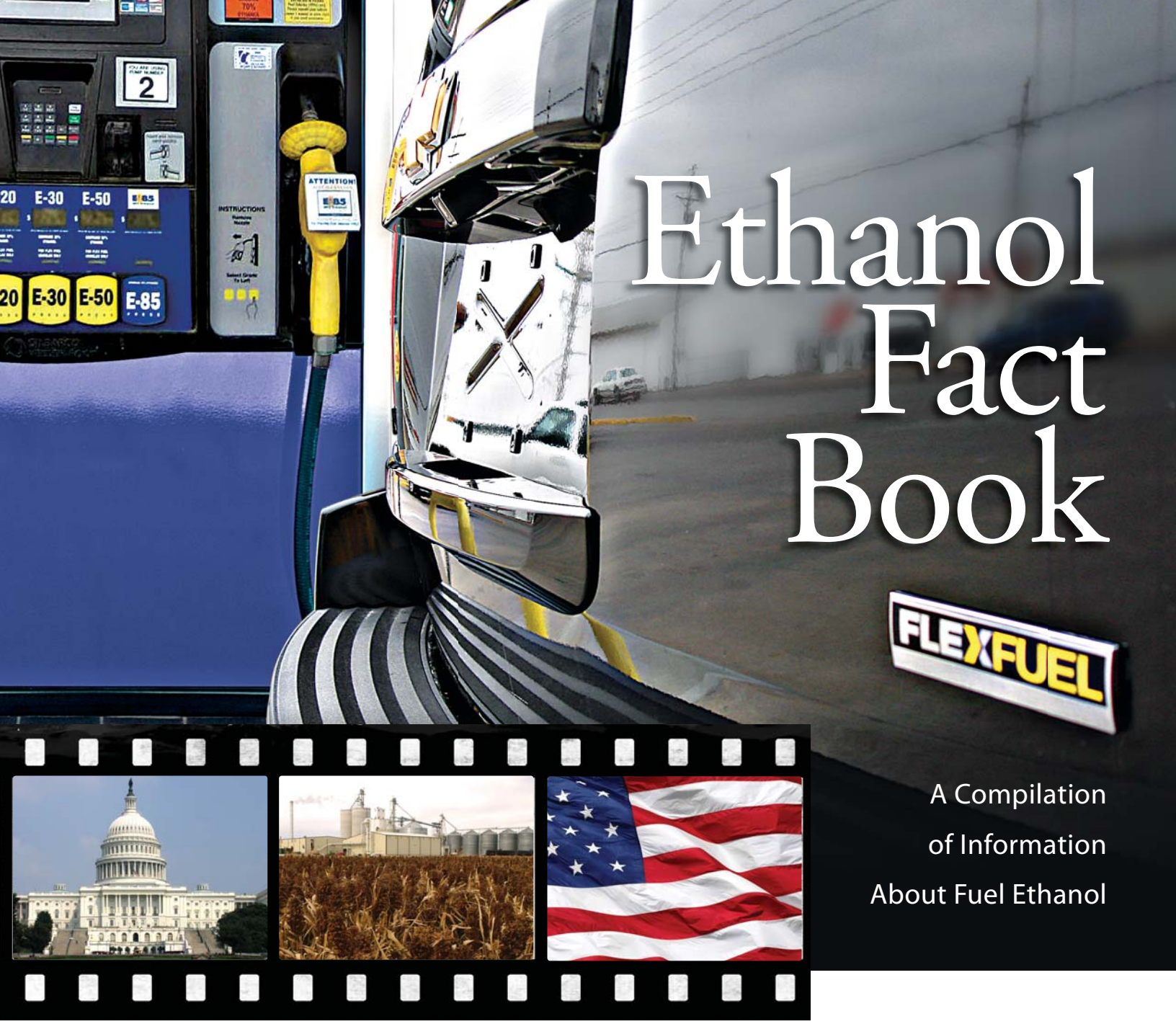

Ethanol Fact Book

A Compilation of Information About Fuel Ethanol

Published by CFDC Clean Fuels Development Coalition

With support from growth energy™ America's Ethanol Supporters

In cooperation with Ethanol Across America

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To Our Readers:

Originally published in 1996, the Ethanol Fact Book is prepared each new Congress to provide public policy makers, industry leaders, the media, related industries, and consumers with a historic and current foundation of peer-reviewed and resource-based knowledge about ethanol.

Since the first Ethanol Fact Book was published, ethanol has assumed an increasingly important role in the American energy mix. The industry has increased annual production capacity to more than 11 billion gallons per year, with billions more under development. These ethanol plants have pumped billions of dollars into the American economy, stemming the massive transfer of wealth to foreign countries resulting from our addiction to oil. In so doing, we have seen a resurgence in rural America. And, along with the ethanol plants springing up from America's cornfields, we are witnessing a technology revolution that promises to dramatically expand the base for ethanol production. Municipal, forest, and agriculture wastes are close to commercial viability as ethanol feedstocks. The efficiency of ethanol production increases every day, with more ethanol being produced and less energy being used to produce it.

This substantial increase in ethanol production has been seamlessly integrated into the motor fuel pool. Every car on American roads can operate on 10% ethanol blends. Ethanol replaces some of the most harmful components of gasoline like benzene, while reducing carbon monoxide emissions. With climate change of paramount concern around the globe, ethanol is sure to play an increasing role in strategies to reduce carbon dioxide (CO_2) emissions. And, there are even more benefits to be realized. With nearly all the nation's gasoline containing ethanol blends, the next critical step will be to fully develop refueling infrastructure and flexfuel vehicles that can operate on up to 85% ethanol. There are nearly 8 million of these FFVs on the road with more being produced every day.

Ethanol is a complex and multifaceted issue that is very often misunderstood and therefore misrepresented. It is often misrepresented by design, and often misunderstood due to time and information resource constraints. The Ethanol Fact Book will provide you with the knowledge to make informed decisions based on the thousands of hours of research that have gone into this document. The Ethanol Fact Book contains over 100 footnotes, references to numerous related organizations, and website links to provide you additional sources for more information.

We would like to acknowledge the member organizations of the Clean Fuels Development Coalition and all of our other sponsors for their support of this important document. Together, we will answer your questions about ethanol tax incentives and production, energy security and oil import reductions, economic impacts and benefits to the Treasury, greenhouse gas reduction and environmental benefits, and advancements in cellulose conversion technologies and flexible fuel vehicle production. We also address many other technical questions and long misunderstood myths about E85, food vs. fuel, energy balances, and the ability of ethanol to positively impact our nation's energy future. The consensus calling for more ethanol is growing everyday. Now in our 23rd year, CFDC will continue to lead the way in driving demand for clean burning renewable fuels like ethanol.

We hope you can join us in this effort!

Sincerely,

Douglas A. Durante; Executive Director
The Clean Fuels Development Coalition
www.cleanfuelsdc.org

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About the *Ethanol Fact Book*

Ethanol Has a Long History of Bipartisan Support

For three decades, every president has supported the increased development and use of ethanol.

"Our overall gasohol program will spur the investments that we, together, must make for a more secure energy future. We will create new markets for our farmers. We will no longer have to throw away waste materials which can be turned into profitable essential fuels."
— President Jimmy Carter, January 11, 1980

"When we took office in 1981 only 75 million gallons of ethanol were being produced. This year more than 450 million gallons will be produced, requiring more than 180 million bushels of corn. It just goes to show there's no limit to what free people can do when the gloom-and-doomers stand aside and get out of the way."
— President Ronald Reagan, August 20, 1984

"Ethanol is a homegrown energy alternative. And ethanol produces a fuel that burns cleaner. And that's good for our environment — just plain and simple, that's good for our environment."
— President George H. Bush, June 13, 1989

"Ethanol production increases farm income, decreases deficiency payments, creates jobs in rural America, and reduces America's reliance on foreign oil."
— President Bill Clinton, October 1996

Finding Common Ground

Ethanol produced from renewable resources has a long history of support from the White House and in the United States Congress. When the transportation sector began the conversion from animal power to the internal combustion engine in the early years of the twentieth century, some federal and state policies failed to reflect two fundamental facts: that crude oil supplies were exhaustible, and that huge quantities of imports could have ruinous effects on the national economy.

In 1973 the United States suffered its first domestic energy crisis directly caused by international forces. With the Arab Oil Embargo of 1973, Americans witnessed the effects of our dependence on imported oil: long lines at gas stations, lost productivity, declines in the stock market, economic recession, and general economic uncertainty.

The first Congressional response to the petroleum crisis was the Energy Tax Act of 1978.[1] It was designed to stimulate the growth of alternatives to gasoline made from crude oil by granting gasoline blended with 10% ethanol a total exemption from the four cent per gallon federal fuel excise tax.[2] The program worked and every president since Jimmy Carter has supported the development of a domestic fuel ethanol industry.[3]

Facts For The Record:

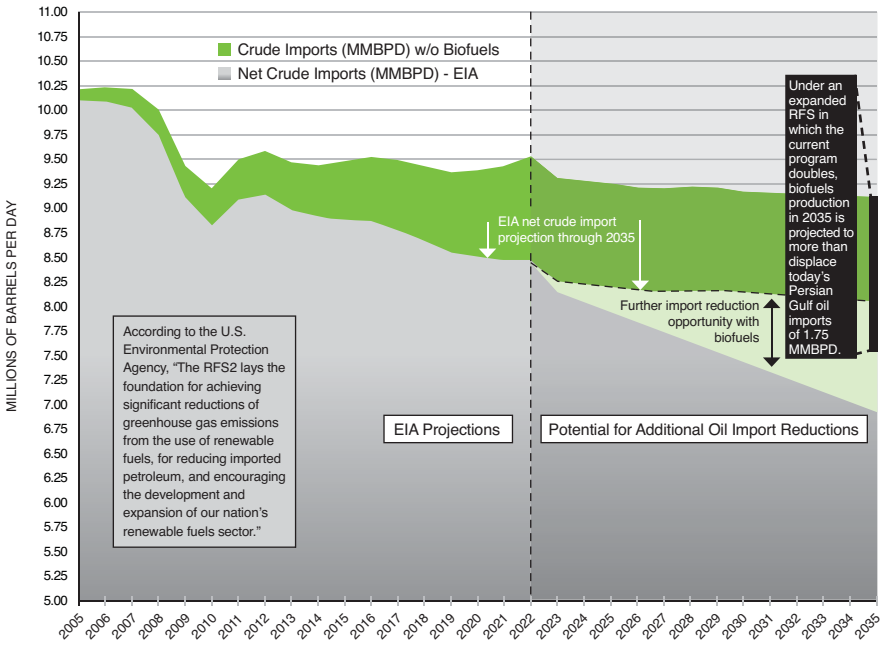
- The Energy Tax Act, Energy Security Act, Alternative Motor Fuels Act, Clean Air Act, and Energy Policy Act all identify ethanol as a way to achieve a variety of important public policy goals. Ethanol was the centerpiece of energy legislation passed by the Senate in 2002, 2003, 2005 and most recently in 2007.

The Evolution of Successful Legislation

Following another oil crisis in 1979, the Iranian Hostage Crisis, and the U.S. grain embargo of the Soviet Union, Congress continued efforts to spur domestic fuel production and reduce American reliance on imported crude. Two additional measures — the Crude Oil Windfall Profit Tax Act of 1980[4] and the Energy Security Act of 1980[5] continued to promote energy conservation and development of domestic fuels. The 1980 Crude Oil Windfall Profit Tax Act extended the expiration date for the ethanol tax exemption from 1984 to 1992,[6] and allowed ethanol to be used as an alternative fuel or in prescribed blends with gasoline by giving ethanol producers various alternatives to utilize this exemption.[7]

Throughout the 1980's, Congressional supporters continued the effort to build a strong, domestic energy industry. In 1982, the Surface Transportation Assistance Act[8] raised the federal gas tax from four cents to nine cents and increased the partial exemption for 10% ethanol blends to five cents of the nine cent tax on gasoline. In 1984, the Tax Reform Act[9] raised the ethanol exemption to six cents per gallon. In 1990, the Omnibus Budget Reconciliation Act[10] decreased the ethanol tax incentive from six cents to five cents and extended the incentive to 2000.

Crude Import Reductions as a Direct Result of Biofuels



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Ethanol Policy Represents Three Decades of Federal and State Cooperation

"It's in our vital interest to diversify America's energy supply — the way forward is through technology. We must continue investing in new methods of producing ethanol using everything from wood chips to grasses, to agricultural wastes … To reach this goal, we must increase the supply of alternative fuels, by setting a mandatory fuels standard to require 35 billion gallons of renewable and alternative fuels by 2017 — and that is nearly five times the current target."

— President George W. Bush,
State of the Union Address, January 23, 2007

"The Governors' Ethanol Coalition, which represents 30 Governors [36 today], believes that increasing dependence on foreign oil is a major risk to the nation's energy, economic, and environmental security. The safest and cheapest way to mitigate these risks is to set and achieve a goal of providing at least 5% of the nation's transportation fuel from ethanol by 2010, and to produce at least 8 billion gallons of ethanol a year by 2012. As soon as practical thereafter, the nation should produce at least 10% of its transportation fuel from ethanol and biodiesel."

— Governors' Ethanol Coalition, April 12, 2005
in a letter to President George W. Bush

"Ethanol has the potential to provide many benefits. As an alternative to gasoline refined from imported oil, its use can improve U.S. national energy security... U.S.-produced ethanol can also boost demand for U.S.-produced farm products, stimulate rural economies, and provide "green" jobs in rural areas."

— Congressional Research Service, 2009[13]

"It's good for our national security and reducing our dependence on foreign oil. It's good for our economy, because it will produce jobs."

— President Barack Obama, February 3, 2010

Ethanol Policy Exemplifies Leadership and Bipartisan Collaboration

In 1988, the Alternative Motor Fuels Act[11] created programs for research, development, and demonstration projects on both vehicles and fuels, plus fuel economy credits for automakers to produce FlexFuel Vehicles (FFVs) capable of running on any combination of gasoline or ethanol (up to 85% or E85). This legislation cleared the way for the manufacture of the first 20,000 vehicles capable of using 85% ethanol blends and today, more than eight million of these vehicles are on U.S. roads.

By passing amendments to the Clean Air Act in 1990,[12] Congress explicitly recognized that changes in motor fuel composition play a vital role in reducing pollution from motor vehicle exhaust. The Act created two new gasoline standards specifically designed to reduce harmful vehicle emissions in highly polluted U.S. cities. The new standards required the use of fuel additives called oxygenates, including ethanol, in areas of the country with high carbon monoxide pollution during the winter months and year-round in areas with high ozone pollution. The Energy Policy Act of 1992 set a national goal of 30% penetration of alternative fuels, including ethanol, in the light-duty vehicle market by 2010 and required some vehicle fleets to purchase alternative fuel vehicles.

Consensus Continues to Increase the Use of Ethanol

In 2004, the American Jobs Creation Act[14] streamlined the system of federal excise tax exemptions for ethanol blends with a tax credit called the Volumetric Ethanol Excise Tax Credit (VEETC). The Jobs Act also redirected billions of fuel tax dollars to the Highway Trust Fund, altered the Small Ethanol Producers Credit, and opened new markets to ethanol blends across the United States.

The Energy Policy Act of 2005[15] created the Renewable Fuel Standard (RFS) requiring the use of ethanol and other biofuels in the U.S. fuel supply and creating tax incentives for E85 fueling infrastructure. Collectively, this history of Congressional initiatives and incentives has provided a solid foundation for this rapidly growing energy industry. The success of the RFS program resulted in an expansion in the Energy Independence and Security Act (EISA) of 2007. EISA requires 36 billion gallons of renewable transportation fuels per year by 2022.

Already in the 111th Congress in 2010, there have been numerous bills introduced by a broad base of bipartisan supporters to advance biofuels.[16]

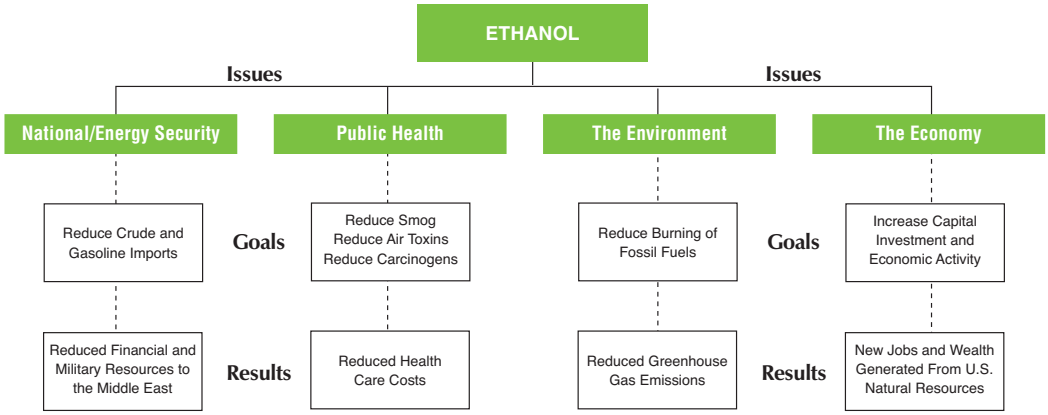
"Six years ago, when Senator Lugar and I introduced the first RFS legislation, we faced great skepticism about our initial goal of 5 billion gallons by the year 2012. At today's pace, it is a source of pride for me that the industry will exceed the current RFS minimum requirement of 7.5 billion gallons per year by the end of next year—five years ahead of schedule. And the prospects for tomorrow can be even brighter – when it comes to reduced energy dependence, when it comes to trade, and when it comes to strengthening the rural economy."

— U.S. Senate Majority Leader Thomas A. Daschle (D-SD), original author and architect of the Renewable Fuel Standard, August 2006.[17]

"The heart of America's geostrategic problem is reliance on imported oil in a market that is dominated by volatile and hostile governments. We can start to break petroleum's grip right now. The energy plan presented here (expand the RFS) is a package of proposals that would dramatically improve America's security posture. It would also provide more jobs for Americans instead of sending billions of dollars to hostile countries, support our farms instead of foreign terrorists, and promote green fuels over fossil fuels."

