas Journal, Russia has proven oil reserves of 60 billion barrels, most of which are located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau. Eastern Siberia is one area where little exploration has taken place however, the Russian Ministry of Natural Resources estimated in 2005 that the Eastern Siberian provinces oil reserves totaled 4.7 billion barrels (10). Russian oil production is currently at 9.8 million bbl/d and consumption of approximately 2.8 million bbl/d, Russia exported (in net) around 7 million bbl/d. According to official Russian statistics, roughly 4.4 million bbl/d of this total is crude oil. Over 70% of Russian crude oil production is exported, while the remaining 30% is refined locally. Crude oil exports via pipeline fall under the exclusive jurisdiction of Russia's state-owned pipeline monopoly, ***Transneft*** (10). As mentioned above, in the 1980s, the Western Siberia region, also known as the "Russian Core," made the Soviet Union a major world oil producer, allowing for peak production of 12.5 million bbl/d in total liquids in 1988. Following the collapse of the Soviet Union in 1991, Russia's oil production fell abruptly, reaching a low of about 6 million bbl/d. According to observers, several other factors are thought to have caused the decline, including the depletion of the country's largest oil fields due to state-mandated production surges and the lack of investment in field maintenance (10). The turnaround in Russian oil output began in 1999 when many analysts attribute the rebound in production to the privatization of the industry following the collapse of the Soviet Union. The privatization clarified incentives and increased less expensive production. Higher world oil prices beginning in 2002, the use of technology that was standard practice in the West and the rejuvenation of old oil fields also helped raise production levels. Other experts partially attribute

(10) Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Oil.html

the increase to after-effects of the 1998 financial crisis, the fall in oil prices and the subsequent devaluation of the ruble (11).

Russian oil production and exportation is expected to plateau soon, if it hasn't already, due to depleted oil fields and untapped oil fields in Eastern Siberia, and start to decrease from its current state of 9 million bbl/d. Although the idea of partnering more closely with Russia, a former enemy state and a current less-than friendly state, may not be an initially pleasing idea, it may prove to be a lucrative partnership for both countries, with more income going into Russia, boosting its economy, and less of the U.S. money and interests being stuck in the quagmire of the Middle East.

**General Electric (GE)**

While the U.S. Government and Department of Energy continues to focus much of its time on developing new energy resources here at home or going abroad to the Middle East, Russia, Venezuela and a slew of other nations with indigenous oil reserves, private companies located within the United States are also searching out alternative fuel sources. While their intentions may be less noble than trying to help the planet or save the national economy, their end results are no less important to those causes. In 2005 General Electric launched its "ecomagination" idea which chairman and CEO, Jeffrey Immelt said aims to "focus our unique energy, technology, manufacturing and infrastructure capabilities to develop tomorrow's solutions such as solar energy, hybrid locomotives, fuel cells, lower-emission aircraft engines,

(11) Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Oil.html

lighter and stronger materials, efficient lighting and water purification technology" (12). GE's interests also extend to the oil and gas fields and on its website it states that "GE is helping to meet the world's increasing demand for oil and gas while also developing the technologies that will be needed to address tomorrow's energy challenges. Our innovations are many, from extracting oil from tar sands, to deep-sea exploration and production. Such technologies are ensuring responsible energy access for generations to come" (13). In announcing its Ecomagination initiative GE has committed itself to more than "doubling its research investment in cleaner technologies, from $700 million in 2004 to $1.5 billion in 2010 as well as introducing more clean-tech products annually, doubling its current $10 billion in annual revenues from ecomagination products and services to at least $20 billion by 2010." GE also pledged to improve its own environmental performance by "reducing its greenhouse gas emissions 1% by 2012 and the intensity of its greenhouse gas emissions 30% by 2008, both compared to 2004 (based on the company's projected growth, GE says its emissions would have otherwise risen 40% by 2012 without further action); and reporting publicly on its progress in meeting these goals" (12).

General Electric has been putting a lot of money into its cleaner energy and fuel projects and because it is still primarily a business, it is still bringing in a hefty profit with all of its worldwide ventures put together. GE continues to support its international projects such as the $250 million offshore drilling contract the company just won in Brazil and the $230 million

(12) Makower, Joel. Ecomagination: Inside GE's Power Play. World Changing. 8 May 2005. http://www.worldchanging.com/archives/002669.html
(13) GE Oil & Gas. General Electric. 2009. http://www.ge.com/products_services/oil_gas.html

contract it was awarded for a Nigeria power plant (14). The fact that GE is continuing to pursue energy interests which may not be on the ecomagination-level doesn't dismiss the fact that their Ecomagination initiative may still be the future of U.S. energy needs. According to Joel Makower, author of *"Ecomagination: Inside GE's Power Play,"* GE has undertaken clean energy and fuel because "it's a huge business opportunity." At the time of his article's publication, Clean Edge estimated that global markets for just three technologies – wind power, solar photovoltaic and fuel cells – will grow to more than $100 billion within 10 years, from about $16 billion (in 2005). That estimate didn't include clean-water technologies, which GE has invested heavily in. Another study predicted that the market for world water treatment technologies would reach $35 billion by 2007. The Clean Edge estimate also did not include energy efficiency – technologies that significantly reduce energy use – which is, arguably, the biggest market of all (15).

Joel Makower is decidedly bias in favor of GE's initiatives to put the environment in the forefront of its research, development and marketing, despite the fact that in the past GE has been at the forefront of some heinous anti-environmental issues, such as PCBs contaminating specific bodies of water in the U.S. Makower presents a pretty good argument for GE's initiative, citing several reasons why he thinks that GE is "heading in the right direction:"

1. **It's being viewed as a business opportunity.** Few other large companies -- BP, Dupont, and Interface are rare exceptions -- have set their sights on making sustainability a cornerstone of top line business growth -- new products, larger markets, stronger customer ties, etc. GE sees ecomagination as an engine for creating new sources of business value for years to come. That's likely to make it sustainable within the company, and not just the flavor of the month.

(14) GE Oil & Gas. General Electric. 2009.
http://www.gereports.com/ge-wins-250-million-offshore-drilling-contract-in-brazil/ ;
http://www.geoilandgas.com/businesses/ge_oilandgas/en/about/press/en/2009_press/120109.htm
(15) Makower, Joel. Ecomagination: Inside GE's Power Play. World Changing. 8 May 2005.
http://www.worldchanging.com/archives/002669.html

2. **It's got solid top-level commitment.** Experts always talk about the importance of having CEO buy-in to make sustainability more than just a nice-to-do company initiative. (Again, BP's John Browne, Dupont's Chad Holliday, and Interface's Ray Anderson are among a handful of exemplars.) Immelt seems to be making ecomagination a personal quest, from his high-profile announcements this week all the way to his personal appearance on the ecomagination Web site. I'm guessing you'll be hearing Immelt preach the ecomagination gospel for the foreseeable future.

3. **It's both inspirational and specific.** GE's ecomagination pledge marries high-level strategy and vision with specific targets and timetables. Both are critical for sustainability to succeed inside a company, and having one without the other is a recipe for failure. In providing both, GE has signaled its intention to be an environmental and clean-tech leader, and has provided a road map of how they plan to get there.

