



Fuel Scorecard 2010



Electricity	0.12	0.02	8.05	0.66	1.20	10.05
Ethanol	0.10	0.04	3.90	0.12	8.90	13.06
Natural Gas	0.45	0.06	3.56	0.58	9.50	14.15
Oil	3.37	1.96	6.74	3.72	13.40	29.19



Truman National Security Project

2010 Fuel Scorecard

Introduction:

America's energy posture matters for national security. Everyday choices like how we fuel our cars can bolster regimes hostile to American interests and values and feed the coffers of terrorist organizations fighting against us. Meanwhile, spikes in fuel cost and the volatility of supply lines bear the potential to wreak havoc on our economy. In the face of a national job crisis, another OPEC oil crisis would be catastrophic.

The United States' current reliance on oil directly supports a number of weak, unstable regimes that provide fertile ground for radicalization. Beyond fueling our enemies, America's current fuel posture contributes to climate change—now firmly recognized as a contemporary national security threat. According to the Department of Defense, climate disruption “may act as an accelerant of instability or conflict” by “contributing to poverty, environmental degradation, and the further weakening of fragile governments.”¹

The CIA has created the Center on Climate Change and National Security; the navy is planning now for how to handle the loss of sinking island bases; and India has constructed a fence to prevent the entrance of “climate change” refugees from Bangladesh. The recent floods in Pakistan—where more than one-fifth of the population was uprooted—clearly illustrate what is at stake. In this volatile, nuclear armed country, violent extremists were ominously among the first responders.

“Except for our own Civil War, [the war on terror] is the only war that we have fought where we are paying for both sides. We pay Saudi Arabia \$160 billion for its oil, and \$3 or \$4 billion of that goes to the Wahhabis, who teach children to hate. We are paying for these terrorists with our SUVs.”

- R. James Woolsey, former Director of Central Intelligence

The price of America's energy posture is greater than any mere price at the pump. It has significant national security implications. American citizens and policymakers deserve to make informed decisions. The scorecard included here details this wider set of security costs associated with four means of fueling automobiles (oil, natural gas, ethanol, and electricity) and ranks them accordingly.

Among the fuel sources assessed here—all with a mix of relative benefits and shortcomings—oil clearly stands out as the most harmful for U.S. national security overall. Across each of our national security metrics, oil ranks in a league of its own. It is high time American consumers and policymakers recalculate their routines, and begin to move America towards an energy posture that does not undermine our nation's security. Ethanol—particularly second generation ethanol – electricity, and natural gas can all play roles in a more secure America.

Instability of Supplier Countries:

Importing fuel supplies from unstable countries means inevitable instability of supply. Supporting failed and failing states means supporting safe havens for crime and terrorist

¹ Department of Defense, “Quadrennial Defense Review Report,” February 2010.

networks. When unstable countries are the primary source of a major commodity that can be controlled by a small number of individuals, the “rents” from this commodity further contribute to instability.

States with large oil supplies and reserves are more likely to experience high levels of corruption, have little or no democratic accountability, and tend to lack fiscal transparency.² Regimes in fragile and weak states often use oil profits to entrench the authority of small groups of ruling elites, as opposed to contributing to the general welfare of society.³

Instability of Supplier Country			
Electricity	Ethanol	Natural Gas	Oil
0.12	0.10	0.45	3.37

Moreover, the price of oil is set globally through a combination of demand, market conditions, and decisions made by major suppliers. This means that by purchasing oil from *anywhere*—even Canada—the United States finances all oil-supplying nations, including governments such as Iran. As the demand driver for one-quarter of the global market, American demand goes a long way to drive up prices. In 2008, when oil prices were particularly high, oil revenue comprised 60% of Iran’s GDP.

For each of these fuels, reserve supplies must also be taken into account. With oil, reserve suppliers play a significant role in price setting and therefore must be considered as equal beneficiaries of U.S. demand. With natural gas, ethanol, and electricity, we need to consider the economies helped by growth in each of these markets. These factors will be measured fully in the second version of this scorecard.