— U.S. Senator Richard Lugar, March 2007

Fuel Ethanol Is Helping Meet National Public Policy Priorities



The Fuel Ethanol Program is a Success

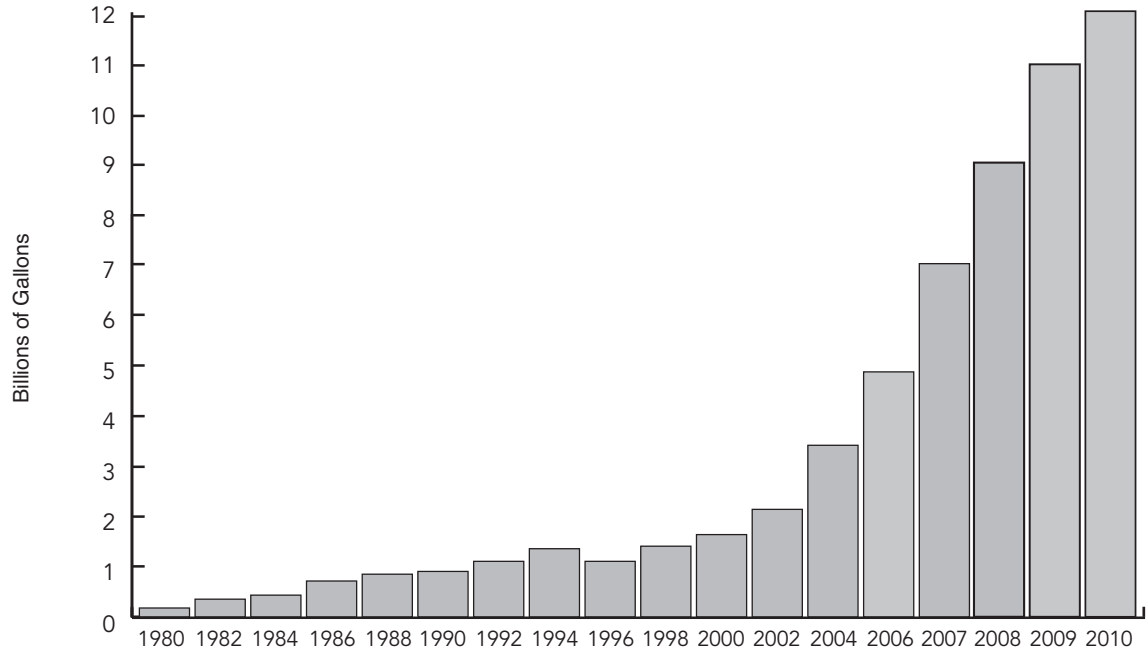
Since passage of the first federal tax incentives to encourage ethanol production:

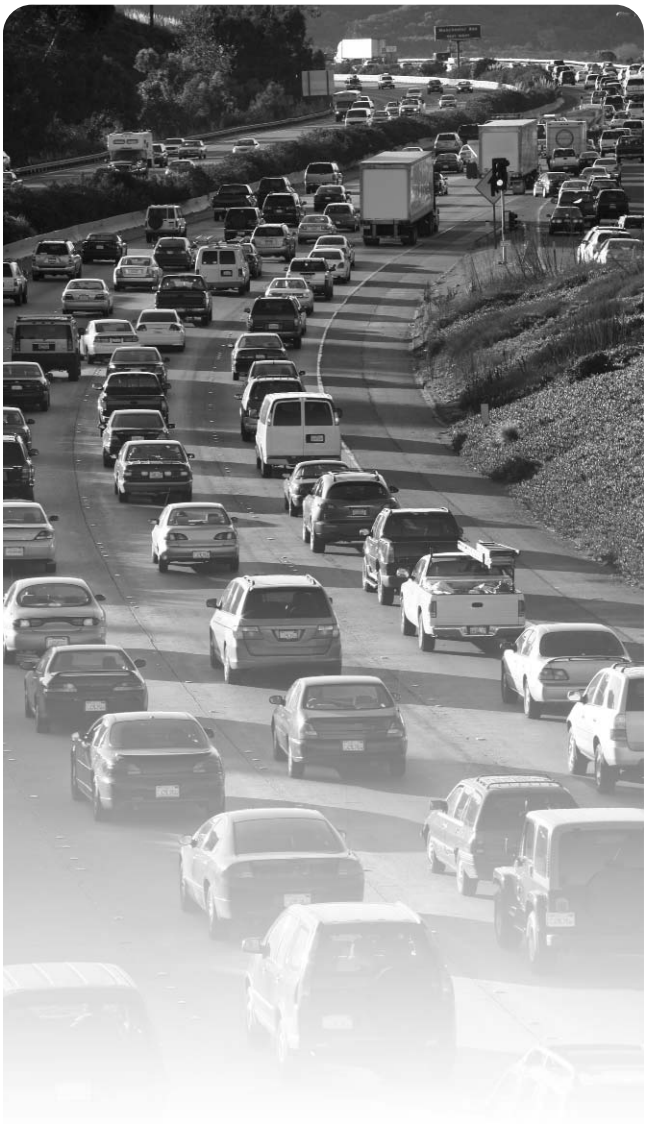
- The U.S. ethanol industry now has the capacity to produce an estimated 13 billion gallons per year of high octane, clean-burning motor fuel. Nearly 14.4 billion gallons of annual operating capacity is projected to be on line by 2012.[18]
- Over $100 billion will have been invested in the ethanol industry by 2022.[19]
- One hundred and seventy ethanol plants located in 26 states are operating. Twenty-four more are under construction or expanding their capacity.[20]
- Eight million FlexFuel Vehicles (FFVs) are on the road today. Automakers have pledged to make 50% of their vehicles FlexFuel by 2012 if E85 refueling stations are available.[21]

Cooperation and Collaboration

Due, in no small part, to the 30 years of Congressional cooperation and incentives, trillions of miles have been driven on American roads with ethanol blended gasoline. The industry has grown from zero production in 1978 to the point where 90% of the nation's gasoline now contains ethanol.[22] Minnesota initiated its own renewable fuel standard and has successfully blended ethanol into nearly 100% of the state's gasoline pool.

U.S. Fuel Ethanol Production 1980-2010





"We are reaching a point of absolute consensus that we need to take control of our energy future. Biofuels like ethanol are an important step down that path. This is not about Republicans or Democrats, federal government or state government, but instead it is a movement for the entire nation. By working together we can build on the phenomenal success of the past two decades."

— U.S. Senator Ben Nelson, former Governor of Nebraska and founder of the Governors' Biofuels Coalition, September 2007

"To safeguard our future economic health as well as our national security, we must move aggressively to diversify our energy sources. Every time we visit the gas pump these days, we are reminded that there is no time to waste."

— Energy Secretary Samuel W. Bodman, July 7, 2006

"All kinds of technology can reduce our reliance on oil, but if we want to do something that's fast and effective, ethanol is the way to go."

— U.S. Senator Barrack Obama (D-IL), February 2006

Facts For The Record:

- Ethanol is the only proven commercial scale renewable transportation fuel currently available in the marketplace,[23] and has the potential to replace at least 10% of the nation's gasoline supply.[24]

U.S. Reliance on Imported Oil Carries a High Price

In response to the nation's first energy crisis: "It is a crisis of confidence. It is a crisis that strikes at the very heart, soul, and spirit of our national will. It is the moral equivalent to war."
— President Jimmy Carter, July 1979

"And I don't know if you saw what Saddam Hussein said the other day. He said the biggest mistake he made is when he first moved into Kuwait, that he didn't move into Saudi Arabia ... So what we've got to do is to become less dependent on foreign oil for security reasons, and that means alternate sources."
— President George H. Bush, June 18, 1992

"It has been the policy of every American president since Harry Truman, that as long as our energy resources are dependent on that part of the world (i.e., Middle East), we are going to be there in force."
— Senator John McCain (R-AZ), 1998[30]

A Clear and Present Danger

Beginning with the Eisenhower Doctrine in 1950, U.S. foreign policy has called for a strong military presence in the Middle East. The primary goal is to ensure the uninterrupted flow of oil from this most turbulent part of the world. Clearly, our fifty-year reliance on imported oil is a primary driver of U.S. military strategy. The 1990 Persian Gulf War provided the United States with first-hand experience of the cost of protecting oil supplies associated with an escalated military conflict in the Middle East. "The original intent of Saddam Hussein," said Senator John Glenn (R-OH) in 1990, "was to take over 70% of the world's known oil reserves. That would give him control over much of the energy for the whole industrialized world."[25]

The cost of maintaining this military presence is staggering, exceeding $50 billion per year.[26] Depending on various assumptions in several studies, the true cost of oil, counting military and energy security expenses is somewhere between $125 and $150 per barrel.[27,28]

Today, the United States imports more than 60% of its oil and, at current rates, will import 70% by 2025. Two-thirds of the world's oil is in the Middle East, primarily in Saudi Arabia, Iran and Iraq. The United States has less than 3% of world oil reserves. The Department of Energy predicts North American oil imports from the Persian Gulf will double from 2001 to 2025.[29]

Facts For The Record:

- Over the last six years, the **U.S. has spent more than $507 billion** on Middle East military costs between Iraq and the "global war on terrorism." — Congressional Research Service, 2007
- A recent *New York Times* editorial put the real cost of gasoline — including military expenditures — at $5 per gallon.[31]

The Real Cost of Oil

Annual U.S. crude oil production today is 5 million barrels per day after peaking at 9 million barrels per day in 1969, increasing our reliance on foreign oil from 30% to nearly 70%.[32] Growing U.S. dependence on foreign oil is the nation's Achilles heel. The twin threats of ruinous price hikes and supply disruptions can have serious consequences for all Americans. National security concerns, economic disturbances and a continual degrading of the environment all stem from our insatiable appetite for petroleum.

According to a study by the National Defense Council Foundation, America spends nearly $50 billion a year defending Persian Gulf oil, adding more than one dollar to the true cost of a gallon of gasoline. Total economic penalties of America's oil dependence equal $297.2 billion to $304.9 billion annually. If reflected at the gasoline pump, these "hidden costs" would force the pump price of gasoline to $5.28 per gallon. A fill-up for the average vehicle would cost well over $100.

The study further concludes the overall economic toll of this dependence on foreign oil is staggering. The diversion of capital and investment resulting from spending $220 billion annually on foreign oil, i.e. money that could be invested in the U.S., costs the U.S. economy more than 800,000 jobs per year. Federal, state, and local government treasuries lose $13.4 billion in tax revenues. According to the Government Accountability Office (GAO), the cost of U.S. military and foreign aid programs in southwest Asia [Persian Gulf] from 1980 to 1990 is estimated at $365 billion, or $36 billion per year.[33] Increasingly volatile oil prices and the U.S. military presence in Iraq no doubt raise these costs significantly and magnify the losses.

"It is increasingly clear that riches from oil trickle down to those who would do harm to America and its friends. If this situation remains unchanged, the United States will find itself sending soldiers into battle repeatedly, adding the lives of American men and women in uniform to the already high cost of oil."

—Timothy Wirth, C. Boyden Gray, John Podesta, "The Future of Energy Policy," Foreign Affairs, July/August 2003

"They say we have foreign oil. Well, how are we going to get it in case of war? It is in Venezuela... It is out in the East, in Persia, and it is in Russia. Do you think that is much defense for your children?"

— Francis Garvan, President, Chemical Foundation, 1936

"We have a serious problem in the U.S. We are addicted to oil, which is often imported from unstable parts of the world."

— President George W. Bush, 2006 State of the Union Address

Facts For The Record:

- U.S. crude oil and refined fuel product imports have more than doubled over the last 20 years. In 2008, the U.S. consumed nearly 20 million barrels per day, while world demand was approximately 85 million barrels per day. With 300 million people, the U.S. consumed 24% of the total and China, with more than 1 billion people, ranked next and is gaining fast. China's demand for energy is expected to increase 150% over the next 15 years. That projected rate of growth is seven times greater than U.S. demand projections. China already imports more than 50% of its petroleum and will certainly compete with the U.S. and other western industrialized countries for world oil supplies in the future.[34]

The True Cost of Gasoline

"Our paramount national security interest in the Middle East is maintaining the unhindered flow of oil from the Persian Gulf to world markets at stable prices."
— U.S. Department of Defense, May 1995[35]

"Oil and motor vehicle use are responsible for enormous hidden economic and health costs due to environmental damage. Economists term these costs 'externalities' because they are not included in the private costs of transportation."
— Office of Technology Assessment, 1994

"Over the last decade, the death rate for lung disease has risen faster than that of any of the top leading causes of death. Tens of millions of Americans live in areas not meeting at least one federal air quality standard. The health costs of air pollution are estimated to be $50 billion each year."
— American Lung Association

"Human mortality and morbidity due to air pollution accounts for over three-quarters of the total environmental cost and could be as high as $182 billion annually."
— Union of Concerned Scientists[36]

Environmental Costs Are Not Included in the Price of Gasoline

Along with national security and economic concerns, the environmental externality cost of our growing dependence on fossil fuels surely poses the most serious threat of all. Burning increasing amounts of petroleum-based transportation fuels is poisoning the earth's atmosphere. Change is required. Nothing less than the continued health of each person and the planet is at stake.

According to the American Lung Association, health care costs associated with air pollution are estimated to be $50 billion each year and growing. Ninety million Americans live in areas with dangerous levels of ozone pollution and tens of millions more live in areas not meeting all federal quality standards.

Air pollution costs from the transportation sector alone are staggering, mainly because the atmosphere enables a fast and widespread diffusion of pollutants. The U.S. Department of Energy estimates 82% of carbon monoxide emissions, 43% of reactive organic gases (precursors to ozone) and 57% of nitrogen oxides come from gasoline alone.

Facts For The Record:

- "One should remember the combined impact of wars, terrorism, and environmental degradation is likely to send the price of oil right through the ceiling over the next two decades. Alternatively, the cost of emerging technologies is likely to decrease over time, as mass production and commercialization takes place." National Defense Council Foundation - The Hidden Cost of Imported Oil.[37]
- If consumers paid the environmental costs of crude oil directly, prices would be $7 to $27 higher per barrel.[38]
- The U.S. Commerce Department estimates that each $1 billion of trade deficit costs the U.S. 19,100 jobs.

Ethanol, on the other hand, is a clean-burning, renewable fuel. Its expanding use is helping to reduce harmful pollutants in our air and therefore helps reduce health care costs and human mortality. Ten percent ethanol blends reduce greenhouse gases (GHG) by nearly 30%, according to the models developed by Dr. Michael Wang of the Argonne National Laboratory. The Clean Air Act Amendments of 1990 required the production and distribution of cleaner-burning gasoline, containing oxygenates such as ethanol, in America's most polluted cities. Since their introduction in 1995, these "reformulated" fuels have dramatically lowered air toxic emissions.

Beginning in 2006, with the Renewable Fuel Standard as the law of the land, greater use of ethanol fuels will mean lower levels of life-threatening toxins in our air.

"Aromatic hydrocarbons in gasoline include benzene, toluene, and xylene. Benzene is a known carcinogen, one of the worst air toxics. 85% of all benzene in the air we breathe comes from motor vehicle exhaust. Xylene from automobile exhaust in the morning rush hour will form ozone [smog] in sunlight to choke our lungs by the afternoon trip home. Toluene, another aromatic, usually forms benzene during the combustion process and thus becomes carcinogenic along with benzene in the gasoline."

— U.S. Senator Tom Harkin (D-IA)[39]

"Corn-ethanol production is expanding rapidly with the adoption of improved technologies to increase energy efficiency and profitability in crop production, ethanol conversion, and coproduct use. ... GHG emissions were estimated to be equivalent to a 48% to 59% reduction compared to gasoline, a twofold to threefold greater reduction than reported in previous studies ... These results suggest that corn-ethanol systems have substantially greater potential to mitigate GHG emissions and reduce dependence on imported petroleum for transportation fuels than reported previously."

— University of Nebraska-Lincoln study on the environmental effects of corn-based ethanol.[40]

"We have to acknowledge that there are inherent risks to drilling four miles beneath the surface of the Earth, and these are risks that are bound to increase the harder oil extraction becomes. If we refuse to take into account the full cost of our fossil fuel addiction — if we don't factor in the environmental costs and national security costs and true economic costs — we will have missed our best chance to seize a clean energy future,"

— President Barack Obama, June 2, 2010, Carnegie Mellon University

Petroleum Imports Account for a Significant Portion of America's Trade Deficit

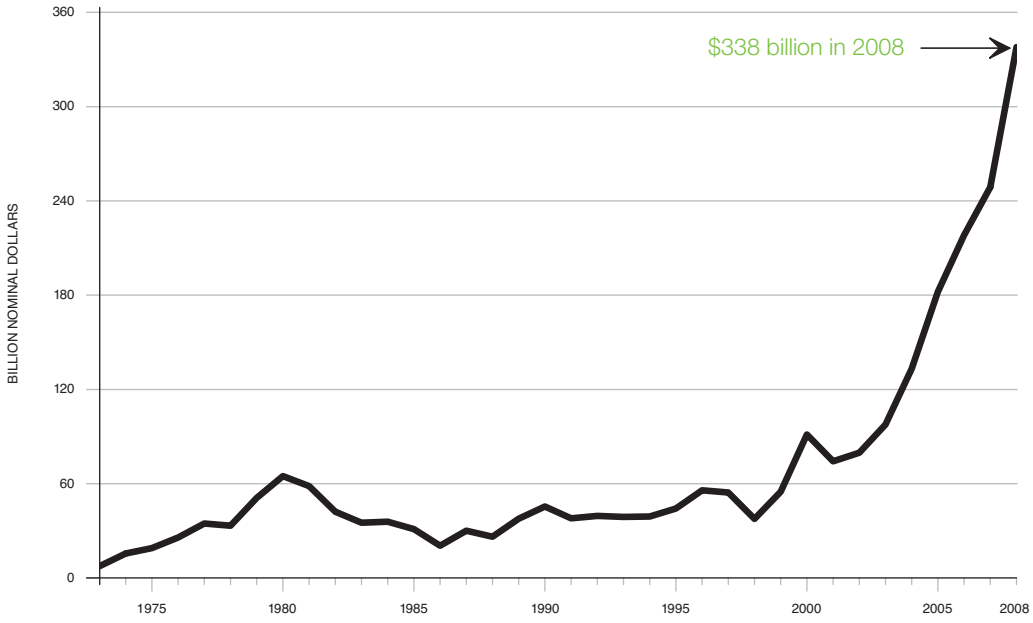
"Today, imported petroleum products account for nearly 40% of the U.S. trade deficit. Some projections suggest that number will approach 70% in the next 10 to 20 years. Based on the accelerating increases of the last few years, that day may not be far off."