4. **They've done their homework.** GE has identified 17 products representing about $10 billion in annual sales as part of the ecomagination platform on which it plans to build. In doing so, the company undertook an intensive process to identify and qualify current ecomagination products, analyzing the environmental attributes of GE products relative to benchmarks such as competitors' best products, the installed base of products, regulatory standards, and historical performance. (Doing this analysis was one of the key roles played by GreenOrder.) For each ecomagination product, GE created an extensive "scorecard" quantifying the product's environmental attributes, impacts, and benefits relative to comparable products. The scorecards were used to create the product claims that can be found in GE's printed materials, ads, and Web site.

5. **It's being integrated with the brand.** GE says the ecomagination "brand" will be integrated into its overall marketing -- at least for the products that qualify. This is no small matter. Most companies have been reluctant to play up their products' environmental benefits (if you don't count those feel-good image ads that come primarily from energy, chemical, and forestry companies), fearing that their green claims won't stand up to scrutiny when weighed against the company's overall environmental footprint. GE's leaders seem willing to take the risk -- largely because they're making specific claims and are willing to back them up.

6. **They're in it for the long haul.** Clearly, ecomagination -- like sustainability itself -- is not a one-off campaign or short-term proposition. GE seems determined to make ecomagination part of its identity. It plans not just to market the brand aggressively to the world, but also internally, to GE's 300,000-employee base, to ensure that the notion of leadership through clean technology is part of everyone's job (16).

Clearly GE has at least begun to step in the right direction with its Ecomagination initiatives and perhaps the U.S. Government and Department of Energy should look more towards private businesses to better our own energy usage and issues while also helping our own economy by putting more money into U.S. businesses.

(15) Makower, Joel. Ecomagination: Inside GE's Power Play. World Changing. 8 May 2005. http://www.worldchanging.com/archives/002669.html

**Research Design:**

There are several different methods that can be used in order to analyze possible future outcomes for the United States and its dependency on foreign oil however, for this study the LAMP method (the Lockwood Analytical Method for Prediction) will be used. The LAMP method is a "systematic method for predicting short-term, unique behaviors (vice continuous or recurring, cyclical behaviors)." The LAMP method is the best analytical method to use here because this situation is dealing with national and international players whose actions and interactions are not predetermined. The LAMP method philosophy states that "the future is not predetermined, is the sum total of all interactions of free will and is a dynamic spectrum of constantly changing relative probabilities" (1). Meaning that nothing in our futures is predetermined however, based upon actions and interactions from the past, as well the "sum total of all interactions of free will" and a constantly changing spectrum of probabilities, one can accurately predict/assess what will happen in the future for specific events in the present.

The LAMP method is a set of rules on how to conduct predictive analysis based solely on qualitative measures as opposed to quantitative measures. Because this study is dealing with human beings as well as an ever-changing environment, the qualitative approach is better than trying to quantify people's opinions and actions. These rules are listed as the 12 steps of the LAMP method and are as follows:

1) **Determine the Predictive Issue**
2) **Specify the Actors Bearing on the Problem**
3) **Conduct in-depth study of perceptions and intentions of each actor**
4) **Specify courses of action for each actor**

(1) Analytic Service Inc. (ANSER). The Lockwood Analytic Method for Prediction (LAMP): An Innovative Methodological Approach to the Problem of Predictive Analysis (PowerPoint). 15 January 2002

5) **Determine the major scenarios**
6) **Calculate the number of alternate futures**
7) **Do pairwise comparison of alternate futures**
8) **Rank order the alternate futures**
9) **Analyze consequences of alternate futures**
10) **Determine focal events for alternate futures**
11) **Develop indicators for each focal event**
12) **Assess the potential for transposition between alternate futures**

Studying the possible national and international solutions for the United States' dependency upon foreign oil is quite adaptable to the LAMP method for predictive analysis. Due in large part to the ever-changing behaviors and perceptions of the individuals and actors involved, from the U.S. Government, the President of the United States, Russia, the DOE, and the Middle Eastern player states. Analyzing the perceptions and opinions of these players in order to determine the potential behavior and actions for the U.S.' future oil and energy dependency is greatly helped by using the LAMP method. The method is not structured by numbers and only quantitative data but allows for purely qualitative data involving opinions and perceptions as well as behavior, actions and interactions. This method allows the analyst to structure their study in such a way that it is easier to understand for the analyst as well as other parties who may read it.

While the LAMP method offers a specific way to structure a study, based largely on the free will of all participants, there will always be some level of haziness when it comes to analyzing the future outcomes of players based largely on free will. Because the LAMP method is based on qualitative data and not hard-set numbers, there will always be some wiggle room for bias on the part of the author/analyst, based on background and education on the subject at hand. While the author of this study does not plan on being biased towards or against one player or

another or for or against one solution over another, the possibility of some bias being perceived within this study is there. It will be determined by each reader of this study whether there is any bias present on the part of the author and how much bias if there is some.

## Case Study/Analysis/Findings: (LAMP method Steps 4-12)

### Potential Courses of Action

Due to the fact that there are many players in this study there are endless possibilities of potential courses of action for each of them when it comes to determining solutions for the U.S. foreign oil dependency. Since the U.S. is the major player and the actor whom this entire study is based around this study will concentrate on the potential courses of action for the United States to take in relation to the other players discussed. There are third primary courses of actions which the U.S. could take in order to stifle it's dependency on foreign oil, the first of which is that the U.S. cuts ties with the Middle Eastern governments which they are currently dealing with in regards to oil import/exportation, and pursues oil importation from other, less hostile and more stable, countries as well as pursuing oil production at home, i.e. ANWR, the Gulf of Mexico. The second potential course of action would be for the U.S. to put even more money into the research and development of alternate fuel and energy sources such as ethanol fuel, photovoltaic/solar power, wind power, etc, while also putting money into and building national interest in national natural gas reserves, all while slowly getting away from oil dependence as a whole. The third and final potential course of action is for the U.S. to continue on its current path of using too much oil and being too dependent upon foreign governments and companies to provide that oil. While these four potential courses of action for the United States don't represent

every single possible course of action, they do represent the four more likely courses of action based on the other actors involved.

**Major Scenarios**

For the above section, this study focused on the potential courses of action of the primary actor involved, the United States. For further analysis, this study will now look at the possible courses of action, or "scenarios," for the other players involved whose actions would affect the United States in some form or another. The other major players this study is looking at now include OPEC, Russia and the Middle East. There are three major scenarios that will be considered: based on continued poor international perceptions and ill-favor towards the United States, OPEC has announced that its member countries will no longer export oil (crude or refined) to the U.S., through massive and coordinated bombings/attacks terrorists have blown up large amounts of major oil pipelines and shipping ports in Russia and the Middle East, and a new massive oil field in Eastern Siberia has been discovered and is currently being developed and extracted for 100% exportation. Each scenario posed by the international players would produce very different futures for the United States and would greatly affect how the United States would have to respond to its own problems of energy consumption. In order to effectively predict the most likely outcome for the United States, there must be an analysis using the LAMP method, of all possible permutations of actions by the United States related to the three possible scenarios presented by the other actors of OPEC, Russia and the Middle East.