For financing state instability, nothing tops oil. While the majority of U.S. oil supplies are domestic or are imported from Canada, the U.S. still depends on regimes such as Saudi Arabia, Venezuela, and Nigeria for a significant portion of its supply – and unstable OPEC nations have control of major oil reserves. Ethanol, electricity, and natural gas are, for the most part, produced domestically – and their growth markets are also either domestic or in more stable countries.

Opposes American Values:

Of the nine top oil-exporting countries in the world, eight are autocracies. Norway is the only exception.⁴ In fact, every single nation that depends on oil for more than 60% of its national income—22 countries in total—is a dictatorship or autocratic monarchy.⁵

² Morton Halperin, Joe Siegel, and Michael Weinstein, *The Democracy Advantage: How Democracies Promote Prosperity and Peace*, (New York: Routledge, 2004); Paul Collier, "Natural Resources, Development and Conflict: Channels of Causation and Policy Interventions," World Bank, 2003.

³ Deutch, John and James R. Schlesinger, “National Security Consequences of U.S. Oil Dependency,” p. 28. Retrieved September 12, 2010 from: www.cfr.org/content/publications/attachments/EnergyTFR.pdf.

⁴ Michael L Ross, “Does Oil Hinder Democracy?” *World Politics*, 53:3, April 2001. Canada is the tenth largest oil exporter.

⁵ Larry Diamond, *The Spirit of Democracy: The Struggle to Build Free Societies Throughout the World*, (New York: Henry Hold and Co. 2008), pp. 76.

Buying oil from autocracies often means using one hand to fund regimes that undermine us, and then using the other to fund our military and diplomats to fight them. Autocracies have been proven more likely to go to war with other countries and to impoverish their own citizens. Moreover, autocratic governance and the lack of democratic outlets for expression have been identified as key contributing factors to terrorism. In their 2003 article, “Education, Poverty, and Terrorism,” Alan Krueger and Jitka Maleckova find that “the only variable that was consistently associated with the number of terrorists was the Freedom House index of political rights and civil liberties.”⁶ When the U.S. allies with and supports such repressive states, their security risk becomes ours.

Opposes American Values			
Electricity	Ethanol	Natural Gas	Oil
0.02	0.04	0.06	1.96

Freedom House classifies five of the world’s top ten oil producers as “Not Free,” and two more as only “Partly Free.” Iran – the world’s fourth largest producer of oil – is, according to the U.S. State Department, also the world’s foremost state sponsor of terror.

The major natural gas producers are slightly more in line with American values. Half of the top ten are considered “Free” by Freedom House and the remaining five are considered “Not Free.” However, because gas is not a global commodity, America’s purchase of gas does not enrich all gas-supplying countries. When we look at the suppliers of natural gas to the United States, four are “Free” and two are “Not Free.” Moreover, due to the discovery of technologies that extract gas from shale, it is likely that most of America’s natural gas will emanate from domestic sources in the future.

Ethanol producers also rank much better in this category. China is the only “Not Free” nation in the top ten world producers according to Freedom House. Since the price of ethanol is set by a mix of global factors and tariffs, demand alone does not drive price. Of those countries that supply the United States with ethanol and those countries whose ethanol sectors are expanding, making them more likely to provide supplies in the future, five are “Free” and none are “Not Free.”

Climate Disruption:

By augmenting severe weather events, climate change is creating a world with a greater number of displaced people who are more vulnerable to exploitation by radical elements. Extremist groups have a record of taking advantage of circumstances created by droughts, floods, and famines and using charities to infiltrate such populations. Climate disruption thereby enhances the possibility of terrorist recruitment, training, and operations.

Moreover, severe weather in its own right causes civil unrest, mass migration, and destabilization in weak states, often begging assistance from the U.S. military in extreme cases such as in Haiti and Pakistan just this year. While frequent intervention is costly for

⁶ Krueger, Alan and Jitka Maleckova, “Education, Poverty, and Terrorism,” *Journal of Economic Perspectives*, Vol. 17, No. 4, Fall 2003: pp. 119-144. Retrieved September 15, 2010 from: <http://www.krueger.princeton.edu/terrorism2.pdf>.

the United States' volunteer military, U.S. failure to intervene would cause a loss for American legitimacy.

Natural gas is undoubtedly the cleanest burning fossil fuel.⁷ In terms of climate disruption, electricity generation is the most harmful. Electricity accounts for 30% of U.S. greenhouse gas emissions, primarily from the burning of conventional coal.⁸ New, renewable sources of electricity (i.e. solar, wind, etc.)