— Federal Reserve Bank of San Francisco, September 2006

Gasoline Use is Fueling our Trade Imbalance

A nation's trade balance is the value of all goods and services sold to other countries (exports) minus the value of all goods and services purchased from other countries (imports). The U.S. trade balance has run in the red since 1975 and just keeps getting redder. In 1976, the trade deficit was $6 billion. In 2005, it was $716 billion.[41] Petroleum products are the largest component of U.S. imports and accounts for 31% of the 2005 deficit. To meet demand in 2005, the U.S. imported 310 million barrels of petroleum at a cost of $18.5 billion each month. On an annual basis, that is $220 billion for imported petroleum products. This represents a massive transfer of U.S. wealth to foreign countries.[42]

Cost of Crude Oil Imports



Source: Energy Information Administration / Annual Energy Review 2008

The main driver of increased petroleum imports is continuing growth in the U.S. transportation sector. Ninety-five percent of transportation fuels are derived from petroleum, the majority of which is imported. The numbers tell the story.

- U.S. daily petroleum consumption for all sectors reached nearly 19.5 million barrels in 2008. Ten and a half million barrels per day, or 54% of total consumption, went to the transportation sector.[43]

- There are 309 million people living in the United States and 205 million of those people are registered drivers. Registered drivers have registered 247 million vehicles.[44]

- To propel those vehicles, drivers purchased 198.8 billion gallons of fuel (gasoline plus diesel sales) in 2008 — an annual average per car consumption of 805 gallons.[45]

- Gasoline makes up the majority of passenger fuel sales—accounting for 62% of the fuel mix or 138 billion gallons of gasoline per year.[46]

- Every day, U.S. drivers fill up 35 million times and drive 8.2 billion miles on 441 million gallons.[47]

"We simply must diversify our sources of energy, and we must do so in a way that lessens our dependence on foreign sources for this energy. The fact that almost 60% of our energy sources are coming from overseas is simply too much, it is unacceptable today. America's energy policy should be consistent with our foreign policy in that it has the principles of independence and security at its foundation."

— U.S. Senate Majority Leader Bill Frist (R-TN), July 22, 2003

Facts For The Record:

- Berkshire Hathaway, Inc. chairman Warren Buffett, and George Soros, chairman of Soros Fund Management, are among investors predicting that a widening trade gap will weaken the dollar even after the U.S. currency rallied last year.[48]
- In 1987, the United States trade deficit in crude oil was $27 billion and nearly doubled to $43.7 billion by 1990. By 1999 it increased to $59.2 billion and surpassed $100 billion in 2002.[49]
- Gasoline consumption has risen by more than 40 billion gallons per year since our first oil embargo.[50]

Reducing Oil Imports is a National Priority

"Because fuel ethanol reduces crude oil imports and is environmentally friendly, it also helps meet other national public policy goals. Since 1988, Congress has enacted three major pieces of legislation designed, among other objectives, to foster the development, introduction, and diffusion of alternative nonpetroleum fuels into the transportation sector and thereby reducing oil imports while, at the same time, creating domestic jobs, improving urban air quality and staying even with, if not reducing, emissions of greenhouse gases."

— Congressional Research Service [51]

"President Obama and this Administration are strongly committed to the development of carbon capture and storage technology as a key part of the clean energy economy. We can and should lead the world in this technology and the jobs it can create."

— U.S. Department of Energy, Secretary Steven Chu [52]

"Failure to meet increasing energy demand with increased energy supplies, and vulnerability to disruptions from natural or malevolent causes, could threaten our nation's economic prosperity, alter the way we live our lives, and threaten our national security."

— Secretary of Energy Spencer Abraham, March 20, 2003

Ethanol Reduces Oil Imports

According to the EPA Regulatory Impact Analysis of the Renewable Fuel Standard (RFS) Program released in April 2007, the U.S. currently consumes about 190 billion gallons of gasoline and diesel fuel annually to meet its transportation fuel needs. Of this volume, about 65% or 124 billion gallons is derived from foreign sources. The United States' dependence on imported oil to meet its growing demand for transportation fuel exacts a cost on the nation in terms of energy security. In addition, petroleum-based fuel exacts a cost on the nation with respect to environmental quality. The RFS program improves national energy security by creating a market for renewable fuels as a substitute for petroleum-based fuels. By incorporating incentives for investing in research and development of renewable fuels, the RFS program also seeks to accelerate the nation's progress toward energy independence.

A Barrel Saved

Ethanol provides additional and diverse fuel supplies, providing finished fuel at the end of the supply chain. The significance of refinery capacity cannot be overstated. Over the last several years, the petroleum industry has repeatedly stated in Congressional testimony that one of the primary causes of price spikes was disruptions to refinery operations, or in times of peak driving and demand, the inability of refineries to produce enough gasoline.

Fuel ethanol is the only commercial-scale renewable transportation fuel produced in abundance in the United States today. Because ethanol increases octane, it also increases gasoline yields (production) at the refinery. For every barrel of ethanol produced, 1.2 barrels of petroleum is displaced at the refinery.[53]

"…Renewables utilized in gasoline [ethanol] play an important role and will continue growing well into the future."

— Red Caveney, President and CEO, American Petroleum Institute, Congressional Testimony, March 29, 2001

"Our national security is inextricably linked to our country's energy security…projected climate change is a threat multiplier in already fragile regions of the world, exacerbating conditions that lead to failed states—the breeding grounds for extremism and terrorism… There is a relationship between carbon emissions and our national security…we think that the evidence is there that would suggest that we have to start paying attention…carbon emissions are clearly part of the problem…we will pay for this one way or another…we will pay to reduce greenhouse gas emissions today, and we'll have to take an economic hit of some kind. Or, we will pay the price later in military terms. And that will involve human lives. There will be a human toll."

— Comments of several former military leaders at the release of their study entitled "National Security and the Threat of Climate Change," April 17, 2007, www.SecurityAndClimate.cna.org

Facts For The Record:

- "Replacing a portion of a gallon of gasoline with ethanol helps reduce America's reliance on petroleum . . . and provides additional markets for domestic corn and other grains." – Government Accountability Office (GAO)[54]
- "At current capacity, we are producing more than 180,000 barrels of fuel ethanol per day, which directly reduces the amount of crude oil we need to import." – DOE/Energy Information Administration, July 2003
- General Accounting Office concluded that ethanol and other oxygenates could displace 311,000 barrels of crude oil per day by 2010.[55]

Reducing Oil Imports is a National Priority

Energy Security is National Security

"But in the interests of our national security, our climate, and our pocket books, we should now move together as a nation – indeed as a community of oil importer nations – to destroy, not oil of course, but oil's strategic role in transportation as quickly and as thoroughly as possible. The national security reasons to destroy oil's strategic role are substantial. Over two-thirds of the world's proven reserves of conventional oil lie in the turbulent states of the Persian Gulf, as does much of the oil's international infrastructure. Increasing dependence on this part of the world for our transportation needs is subject to a wide range of perils. Just over a year ago, in response to bin Laden's many calls for attack on such infrastructure, al Qaeda attacked Abcaiq, the world's largest oil production facility, in northeastern Saudi Arabia. Had it succeeded in destroying , e.g., the sulfur-clearing towers there through which about two-thirds of Saudi crude passes – say with a simple mortar attack – it would have succeeded in driving the price of oil to over $100 per barrel for many months, perhaps close to bin Laden's goal of $200 per barrel. What we need is a transportation fuel that is as secure as possible, as clean as possible and as cheap as possible. Today, oil meets none of these needs."

— Former CIA Director James Woolsey, Member of the National Energy Commission, before the Senate Finance Committee, April 19, 2007

Bombs, Boots, Bullets...or Biofuels

"A new study ordered by the Pentagon warns that the rising cost and dwindling supply of oil — the lifeblood of fighter jets, warships, and tanks — will make the U.S. military's ability to respond to hot spots around the world 'unsustainable in the long term.' The costs of relying on oil to power the military are consuming an increasing share of the military's budget. Energy costs have doubled since the terrorist attacks of Sept. 11, 2001, and the cost of conducting operations could become so expensive in the future that the military will not be able to pay for some of its new weapon systems. All four branches of the military must 'fundamentally transform' their assumptions about energy, including taking immediate steps toward fielding weapons systems and aircraft that run on alternative and renewable fuels."

— Boston Globe, May 1, 2007

"The developing world will bear the brunt of the collateral damage from our historic global warming emissions, but the United States will experience its own self-inflicted wounds, including threats to our national security and military readiness."

— Chairman Edward J. Markey, (D-MA). Chairman, Select Committee on Energy Independence and Global Warming, April 17, 2007

"The U.S. has been very blessed by the age of oil. The age of oil isn't sustainable."

— Retired Navy Vice Admiral Dennis McGinn, CQ, April 20, 2007

For more on ethanol's role in energy independence, see the "Energy Security" Issue Brief at the CFDC website at http://cleanfuelsdc.org/pubs/documents/05CFDC-005_IssueBrief_F.pdf

Ethanol Production Creates Jobs and Stimulates the Economy

"We have to create new jobs every 5-7 years. I would love to claim credit for the jobs created on my watch but they were started by the information technology revolution. Those jobs permeated quality jobs throughout the United States and drove the economy. Today, that same opportunity exists with expanding biofuels, solar, wind, and other renewable energy sources. We are missing a great opportunity. If I were running for office today, I would run on that issue alone and tell the American public that if you don't want renewables, you don't want me."

— Former President Bill Clinton, Center for American Progress speech, Georgetown University, 2006

More Jobs and Lower Taxes

Producing fuel ethanol in the U.S. generates jobs and wealth by processing domestic resources into clean burning transportation fuel. Thousands of jobs, increased farm income, and tax receipts in the hundreds of millions of dollars follow. As importantly, costly petroleum imports are replaced by American-made fuel.

By 2009, the U.S. ethanol production industry consisted of 170 plants operating in 26 states. The annual capacity of more than 10.5 billion gallons was a whopping 25% increase from 2008.[56] With dozens more plants coming on line in 2010 and 2011, U.S. capacity will increase to nearly 12 billion gallons. This accelerated growth pattern has magnified the economic contributions of the industry.

Facts For The Record:

- In 2008 U.S. ethanol production supported more than 494,000 jobs.[57]
- A 100 million gallon per year ethanol plant will create $192,257,800 in total annual economic output, generate 113 new jobs and $9,981,700 in income, and increase tax revenue by $1,542,300.[58]
- Achieving the RFS target of 36 bgy will increase annual household income by $24.6 billion, create 1.18 million jobs, and $222.6 billion in federal tax revenues.[59]
- Ethanol plants built in 2008 supported more than 494,000 jobs in all sectors of the economy and added $65.6 billion to GDP. [60]

According to economist Dr. Donis Petersan, of the Nebraska Public Power District, a 100 million gallon per year ethanol plant results in:

- $150 million in capital construction investment.
- $70 million to the local economy during construction.
- Expansion of the local economic base by $233 million each year.
- 45 direct jobs plus 101 indirect jobs throughout the area.
- Household incomes raised by $7.9 million annually.
- Millions more in increased local, state, and federal tax revenues.
- Grain prices raised by 5 to 10 cents per bushel.
- Tax revenues of $3.2 million annually.

Replacing foreign oil with ethanol stimulates virtually all major sectors of the U.S. economy. Estimates of the number of U.S. jobs already attributed to ethanol range from 95,000 to 135,000—and that number is growing rapidly as plants are built or expanded. Far beyond rural America and agriculture, ethanol influences the technology, manufacturing, transportation, and construction sectors—along with several others.

"API supports a realistic and workable renewable fuels standard. Our industry is the nation's largest user of ethanol and is increasing the volume of renewable fuels in America's transportation fuel portfolio."

— American Petroleum Institute statement on 2007 Energy Bill [61]

"Growth in the energy sector continues to create a variety of job opportunities for skilled tradespeople. This is especially evident with ethanol plants. The extensive piping, boiler, and pressure vessel work at an ethanol plant requires special skills that our members provide. The duration of these projects and the geographic diversity of the plant locations will continue to be an important part of the skilled trades work load in both urban and rural areas of many states."

— Mark McColley, Business Manager, Steamfitters & Plumbers Local Union # 464, January 2010

"Combined with improved energy efficiency, biofuels are the primary near-term option for insulating consumers against future oil price shocks and for lowering the transportation sector's carbon footprint. The direct consumer benefit has been well documented and producing and using more biofuels today means an immediate reduction in oil imports in addition to an immediate increase in domestic employment."

— President Barack Obama, Letter to Governor's Biofuels Coalition dated May 27, 2009

For more information, see the Issue Brief "Economic Impacts of Ethanol Production" at the CFDC web site at http://cleanfuelsdc.org/pubs/documents/EconomicImpactIssueBrief2008.pdf

Ethanol Saves Taxpayers and the U.S. Treasury Billions of Dollars Annually

Ethanol Increases Employment and Lowers the Deficit

Fuel ethanol production generates wealth and jobs with value-added processing of domestic, renewable resources into clean-burning transportation fuel. As a result, the fuel ethanol industry is a significant part of state and federal economies. Two of the largest sectors of the U.S. economy, agriculture and energy, are directly affected by ethanol production and sales. Indeed, the Government Accountability Office (GAO) reports that a 50% decline in the production of fuel ethanol would actually cost the U.S. Treasury $3.2 billion annually. A more dramatic 90% production decline would cost the Treasury $6.3 billion.[62]

A study published in the Journal of Agrobiotechnology Management & Economics by Professor Woteki found that the future of the biofuels industry depends on the extension of tax credits and the ethanol import tariff. The study projected that without these important programs, commodity prices would fall and slash farm income by an average of $3.1 billion per year for each year over the 2011-2016 period.[63] In addition, Woteki projected that farm income for American corn growers would fall between $5.9 billion and $10.2 billion each year. Between 56,000 and 112,000 American jobs would be lost.

A nationwide consumer analysis concluded that consumers would pay an additional $5.4 billion per year in the absence of the ethanol tax incentive. The state-by-state analysis conducted by AUS Consultants analyzed the impact of an elimination of the ethanol tax incentive in terms of jobs, income, and gasoline prices. Specifically, the report concluded:

- Consumers would pay $3 billion more in higher gasoline costs, including $500 million in increased federal gas taxes;
- Household income would fall by $2.9 billion; and
- 120,600 Americans would lose their jobs.

Facts For The Record:

- A dramatic 90% decline in ethanol production would cost the U.S. taxpayers $6.3 billion annually. – U.S. Government Accountability Office (GAO) [64]
- The American ethanol industry has generated an estimated $33.4 billion in federal tax revenues and nearly $17 billion in state and local tax revenues since 1978 – a 5 to 1 return on investment of the federal tax incentive.[65]
- The combination of reduced farm program costs and increased income tax revenues results in a net gain to the U.S. Treasury of $1.30 per gallon of ethanol produced. As a result, ethanol generates $555 million of net tax revenue for the Federal Treasury annually through personal and business tax receipts.[66]

Ethanol Provides a Return on Investment

On one side of the ledger, ethanol is stimulating the economy and creating revenue for local, state, and federal tax bases. Therefore, on the other side of the ledger, losing U.S. ethanol production would cost the government and taxpayers billions of dollars in lost opportunity.

"In the 2007 Energy Independence and Security Act, congress recognized the need for a home-grown fuel source...Every year, we send billions of dollars overseas, often to unfriendly places. With renewable fuels, we can send those billions to rural and farming communities, to people who need help most in these challenging economic times."

— EPA Administrator Lisa Jackson, May 2009

"By the year 2022, America is required by law to be using 36 billion gallons of renewable fuels a year. That's enough to reduce foreign oil imports by 11.3 billion barrels a year, while saving the U.S. $817 billion that would otherwise go to foreign oil producers. It's enough to create more than one million new jobs, add $1.7 trillion to the Gross Domestic Product and increase federal tax receipts by $209 billion."

— U.S. Senator Ben Nelson, Sept. 2009[67]

"Here's the truth: Ethanol is reducing our dependence on foreign oil. Ethanol has a significant net energy balance – the same cannot be said for gasoline. Ethanol is reducing our greenhouse gas emissions. Ethanol is not the culprit behind rising food and feed prices here at home or abroad. Ethanol is lowering the price of crude oil and lowering the price of gasoline. Ethanol is increasing our national security, helping our balance of trade, and reducing our dependence on Middle East oil and the whims of Big Oil. It's time we clear the air, look at the facts, and recognize once again that everything about our domestic renewable fuels industry is good, good, good."

— U.S. Senator Chuck Grassley, (R-IA) May 15, 2008[68]

Fuel Ethanol Provides Tremendous Trade Benefits

"Here's the puzzle: the trade deficit means that America is living beyond its means, spending far more than it earns. (In 2005, the United States exported only 53 cents' worth of goods for every dollar it spent on imports.) To pay for the excess of imports over exports, the United States has to sell stocks, bonds and businesses to foreigners. In fact, we've borrowed more than $3 trillion just since 1999."

— Economist and Nobel Laureate Paul Krugman, April 2006[72]

"Oil imports now account for most of the U.S. trade deficit, which was running at an annualized pace of $717 billion, or 5.05% of GDP, in the first quarter of 2008. Imports of "petroleum and products" accounted for $449 billion of that...The trade deficit in the United States widened more than expected in September [2009], to $36.5 billion, in part because of an increase in oil prices, the Commerce Department said Friday... but an increase in the price of oil, which climbed $3.42, to $68.17 a barrel, in September, helped widen the gap. The United States imported $19.51 billion in oil in September, up from $17.38 billion in August."

— Justin Fox, TIME Magazine, May 29, 2008[73, 74]

Ethanol Creates Balance

In 2008, the U.S. imported nearly $1 billion of crude oil per day.[69] The trade benefits from ethanol production are twofold. On one hand, ethanol production creates a number of valuable co-products for export such as distillers dried grains, corn gluten, animal feed supplements, and corn oil. On the other hand, ethanol improves the nation's trade balance by displacing imported petroleum products, a key element of our burgeoning trade deficit.