**Permutations of Behavior**

Per the LAMP analysis method, the equation for determining how many "alternate futures" are possible for the interested state actors in the study (United States [including the

USG, DOE and private U.S. companies] and OPEC/oil producing and exporting states [including the Middle Eastern States and Russia]) is $X^Y = Z$. In this equation, X equals the numbers of courses of action of which the United States could implement, Y equals the number of national actors involved and Z equals the total number of alternate futures to be compared. In this study there are three courses of action which the United States could undertake and two primary actors, with the "United States" representing both the government and government agencies such as the Department of Energy and the Energy Information Administration as well as representing private U.S. companies with ties to energy development and OPEC representing all OPEC member states as well as other oil producing and exporting countries. With this information in mind, the equation for alternate futures becomes $3^2 = 9$, meaning that there are 9 possible futures, or courses of action, for the United States to compare with each of the three "international" scenarios dictated by outside events. Each scenario posed provides the same number of permutations for possible alternate futures (9), therefore the next step is to create a table of the alternate future permutations in order to perform a "pairwise comparison" of the alternate future permutations for each of the three scenarios presented. The abbreviations for the alternate future scenarios will be as follows, and will be used in all tables to follow:

U.S. Cuts Oil Ties with Middle Eastern Countries; Pursues Oil Elsewhere = CT

U.S. Puts More Money and Time into Research and Development of Alternate Fuels = AF

U.S. Keeps its Status Quo with Oil Usage and Dependency = SQ

The three scenarios presented will similarly be identified as follows:

Scenario 1 = OPEC Decides to No Longer Export to the U.S. = (OP)

Scenario 2 = Terrorists Blow Up Major Oil Pipelines & Ports in Middle East & Russia = (TB)

Scenario 3 = Oil Field is Found and Developed in Eastern Siberia for 100% Exportation = (ES)

| Table 1 - Alternate Future Permutations | | |
|---|---|---|
| Possible Future # | United States | OPEC/Oil Producers |
| 1 | CT | CT |
| 2 | CT | AF |
| 3 | CT | SQ |
| 4 | AF | AF |
| 5 | AF | CT |
| 6 | AF | SQ |
| 7 | SQ | SQ |
| 8 | SQ | CT |
| 9 | SQ | AF |

**Pairwise Comparisons for Each Scenario**

Utilizing the alternate futures table (Table 1), shown above, it is now possible to conduct a pairwise comparison of each alternate future for each given scenario. A pairwise comparison is a simple way of comparing the likelihood of each alternate future taken in context of each given scenario. A pairwise comparison would compare alternate future #1 to alternate future #2 in relation to the given scenario, determining which is more likely to occur based on the analyst's understanding of the scenario and the viewpoints of each actor involved, in this case two actors. Next the analyst would compare alternate future #1 to alternate future #3 again determining which is most likely to occur given the scenario at hand. This continues on until all alternate futures have been compared to one another. The equation for determining how many pairwise comparisons are necessary is: $X = (n-1) + (n-2) \ldots + (n-n)$. In this equation n equals the total number of alternate futures to be analyzed and X equals the total number of pairwise

comparisons that must be made. For this particular analysis n equals 9, therefore X equals 36 pairwise comparisons that must be made.

Tables 2 through 4 represent the pairwise comparisons between the two major players and the three alternate futures with respect to the three individual scenarios.

**Table 2 - Alternate Future Permutations**
**Scenario 1 - OPEC No Longer Exports to U.S. - OP**

| Possible Future # | United States | OPEC/Oil Producers | Votes | |
|---|---|---|---|---|
| 1 | CT | CT | xxxxxxx | 7 |
| 2 | CT | AF | xxxxx | 5 |
| 3 | CT | SQ | xxxx | 4 |
| 4 | AF | AF | xxxx | 4 |
| 5 | AF | CT | xxxxxxxx | 8 |
| 6 | AF | SQ | xxxxx | 5 |
| 7 | SQ | SQ | | 0 |
| 8 | SQ | CT | xx | 2 |
| 9 | SQ | AF | x | 1 |
| | | | | 36 |

CT = U.S. cuts ties with foreign oil exporting countries
AF = U.S. puts more money and effort towards developing alternate fuel sources
SQ = The status quo is maintained

| Table 3 - Alternate Future Permutations<br>Scenario 2 - Terrorists Blow Up Pipelines/Ports - TB | | | | |
|---|---|---|---|---|
| Possible Future # | United States | OPEC/Oil Producers | Votes | |
| 1 | CT | CT | xx | 2 |
| 2 | CT | AF | xxxxx | 5 |
| 3 | CT | SQ | xxx | 3 |
| 4 | AF | AF | xxxxxxxx | 8 |
| 5 | AF | CT | xxxxxxx | 7 |
| 6 | AF | SQ | xxxxxx | 6 |
| 7 | SQ | SQ | | 0 |
| 8 | SQ | CT | xx | 2 |
| 9 | SQ | AF | xxx | 3 |
| | | | | 36 |

CT = U.S. cuts ties with foreign oil exporting countries
AF = U.S. puts more money and effort towards developing alternate fuel sources
SQ = The status quo is maintained

| Table 4 - Alternate Future Permutations<br>Scenario 3 - Oil Found in Eastern Siberia for 100% Export - ES | | | | |
|---|---|---|---|---|
| Possible Future # | United States | OPEC/Oil Producers | Votes | |
| 1 | CT | CT | x | 1 |
| 2 | CT | AF | x | 1 |
| 3 | CT | SQ | xxx | 3 |
| 4 | AF | AF | xxx | 3 |
| 5 | AF | CT | xxxxxx | 6 |
| 6 | AF | SQ | xxxxx | 5 |
| 7 | SQ | SQ | xxxxxx | 6 |
| 8 | SQ | CT | xxxxxxx | 7 |
| 9 | SQ | AF | xxxx | 4 |
| | | | | 36 |

CT = U.S. cuts ties with foreign oil exporting countries
AF = U.S. puts more money and effort towards developing alternate fuel sources
SQ = The status quo is maintained

Using the voting results from Tables 2 through 4 for the above Alternate Future Permutations, it is now possible to rank order, per the votes, the more likely alternate futures.

**Ranking the Alternate Futures**

Tables 2 through 4 showed the three alternate futures and the final voting numbers. Tables 5 though 7 below show those same results but reordered to show the more likely alternate futures on top with the less likely alternate futures following.