Climate Disruption			
Electricity	Ethanol	Natural Gas	Oil
8.05	3.90	3.56	6.74

generate much cleaner power than burning coal, but these technologies are not currently in use at a scale that would displace fossil fuels. Moving our electricity grid to less carbon-intense fuels, possibly through power payback laws (often called feed-in tariffs) could jumpstart renewable energy businesses by compensating producers for the energy they sell back to the grid. Such action is necessary if we are to make electricity a more secure option for transportation “fuel” over the long term, by moving to a greater electric car fleet.

Ethanol's effects on the climate depend on the precise type of ethanol fuel used (grain vs. cellulosic). The carbon intensity level of cellulosic “second generation” ethanol is significantly preferable to that of grain ethanol. Sugar ethanol uses less carbon than corn ethanol. Ethanol itself burns more cleanly than oil-based gasoline by as much as 60-80%.⁹ Such numbers, however, need to be handicapped by a fuel's total life cycle – the full cost of changing land use, extraction, transportation, etc. In version 2.0 of this report, we will include metrics that gauge total life cycle carbon costs of each fuel. Some studies report that over a 30-year period, ethanol may have a total lifecycle cost that could be twice as significant as oil-based gasoline.¹⁰

Possible Threat to Supply Chain:

Supply disruptions can have severe effects on the U.S. economy. The further each source has to travel to enter the American market, the more vulnerable it is to transportation accidents, pilferage, strong storms and natural disasters. Other supply chain disruptions can be intentional. Terrorist attacks are only one form of intended supply-chain disruption. The long lines for gas generated by the OPEC oil embargo in the 1970s remain notorious across the United States. The effects of such disruption today would be far worse. In

Possible Threat to Supply Chain			
Electricity	Ethanol	Natural Gas	Oil
0.66	0.12	0.58	3.72

⁷ Beddor, Christopher, Winny Chen, Rudy deLeon, Shiyong Park, and Daniel J. Weiss, “Securing America’s Future: Enhancing Our National Security by Reducing Oil Dependence and Environmental Damage,” p. 12. Retrieved September 12, 2010 from: http://www.americanprogress.org/issues/2009/08/securing_future.html.

⁸ Ibid., p. 13.

⁹ Pew Center on Global Climate Change, “Climate TechBook: Ethanol,” p. 2. Retrieved September 12, 2010 from: <http://www.pewclimate.org/docUploads/Ethanol-Fact-Sheet.pdf>.

¹⁰ Harris, Richard, “Study: Ethanol Worse for Climate than Gasoline.” Retrieved September 12, 2010 from: <http://www.npr.org/templates/story/story.php?storyId=18784732>.

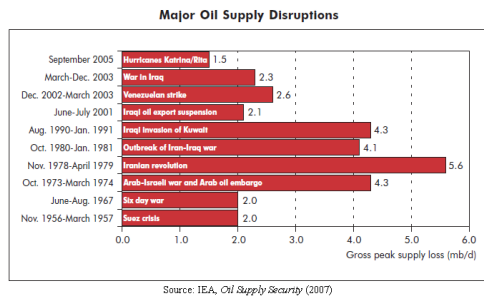
1978, the U.S. imported just 30% of the oil we consumed.¹¹ 30 years later, the U.S. imports 66% of its oil.¹²

The OPEC cartel creates a particularly significant security threat because of its ability to withhold oil from the global market, regardless of where we source our oil. While 50% of the U.S. oil supply comes from OPEC nations the cartel possesses even greater power, due to its control over global supplies and reserves.¹³

It is estimated that OPEC controls 70% of global oil reserves and 40% of daily oil supplies. A great majority of product supply in OPEC nations comes from National Oil Companies, not private corporations. National Oil Companies control between 78% and 90% of global oil reserves,¹⁴ and they rarely respond to market forces.¹⁵ As a result, global oil supplies are characterized more by volatility than by predictability, and we face significant supply chain risk from purely political causes.