In 2009, over ten billion gallons of ethanol were used in the United States. This resulted in a gallon-for-gallon reduction in the amount of gasoline used, and using less gasoline means importing less petroleum.[70] Given average crude oil prices of $94.04 paid by U.S. refiners in 2008, the use of ethanol replaced 9 billion gallons of oil and lowered the trade deficit by $20 billion.[71]

"In the last 10 years, the total of U.S. trade deficits has exceeded $1 trillion. This persistent pattern has contributed significantly to declining real wages and to increasing job insecurity. Most of its victims are middle-income working people. It is estimated that the manufactured goods trade deficit represents a loss of some three million American jobs."

— AFL-CIO Executive Council[75]

"Our annual trade deficit now exceeds 4% of GDP. Equally ominous, the rest of the world owns a staggering $2.5 trillion more of the U.S. than we own of other countries."

— Warren Buffett, Fortune Magazine, November 2003[76]

"This morning's announcement, that the United States had a $617 billion annual trade deficit in 2004, is devastating news for the American economy. This kind of trade deficit is unsustainable and could have long term, serious consequences for future economic growth in the U.S. and for job creation."

— U.S. Senator Byron Dorgan (D-ND)[77]

"The U.S. experienced a trade deficit of $36.4 billion in November 2009, including a $6.1 billion deficit with OPEC. "

— U.S. Department of Commerce, Bureau of Economic Analysis[78]

Facts For The Record:

- "Without ethanol to expand the available fuel supply crude oil prices would be $35.70 per barrel higher than they are currently! Looked at another way, world ethanol production is keeping crude oil prices 27.5 percent lower than would otherwise be the case." — John Urbanchuck, LECG[79]
- Ethanol reduced the United States trade deficit by displacing over $30 billion in oil in 2008.[80]
- "The U.S. trade deficit surged to a larger-than expected $40.2 billion in December (2009), the biggest imbalance in 12 months...Much of the increase came from a jump in oil imports." — Associated Press, Feb. 11, 2010

The Federal Fuel Ethanol Tax Incentive

"I will vigorously oppose efforts in the Senate to increase anybody's taxes, including taxes on ethanol. And in any case, we should not raise taxes on renewable fuels since such taxes are not in the interest of the economy, the environment or Texas and American corn growers."
— U.S. Senator Phil Gramm (R-TX), September 1995

"In the last two decades, ethanol has grown from a fledgling industry to make a real contribution to our environment, our national economy, and our efforts to wean ourselves from foreign sources of energy. ... To continue the progress made so far, and to provide Americans with a choice of oxygenated fuels, it is critical that we extend these tax incentives beyond 2000. Only by extending these incentives will farmers and renewable fuels producers have the certainty they need to invest in new ethanol plants and thus to further expand our domestic renewable fuels industry."
— President Bill Clinton, July 31, 1997

"Nebraska's ethanol production is helping with one of America's toughest problems today, our dependence on foreign sources of energy. We shouldn't play games with this home-grown, clean-burning energy supply, especially when more than 13,700 Nebraska jobs are involved... We should extend this triple-duty tax credit that helps our national security, environment and jobs."
— U.S. Senator Ben Nelson (D-NE), April 2010

Overview

Federal government incentives to help develop certain industries are not a new idea — it's a proven concept. By the end of World War II the government invested more than $12.7 billion in direct funding to build 1,600 various industrial plants and another $6 billion in indirect subsidies to build hundreds more — this would be the equivalent of $95 billion today.[81] This investment launched the United States as the world's strongest industrial power. While many in the oil industry remain among the most adamant critics and oppose tax incentives for ethanol, the petroleum industry is one of the industries that have been substantially supported by the U.S. government. A study by the U.S. Government Accountability Office (GAO), found that since 1968 the oil industry received approximately $150 billion in tax incentives.[82]

Federal tax policy has served consumers and the ethanol industry well. When modern-era sales started in the 1970s, a total exemption from the federal fuel tax enabled ethanol to compete with gasoline. These early sales provided the basis for the eventual commercial viability of the industry.

In 2004, Congress passed the American Jobs Creation Act (AJCA). One provision of the law created the Volumetric Ethanol Excise Tax Credit (VEETC) that replaced the partial tax exemption system with a tax credit for each gallon of ethanol blended.

VEETC

The VEETC credit is $0.45 per gallon of ethanol blended with gasoline. Unlike the previous exemption system, VEETC does not prescribe a certain level of blending but rather grants the credit for each gallon of ethanol blended. The credit is available to those blending "an alcohol fuel mixture" as a part of their trade or business. Fuel blenders must pay the current federal tax rate of 18.4 cents on each gallon of ethanol and gasoline in the fuel blend. VEETC can then reduce a blender's federal motor fuel tax liability. If the amounts of VEETC credits exceed the tax liability, the difference is refunded. The credit may be taken only once for each gallon of ethanol. All ethanol, whether imported or domestically produced, is eligible. The VEETC expires on December 31, 2010.

Higher Ethanol Blends and E85

In addition to establishing VEETC, the AJCA defined new opportunities for ethanol sales in non-taxed fuel markets. For example, U.S. cities and towns are not subject to federal excise taxes on motor fuel. Since the cities were already tax exempt, partial exemptions for ethanol blends were of little value. VEETC allows a city's fuel supplier to receive the credit and price ethanol blends competitively with other fuels. E85, the fuel blend containing up to 85% ethanol, is more competitive with gasoline now that VEETC treats it like any other ethanol blend. This allows E85 and other ethanol blends to benefit from the credit and creates an opportunity to compete effectively in the marketplace.

Facts For The Record:

- "Under current circumstances, we cannot avoid being there [the Middle East]. We have to be there. But over the long run, it is the purest of folly to assume that problems, such as the proliferation of weapons of mass destruction and terrorism in that part of the world, in part funded by oil money, are going to somehow magically go away." — James Woolsey, former Director, Central Intelligence Agency, Chairman of the Advisory Committee, Clean Fuels Foundation, Fuel Ethanol in the 21st Century Seminar, March 1998

- "U.S. taxpayers are providing at least $5 billion a year in tax breaks in the form of foreign tax credits to provide U.S. multinational oil companies with an incentive to invest billions of dollars to find and produce oil overseas so that it can then be exported to the United States." — Citizen Action [83]

The Federal Fuel Ethanol Tax Incentive

Increased Tax Revenues to the Highway Trust Fund

Federal law requires the full federal motor fuel tax of 18.4 cents per gallon be collected on all ethanol sold. These tax receipts, along with those on fuel blended with ethanol, are credited to the Highway Trust Fund (HTF). Previously, ethanol blenders paid 13.2 cents per gallon on 10% ethanol blends and proportionately reduced rates on blends below 10%. As a result, the HTF received only 10.7 cents per gallon of tax revenue on ethanol blends and 2.5 cents of that amount was transferred to the federal General Fund. This revenue loss directly affected the building and maintenance of the nation's transportation systems.

In addition, states that used large amounts of ethanol were penalized by receiving fewer federal transportation funds because of the distribution formula that allocates funds based on federal tax revenues generated in a state. Now, all ethanol blends are taxed at the full rate and all receipts go directly to the Highway Trust Fund. Revenues available to the nation's transportation infrastructure increased by nearly $3 billion annually.

Small Producers Credit

Congress passed the Small Ethanol Producer Tax Credit program in 1990 to encourage domestic ethanol production. It allows certain producers a nonrefundable federal income tax credit equal to 10 cents per gallon for the first 15 million gallons produced annually.

The American Job Creation Act changed the definition of "small ethanol producer" from those producing fewer than 30 million gallons annually to those producing fewer than 60 million gallons annually. Dozens of producers who were previously ineligible now qualify for credits because of their annual production levels. The program was extended through December 31, 2010.

The small producer credit offsets federal income tax liabilities but also becomes taxable income. The credits may be "carried back" one year and forward for up to three years. Unused credits become an income tax deduction after the "carry forward" period has expired. The American Jobs Creation Act also allows these credits to offset Alternative Minimum Tax liabilities, an option not previously available. The American Jobs Creation Act also allows cooperatives to allocate the tax credits among their member owners.

Imported Ethanol

The Renewable Fuel Standard and the reduced tax rate for ethanol blends do not distinguish between ethanol produced in the U.S. and ethanol brought in from outside the country. Imported ethanol from countries such as Brazil can help U.S. refiners meet their renewable requirements and represents attractive value-added markets for this Brazilian ethanol. There is a tax on ethanol imported into the U.S., just as there is on U.S. ethanol going into Brazil. While the Brazilian duty is waived periodically, U.S. ethanol receives no tax advantage in the Brazilian market. Conversely, Brazilian ethanol receives the same lower excise tax break U.S. products get. Consequently, the U.S. import duty is largely offset when these foreign products receive U.S. tax advantages.

"I support the ethanol tax benefit. I support the current ethanol program and would support its extension beyond the 2007 expiration date."

— President George W. Bush, November 2000

"What's wrong with using the tax breaks to spur domestic energy production? We've certainly done it in the past, and, with our precarious dependence on foreign oil, we will have to do much more of it in the future. Money invested in producing domestic fuels, whether ethanol, methanol, shale oil, or coal liquids and gases, is money spent in this country and not money lost to OPEC. It stimulates the economy, creates jobs, and most importantly, helps free us from our addiction to imported oil."

— U.S. Senator Birch Bayh (D-IN), December 3, 1980 [84]

Ethanol Helps Reduce Harmful Pollutants from the Air You Breathe

Ethanol is better than Gasoline, or Benzene, or Toluene, or Xylene, or…

When you consider the following data, ethanol has significant environmental and personal health benefits:[85,86,87]

- The Environmental Protection Agency (EPA) estimated total annual cancer cases from gasoline and its combustion products in 1995 was between 250 and 600,[88] and ranked gasoline as the number one source of toxic emissions.[89]

- Because ethanol is inherently cleaner than gasoline, it emits less hydrocarbons, nitrogen oxides, carbon monoxide and hydrogen. As a result, it is used to meet environmental and alternative fuel requirements set forth in the Alternative Motor Fuels Act of 1988, the Clean Air Act Amendments of 1990, the Energy Policy Act of 1992, and the Energy Tax Act. These public laws represent bipartisan efforts to reduce the environmental and economic impacts of gasoline consumption on society.

- The Environmental Protection Agency (EPA) found benzene, released in the air from burning coal and oil, gasoline service stations, and motor vehicle exhaust, to be the most likely air toxin to cause cancer. There is a 25% greater cancer risk because of benzene. The good news is that, because of motor vehicle standards, fuel composition changes, and motor vehicle inspection and maintenance programs, benzene emissions will decrease by about 60% between 1999 and 2020.

- A 2002 EPA study analyzing sources of air pollution during 1996 confirmed that gasoline vehicles and gasoline non-road equipment are the largest contributors to mobile source ambient concentrations of gaseous hazardous air pollutants (HAPs).

- Ethanol is rapidly biodegraded in surface water, groundwater and soil, and is the safest component in gasoline today. – *The Governors' Ethanol Coalition*

- Ethanol reduces tailpipe carbon monoxide emissions by as much as 30%, toxics content by 13% (mass) and 21% (potency), and tailpipe fine particulate matter (PM) emissions by 50%. – *Gary Z. Whitten, Smog Reyes, February 2004*

- Blending ethanol in gasoline dramatically reduces carbon monoxide tailpipe emissions. According to the National Research Council, carbon monoxide emissions are responsible for as much as 20% of smog formation. Additionally, ethanol-blended fuels reduce tailpipe emissions of volatile organic compounds, which readily form ozone in the atmosphere.

- The American Lung Association of Metropolitan Chicago credits ethanol-blended reformulated gasoline with reducing smog-forming emissions by 25% since 1990.

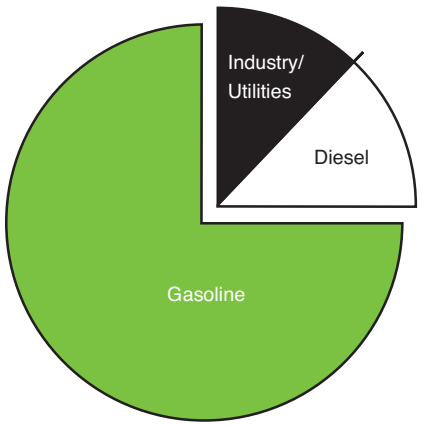
The Addition of Ethanol Improves Gasoline

The principal air quality concerns arising from gasoline powered mobile-source emissions are ozone, toxins, and carbon monoxide. Most toxic air pollutants decrease when ethanol is blended with gasoline, primarily through dilution.

"Transportation sources (i.e., burning gasoline and diesel) are responsible for 55.8% of outdoor air pollution. That includes 77.3% of the total carbon monoxide, 44.5% of the oxides of nitrogen, 3.3% of the sulfur oxides, 35.6% of volatile organic compounds (VOCs), and 26.3% of particulate matter (less than 10 microns), and 26.6% of lead emitted into the air."

— American Lung Association

Gasoline is the largest source of man-made carcinogens.



Source: U.S. Environmental Protection Agency

Facts For The Record:

- Using either E85 (85% ethanol, 15% unleaded gasoline) or E10 (10% ethanol, 90% unleaded gasoline) fuel greatly improves air quality and energy efficiency. Results show that ethanol can reduce greenhouse gas emissions up to 85%. There is also a 50% to 60% reduction in fossil energy use. — Argonne National Laboratory, December 2005

For more information, see the issue brief "Environmental Impacts of Ethanol Production" at the CFDC web site at http://cleanfuelsdc.org/pubs/documents/EconomicImpactIssueBrief2008.pdf

Ethanol Helps Meet National Emission Reduction Goals

"Carbon monoxide is a colorless, odorless gas that is produced as a result of incomplete burning of carbon-containing fuels. Exposure to carbon monoxide reduces the blood's ability to carry oxygen. Carbon monoxide exposures especially affects unborn babies, infants, and people with anemia or a history of heart disease."

— American Lung Association[92]

Ethanol Reduces Greenhouse Gases and Supports Federal Clean Gasoline Programs

In response to public concerns regarding air quality and health, industry and government agreed to improved gasoline specifications in the Clean Air Act Amendments of 1990 — creating oxygenated gasoline, and reformulated gasoline (RFG) standards.

Ethanol Supports the Federal Oxy-Fuel Carbon Monoxide (CO) Reduction Program

Ethanol is required in CO control programs and, while optional in RFG, it remains a key component of clean fuel formulations in major urban areas such as the Northeast region of the United States. CO is a key contributor to ozone formation. EPA estimates transportation accounts for 66-80% of CO emissions in our nation's cities.[90] Tests conducted by EPA indicate ethanol blends are likely to reduce carbon monoxide emissions in vehicles by 10-30% depending on the vehicle's combustion technology. The potential improvement in CO emissions over straight gasoline is significant.[91]

Facts For The Record:

- The Auto/Oil Air Quality Improvement Research Program — a cooperative effort by the Big Three domestic automakers and 14 petroleum companies — conducted exhaustive tests over eight years and found that gasoline containing oxygenates, such as ethanol, reduces emissions of carbon monoxide.[93]

Ethanol Supports the Federal Ozone and Air Toxins Reduction (Reformulated Gasoline) Programs

The federal reformulated gasoline (RFG) specification also includes a limit on benzene (a gasoline octane enhancer and a known carcinogen), as well as a ban on heavy metal additives such as lead and manganese. As a source of "clean octane," ethanol remains a vital component of RFG, enabling refiners to meet emission requirements. Similar to the nation's transition from leaded gasoline, RFG helps sustain the nation's effort to improve air quality by reducing harmful fuel related components. RFG is sold in 17 states and the District of Columbia since 1995 and has reduced toxic gasoline related emissions by nearly one million tons.

"A typical FFV driver can prevent 4 tons of lifecycle CO2 and other pollutants from entering our air every year by simply fueling with E85 instead of gasoline. Additionally, using E85 can reduce ozone-forming pollutants by 20% and evaporative emissions by 25% or more."

— American Lung Association of the Upper Midwest[94]

RFG with Oxygenates, Like Ethanol, Substantially Reduces Harmful Gasoline Emissions	
Air Toxics	-28%
Volatile Organic Compounds	-17%
Nitrogen Oxides	-3%
Carbon Monoxide	-13%
Sulfur Oxides	-11%
Carbon Dioxide	-4%
Particulate Matter	-9%
Reduced Cancer Risk	**-20% to -30%**

Source: Clean Fuels Development Coalition Technical Commitee, California Air Resources Board

Ethanol Reduces Greenhouse Gas Emissions

"We're boosting the production and use of advanced biofuels to double our use of renewables and break our dependence on foreign oil. That will benefit rural communities, spark new demand, and – with clarity on where the regulations stand – promote investments in research to expand the effectiveness and uses of renewable biofuels. And of course, we will continue to face down our climate crisis and move into the clean energy future."
— Lisa Jackson, EPA Administrator, March 8, 2010 [98]

"Scientists in the Obama and Bush Administrations, and at the National Academy of Sciences and at the U.N. IPCC tell us that we have a narrow window of time in which to avert the ravages of global warming. They tell us about frequent and intense storms, wildfires in the West, heat waves across the nation, increased droughts and flooding, threats to agriculture, global conflict, refugees and food shortages. In 2005, Hurricane Katrina took an estimated 1,700 lives, displaced 1 million people, and cost well over $100 billion. Four years later, there is still suffering, and it will take billions more to protect the coast in that region. Katrina provides a window into the kind of world we can expect if we fail to act."
— U.S. Senator Barbara Boxer, Senate Environment and Public Works Committee hearing, October 27, 2009 [99]

"This use of ethanol as an "oxygenate" promotes more complete combustion of the fuel, which can reduce exhaust emissions of carbon monoxide—a regulated pollutant harmful to human health—by 20% to 30% compared with pure gasoline."
— U.S. Department of Energy [100]

"Emissions from transportation are growing faster than average for all emissions and are forecast to exceed 1990 levels by 26% in 2010 and by 42% in 2020."
— Canadian Office of Natural Resources, Commissioned Study by S&T Consultants Inc.