**Table 5 - Alternate Future Rankings**
**Scenario 1 - OPEC No Longer Exports to U.S. - OP**

| Possible Future # | United States | OPEC/Oil Producers | Votes | |
|---|---|---|---|---|
| 5 | AF | CT | xxxxxxxx | 8 |
| 1 | CT | CT | xxxxxxx | 7 |
| 2 | CT | AF | xxxxx | 5 |
| 6 | AF | SQ | xxxxx | 5 |
| 3 | CT | SQ | xxxx | 4 |
| 4 | AF | AF | xxxx | 4 |
| 8 | SQ | CT | xx | 2 |
| 9 | SQ | AF | x | 1 |
| 7 | SQ | SQ | | 0 |
| | | | | 36 |

CT = U.S. cuts ties with foreign oil exporting countries
AF = U.S. puts more money and effort towards developing alternate fuel sources
SQ = The status quo is maintained

| Table 6 - Alternate Future Rankings<br>Scenario 2 - Terrorists Blow Up Pipelines/Ports - TB | | | | |
|---|---|---|---|---|
| Possible Future # | United States | OPEC/Oil Producers | Votes | |
| 4 | AF | AF | xxxxxxxx | 8 |
| 5 | AF | CT | xxxxxxx | 7 |
| 6 | AF | SQ | xxxxxx | 6 |
| 2 | CT | AF | xxxxx | 5 |
| 3 | CT | SQ | xxx | 3 |
| 9 | SQ | AF | xxx | 3 |
| 1 | CT | CT | xx | 2 |
| 8 | SQ | CT | xx | 2 |
| 7 | SQ | SQ | | 0 |
| | | | | 36 |

CT = U.S. cuts ties with foreign oil exporting countries
AF = U.S. puts more money and effort towards developing alternate fuel sources
SQ = The status quo is maintained

| Table 7 - Alternate Future Rankings<br>Scenario 3 - Oil Found in Eastern Siberia for 100% Export - ES | | | | |
|---|---|---|---|---|
| Possible Future # | United States | OPEC/Oil Producers | Votes | |
| 8 | SQ | CT | xxxxxxx | 7 |
| 7 | SQ | SQ | xxxxxx | 6 |
| 5 | AF | CT | xxxxxx | 6 |
| 6 | AF | SQ | xxxxx | 5 |
| 9 | SQ | AF | xxxx | 4 |
| 3 | CT | SQ | xxx | 3 |
| 4 | AF | AF | xxx | 3 |
| 1 | CT | CT | x | 1 |
| 2 | CT | AF | x | 1 |
| | | | | 36 |

CT = U.S. cuts ties with foreign oil exporting countries
AF = U.S. puts more money and effort towards developing alternate fuel sources
SQ = The status quo is maintained

**Analysis of Alternate Futures**

**Scenario One:**

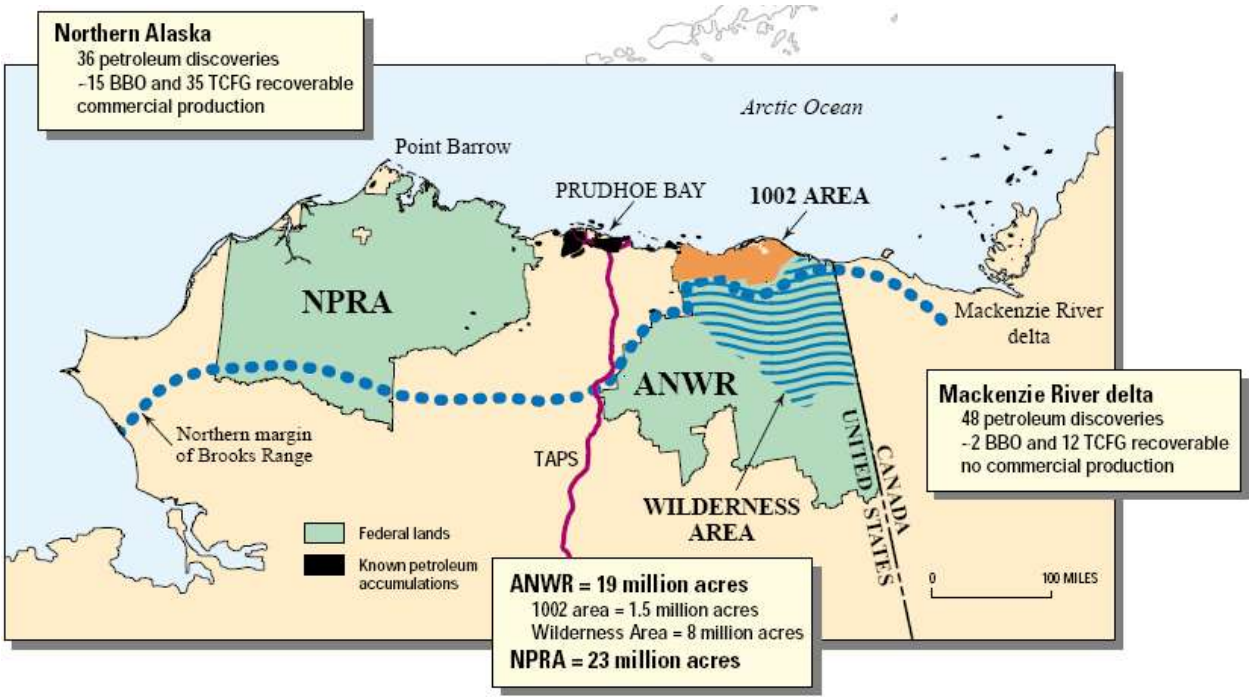
Scenario 1 posed by the international community to the United States would be that OPEC (along with other oil developing/exporting countries) decide to no longer export to the United States. This scenario would be based upon the relatively low-standing that the U.S. has had in the world in recent years and the recent economic downturn of the country. OPEC member nations would come to the decision that the United State's oil imports and money involved weren't worth the effort of having to deal with the country anymore, especially given the fact that the U.S. economy has taken a drastic plunge as of late and that the president, Barack Obama, has decided to put more money towards alternate fuels and energy sources.

There were four alternate futures for this given scenario that received more than four votes and these four alternate futures will be analyzed further.

**Alternate Future #5: U.S. – Alternate Fuels, OPEC – Cuts Ties**

In this alternate future OPEC and the other non-member, oil exporting countries, decide to no longer export oil to the United States. Essentially, given this scenario, OPEC has already cut ties with the United States, as far as oil imports/exports go and it is assumed that the United States has been forced to cut those ties as well. Given the new development that the United States will no longer be receiving oil from outside sources the U.S. is now forced to look within for oil as well as new energy and fuel sources. The U.S. is now forced to halt the debate concerning drilling in the Alaska National Wildlife Refuge (ANWR) and begin drilling immediately. While the oil from ANWR won't make up totally for the loss of importing oil, at

only 7.7 billion barrels assessed to be in the federal portion of the ANWR 1002 Area, the 1.5 million acre controversial drilling area in the Alaskan North Slope (1), it will help to keep U.S. oil needs under control once usable oil is extracted around the year 2016.




In this alternate future the United States is forced to turn its attention even more so on the research and development of alternate energy and fuel sources, such as solar power, wind power, hydroelectric power and even more natural gas usage just to name a few. While the initial cost of this research and development will be extraordinary, in the billions of dollars, in the long run the environment is sure to benefit as will the health and well-being of Americans throughout the country. In the short-term however, Americans will be forced to reevaluate their energy and fuel usage and make some long-term changes in their lives. These changes will come in the form of buying more electric and alternate fuel vehicles versus the standard petroleum-based fuel

(1) USGS. Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis. April 2001. http://pubs.usgs.gov/fs/fs-0028-01/fs-0028-01.pdf

vehicles as well as changing how much electricity and water each household uses.