“We bled [Russia] to the point of bankruptcy. So if we were able to do it to the Russians, we can now do it to the Americans, and the best way to do it is to go after their Achilles heel and attack oil.”
 - Osama bin Laden

Our energy supply has also been identified as a weakness by our enemies. Osama bin Laden said the best way to attack America “is to go after their Achilles heel and attack oil.”¹⁶ Bin Laden’s cohorts have called for similar focus. In *The [Islamic] Laws of Targeting Petroleum-Related Interests and a Review of the Laws Pertaining to the Economic Jihad*, a 2004 manifesto, author Shaykh Abdullah bin Nasser al-Rashid said that targeting the global energy infrastructure will lead to higher oil prices and less energy security for the West.¹⁷



Terrorist networks have heeded these words. The Institute for Information Infrastructure Protection reports that there were 330 terrorist attacks in 159 countries on oil and gas infrastructure from 1990 to 2005. Most of those attacks were on pipelines (247) and

¹¹ Luft, Gal. “The World Oil Crisis: Implications for Global Security and the Middle East.” Jerusalem Issue Brief, vol. 5, no. 7. October 16, 2005. Retrieved September 12, 2010 from: <http://www.jcpa.org/brief/brief005-7.htm>.

¹² Beddor, et al., p. 7.

¹³ Ibid, p. 5.

¹⁴ Electrification Coalition, “Electrification Roadmap: Revolutionizing Transportation and Achieving Energy Security,” November 2009: p. 28. Retrieved September 14, 2010 from: <http://www.electrificationcoalition.org/electrification-roadmap.php>.

¹⁵ Deutsch, et al., p. 19.

¹⁶ Gal

¹⁷ Giroux, Jennifer and Caroline Hilpert, “The Relationship Between Energy Infrastructure Attacks and Crude Oil Prices,” Journal of Energy Security, October 27, 2009. Retrieved September 12, 2010 from: http://www.ensec.org/index.php?option=com_content&view=article&id=216:the-relationship-between-energy-infrastructure-attacks-and-crude-oil-prices&catid=100:issuecontent&Itemid=352.

refineries (36).¹⁸ As much as 1 million barrels per day have been taken out of the global oil market by terrorist attacks alone.¹⁹

Since 2005, the rate of attack by terrorists has risen. In Iraq alone, there were over 400 terrorist attacks and sabotage operations targeting the oil and gas sector from 2003 to 2007.²⁰ Similarly, military convoys have become targets for insurgents: 50% of military convoys in Iraq and Afghanistan are for fuel. As a result of al Qaeda and its affiliates' stated goal to attack global oil and gas supplies and the military's long-tail fuel convoys, the military has endured one casualty for every 24 convoys in Iraq and Afghanistan.²¹

Global oil and gas supplies have to travel through vulnerable chokepoints – narrow channels along widely used global sea lanes – to reach the U.S. market. The Energy Information Administration reports that 51% of global oil supplies travel through at least one chokepoint. Approximately 20% of world oil supply travels through the Strait of Hormuz in the Middle East alone. Another 18% travels through the Strait of Malacca in Southeast Asia. Supplies traveling through these chokepoints are vulnerable to attacks by pirates, terrorists, or others intent on driving up price and increasing supply volatility.²²

In version 2.0 of this report, we will include a metric that accounts for transit chokepoints, however, we expect these findings to simply exacerbate the tendencies noted in these metrics. Oil remains the fuel that travels through the greatest number of chokepoints. Liquid natural gas travels through chokepoints like oil, but the threat to U.S. supply is reduced because 98% of natural gas consumed in America is produced in the U.S. and Canada. Similarly, 98% of American consumed ethanol is produced in the U.S. and, therefore, is not vulnerable to global transit chokepoints.

Cost Spike Volatility:

Fuel can be, and often is, used as a weapon. Because the world is dependent on fuel, those who produce it can manipulate the market to increase profits.

As stated above, OPEC controls approximately 40% of daily global oil supplies. OPEC nations have previously acted in concert to keep supply low relative to demand. In 1999, OPEC cut production supplies, which led to a spike in prices²³ from which they subsequently profited. In 2008, with oil prices approaching \$150 per barrel, OPEC refused to increase its production levels.²⁴

Cost Spike Volatility			
Electricity	Ethanol	Natural Gas	Oil
1.20	8.90	9.50	13.40

¹⁸ Simonoff, Jeffrey S., Carlos E. Restrepo, and Rae Zimmerman. "Trends for Oil and Gas Terrorist Attacks." Institute for Information Infrastructure Protection, Research Report No. 2, November 2005.