Gasoline Contributes to Greenhouse Gases

"Gasoline and diesel consumption account for about 41% of the greenhouse gases inventory in the United States.[76] Human activities over the past 200 years, particularly fossil fuel combustion, have been resulting in significant emissions of anthropogenic (i.e., human-induced) greenhouse gases, primarily carbon dioxide. Emissions of these anthropogenic greenhouse gases have already altered the chemical composition of the atmosphere. This is creating an 'enhanced greenhouse effect,' akin to an atmospheric blanket trapping gases beneath it." — U.S. Environmental Protection Agency [95]

"By fuel, world carbon dioxide emissions from the consumption of liquid fuels are projected to grow at an average annual rate of 0.9 percent from 2006 to 2030... The highest rate of growth in petroleum-related carbon dioxide emissions is projected for China, at 3.2 percent per year, as its demand for liquid fuels increases to meet growing demand in its transportation and industrial sectors. The United States is expected to remain the largest source of petroleum-related carbon dioxide emissions throughout the period, with projected emissions of 2.6 billion metric tons in 2030." — International Energy Outlook 2009 [96]

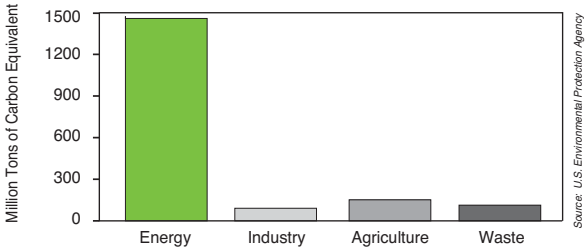
Ethanol Reduces Greenhouse Gases

In addition, the RFS program helps to reduce the country's greenhouse gas emissions, thereby reducing the nation's contribution to global climate change and its potential effects on the U.S. economy, security, and public health.[97]

Ethanol Reduces Greenhouse Gases

The Greenhouse gases, Regulated Emissions and Energy use in Transportation (GREET) model was developed by Dr. Michael Wang at the Argonne National Laboratory's Center for Transportation Research with support from the DOE/Office of Energy Efficiency and Renewable Energy. The GREET model shows cornstarch ethanol clearly outpaces petroleum-based fuels, and that tomorrow's cellulose-based ethanol will do even better. On a per-gallon basis, GREET shows corn-based ethanol reduces GHG emissions by 29%.

Total U.S. Greenhouse Gas Emissions by Source



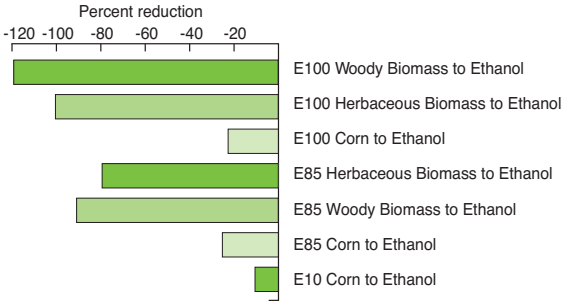
This translates to an annual per-vehicle reduction of more than four tons of carbon dioxide. If five million flexible fuel vehicles burn E85 instead of gasoline, total carbon dioxide emissions are reduced by 20 million tons per year. This reduction is equal to shutting down five 500-megawatt coal fired power plants. Ethanol produced from cellulosic materials will offer even greater benefits, with an 85% reduction in greenhouse gas emissions.

"There is no debate among any statured scientists of what is happening; the only debate is the rate at which it's happening." — Harvard University [102]

"… There is now an effective consensus among the world's leading scientists and serious and well informed people outside the scientific community that there is a discernible human influence on the climate, and a link between the concentration of carbon dioxide and the increase in temperature... The time to consider the policy dimensions of climate change is not when the link between greenhouse gases and climate change is conclusively proven but when the possibility cannot be discounted and is taken seriously by the society of which we are part... . We in BP have reached that point."

— Sir John Browne, Group Chief Executive, British Petroleum (BP America) – Stanford University, May 19, 1997

Greenhouse Gas Reductions Compared to Gasoline



Source: U.S. Department of Energy, Office of Fuels Development and Congressional Research Service

Facts For The Record:

- Moreover, the use of ethanol reduces greenhouse gas (GHG) emissions. On a per-gallon basis, GREET shows that corn ethanol could reduce GHG emissions by 18% to 28%; cellulosic ethanol offers an even greater benefit, with an 87% reduction in GHG emissions. — *Argonne National Laboratory* [101]
- General Motors Corporation commissioned a "Well-to-Wheels" life cycle analysis of energy use and greenhouse gas emissions in 2002. That study compared 15 propulsion technologies and 75 different fuel pathways. The results were that "ethanol as E85 reduces greenhouse gas emissions more than any other alternative fuel."

"The way people in this country use oil is a serious threat to our security, our economy and the well-being of our planet. Al-Qaeda must revel in the irony that America is effectively helping to fund both sides of the war they caused. As we sacrifice blood and treasure, some of our gas dollars flow to the fanatics who build the bombs, hatch the plots and carry out attacks on our soldiers and citizens. The transfer of American wealth to the Middle East helps sustain the conditions on which terrorists prey."

— U.S. Senator John McCain (R-AZ), April 23, 2007 [105]

"The lure and the illusion of low gasoline prices have lulled us into placing our economic security in jeopardy, our military forces at risk and our leadership in question."

— Former Strategic Air Command, General Lee Butler (USAF ret.), former Chairman, Clean Fuels Foundation

"The economic well-being and future security of this nation depend upon maintaining and building long-term energy security and strengthening the domestic energy industry."

— President Ronald Reagan, January 25, 1988

Ethanol is a Winner

Periods of soaring crude oil prices and tight supplies continue to periodically strike the economy. Two and three dollar per gallon gasoline has become the norm. When Hurricane Katrina damaged petroleum refineries on the Gulf Coast in 2005, we were reminded how tenuous crude oil supplies and refined product prices can be. Lines formed at gas stations and prices reached $5 per gallon in some areas. Natural gas prices soared to three times historical highs and rationing in some areas was required. Tapping into the vast potential of American agriculture and the enormous biomass resources could allow the U.S. to shrug off those factors and supply clean and abundant energy.

Agriculture is the nation's largest industry and major creator of wealth in this country. Agriculture is also responsible for nearly 25% of the nation's employment, according to the USDA.[103] Ethanol production represented 6% of the corn crop in 2000, 14% in 2005, and just under 30% in 2009 (based on 13.2 billion bushel 2009 harvest and 10.6 billion gallons of ethanol produced in 2009) — equal to the amount of corn currently exported. This pours billions of dollars into rural economies and saves taxpayers billions of dollars – but there needs to be a balance. A sustainable 21st century must include a vibrant rural economy that produces diverse cellulose feedstocks for the production of renewable fuels.

Facts For The Record:

- "About 75% of the anthropogenic [man-made] emissions of carbon dioxide to the atmosphere during the past 20 years are due to fossil fuel burning." — United Nations Intergovernmental Panel on Climate Change, January 2001[104]
- Ethanol-enriched fuels reduced greenhouse gas emissions by 7.8 million tons, which is comparable to removing 118 million cars from the nation's roads each year. — Argonne's GREET 1.6 Model
- The use of ethanol-blended fuels reduced carbon dioxide-equivalent greenhouse gas emissions by approximately 5.7 million tons in the United States during 2003. This reduction is equivalent to removing the annual greenhouse gas emissions of more than 853,000 cars from the road. — Argonne National Laboratory

Win, Win, Win

Farmers win with increased income opportunities from new crops grown specifically for cellulose production; agricultural processors win by benefiting from increased quantities of feedstocks; the environment wins by lessening the emphasis upon traditional row crops as a source of farm income because of new diverse planting opportunities that require fewer inputs (e.g., switchgrass and fast-growing woody crops are highly compatible with improved wildlife habitats and land conservation); the nation wins as we increase our energy self-reliance by developing a national energy strategy that is not reliant on imported and expensive petroleum.

Concerned philanthropists Bill Gates (Microsoft), Richard Branson (founder and chair of the British conglomerate Virgin Group), and Vinod Khosla [106] (venture capitalist, Google, Sun Microsystems) are among a growing list of successful entrepreneurs trying to stimulate ethanol production. Branson established Virgin Fuels, which will channel $3 billion to helping solve the climate crisis, and $400 million into biofuels investments over the next three years.

"There is no single panacea that will solve our energy crisis; we must rely on and encourage multiple forms of production"

— President Jimmy Carter, State of the Union Address, January 21, 1980

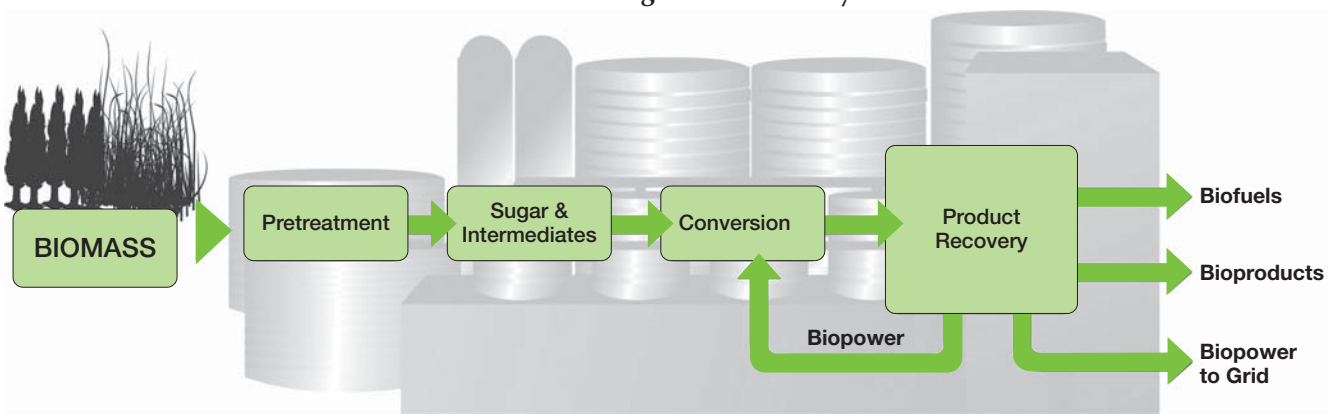
"I think we have a replacement for oil today. It's cheaper, cleaner, it doesn't require a change of infrastructure, and it appeals to most of the lobbies. What is this platform? It's ethanol."

— Vinod Khosla, CEO, Khosla Ventures [107]

"I believe cellulosic ethanol is the future of fuel, over the next 20 or 30 years, I think it actually will replace the conventional fuel that you get out of the ground."

— Richard Branson, Virgin Fuels [108]

Generic Integrated Biorefinery



For more information, see the Issue Brief "Converting Cellulose into Ethanol and Other Biofuels" at the CFDC web site at http://cleanfuelsdc.org/pubs/pubs.html#issuebriefs

Diverse Ethanol Feedstocks

"Corn stover is a lignocellulosic biomass source that does not compete with human food production capacity... the largest source of agricultural residue currently available as a feedstock for biofuels production... Since corn will continue to be grown for its grain value, the stover can become an additional source of biofuels feedstock and provide corn growers an additional source of revenue.
— NREL study[111]

"Industrial biotech is the enabling technology that will allow farmers to harvest two crops from every field – a food crop and a biomass crop for fuel production. Biotech breakthroughs mean that the nation's breadbasket could also become the energy fields of the United States. The question is not when, but how soon this will happen.
— Brent Erickson, Biotechnology Industry Organization, March 2006[112]

"We can get fuel from fruit, from the sumac by the roadside, or from apples, weeds, sawdust; almost anything. There is enough alcohol in one year's yield of an acre of potatoes to cultivate that field for a hundred years. And it remains for someone to find how this fuel can be produced commercially—better fuel at a better price than we now know."
— Henry Ford, 1908

"I am informed that many new distilleries are being planned to make alcohol from corn, potatoes, beet sugar waste, etc. Development along these lines should be encouraged until every section of the country has its own industrial distillery."
— C.M. Freeman, Secretary, National Grange, 1906

"Advancing biomass and biofuel production holds the potential to create green jobs, which is one of the many ways the Obama Administration is working to rebuild and revitalize rural America,"
— USDA Secretary Tom Vilsack, announcing BCAP program, News Release 2/10/2010

Delivering On the Promise of Cellulose Conversion

There is no better time than the present to aggressively invest in expanding the U.S. ethanol program by developing cellulose conversion technologies. Today, ethanol can be produced from grains (e.g., corn, wheat, sorghum, etc.) or "cellulose." Recent legislation defines cellulose as dedicated energy crops and trees; wood and wood residues; plants; grasses; agricultural residues; fibers; animal wastes and other waste materials; and municipal solid waste. Forestland and agricultural land, the two largest potential biomass sources, can yield more than 1.3 billion dry tons per year of biomass potential. This is enough feedstock to produce biofuels to meet more than one-third of the current demand for transportation fuels – about 60 billion gallons per year (BGPY) (e.g., 140 BGPY gasoline and 25 BGPY diesel x .33 = 54.45 BGPY).[109]

Cellulose can be converted into ethanol via enzymatic (i.e., sugar/enzymatic/microorganisms) or thermo-chemical (i.e., heat or gasification processes). Ethanol produced in conventional corn/grain-based plants and ethanol produced from cellulosic sources are the same product, but are made with different feedstocks and different processes. As a result, today it costs more to produce cellulose-based ethanol versus corn or grain-based ethanol – but progress is being made. Corn and cellulose processes are designed to extract fermentable sugars from biomass materials and then ferment them into ethanol. DOE recently provided loan guarantees to six companies to help prove technological developments, improving yields, and driving down cellulose-based ethanol production costs.[110] There are also dozens of private companies investing millions of dollars to move cellulose based ethanol production from the lab to the market. There is a growing consensus on

the steps needed for cellulosic ethanol from biomass to succeed in the market place. The National Resources Defense Council said it believes increased spending on research and development in conversion and processing technologies, funding for demonstration projects, and joint investment or other incentives to spur commercialization are pathways to success.

Brazilian Ethanol Program Highlights [114]

- Brazil has substituted 1.87 billion barrels of gasoline with ethanol - representing 13.8% of the country's current proven crude oil and condensate reserves. Ethanol has saved Brazil $241 billion.
- Ethanol production has created an estimated one million direct jobs.[115]
- In January 2008 ethanol surpassed gasoline sales.
- Hydrous Ethanol (E100) is distributed at every gasoline station in the country.
- All gasoline in the country contains 20-25% anhydrous ethanol. It is sold in over 33,000 gasoline stations.
- Neat (100%) ethanol cars represented >88% of car sales between 1983-1988.
- In 2009 FlexFuel Vehicles (FFV) represented 88.2% of new car production, or 35% of the existing fleet.
- From 2003-2009 the Brazilian FFV Fleet grew by 9.6 million vehicles.
- FlexFuel Vehicles in Brazil are projected to be 90% of the fleet by 2020.
- All automakers in Brazil make FFVs.
- BP and Shell Oil are investing in ethanol plants in Brazil.
- Ethanol has been shipped in pipelines in Brazil for 30 years.
- Annual ethanol production is in the range of six billion gallons, second to the United States.
- Brazil's first ethanol program was during WWII. Ethanol then accounted for 43% of the country's gasoline pool.

Fuel Ethanol Has Enormous Potential: The Brazilian Example

Most energy experts would agree that it takes a long-term commitment by government to develop alternative fuels. Ethanol is no exception. Brazil has created the example of how a commitment by government can help achieve the longer-term goal of reducing crude oil imports by increasing ethanol production and use.

In 1975 Brazil began an ambitious three stage national alcohol fuel program. Today, Brazil has achieved unheralded success, thanks to a history of consistent and generous government incentives, requirements for automakers to produce FlexFuel Vehicles, and an import duty on non-Brazilian ethanol. The duty helped the Brazilian ethanol industry develop and thrive without fear of being undermined by imports. Today, ethanol use in Brazil has surpassed gasoline use. An estimated 35% of Brazilian passenger cars, and over 90% of vehicles being sold today, can burn any combination of ethanol or gasoline.

Consumers in Brazil have responded to choice. They chose ethanol.[113]

Ethanol is a Strategic and Flexible Fuel

"Ethanol is by far the most energy efficient method of producing liquid transportation fuels. There is a net energy gain for ethanol production, versus an energy loss for other fuels, as follows: ethanol 125%, refined gasoline 85%, methanol 55%, and coal gasification 45%."
— U.S.D.A., Minnesota Dept. of Agriculture

"'The most economical and practical use of ethanol is as a 10% blend in gasoline. It requires no modification to the vehicle, no major changes to the service station pumps or storage tanks, and has a long history of successful use by consumers."
— Red Caveney, President, American Petroleum Institute [116]

"We'll take all the ethanol that corn growers produce. We'll use that enthusiastically as a 10% blend with gasoline."
— Peter J. Robertson, Vice Chairman, Chevron [117]

"One factor behind lower prices in Dallas and Houston (Texas) is the wider availability there of ethanol-based fuel, which is cheaper than regular gasoline."
— Lynton Allred, Texas Association of Independent Gasoline Marketers

"When considering the economic benefits of ethanol production, ethanol production costs in Brazil are equivalent to crude oil at $19 per barrel."
— World Bank [118]

While many alternative fuels may be needed, not all alternative fuels are created equal. A domestic, renewable, clean, liquid fuel that is compatible with existing vehicles and can be used in the existing refueling infrastructure without changes would be a truly strategic commodity, considering the nation's ongoing oil import predicament. That statement defines ethanol. It is argued that one of the reasons many alternative fuels have struggled to make a significant dent in the transportation fuel pool is due to the enormous cost and task of changing refueling infrastructure. For example, hydrogen, natural gas, compressed natural gas (CNG), electricity, and other alternative fuels require special handling and equipment and are typically limited to specially-made vehicles that can only operate on one fuel.

While ethanol has its opponents, ethanol is unique among alternative fuels because of its diversity and success in application. When 10% ethanol is blended with gasoline, no changes to refueling systems or vehicles are required. Ethanol blends up to 85% can be used in more than 8 million flexible fuel vehicles currently on the road with new models widely available to the public at no additional cost. With these many applications, ethanol is indeed the most "strategic and flexible" of all the alternatives and, more importantly, the most successful.

Although the chemical makeup of ethanol exhibits an affinity for water and thus may limit its ability to be transported in pipelines, many oil companies attest to the fact that ethanol presents no particularly unique problems. Blending equipment for gasoline additives exists at every fuel terminal in the country. Merely augmenting these systems to allow for ethanol blending is neither complex nor time consuming. The transition, therefore, to large quantities of ethanol is achieved with much greater ease than any of the other alternative fuels.