**Focal Events and Indicators for Scenario 1, Alternate Future 5**

This particular alternate future states that OPEC and other non-member oil producing states have decided to discontinue the export of oil to the United States and the United States responds by looking inward for national oil reserves and production as well as focusing more energy and money towards the research and development of alternate fuels and energies. In order for this future to occur the following focal events would have to happen.

Focal Events:

- International ill-favor with the United States spreads among the major oil producing countries in the world
- The U.S. economy is bad enough where the loss of U.S. oil imports would not drastically hurt international oil-producing countries
- The U.S. can no longer afford to import as much oil from other nations/OPEC due to the rise in world-wide oil prices
- The economies of China, Japan, Russia and European countries gain momentum and can make up for the loss of the United States no longer paying for oil from OPEC member nations

Indicators:

- Economies of other major world players, i.e. China, Japan, Russia, grow along with their oil usage
- U.S. cannot afford to import as much international oil as it once did

- U.S. focus continues to move towards alternate fuels and away from oil

**Alternate Future #1: U.S. – Cuts Ties, OPEC – Cuts Ties**

This alternate future, based on scenario one, is essentially the same as the above mentioned alternate future. OPEC and other non-member, oil producing countries have decided to no longer export oil to the United States, effectively cutting all "energy ties" with the U.S. Given this situation the United States has been forced to cut those same ties. It can be assumed that the United States would attempt to re-build those ties with OPEC or forge new ties with other oil-producing countries which it didn't have ties with before. In the end, just as with the previous alternate future, the U.S. would put more energy and money into research and development of alternate fuel and energy sources such as solar, wind, hydroelectric, natural gas, etc.

**Focal Events and Indicators for Scenario 1, Alternate Future 1**

Again, the focal events and indicators for this particular alternate future will be the same as the above mentioned scenario because the United States, when cut off from the world's oil supplies, would most certainly look inward towards its own oil reserves as well as putting more emphasis on alternate fuel research and development. In order for this future to occur the following focal events would have to happen.

<u>Focal Events:</u>

- International ill-favor with the United States spreads among the major oil producing countries in the world

- The U.S. economy is bad enough where the loss of U.S. oil imports would not drastically hurt international oil-producing countries
- The U.S. can no longer afford to import as much oil from other nations/OPEC due to the rise in world-wide oil prices
- The economies of China, Japan, Russia and European countries gain momentum and can make up for the loss of the United States no longer paying for oil from OPEC member nations

Indicators:

- Economies of other major world players, i.e. China, Japan, Russia, grow along with their oil usage
- U.S. cannot afford to import as much international oil as it once did
- U.S. focus continues to move towards alternate fuels and away from oil

**Alternate Future #2: U.S. – Cuts Ties, OPEC – Alternate Fuels**

In this alternate future the United States is forced to cut its oil ties with OPEC nations and other non-member, oil producing nations due to OPEC declaring that it would no longer export oil to the United States. While it is a given that OPEC has cut ties with the United States in regards to oil exports, OPEC nations have also decided to put more time and effort, not to mention, money, into the research and development of their own alternate fuels and energy resources. Realizing that the lost income from no longer exporting oil to the United States, as well as the environmental realization that drilling for oil may pose long-term problem for their countries, OPEC nations have opted to pool their money and resources and help each other out to produce more photovoltaic solar cells, wind farms and hydroelectric plants throughout their

countries. The sharing of information becomes a great resource in itself as member nations begin forging better relationships in the energy and alternate fuels categories. This sharing of information begins to filter over to politics and soon these countries are finding ways to better work together on their mutual problems.

The United States, in this scenario, will be forced to act more autonomously, initially not benefiting from the other countries efforts to steer away from oil dependency and information sharing. The U.S. will look inward, focusing its efforts and money on "in-house" oil production as well as its own alternate fuels and energies. Because both sides will be working separately towards the same goals of less oil dependency and more alternate fuels development, in the end the information sharing will extend to the United States.

**Focal Events and Indicators for Scenario 1, Alternate Future 2**

This scenario seems a bit more idealized than the other two and for this to take place the following focal events and indicators would have to occur.

Focal Events

- OPEC/oil producing countries realize it is financially beneficial to them to stop exporting oil to the U.S.
- OPEC/oil producing countries realize the environmental and long-term financial benefits of developing alternate fuels and energy sources
- OPEC/oil producing countries realize that by working together and sharing information they can achieve more than on their own

Indicators

- OPEC/oil producing nations cut fuel ties with the United States
- OPEC/oil producing nations begin talks concerning alternate fuels and energy, with the noticeable exclusion of the United States
- International research and development of alternate fuels and energy commences

**Alternate Future #6: U.S. – Alternate Fuels, OPEC – Status Quo**

In this alternate future OPEC and other non-member, oil producing countries have decided to cut ties with the United States and discontinue oil exports to the U.S. Other than cutting those ties OPEC nations have continued on, keeping the status quo. While they have lost a large customer in the United States, with the downturn of the U.S. economy and the international hatred towards the U.S., cutting them off from oil exports doesn't have the OPEC member nations worried. With the continued rise of major world powers and their economies, countries such as China, Japan and Russia, along with European countries, should offset the loss of the United States as a customer.

The United States, having been cut off from foreign oil imports, will focus more time and money on the research and development of alternate fuels and energy sources. The initial costs of this venture will reach into the billions of dollars but should benefit the country in the long-term. The Department of Energy will most likely get more money in order to conduct more research and development in the alternate fuels categories since the U.S. government will no longer be spending money on the import of foreign oil.

**Focal Events and Indicators for Scenario 1, Alternate Future 6**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- OPEC/oil producing countries begin talking more with China, Japan and Russia in regards to oil exportation to those countries
- The U.S. is left out of certain talks regarding OPEC imports/exports

Indicators

- OPEC/oil producing countries begin to pull away from the United States, somewhat politically but not overtly
- Price in oil begins to rise to a point that is too much for the United States to pay