¹⁹ Gal

²⁰ "Insurgent Attacks on Iraq's Oil Sector." Insights, Issue No. 6, August 2007.

²¹ Army Environmental Policy Institute. "Sustain the Mission Project: Casualty Factors for Fuel and Water Resupply Convoys." Final Technical Report, September 2009: p. i.

²² Energy Information Administration. "Country Analysis Briefs: World Oil Transit Chokepoints." Retrieved September 12, 2010 from:

http://www.eia.doe.gov/cabs/World_Oil_Transit_Chokepoints/Full.html.

²³ Deutch et al., p. 1.

Global fuel prices are also vulnerable to geopolitics. Regional instability can significantly affect prices. For example, oil prices spiked in 1990 following Iraq's invasion of Kuwait.²⁵ Global demand is expected to continue to rise as well. The Energy Information Administration predicts global oil consumption will increase from 80.1 million barrels per day in 2003 to 118 million barrels per day in 2030.²⁶

These realities come at great cost to the Department of Defense. From 2004 to 2008, the Defense Energy Support Center's petroleum purchases increased from \$5.9 billion to \$18.1 billion, mostly as a result in price spikes. In 2008, the Department spent \$16 billion on petroleum.²⁷ Furthermore, each \$10 increase in a barrel of oil costs the Department of Defense \$1.3 billion.²⁸

Fuel supplies are even more costly to the Department when the fully burdened cost of fuel is considered. The military purchases fuel at a price between \$2 and \$3 per gallon, but transport to theaters of conflict increase the cost to \$15 per gallon. When protection costs are factored into the total cost of the fuel, the fully burdened cost of fuel for the Department of Defense is close to \$45 per gallon.²⁹

Natural gas has proven to be a less volatile fuel, when historical prices are considered. With much of this fuel produced in the United States, cost rarely spikes with the sort of volatility associated with oil. In fact, the discovery of extraction technologies that can separate gas from shale rock will likely lead to cost reductions throughout the United States. Although shale-gas has environmental externalities that are problematic, they are more of a threat to our water purity than to climate disruption, and therefore do not factor into our security scores. Electricity, which is derived largely from a mix of coal and gas, with some oil, falls in the middle of such volatility scores.

Ethanol has some degree of cost volatility, as its prices are partially predicated on tariffs and price supports, but are also determined by natural circumstances such as crop success in a given year. As ethanol moves from first generation agricultural sources to biofuels based on algae and cellulosic matter, such cost volatility should be reduced.

Conclusion:

American power in the world would be severely compromised by sharp cuts to our fuel power at home. Therefore, smart decisions about fuel sources need to be made now to ensure the safest, strongest America over the long term. Our current reliance on oil—the

²⁴ Beddor et al., p. 5.

²⁵ Bamberger, Robert. "Energy Policy: Historical Overview, Conceptual Framework, and Continuing Issues." CRS Report for Congress RL31720: January 30, 2003, p. 2.

²⁶ Deutch et al., p. 16.

²⁷ Deloitte, "Energy Security: America's Best Defense." Retrieved September 12, 2010 from: <http://www.deloitte.com/us/aerospacedefense/energysecurity>.

²⁸ CNA. "Repowering America's Economy: Energy Innovation at the Crossroads of National Security Challenges," p. 3. Retrieved September 12, 2010 from: <http://www.cna.org/research/2010/powering-americas-economy-energy-innovation>.

²⁹ Deloitte, p. 19.

worst performer in this report—is leaving our country more vulnerable to shock while shoring up the capacity of regimes intent on endangering America’s interests, values, and leadership in the world. While the alternatives present challenges of their own, we cannot make the perfect the enemy of the good. We owe it to future generations to make choices according to the facts and to devote our national resources to power sources that will sustain America’s strength while causing the least harm. We believe that moving America towards new transportation fuel sources that include ethanol – particularly second generation ethanol, natural gas, and electricity is crucial to our country’s national security future. It is high time we get started.