The Evolution of a Revolution

Historically, many petroleum refiners have been reluctant to fully embrace ethanol for obvious market share and competitive reasons. Others fully support ethanol and dismiss claims that it presents their industry with unique problems. The transportation network of tomorrow will utilize many resources, both conventional and renewable. New fuel-efficient vehicles and smart highways will improve the efficiency of fuels. The flexibility of fuel from these domestic and renewable resources can provide liquid "biofuels" for internal combustion engines, electric and hybrid vehicles, and fuel cell vehicles.

Today, Valero, the largest independent oil refiner, is also one of the largest ethanol producers. Sunoco owns an ethanol plant in New York, and BP and Shell are buying interests in ethanol plants in Brazil. ExxonMobil, ConocoPhillips, and other major oil companies are investing billions of dollars in research to develop biofuels from algae and other feedstocks.

"Big Oil has reacted aggressively against the expansion of ethanol production, suggesting that it perceives the growth of biofuels as an independent, competitive threat to its market power in refining and gasoline marketing….consumers have a large stake in the outcome of the war being waged by Big Oil against ethanol… supporting increased competition in the automobile fuels market will help discipline a market dominated by a handful of multinational oil companies that are extracting monopoly profits from U.S. gasoline consumers."

— *Big Oil v. Ethanol,* Consumer Federation of America, July 2007

Facts For The Record:

- "In a report issued on Tuesday, the McKinsey Global Institute, the economics research arm of McKinsey & Company, warned that unless robust efficiency measures are undertaken, global markets face the "risk of a second oil-price shock" once the economy recovers and demand for liquid fuels surges...Low-cost fuel savings could also be had by requiring all new vehicles globally to be made with "flex-fuel" engines, McKinsey suggested, which would allow consumers to choose between conventional gasoline and alternative fuels. Making new cars flex-fuel would raise prices by about $100 for each model rolling off assembly lines." New York Times, March 24, 2009

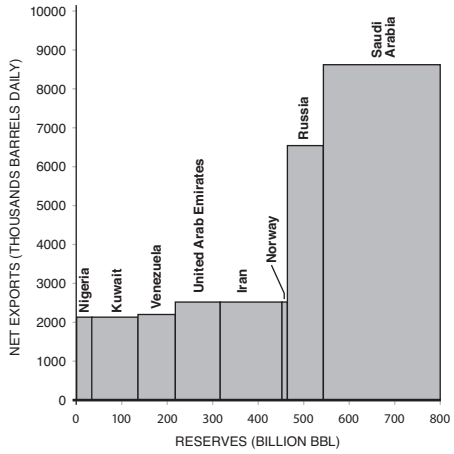
- "For example, even as recently as in their 2007 World Energy Outlook, the International Energy Agency was projecting that the Saudis would be pumping 12 million barrels per day by 2010. In the event, however, Saudi production went down rather than up in 2007… without the Saudis' willingness or ability to adjust production to smooth out price changes, any disturbance to supply or demand would have a significantly bigger effect on price after 2005 compared with earlier periods." James Hamilton, "Causes and Consequences of the Oil Shock of 2007-2008." Feb. 3 2009 [119]

Choice

"Switching to diesel fuel and using hybrid cars make limited but worthwhile contributions. 'Plug in hybrids' may increase this – awareness about this option has really emerged only since this analysis was completed. Fuel cells may become material towards the end of the period. But the major early contribution – and the largest over the 50 year time frame as a whole – comes from biofuels."

— Philip New, Vice President, Global Biofuels, BP[125]

Top eight world-wide countries for petroleum reserves and net exports



Putting Oil in the Rear View Mirror

The facts about ethanol need to be compared to the facts about oil.

- Peak oil production occurred in the U.S. in 1969. The U.S. has about 2% of the World's proven oil reserves.
- Discovered oil reserves outside of OPEC and the former Soviet Union peaked in 1997.[120] Some oil analysts believe the rest of the world reached peak oil in 2005.[121]
- By mid-century, the world's vehicle population is expected to reach 2 billion, almost triple the current level.[122]
- A report by the Paris-based International Energy Agency says world energy demand is expected to surge by up to 60% by the year 2030. China today imports about 30% of its oil needs and in 2030 this will be more than double.[123] By the year 2030, world demand for oil could reach 121 million barrels per day, compared to current demand of 82 million barrels per day. According to the 2009 World Energy Outlook, the world needs an additional 50 million barrels per day of crude oil that they classify as "from fields that have yet to be developed or found."

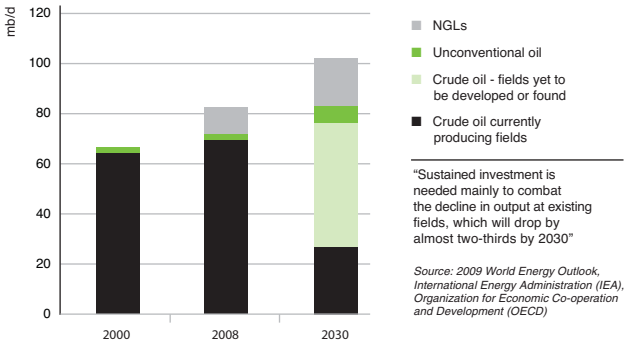
The nation's continued reliance on oil for transportation does not appear to be sustainable when considering the short and long term economic, environmental, or national security implications. The price volatility, ownership, supply and demand, amount of reserves, and geographical location of proven oil reserves in the following graphs do not paint a pretty picture of the nation's energy future without the increased production and use of renewable transportation fuels.

Facts For The Record:

- If every vehicle in the U.S. was a FlexFuel Vehicle running on E85, gasoline consumption would be reduced by 90 billion gallons per year.
- One out of every 10 jobs in the U.S. is dependent on the automotive industry. No other industry is linked to so much U.S. manufacturing or generates more retail business and employment.[124]

IEA World Oil Production Projection: Reference Case

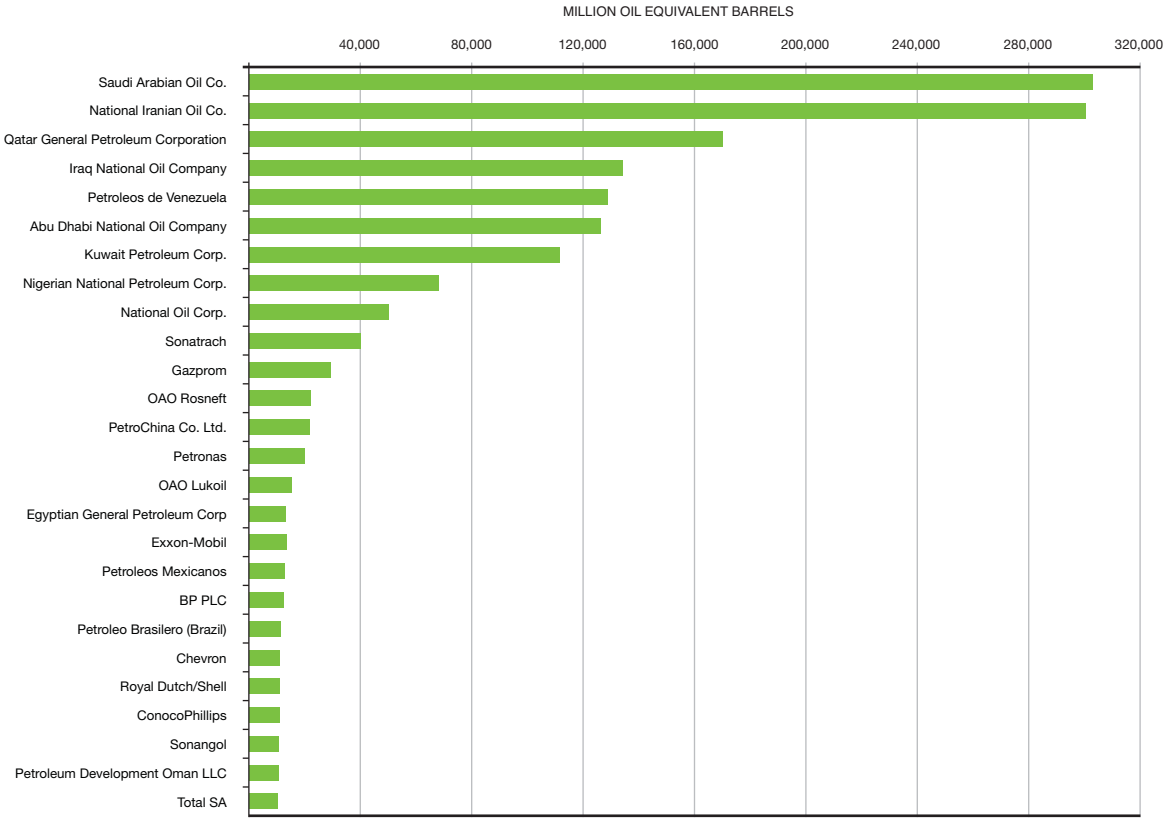
"The Case of the Missing 50 Million Barrels Per Day of Crude Oil Supply"



"Ethanol is America's best renewable fuel because it can help create green-collar jobs, boost our domestic economy, and improve our environment right now. By expanding our use of ethanol today, we can make immediate progress in three vital areas: greater energy independence, a stronger American economy and a cleaner environment. High-tech and homegrown ethanol has created hundreds of thousands of jobs over the past five years, and we can create even more."

— General Wesley Clark, U.S. Army (Ret.) Former NATO Supreme Allied Commander, February 5, 2009.

World's Largest Oil and Gas Companies



Flexibility

"One of the biggest energy policy questions facing us is how to diversify energy supplies for transportation... the United States faces significant energy security challenges stemming from our dependence on foreign oil. Biologically-derived fuels will have an important role to play in promoting our energy security."

— U.S. Senator Jeff Bingaman, (D-NM) Chairman, Senate Energy Committee, March 27, 2007

"The United States transportation sector depends on petroleum for 97% of its energy needs. The largest contributor to the U.S. balance of trade problem is imported oil. By 2020, up to 74% of the oil we use will be imported, costing the U.S. $173 billion per year."

— United States Department of Energy [129]

"The transition to ethanol has been seamless. Virtually every one of our terminals is capable of receiving ethanol, by rail or barge… receiving tank loads of ethanol is no different than receiving shipments of gasoline. It is done all the time and presents no additional burden to gasoline marketers. Once at the terminal, blending ethanol with gasoline is equally uncomplicated. Blending equipment for gasoline additives exists at every fuel terminal in the country, merely augmenting these systems to allow for ethanol blending is neither complex nor time consuming. I see no reason why my experience with ethanol in the Northeast is unique or could not be duplicated."

— Leo Liebowitz, Chairman of the Board, Getty Petroleum, September 1999

FFVs and Blender Pumps Are Blazing a New Trail

There are nearly 200 million registered drivers and 231 million vehicles in the U.S. Consumers purchase about 185 billion gallons of fuel at 160,000 refueling stations. Consumers are reliant on gasoline/petroleum for 97% of their fuel.[126] The nation's precarious energy predicament has fueled a long-time debate: Should the nation build the alternative fuel cars first, or the refueling infrastructure to support them? The debate is over. Chrysler, Ford, and General Motors have produced the vast majority of the 8 million FFVs on the road already reaching their commitment to make FFVs 50% of production in 2010.[127] There could be over 12 million FFVs on the nation's highways by 2012 and 25 million by 2015.

Consumers are already crossing the bridge from oil dependence to flexibility and choice. According to Department of Energy estimates, over 500,000 drivers are using higher blends of ethanol in their FFVs. Many of the new stations selling higher blends of ethanol are installing specially designed blender pumps that will give consumers the choice to blend from 10% to 85% ethanol for their FFVs. According to Growth Energy's on-line E85 refueling database (www.e85refueling.com), there are more that 2,100 E85 stations established in 44 states.[128] The nation needs an increased commitment from industry and government to increase the investment into more E85 pumps to support the growing number of FFVs.

Federal and state governments often support national legislation with public education campaigns. Examples include smoking awareness, driver education, and national campaigns about health related matters. Economic, environmental and energy/national security implications of reliance on imported crude oil should not be excluded from this list. The nation needs a commitment from industry and government to make consumers aware of the availability and importance of FFVs so they can reap the economic, environmental, and national security benefits provided by the RFS.The nation has a long way to go, but it is crossing the bridge from oil dependence to energy diversity and choice. Thousands of consumers today are now choosing to buy higher blends of ethanol for their FFVs that can use up to 85% ethanol (E85). They are filling them up at over 2,200 E85 stations across the United States (find a station at www.e85fuel.com). Many of the new stations selling higher blends of ethanol are installing specially designed "blender pumps" that will give consumers the choice to blend from 10% to 85% ethanol for their FFVs.

Now there needs to be a concerted and equal commitment from industry and government to educate the public and increase the awareness of FFVs so consumers can reap the economic, environmental, and national security benefits of the RFS.

Facts For The Record:

- According to the Energy Information Administration's Energy Outlook 2010, 78% of U.S. energy consumption will be fossil fuels by 2035.[130]
- "Looking at just forestland and agricultural land, the two largest potential biomass sources, this study found that over 1.3 billion dry tons per year of biomass potential – enough to produce biofuels to meet more than one-third of the current demand for transportation fuels."—Joint study by DoE and USDA, 2005[131]
- A "Well to Wheel" (WTW) life cycle analysis model was used to calculate greenhouse gas emissions produced by fuels in internal combustion engines. "The WTW model for cellulosic ethanol showed greenhouse gas emission reductions of about 80% (over gasoline)."— Argonne National Laboratories

Benefits of the Renewable Fuel Standard

"The Renewable Fuel Standard will help bring new economic opportunity to millions of Americans, particularly in rural America. EPA is proud to be a part of the President's effort to combat climate change and put Americans back to work – both through the new Renewable Fuel Standard and through our co-chairmanship with the Department of Energy of the Interagency Task Force on Carbon Capture and Storage."

— Lisa Jackson, EPA Administrator, February 2010[132]

"The renewable fuel standard (RFS) and the recent RFS2 rulemaking was extensively peer reviewed and represents among the most commented on regulation during my 30 years at the U.S. Environmental Protection Agency. The release of the RFS2 regulations represents hundreds of thousands of hours of research, analysis, and input from government, industry, academia and the public. The results of the research and the RFS2 Regulatory Impact Analysis quantifies the economic, environmental, and energy/national security benefits of the use of biofuels to meet the federal RFS."

— Margo T. Oge, Director, Office of Transportation and Air Quality Office of Air And Radiation, U.S. Environmental Protection Agency, before the Governors' Biofuels Coalition, February 23, 2010.

The Potential Benefits from Achieving the National Renewable Fuel Standard

Congress passed the Energy Policy Act of 2005 which created the nation's first Renewable Fuel Standard (RFS). The RFS directly addressed the economic and energy/national security implications from importing oil. The success of the program resulted in an expansion in the Energy Independence and Security Act of 2007 (i.e., EISA and RFS2). The expanded program creates a market for a significant volume of biofuels derived from a multitude of feedstocks and technologies. Further, the program requires reducing greenhouse gas emissions.

EISA requires 36 billion gallons of renewable transportation fuels per year (BGPY) by 2022. Of the 36 BGPY RFS2 total, there are nested subsets of 21 BGPY of advanced biofuels (16 BGPY of which must be cellulosic biofuel, and the remaining 5 BGPY of "other" advanced biofuels including biomass-based diesel) and 15 billion gallons of other renewable fuels. Ethanol is likely to be the dominant fuel produced to meet these requirements. Although the legislation caps the amount of ethanol that can be produced from corn starch at 15 billion gallons per year, the "other" advanced biofuels can be ethanol derived from grains, provided it is not corn starch. Wheat, milo, sorghum, and barley are all viable feedstocks. In addition, the majority of cellulosic biofuel is almost certainly going to be ethanol given the tremendous amount of investment taking place in that area.

RFS Requirement for Biofuels and Biodiesel

Year	BGPY	Year	BGPY
2010	12.95	2017	24.00
2011	13.95	2018	26.00
2012	15.20	2019	28.00
2013	16.55	2020	30.00
2014	18.55	2021	33.00
2015	20.50	2022	36.00
2016	22.25		

Regardless of the mix of fuels used to meet the RFS, the positive economic, environmental, and energy/national security benefits of the federal RFS law, stemming from the production and use of ethanol and other biofuels, were validated by the U.S. Environmental Protection Agency (EPA) in the release of its RFS2 regulations on February 3, 2010.

Highlights from the EPA's RFS2 Regulatory Impact Analysis

Economic Impact Analysis

- The net economic benefit of the RFS in 2022 will be $13 billion to $26 billion.
- Capital investment into renewable fuel production is estimated at $100+ billion.
- Rural development and net farm income will increase by 36%, or $13 billion/yr.
- The nation's imported oil bill will be reduced by $34 billion annually.
- Consumers will save 2.4 cents per gallon on all gasoline and 12.1 cents for diesel. These annual savings amount to $5.9 billion for gasoline, $1.3 billion for diesel, for a total savings to consumers of $7.2 billion per year. Depending on the mix of diesel to ethanol, the range could go up to a total of $11.8 billion in total fuel cost savings. Fuel savings were based on baseline assumption that oil would cost $88 per barrel in 2022.
- Consumers might expect to pay as little as $10 more per person on food prices annually.

Environmental Impact Analysis

- Greenhouse gases will be reduced by 138 million tons per year or the emission reduction equivalent of removing 27 million vehicles from the nation's highways.
- Carbon monoxide will be lower due to lower exhaust emissions.
- Carcinogens (e.g., benzene down 2.5%) and other air toxics will be reduced due to the displacing of gasoline with ethanol/biofuels.

Energy Security Impact Analysis

- The U.S. imports 66% of its oil needs. The RFS will save $2.6 billion annually in energy security related costs by 2022.

According to the U.S. Environmental Protection Agency website, *the RFS2 lays the foundation for achieving significant reductions of greenhouse gas emissions from the use of renewable fuels, for reducing imported petroleum, and encouraging the development and expansion of our nation's renewable fuels sector.*

The Convenient Truth: Frequently Asked Questions

What is fuel ethanol?