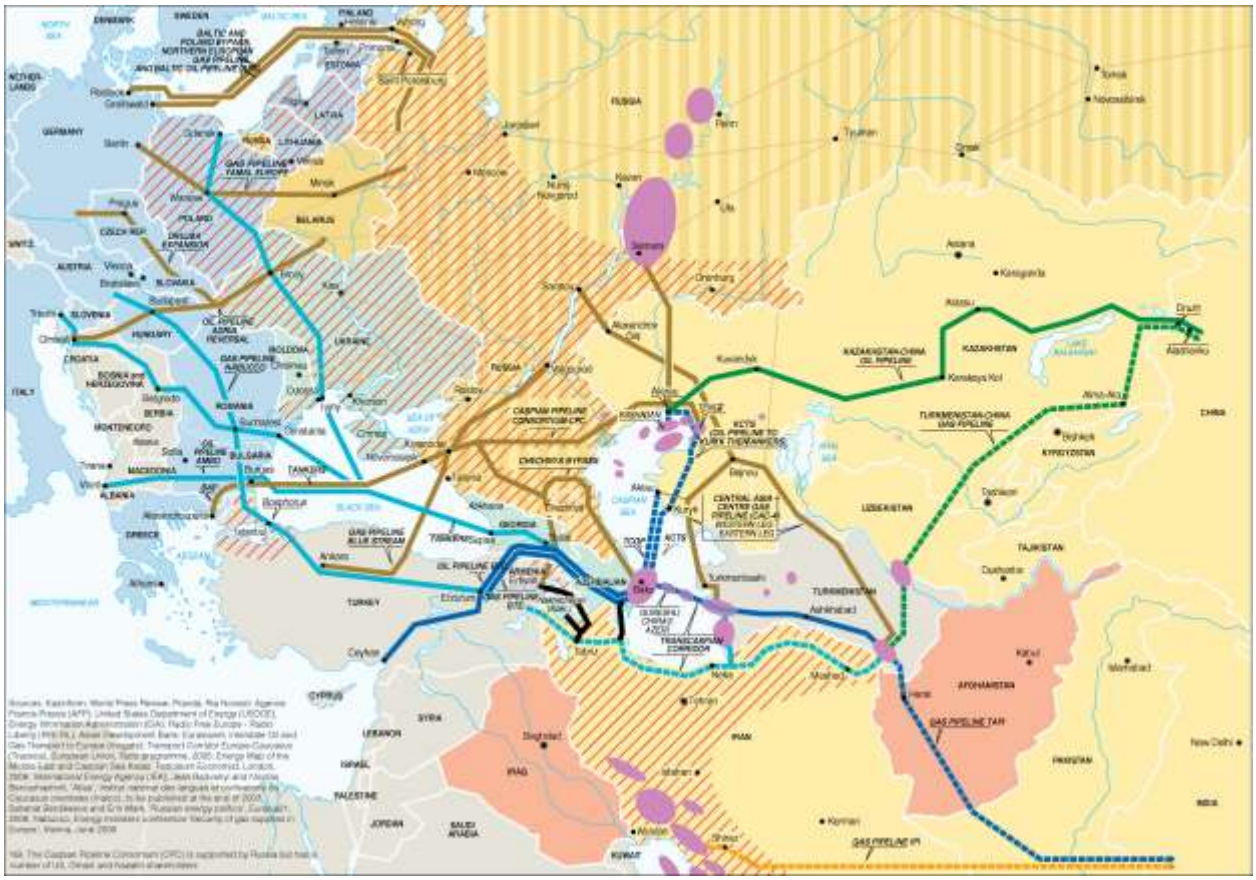
**Scenario Two:**

Scenario 2 involves terrorists, presumably from various international terrorist organizations, blowing up and thus destroying major oil pipelines and ports around the world, specifically in the Middle East and Russia, to include Afghanistan, Kazakhstan and other parts of Southwest Asia. Terrorist networks, al-Qaida for example, realize that the United States is hugely dependent upon the import of foreign oil and they also realize that the emerging oil markets in central Asia, Kazakhstan and Turkmenistan for example, could help the U.S. with its oil dependency. In an effort to stifle all things Western and American, the terrorist networks have found the key nodes of the emerging central Asian pipelines, as well sea ports from which the oil is shipped from, and have destroyed significant portions of each. Some background of the area and its potential importance to the United States follows.

In 2007 Kazakhstan exported only 19,000 bbl/d of oil to the United States, yet it is important to the world energy markets because it has significant oil and natural gas reserves. "After years of foreign investment into the country's oil and natural gas sectors, the landlocked central Asian state has recently begun to realize its enormous production potential. Major oil production growth is expected in the next decade from Kazakhstan. Existing production from the Tengiz field is expected to double and the Kashagan field will add an additional 1 million bbl/d after 2011. Construction of oil export infrastructure is a critical component of sustained growth from the country" (2).

Currently the U.S. and European Union are seeking to establish supply lines across the southern Caucasus, the Black Sea and Turkey, thus avoiding Russian and Iranian territory (although the Europeans are considering a gas pipeline across the north of Iran). Russia is trying to control the oil and gas routes across transit countries (Georgia, Ukraine, Belarus, Hungary and Poland). On 12 May 2007 it signed an agreement with Turkmenistan and Kazakhstan to renovate the CAC-4 gas pipeline, thus spoiling competing western plans. It has also commissioned a gas pipeline allowing it to bypass Chechnya. Finally, Russia could neutralize the Ukraine, Poland and the Baltic states as transit countries by joining in the construction of gas and oil pipelines across the Baltic Sea (with direct access to the German market) and from Burgas to Alexandropouli. Additionally, Azerbaijan insists on bypassing its neighbor Armenia, with which it still has a conflict (3). This information is all depicted in the below graphic.

(2) Energy Information Administration. Department of Energy. Kazakhstan Energy Profile. 2009. http://tonto.eia.doe.gov/country/country_energy_data.cfm?fips=KZ
(3) United Nations Environment Programme (UNEP). Major Oil Pipelines Projects. 2007. http://maps.grida.no/go/graphic/major-oil-pipeline-projects




**Alternate Future #4: U.S. – Alternate Fuels, OPEC – Alternate Fuels**

Due to the fact that terrorist networks have blown up key nodes of potential oil sources and reserves, the United States will continue to import from other countries as they have been doing, specifically OPEC member nations. Realizing that these resources won't always be around and that much of the U.S.' imported oil comes from unstable countries, the United States begins to focus more time, effort and money into the research and development of alternate energies and fuel sources. Along with the United States, OPEC member nations, as well as other non-member nations, begin to look into the research and development of alternate energy and fuel sources, realizing that their own oil supplies will soon dwindle and that one of their largest

customers, the United States', economies isn't doing so well and that they are beginning to spend what money they do have on alternate energy and fuel sources as opposed to spending it on foreign oil.

**Focal Events and Indicators for Scenario 2, Alternate Future 4**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- U.S. military forces stay in primarily Muslim, conservative Islam, nations where terrorist networks are located
- Terrorist networks amass enough people, power, firepower, in order to pull off a coordinated, concerted effort to blow up and destroy major oil pipelines and ports through the oil-producing world

Indicators

- Intelligence groups start receiving information indicating that a large-scale attack could be happening soon
- Construction of major oil pipelines in conservative Islamic states continues/is heightened

**Alternate Future #5: U.S. – Alternate Fuels, OPEC – Cuts Ties**

This alternate future is much like that above stated one except that instead of focusing their time, effort and money on the research and development of alternate energy and fuels, OPEC nations and non-member nations cut all ties to the United States. For fear of continued

hostilities towards their oil production, OPEC has decided to cut ties with the United States based on their assessment that the terrorist network(s) responsible for the oil pipeline attacks, were primarily trying to attack U.S. interests as opposed to OPEC interests. The United States on the other hand, has continued to turn their attention and efforts towards the production of alternate fuels.

**Focal Events and Indicators for Scenario 2, Alternate Future 5**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- U.S. military forces stay in primarily Muslim, conservative Islam, nations where terrorist networks are located
- Terrorist networks amass enough people, power, firepower, in order to pull off a coordinated, concerted effort to blow up and destroy major oil pipelines and ports through the oil-producing world

Indicators

- Intelligence groups start receiving information indicating that a large-scale attack could be happening soon
- Construction of major oil pipelines in conservative Islamic states continues/is heightened

**Alternate Future #6: U.S. – Alternate Fuels, OPEC – Status Quo**

In this alternate future the United States has decided to focus even more on research and development of alternate energy and fuel sources. Because the oil extracted and produced by OPEC member nations comes from their own countries and these countries don't currently have as much at stake in the central Asian oil market, where the majority of the pipeline attacks occurred, OPEC nations are able to maintain their status quo. Production of oil in OPEC nations and other nations where an oil pipeline hasn't been attacked are able to maintain their everyday operations of oil extraction and production without much concern paid to the oil pipeline attacks.

**Focal Events and Indicators for Scenario 2, Alternate Future 6**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- U.S. military forces stay in primarily Muslim, conservative Islam, nations where terrorist networks are located
- Terrorist networks amass enough people, power, firepower, in order to pull off a coordinated, concerted effort to blow up and destroy major oil pipelines and ports through the oil-producing world

Indicators

- Intelligence groups start receiving information indicating that a large-scale attack could be happening soon
- Construction of major oil pipelines in conservative Islamic states continues/is heightened

**Alternate Future #2: U.S. – Cut Ties, OPEC – Alternate Fuels**

In this alternate future the United States has decided to cut all ties with foreign oil suppliers based on the terrorist attacks on the oil pipelines and sea ports. With the fear of more attacks on their foreign fuel interests, the U.S. government has decided to focus inward to developing nationally-based, potential oil fields as well as focusing on other types of fossil fuels such as coal and natural gas. The U.S. will also focus its energy more towards the development of alternate fuels and energy sources within its borders. Member nations of OPEC realize that although the terrorist attacks on the oil pipelines and sea ports don't necessarily affect them, future attacks could. In order to defer potential future attacks on their interests as well as waning U.S. interest in continued import of foreign oil, OPEC member nations have decided to focus more time and money on the research and development of alternate energy and fuel sources.

**Focal Events and Indicators for Scenario 2, Alternate Future 2**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

<u>Focal Events</u>

- U.S. military forces stay in primarily Muslim, conservative Islam, nations where terrorist networks are located
- Terrorist networks amass enough people, power, firepower, in order to pull off a coordinated, concerted effort to blow up and destroy major oil pipelines and ports through the oil-producing world

Indicators

- Intelligence groups start receiving information indicating that a large-scale attack could be happening soon
- Construction of major oil pipelines in conservative Islamic states continues/is heightened

**Scenario Three:**

In this scenario the suspected large oil deposits in Eastern Siberia prove to be true and the Russian Ministry of Natural Resources 2005 estimate that the Eastern Siberian provinces oil reserves totaled 4.7 billion barrels were right on target (4). The Russian government has decided that they will export 100% of the oil extracted from these Eastern Siberian reserves (at least for the first 10-15 years) as they can live off of the other oil fields they have been extracting for years. Russia will start the extraction/production process for these oil reserves immediately however, the oil will not be ready for export for another 5-8 years. During this waiting period the Russian government and private oil companies will see an influx of outside investors and a huge influx of foreign money into their country. U.S. companies and the government will most likely invest millions to billions of dollars in the development of the Eastern Siberia oil fields for future import to the U.S.

**Alternate Future #8: U.S. – Status Quo, OPEC – Cut Ties**

Due to the fact that the Eastern Siberia oil reserves won't be ready for export until approximately 2014-2017, the United States maintains its current heading in regards to oil

(4) Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Oil.html

importation and alternate fuels research and development. The U.S. will continue to import oil from OPEC nations as well as other non-member nations, as well as producing its own home-based oil in order to keep up with national fuel and energy demands. President Obama's energy focus will continue to be geared towards research and development of alternate fuel and energy sources while also trying to maintain international political ties while trying to pull away from unstable and hostile countries currently supplying the U.S. with oil.

OPEC on the other hand will attempt to cut ties with the United States based on a poor American economy and waning interest in fossil fuels for energy needs. Instead, OPEC will pour money into Russia and the private companies controlling the Eastern Siberia oil fields in the hopes that they will be able to someday profit off of the sale of the oil.

**Focal Events and Indicators for Scenario 3, Alternate Future 8**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- Russia decides to put more money into the development of the suspected Eastern Siberia oil fields/reserves
- The discovery of oil in Eastern Siberia and the decision to produce it for export only
- The American economy continues to decline, forcing OPEC to reconsider its current contracts with the United States

Indicators

- The Russian Ministry of Natural Resources requests more studies to be done on the possibility of oil existing in Eastern Siberia
- The Russian government begins funneling more of its money towards the exploration of Eastern Siberia
- Russia begins building oil pipelines from Eastern Siberia west towards the Caspian Sea and east towards Vladivostok

**Alternate Future #7: U.S. – Status Quo, OPEC – Status Quo**

In this alternate future both the United States and OPEC maintain their current rates of import and export of oil. Realizing that the oil being extracted from the Eastern Siberia oil fields won't be viable and usable until approximately 2014-2017, both sides decide to continue on with existing contracts of importing and exporting oil. The United States, and specifically the Department of Energy, will continue to look for alternate fuels and energies to supplant foreign oil and all fossil fuel needs, while OPEC will continue to export oil around the world.

**Focal Events and Indicators for Scenario 3, Alternate Future 7**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

<u>Focal Events</u>

- Russia decides to put more money into the development of the suspected Eastern Siberia oil fields/reserves
- The discovery of oil in Eastern Siberia and the decision to produce it for export only

Indicators

- The Russian Ministry of Natural Resources requests more studies to be done on the possibility of oil existing in Eastern Siberia
- The Russian government begins funneling more of its money towards the exploration of Eastern Siberia
- Russia begins building oil pipelines from Eastern Siberia west towards the Caspian Sea and east towards Vladivostok

**Alternate Future #5: U.S. – Alternate Fuels, OPEC – Cut Ties**

In this alternate future the United States starts to focus more on the research and development of alternate fuels and energy sources. Because the oil from the Eastern Siberia fields won't be ready for export until approximately 2014-2017 the United States government is not going to bank on that being the savior to the U.S. energy and fuel needs. While private U.S. companies most likely will invest in the future of the Eastern Siberia oil fields the U.S. government again, will focus on building on the green energy and green fuels base that the DOE and other private companies have started.

OPEC will realize that one of their largest customers, the United States, is trying to back away from being so dependent upon fossil fuels. They will decide to "cut and run," cutting oil ties with the U.S. to instead focus on developing the oil fields in the Eastern Siberia region. Realizing they could make a profit from the oil extracted there if they were on the ground floor of the operation.