Ethanol, otherwise known as ethyl alcohol, alcohol, grain-spirit, or neutral spirit, is a clear, colorless, flammable oxygenated fuel. Ethanol is blended with gasoline to extend fuel supplies at volume levels of 5.7, 7.7, or 10%. These fuel formulations are approved by all automakers and the EPA. Ethanol is also used to increase octane and improve the emissions quality of gasoline as required by the Clean Air Act Amendments of 1990 in carbon monoxide and ozone nonattainment areas. Ethanol is also used as an alternative fuel to meet Clean Air Act and Energy Policy Act crude oil displacement goals. In this application, 85% ethanol and 15% gasoline is blended to be used in flexible fuel vehicles. In the future, ethanol can be used as a fuel to power fuel cells, airplanes and other energy applications.

Will ethanol perform well in my vehicle and is it covered under my warranty? **YES!**

All automobile manufacturers approve the use of ethanol/gasoline blends up to 10%. Approval of ethanol blends is found in the owner's manual under references to refueling or gasoline. General Motors Corporation states in its owner's manual they recommend the use of fuel oxygenates, such as ethanol, when and where available. Fuel ethanol blends are sold in nearly every state and can be found in 90% of the nation's gasoline.[133] Ethanol-blended gasoline has achieved nearly 100% market share of all gasoline sold in certain carbon monoxide (oxygenated gasoline) and ozone nonattainment areas (reformulated gasoline, RFG). Minnesota has adopted a statewide oxygenated fuel program that has resulted in ethanol being blended in more than 95% of the state's gasoline. Therefore, fuel ethanol is successfully used in all types of vehicles and engines that require gasoline.

Is ethanol-blended fuel bad for fuel injectors? **NO!**

Ethanol or ethanol-blends have never contributed to burning or fouling of port fuel injectors. Some components in gasoline, such as olefins, have been identified as causing deposits that can foul injectors. Since ethanol burns 100% and leaves no residue, it cannot contribute to the formation of deposits. Ethanol blends actually keep fuel injectors cleaner — helping improve engine performance. Ethanol does not increase corrosion, nor will it harm any seals or valves.

Will ethanol-blended fuel cause vapor lock? **NO!**

Vapor pressure specifications of gasoline continue to be lowered by state and federal statute, virtually eliminating the vapor lock problems that were reported years ago. Additionally, all major auto manufacturers now have in-tank fuel pumps, which are not subject to vapor lock like the older in-line fuel pumps.

Will ethanol blends make engines run hotter? **NO!**

Ethanol actually helps keep your engine cooler, since the ethanol in the fuel combusts at a lower temperature. In fact, many high-powered racing engines use pure alcohol for that very reason. The IndyCar Series® converted to using 100% ethanol beginning in 2007.

Will ethanol-blended fuel plug fuel lines? **NO!**

Occurrences of plugged fuel filters are virtually non-existent now. The "cleansing" nature of ethanol blended fuels can actually keep your fuel system cleaner and lead to improved performance. In the case of dirty fuel systems, contaminants and residues that have been deposited by gasoline can be loosened. That residue can get caught in the fuel filter. In older cars, especially those made prior to 1975, replacing the filter solves the problem from that point on—and once your car's fuel system is clean, your car's performance should improve as well.

Can ethanol blends be used in older cars? **YES!**

The formulation of gasoline has changed dramatically over the past few years without affecting the performance of older cars. Many older cars were designed to run on leaded gasoline, with the lead providing necessary octane performance — and the lead oxides that were formed during combustion provided a cushion that reduced wear on non-case-hardened valve seats. When lead was phased out of gasoline, oil companies added toxic chemicals to raise the octane rating — and other additives to replace the "lubrication" value of lead. Ethanol added to gasoline increases the octane level of the final fuel by three points — and it does so using a natural, renewable additive that works well in older engines.

Can ethanol blended fuels be used in small engines? **YES!**

Ethanol blended fuel is perfectly acceptable in lawn mowers, snowmobiles, and other small engines. Manufacturers of this equipment know that more than 90% of the gasoline sold across the U.S. contains ethanol, so they've made certain that their engines perform using clean-burning fuels. Ethanol blends may be used anywhere that unleaded gasoline is used—from ATVs to chainsaws, from lawn mowers to personal watercraft. Virtually every small engine manufacturer, including Briggs & Stratton, Honda, Toro/Lawnboy, Kohler, and Snapper, approves the use of ethanol-blended fuel in its equipment.

Facts For The Record:

- Estimates that by 2012, the RFS will:
  - The U.S. has 21 billion barrels (1.5%) of the world's 1,342 billion barrels of proven oil reserves.
    Source: DOE/Energy Information Administration
  - The world's 10 largest oil and natural gas companies are 100% owned by foreign governments.
    Source DOE/EIA, Country Analysis Briefs
  - ExxonMobil is ranked 17 among the world's largest oil reserve holders.
    Source: Oil and Gas Journal, December 22, 2008.
  - All U.S. oil companies combined control less than 10% of world oil reserves.
    Source: Oil and Gas Journal, December 22, 2008.
  - The U.S. is going to need 6-10% more energy in the next 20 years.
    Source: Energy Information Administration, AEO 2009 Table A1.

For more information, EPA: www.epa.gov/otaq/gasoline/information.htm Keyword Search: Ethanol DOE: www.afdc.energy.gov/afdc/ethanol/ Keyword Search: Ethanol

The Convenient Truth: Performance, Food vs. Fuel

With the incredible growth in ethanol production, will we run out of corn? **NO!**

In 2009, U.S. corn farmers produced a record 13.2 billion bushels of corn. Of that, 4.2 billion bushels went to the production of ethanol and co-products—so there is plenty of room to expand ethanol production without limiting the availability of corn. Average corn yields continue to increase and other nations are growing more corn as well, so the supply continues to grow. At the same time, new raw materials for ethanol production are being developed including cornstalks, switch grass, vegetable matter, waste from paper/pulp production, and other "cellulosic" sources.

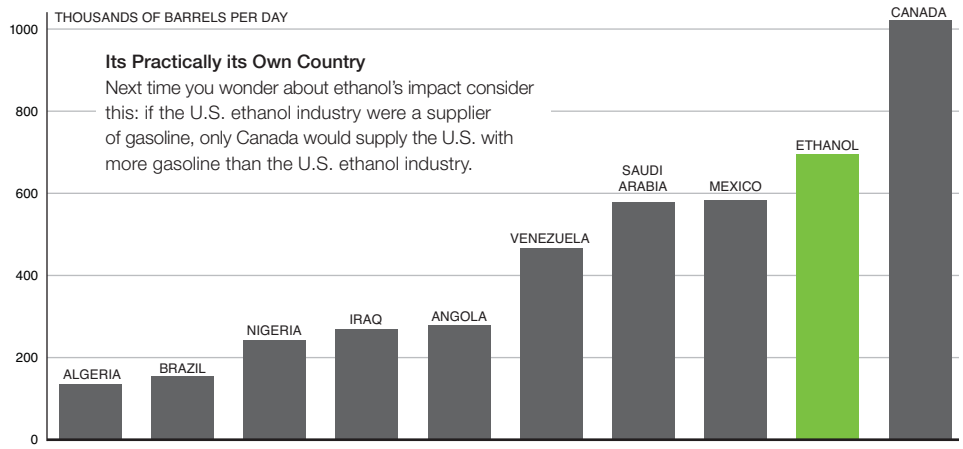
Are we going to have to choose between food and fuel? **NO!**

Ethanol production yields many valuable human and animal feed co-products. A bushel of corn used in the fuel ethanol process produces 1.5 pounds of corn oil, 17.5 pounds of high protein feed (distillers dried grains, or DDG), 2.6 pounds of corn meal, and 31.5 pounds of starch that can be converted to beverages or sweeteners, or used to produce 2.8 gallons of ethanol.[134] Co-products from the milling of corn have important nutritional properties that add value to feed rations and livestock feeding programs.[135] The use of corn co-products provides a cost-competitive feed on a per-head basis. Corn co-products compete with other feed ingredients, helping to reduce overall costs to the producer.[136] The corn used to make ethanol is field corn, which is primarily fed to livestock, not humans—so ethanol production does not have a dramatic impact on the amount of corn eaten by people. Additionally, ethanol facilities also make distillers grains and gluten feed—products that are fed to livestock, producing high quality meat and dairy products for the U.S. and abroad. Wet mill ethanol facilities (also called "corn refineries") produce food ingredients such as cornstarch, corn sweeteners and corn oil—all products that add to the food supply for humans. Bottom line: We can have both food and fuel—and more of both, thanks to ethanol production.

Fueling the United States

Top Crude Oil Sources and the U.S. Ethanol Contribution

(Gasoline Equivalent)



Source: Growth Energy, based on EIA 2009 monthly petroleum supply data.

Does ethanol increase gas prices? **NO!**

Historically, ethanol prices have correlated with the price of gasoline and other fuel blending components—and ethanol blends typically cost less at the pump. During 2006, many petroleum marketers phased out MTBE (an oxygenate that has been banned in many states) more rapidly than anticipated—creating a huge and sudden demand for ethanol in new markets such as Texas. This action temporarily raised the price of ethanol on the commodity market (due in great part to distribution challenges which caught railroads and trucking companies by surprise)—and, at times, ethanol blends were priced higher at the pump as a result. Ethanol production capacity across the nation is ramping up at an amazing rate. It is expected that ethanol prices will continue to moderate as availability and distribution improve—and ethanol blends will resume their price position at or below that of ordinary unleaded gasoline. According to a new analysis by Merrill Lynch Commodity Strategist Francisco Blanch, "retail gasoline prices would be $21/bbl higher, on average, without the incremental biofuel supply." This translates to a $526 a year savings on gasoline for the average family, based on 2008 data.

How much does ethanol cost compared to gasoline?

The lower tax rate for ethanol-blended gasoline makes ethanol less expensive than gasoline for gasoline wholesalers. Gasoline wholesalers increase the retail price of ethanol due to ethanol's high quality and value as an octane enhancer. The cost of producing ethanol is generally higher when compared to the production of gasoline because crude oil prices in the Middle East can be as low as $3-$5 per barrel and can be sustained at levels of $10 per barrel. The majority of ethanol's production costs are the result of the cost of the feedstock (i.e., grain) paid to U.S. farmers. The average cost of producing ethanol ranges from $1.10 to $1.50 per gallon. The $0.45 per gallon federal ethanol tax credit provides the price differential between the wholesale price of gasoline and the traditionally higher cost of producing ethanol.

Do we get more energy out of ethanol production than it takes to produce ethanol? **YES!**

But let's first set the benchmark — Gasoline has an energy ratio of 0.805. In other words, for every unit of energy dedicated to the production of gasoline there is a 19.5% energy loss.[137] Dozens of studies have proven that ethanol is a net energy winner — creating more energy than it takes to produce. Moreover, these studies take into account the energy required to grow, harvest and transport the corn to the ethanol plant. Corn ethanol is energy efficient, as indicated by an energy ratio of 1.34; that is, for every Btu dedicated to producing ethanol, there is a 34% energy gain.[138] According to the U.S. Department of Agriculture, producing ethanol from domestic corn stocks achieves a net gain in a more diverse form of energy. Ethanol production also utilizes abundant domestic energy supplies like coal and natural gas to convert corn into a premium liquid fuel that can replace petroleum imports by a factor of 7 to 1.[139]

Since 1995, nine independent studies have found that ethanol has a positive net energy balance—including conclusive studies conducted by the University of Nebraska and other educational institutions. In June 2004, the U.S. Department of Agriculture found that ethanol production results in 1.67 times more energy. In 2002, a similar study found the ratio to be 1.35 to 1 — proving that ethanol production has become more efficient.[140] If farmers and industry were to use all the best technologies and practices, the net energy ratio would be 2.21 to 1.99.[141] Farmers are also using less

For more information, see the Issue Brief "Net Energy Balance of Ethanol Production at www.cleanfuelsdc.org/pubs/documents/EnergyBalanceIssueBriefMarch09.pdf

energy to produce their corn crops and crop yields continue to increase annually which further improves the ratio.

It's also important to realize that the energy used in ethanol production results in more products than just ethanol. Co-products such as distillers grains, carbon dioxide and corn sweeteners are produced—further reducing the amount of energy devoted solely to ethanol production.

Does ethanol really help reduce greenhouse gas emissions? **YES!**

The greatest contributor to greenhouse gas emissions is transportation fuel—the exhaust from the millions of cars, trucks, and other vehicles on America's highways. The Argonne National Laboratory has found that using ethanol in gasoline produces 32% fewer emissions of greenhouse gases than gasoline for the same distance traveled.

Ethanol also reduces emissions of other harmful pollutants such as carbon monoxide—and it dilutes and displaces toxic gasoline components such as benzene and toluene.

How much water is used in ethanol production?

The amount of water used in ethanol production has declined dramatically as ethanol production has become more efficient. Today, it takes about 3.5 gallons of water to produce one gallon of ethanol—and much of that is processed and returned to streams and watersheds. At one time, it took 8 gallons of water to produce one gallon of ethanol, so the industry is continually getting better at conserving this precious resource. To put this in perspective, a 100 million gallon per year ethanol plant uses about as much water as it takes to irrigate about 1,000 residential lawns of 5,000 square feet each during a typical spring-summer season.

For more information, see the Issue Brief "Environmental Impacts of Ethanol Production: at www.ethanolacrossamerica.net/PDFs/EnvironmentalImpactIssueBrief2009.pdf

Online Resources

The Ethanol Fact Book is a broad source of reference-based information on a wide range of different issues. For more specific information on ethanol and the policies and programs that drive its use, please review the Clean Fuels Development Coalition's web site at www.CleanFuelsDC.org, or browse the multitude of other credible online resources for information on ethanol provided on the next two pages.

Legislation (Bills, Hearings, Committees)

The White House ..... www.whitehouse.gov
United States House of Representatives ..... www.house.gov
United States House of Representatives Law Library ..... uscode.house.gov
United States Senate ..... www.senate.gov
Thomas (Legislation Information) ..... www.thomas.loc.gov

Government Research

Alternative Fuels Data Center ..... www.afdc.nrel.gov
Department of Commerce ..... www.doc.gov
Department of Energy ..... www.doe.gov
Argonne National Laboratory ..... www.anl.gov
Bartlesville Project Office National Oil Program ..... www.oil.bpo.gov/bpo-oil.html
Brookhaven National Laboratory ..... www.suntid.bnl.gov
Clean Cities ..... www.ccitites.doe.gov
Energy Efficiency & Renewable Energy Network ..... www.eren.doe.gov
Federal Register ..... www.ssdc.ucsd.edu/gpo/fedfld.html
Fossil Energy Worldwide Web Network ..... www.fe.doe.gov
Lawrence Berkeley Laboratory ..... www.lbl.gov
Lawrence Livermore Laboratory ..... www.llnl.gov
Los Alamos National Laboratory ..... www.lanl.gov
Morgantown Energy Technology Center ..... www.metc.doe.gov
National Renewable Energy Laboratory ..... www.nrel.gov
Office of Science and Technical Information ..... www.apollo.osti.gov
Sandia National Laboratories ..... www.sandia.gov
Department of Treasury ..... www.ustreas.gov
Energy Information Administration (EIA) ..... www.eia.doe.gov
Energy-Related Web Servers ..... www.fe.doe.gov/moweb.html
Environmental Protection Agency ..... www.epa.gov
Office of Transportation and Air Quality ..... www.epa.gov/otag
General Accounting Office ..... www.gao.gov
Government Printing Office ..... www.access.gpo.gov
Internal Revenue Service ..... www.irsustreas.gov
Library of Congress ..... www.loc.gov
Office of Technology Assessment ..... www.ota.gov

Ethanol/Energy/Environmental and National Security Related Organizations

Consensus for a larger and sustainable ethanol industry is thriving in Congress and in towns and organizations all across America. The success of ethanol can be widely attributed to the thousands of people who have dedicated their time and resources to advance energy, environmental, economic, and national security through the enactment of enhanced national energy and environmental policy to encourage the production and use of renewable fuels.