**Focal Events and Indicators for Scenario 3, Alternate Future 5**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- Russia decides to put more money into the development of the suspected Eastern Siberia oil fields/reserves
- The discovery of oil in Eastern Siberia and the decision to produce it for export only
- The American economy continues to decline, forcing OPEC to reconsider its current contracts with the United States
- The United States decides to focus less on the import of fossil fuels from other countries and more on developing green energy and fuels at home

Indicators

- The Russian Ministry of Natural Resources requests more studies to be done on the possibility of oil existing in Eastern Siberia
- The Russian government begins funneling more of its money towards the exploration of Eastern Siberia
- Russia begins building oil pipelines from Eastern Siberia west towards the Caspian Sea and east towards Vladivostok

**Alternate Future #6: U.S. – Alternate Fuels, OPEC – Status Quo**

This alternate future is much like the one just mentioned, the United States will realize that whatever oil is to be extracted and produced from Eastern Siberia, it won't be in the near

future and may not help the United States in its long-term goals of ridding itself from fossil fuels as its primary means of energy and fuel. The U.S. will focus more money, time and effort into the research and development of green energy programs. OPEC on the other hand, will maintain its current contracts with its customers also realizing that whatever oil is to be extracted from Eastern Siberia won't be right away. Both sides will likely look into investment opportunities with the Eastern Siberia oil fields but won't put all their eggs in that basket.

**Focal Events and Indicators for Scenario 3, Alternate Future 5**

In order for the above alternate future to occur the following focal events must take place. Indicators that this alternate future will occur follow the focal events.

Focal Events

- Russia decides to put more money into the development of the suspected Eastern Siberia oil fields/reserves
- The discovery of oil in Eastern Siberia and the decision to produce it for export only

Indicators

- The Russian Ministry of Natural Resources requests more studies to be done on the possibility of oil existing in Eastern Siberia
- The Russian government begins funneling more of its money towards the exploration of Eastern Siberia
- Russia begins building oil pipelines from Eastern Siberia west towards the Caspian Sea and east towards Vladivostok

**Conclusion:**

The United States is currently hugely dependent upon foreign oil imports, importing approximately 10,000+ bbl/d while also producing approximately 8,000+ bbl/d for in-house use. Presently, the U.S. imports oil from such well-known and unstable countries as Iraq, Kazakhstan, Turkmenistan, Venezuela and Libya. Of the monthly import of approximately 350,000 barrels of oil, about half (~43%) comes from the eleven OPEC-member nations; Algeria, Angola, Ecuador, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela. While OPEC may no longer be able to control world oil prices like they were once able to do, the organization is still in control of much of the world's viable, and reachable, oil supplies.

The U.S. Department of Energy has been researching and developing new fuel and energy sources in which the United States can move away from its dependency on foreign oil. This research and development is fully backed by President Barack Obama who recently (April 2009) approved the American Recovery and Reinvestment Act which plans to double alternative energy production over the next three years. Alternate fuel and energy sources consist of photovoltaic solar cells (of which the largest system in North America is currently in use at Nellis Air Force Base, Las Vegas, Nevada), wind energy (wind farms are currently located throughout the American mid-west, with a large portion located right in West Texas), hydroelectric power, natural gas (deposits are located throughout the United States). Although the U.S. is trying to move away from fossil fuels there are numerous coal, natural gas and oil deposits throughout the country, while not being able to completely replace current foreign oil imports, they would be able to offset the need quite a bit until alternate energy and fuel sources were at a sustainable level for use by all of the country.

In short, there are many different avenues which the United States can take in order to lower its dependency upon foreign oil as a primary energy/fuel source. While completely withdrawing from the import of foreign oil will likely not happen, given the political and world economic ramifications, pulling away from importing from hostile and unstable countries should be the primary energy concern for the U.S. government. There are presently untapped, potential oil reserves right in the United States along with natural gas and coal deposits. There is also a multitude of alternate energy/fuel sources currently in use and others in the research and development stages. The current U.S. economy may not be ready for more investments in the areas of alternate fuel and energy research and development however, in the near future the government will need to make an even bigger effort with and investment in alternate fuels and energy. While the "green movements" around the U.S. are starting to gain momentum, the American need for fuel likely won't dissipate much in the future.

**References:**

Alvarez, Robert. Is the Energy Department Ready to Reboot the Country? Institute for Policy Studies. 27 March 2009. http://www.ips-dc.org/articles/is_the_energy_department_ready_to_reboot_the_country

Analytic Service Inc. (ANSER). The Lockwood Analytic Method for Prediction (LAMP): An Innovative Methodological Approach to the Problem of Predictive Analysis (PowerPoint). 15 January 2002

British Petroleum. Table of World Oil Production. http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/publications/energy_reviews_2006/STAGING/local_assets/downloads/pdf/table_of_world_oil_production_2006.pdf

Chapter I, Article 2 of The Statute of the organization of the Petroleum Exporting Countries (as amended)

Cohen, Ariel. Reducing U.S. Dependence on Middle Eastern Oil. 7 April 2006. http://www.heritage.org/research/features/nationalsecurity/bg1926.cfm

DOE Environmental Information Administration. 2009 Energy Conference. April 2009. http://www.eia.doe.gov/conference/2009/plenary/Chu.pdf

DOE Environmental Information Administration. Country Analysis Briefs. 2009. http://www.eia.doe.gov/emeu/cabs/index.html

EERE News: DOE Requests $2.3 Billion for Efficiency, Renewable Energy in FY 2010". Apps1.eere.energy.gov. 13 May 2009. http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=12509

Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Oil.html

Energy Information Administration (EIA). U.S. Imports by Country of Origin. 2009. http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_m.htm

Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Background.html

Energy Information Administration (EIA). Country Analysis Brief: Russia. 2009. http://www.eia.doe.gov/emeu/cabs/Russia/Oil.html

Energy Information Administration. Department of Energy. Kazakhstan Energy Profile. 2009. http://tonto.eia.doe.gov/country/country_energy_data.cfm?fips=KZ

General Electric. GE Global Research: Energy. 2009. http://www.ge.com/research/grc_2_1_1.html

GE Oil & Gas. General Electric. 2009. http://www.ge.com/products_services/oil_gas.html

GE Oil & Gas. General Electric. 2009. http://www.gereports.com/ge-wins-250-million-offshore-drilling-contract-in-brazil/ ; http://www.geoilandgas.com/businesses/ge_oilandgas/en/about/press/en/2009_press/120109.htm

Green Car Congress. Alaska North Slope Production Dropping Faster Than Anticipated. 20 March 2006. http://www.greencarcongress.com/2006/03/alaska_north_sl.html

Hammes, David and Wills, Douglas. "Black Gold: The End of Bretton Woods and the Oil-Price Shocks of the 1970s." The Independence Review, v. IX, n. 4. 2005.

Makower, Joel. Ecomagination: Inside GE's Power Play. World Changing. 8 May 2005. http://www.worldchanging.com/archives/002669.html

United Nations Environment Programme (UNEP). Major Oil Pipelines Projects. 2007. http://maps.grida.no/go/graphic/major-oil-pipeline-projects

U.S. DOE. Wind and Hydropower Technologies Program. 2009. http://www1.eere.energy.gov/windandhydro/

U.S. DOE. Solar Energy Technology Program. 2009. http://www1.eere.energy.gov/solar/

U.S. Department of Energy. Energy Sources: Oil. 2009. http://www.energy.gov/energysources/oil.htm

USGS. Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis. April 2001. http://pubs.usgs.gov/fs/fs-0028-01/fs-0028-01.pdf