Ethanol/Energy/Environmental and National Security Related Organizations

Clean Fuels Development Coalition .....www.cleanfuelsdc.org
Ethanol Across America .....www.ethanolacrossamerica.net
American Coalition for Ethanol .....www.ethanol.org
Citizen Action .....www.essential.org/CMEP
Clean Air Network .....www.naturalgas.com
Clean Fuels Foundation .....www.cleanfuelsfoundation.org
CONEG Policy Research Center Inc. .....www.coneg.org
Energy Future Coalition .....www.EnergyFutureCoalition.org
Environmental Education on the Internet .....www.nceet.snre.umich
Ethanol Producers and Consumers .....www.ethanolmt.org
Global Climate Coalition .....www.worldcorp.com
Governors' Biofuels Coalition.....www.governorsbiofuelscoalition.org
Growth Energy .....www.growthenergy.org
Intergovernmental Panel on Climate Change .....www.ipcc.ch
Interstate Oil and Gas Compact Commission .....www.iogcc.oklaosf.state.ok.us
National Commission on Energy Policy .....www.NationalCommissiononEnergyPolicy.org
National Conference of State Legislatures.....www.ncsl.org
National Technology Transfer Center.....www.nttc.edu
National Renewable Energy Laboratory.....www.nrel.gov
Natural Resources Defense Council .....www.nrdc.org
Nebraska Ethanol Board .....www.NE-Ethanol.org
New England Instate Water Pollution Control Commission .....www.neiwpcc.org
Northeast Regional Biomass Program .....www.nrbp.org
Northeast States for Coordinated Air Use Management.....www.nescaum.org
Petroleum Internet Resources .....www.slb.com/petr.dir
Renewable Fuels Association .....www.EthanolRFA.org
Set America Free .....www.SetAmericaFree.org
Society of Automotive Engineers.....www.sae.org
State and Local Government on the Net.....www.piperinfo.com/piper/state/states.html
State Search .....www.state.ky.us/nasire/NASIREhome.html
United Nations Foundation .....www.unfoundation.org
USA CityLink.....www.usacitylink.com//default.html
Government Web Servers .....www.eit.com/web
25 x 25 Campaign www.25x25.org

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American Coalition for Ethanol
The American Coalition for Ethanol (ACE) is the grassroots voice of the U.S. ethanol industry. ACE works with a wide range of groups in support of ethanol, including commodity organizations, rural electric cooperatives, ethanol producers, grain cooperatives, businesses and individuals. ACE is organized to promote and expand the development of the ethanol industry, and to reduce America's dependence on foreign oil imports; to provide an alternative use for farm products; to create a public awareness of the uses and benefits of ethanol, at the same time dispelling fears and erroneous product information; to support legislative efforts to promote ethanol usage and to do all other things necessary or expedient for the promotion and increased usage of ethanol. For more information contact:
Brian Jennings • 605-334-3381 • bjennings@ethanol.org
5000 S. Broadband Lane, Suite 224, Sioux Falls, SD, 57108 • www.ethanol.org

Chrysler Group LLC
Our concern for the environment has led to a number of firsts in green technology. Chrysler Group was the first manufacturer to introduce the electric minivan, the first U.S. manufacturer to introduce CFC-free vehicles and the first car maker to sell one million Flex Fuel Vehicles (FFV)—by 2012, nearly half our fleet will be FFV capable. The company also offers advanced diesel technology with the legendary 6.7L Cummins, featuring ultra-clean emissions technology, in a full-size pickup. Our 5.7L HEMI V8 engine with MDS fuel-saving technology has the ability to switch from eight to four cylinders to save fuel. For the 2011 model year, Chrysler Group will launch the all-new Jeep® Grand Cherokee with the Pentastar V-6 engine. The Pentastar is E-85 capable and will eventually replace seven current V-6 engines in use by the company. Chrysler Group and Fiat created an alliance in 2009 that gave Chrysler Group access to a number of new powertrain technologies to improve fuel economy and reduce emissions. As part of the alliance, Chrysler Group is the center of competence for vehicle electrification for both companies and is currently developing a Fiat 500 EV to launch in 2012. For more information contact:
Nick Cappa, Engineering and Technology Public Relations, Chrysler Group LLC
nick.cappa@chrysler.com

Ford Motor Company
At Ford Motor Company, we recognize that tremendous opportunities exist for innovation and development of renewable fuels. We are a leader in developing flexible fuel vehicles designed to run on E85, placing more than 4 million FFVs on the roads globally. In the U.S., we have pledged to make half of the vehicles we produce capable of running on alternative fuels by 2012, provided the necessary fuel and infrastructure are in place to support them. Additionally, we have delivered on our pledge to double our production of flexible fuel vehicles in 2010. As the market for renewable fuels grows, new policies for land use, bio-engineering initiatives to increase yields and develop advanced biofuels, and more efficient production techniques will all contribute to securing America's energy future. In our market-driven economies, price signals and demand will encourage this innovation and growth. For more information contact:
Curt Magleby • 313-337-6180 • cmagleb1@ford.com.
One American Road • Dearborn, MI 48126-2701 • www.ford.com

Governors' Biofuels Coalition
A bipartisan coalition of U.S. member states and international members, the Governors' Biofuels Coalition works to promote the development and use of all biofuels, including ethanol, biodiesel, advanced biofuels, co-products, and new applications and technologies yet to come. The Coalition's goal is to increase the use of ethanol based fuels, to decrease the nation's dependence on imported energy resources, improve the environment and stimulate state and national economies. The Coalition supports the production of biofuels from all renewable resources using sustainable agricultural methods and encourages its use in environmentally acceptable applications. For more information contact:
The Coalition's Administrative Office • Box 95085 • Lincoln, NE 68509
www.governorsbiofuelscoalition.org

Green Plains Renewable Energy, Inc.
Green Plains is a vertically-integrated ethanol producer based in Omaha, Nebraska. We currently have an ethanol production capacity of approximately 480 million gallons per year with our 6 plants located in Bluffton, Indiana; Central City, Nebraska; Obion, Tennessee; Ord, Nebraska; Shenandoah, Iowa; and Superior, Iowa. We also operate an independent third party ethanol marketing business, Green Plains Trade, for which we have 360 million gallons of annual production under contract. Green Plains also provides agribusiness services through our Subsidiary – Green Plains Grain headquartered in Everly, Iowa. Green Plains Grain is a full-service agribusiness organization that specializes in grain, agronomy, and petroleum products in Iowa, southwestern Minnesota and western Tennessee. Looking to next generation technology, Green Plains is part of a joint venture called BioProcessAlgae to commercialize algae production technology. In addition to Green Plains the other partners in the venture are CLARCOR Inc., Bioprocess H2O, and NTR plc. BioProcessAlgae received a grant from Iowa Office of Energy Independence for approximately $2.1 million to build a pilot project at Green Plains' ethanol plant in Shenandoah, Iowa. For more information contact:
Jim Stark • P. 402.315.1630 • 9420 • F. 402.884.8776 • Underwood Ave Ste. 100
Omaha, NE 68114 • jim.stark@gpreinc.com • www.gpreinc.com.

Growth Energy
Growth Energy is a group committed to the promise of agriculture and growing America's economy through cleaner, greener energy. Growth Energy members recognize America needs a new ethanol approach. Through smart policy reform and a proactive grassroots campaign, Growth Energy promotes reducing greenhouse gas emissions, expanding the use of ethanol in gasoline, decreasing our dependence on foreign oil, and creating American jobs at home. For more information contact:
777 North Capitol St., NE • Washington, DC 20002 • 202.545.4000
GrowthEnergy.org

Husker Ag LLC
Husker Ag LLC is a name plate 70 million gallons per year plant producing at over 73 million gallons per year. For more information contact:
Seth Harder • 402-582-4446 • sethh@huskerag.com
54048 Highway 20 • Plainview, NE 68769 • www.huskerag.com

ICM, Inc.
Established in 1995 and headquartered in Colwich, Kan., ICM, Inc., provides innovative technologies, solutions, and services to sustain agriculture and advance renewable energy, including food and feed technologies that will increase the supply of world protein. By providing proprietary process technology to 102 facilities with a combined production capacity of approximately 6.7 billion gallons of annual ethanol production, ICM has become a world leader in biorefining technology. The full-service provider also offers a comprehensive line of more than 100 products and services tailored to make biofuels production more efficient and more profitable. ICM is further upholding its responsibility as an industry leader by heavily investing in the continued advancement of renewable energy technologies. In an effort to speed that advance, ICM has been conducting research and testing at its two state-of-the-art research facilities in Colwich and St. Joseph, MO, in conjunction with a growing list of strategic partners spanning multiple industries. For more information contact:
www.icminc.com

KATZEN International, Inc.
KATZEN International, Inc. is a developer and designer of process technology for the ethanol and related industries, worldwide. For more than 5 decades, KATZEN International, Inc. has been the leader at the cutting edge of technology. The firm consists of highly experienced chemical, biochemical and mechanical engineering and design professionals. Their R&D and design engineering efforts are continually developing the superior technology solutions that create ongoing improvement in the bottom-line performance of the industry. For more information contact:
Robert E. Eickelberger • 513-351-7500 • eickelberger@katzen.com,
projects@katzen.com
2300 Wall Street, Suite K • Cincinnati, OH 45212-2789 • www.KATZEN.com

National Farmers Union
National Farmers Union (NFU) was founded in 1902. NFU is a general farm organization of farm and ranch families throughout the United States. For more than 100 years, National Farmers Union's primary goal has been to sustain and strengthen family farm and ranch agriculture. The key to this goal has been Farmers Union's grassroots structure in which policy positions are initiated locally. The policy process includes the presentation of resolutions by individuals or a group of Farmers Union members, followed by possible adoption of the resolutions at the local, state and national levels. NFU believes that good opportunities in production agriculture are the foundation of strong farm and ranch families and that strong farm and ranch families are the basis for thriving rural communities. Vibrant rural communities, in turn, are vital to the health and economic wellbeing of the entire U.S. economy. For more information contact:
Roger Johnson, President • Chandler Goule, Vice President of Government Relations NFU
20 F Street, NW, Suite 300, Washington, DC 20001 • 202-554-1600 • www.nfu.org

POET
POET, the largest dry mill ethanol producer in the United States, is an established leader in the bio-refining industry. Formerly known as Broin, POET is a fully-integrated biofuels company, orchestrating the development, design, engineering, construction and management of ethanol production facilities and then marketing the products. There are 26 POET Biorefining production facilities in five states producing and marketing over 1.5 billion gallons of ethanol annually. In addition to ethanol, POET Nutrition has perfected the leading brand of premium dried distillers grains (DDGS) on the market, Dakota Gold. The 26 POET Biorefining facilities annually produce more than 3 million tons of DDGS that are sold all over the world. POET is also leading the way in the next chapter of biofuels

About our Sponsors

by jointly funding the design and construction of a commercial cellulosic ethanol production facility with the U.S. Department of Energy. For more information contact:
Nathan Schock, Public Relations Director • 605-965-6428 • nathan.schock@poetenergy.com
4615 N. Lewis Ave. • Sioux Falls, SD 57104 • www.poetenergy.com

United States Department of Agriculture, Office of Energy Policy and New Uses
The Office of Energy Policy and New Uses was established in 1998. The office provides policy advice for the Office of the Secretary on energy matters, coordinates energy-related activities within the Department, serves as liaison with other Departments on energy issues, and conducts a program on the economic feasibility on new uses of agricultural products. For more information regarding ethanol contact:
Dr. Harry Baumes, Acting Director • 202-401-0497 • hbaumes@oce.usda.gov
Dr. Hosein Shapouri, Agricultural Economist • 202-401-0531 • hshapouri@oce.usda.gov
Office of Energy Policy and New Uses, Office of the Chief Economist, USDA
1400 Independence Av. SW • Washington DC 20250 • www.usda.gov/oce/energy

SUPPORTING COMPANIES AND ORGANIZATIONS

Ag Processing Inc
Ag Processing Inc (AGP®) is a farmer-owned cooperative engaged in the procurement, processing, marketing, and transportation of grains and grain products. Since its formation in 1983, AGP has been committed to the success of its owners. Today, that is 184 local cooperatives representing over 250,000 farmers throughout the Midwest, and five regional cooperatives representing farmers throughout the United States and Canada. AGP operates nine soybean processing plants including six plants in Iowa, located at Eagle Grove, Emmetsburg, Manning, Mason City, Sergeant Bluff, and Sheldon. Other AGP processing plants are located at Dawson, Minnesota, St. Joseph, Missouri, and Hastings, Nebraska. AGP holds the distinction of being The largest "cooperative" soybean processing company in the world; A leading supplier of refined vegetable oil in the United States; A pioneer in renewable fuels, constructing the first purpose-built soy biodiesel plant in the U.S. in 1996 and operating an ethanol plant in Hastings, NE since 1995. For more information contact:
Ag Processing Inc • 800-247-1345/402-496-7809 • P.O. Box 2047 • Omaha, NE 68103-2047
12700 West Dodge Road, Omaha, NE 68154-2154 • www.agp.com

American Council On Renewable Energy (ACORE)
ACORE, a 501(c)(3) membership non-profit organization headquartered in Washington, DC, is dedicated to bringing renewable energy into the mainstream of the US economy and lifestyle through research and communications programs and membership committees. ACORE'S membership works in all sectors of the renewable energy industries including wind power, solar energy, geothermal energy, hydropower, ocean energy, biomass, biofuels, and waste energy. ACORE provides a common platform for the wide range of interests in the renewable energy community including end users, technology companies, manufacturers, utilities, professional service firms, financial institutions, colleges and universities, associations, non-profit organizations and government agencies. ACORE serves as a thought leadership forum through which these parties work together on common interests. ACORE co-organizes the REFF-Wall Street and REFF-West Finance Conferences, the RETECH All-Renewables Energy Conference and Exhibition, the Phase II National Policy Forum in Washington, DC, and hosts both domestic and global policy events furthering the mission of renewable energy. For more information contact:
Tom Weirich, Vice President of Corporate Relations • P. 202-777-7582 • F. 202-393-0606
1600 K Street NW, Suite 700 • Washington, DC 20006 • weirich@acore.org • www.acore.org

Biomass Coordinating Council (BCC)
The Biomass Coordinating Council (BCC) is formed under the auspices of the American Council On Renewable Energy (ACORE), a 501(c)(3), non-profit organization based in Washington, D.C. The BCC is working to accelerate the adoption of renewable biofuels, bio-power, and bio-based products into mainstream American society through work in policy initiatives, convening, networking, and communications. BCC's goals include reducing America's dependence on oil, creating a cleaner environment, and expanding markets for rural America. BCC promotes all renewable and sustainable uses of biomass including: Biofuels such as ethanol, methanol, biodiesel, and other biofuels for surface transportation, maritime, and aviation use; Biopower, heating, and cooling through combined cycle systems to boost efficiency and improve economics. Technologies include co-firing and co-gasification with coal; and Bio-based products such as plastics, solvents, lubricants, adhesives, and fertilizers to replace petrochemical-based products. For more information contact:
William C. Holmberg • borefiner@aol.com

BlueFire Ethanol Fuels, Inc.
BlueFire Ethanol Fuels, Inc. was established to deploy the proven Arkenol Process Technology ("Technology") for the profitable conversion of cellulosic waste materials to ethanol. BlueFire is the exclusive North America licensee of the Technology for use in the production of ethanol for the transportation fuel market. BlueFire's goal is to develop and operate high-value carbohydrate-based transportation fuel production facilities to provide a viable alternative to fossil fuels on a world-wide basis. These "biorefineries" will convert widely available, inexpensive, organic materials such as agricultural residues, high-content biomass crops, wood residues, and cellulose in municipal solid wastes into ethanol. For more information contact:
Rigel Z. Stone, Dir. of Corporate Communications • 949-588-3767 • rstone@bluefireethanol.com.
31 Musick • Irvine, CA 92618 • www.BlueFireEthanol.com

Burns & McDonnell Engineering Company, Inc
Burns & McDonnell Engineering Company, Inc. is an internationally recognized architectural, engineering and construction firm that has been making its clients successful for over 110 years. Burns & McDonnell has extensive experience in the design of grain-processing, chemical, refining, and food processing facilities. Many of the unit operations utilized in biofuels production have been in our core business since 1950. We have been involved in ethanol plant design utilizing most major process technologies and a variety of feedstocks. In addition, we have completed process evaluations and studies involving many of the available biodiesel technologies. We maintain a staff of qualified engineers and professionals needed to handle projects such as technology evaluations, front end designs, revamps of existing facilities, and full Engineering, Procurement, and Construction (EPC) of grassroots facilities. Burns & McDonnell plans, designs, permits, constructs and manages facilities all over the world with one mission in mind — to make our clients successful. For more information contact:
Ron Jones, Director of Biofuels Development • P: 314-682-1571 • F: 314-682-1600 • 425 South Woods Mill Road, Suite 300 • Chesterfield, MO 63017 • ronjones@burnsmcd.com

Chief Ethanol Fuels, Inc.
Chief Ethanol Fuels is the longest operating ethanol plant in Nebraska. A subsidiary of Chief Industries, Chief Ethanol Fuels began as a 10 million gallon per year facility in 1985 and has evolved into one of the most efficient ethanol facilities in the United States. The plant has increased capacity steadily over the last two decades, currently producing about 70 million gallons annually. Chief Ethanol has been an integral part of the Hastings, Nebraska community, providing a value added outlet for local grain, high quality distillers grains to local cattle operations, and creating numerous direct and indirect jobs. For more information contact:
Duane Kristensen • 402-463-6885 • Duane.kristensen@chiefind.com
4225 E. South Street • Hastings, NE 68901 • www.chiefethanol.com

Clean Fuels Foundation
The Clean Fuels Foundation was established in 1996 as the first charitable 501© 3 organization dedicated specifically to educating the public about the need to develop alternative transportation fuels. The Clean Fuels Foundation has created and implemented several national education and awareness campaigns that include the Environmental Inaugural Ball, the Ethanol Across America program and Radio Show, and developed and distributed a multitude of publications. The effort is focused on educating key stakeholders about the benefits of reducing imported crude oil imports and replacing gasoline with clean burning renewable fuels. For more information contact:
Burl Haigwood • 301-718-0077 • burl.haigwood@cleanfuelsdc.org

ClearFuels Technology, Inc.
ClearFuels will be a low cost first mover in drop-in renewable diesel and jet fuel production by leveraging its proven, proprietary High Efficiency Hydrothermal Reformation (HEHTR) technology platform. The integrated ClearFuels-Rentech biomass-to-diesel technology will enable versatile production of next-gen renewable diesel and jet fuel at ClearFuels' multi-feedstock, flexible biorefineries. For more information contact:
Eric Darmstaedter • ClearFuels Technology, Inc., CEO • Hawaii Agricultural Research Center
99-193 Aiea Heights Drive, Suite 308 • Aiea, Hawaii 96701 • www.clearfuels.com

CoBANK
With approximately $60 billion in assets, CoBANK serves vital industries across rural America, providing loans, leases, export financing and other financial services to agribusinesses and rural power, water and communications providers in all 50 states. We have been the leading lender to some of America's most successful businesses for more than 50 years. CoBANK is a member of the Farm Credit System, a nationwide network of banks and retail lending associations chartered to support the borrowing needs of U.S. agriculture and the nation's rural economy. In addition to serving its direct borrowers, the bank also provides wholesale loans and other financial services to affiliated Farm Credit associations and other partners across the country. We are also one of the largest sources of funding for ethanol facilities, with nearly 20 years active participation in the industry. As a borrower-owned bank operating on a cooperative basis, a substantial portion of our earnings are annually returned to our customers in the form of patronage refunds. For more information contact:
Tom Houser • 800-346-5717 Ext. 2013 • thouser@cobank.com
11422 Miracle Hills Drive, Suite 300 • Omaha, NE 68154 • www.cobank.com

Coskata Inc.
Coskata Inc. is a biology-based renewable energy company with a platform technology that enables the low-cost production of biofuels and chemicals, from virtually any carbonaceous material. Using anaerobic microorganisms and innovative bioreactor designs, Coskata creates and enables additional energy resources worldwide. Their process combines the flexibility of gasification with the efficiency of biological conversion of syngas into fuels or chemicals. Founded in 2006 by leading renewable energy investors and entrepreneurs including Khosla Ventures, Advanced Technology Ventures, and GreatPoint Ventures, Coskata has assembled an experienced management team to lead the development and commercialization of its compelling technology. For more information contact:
www.coskata.com.

ESE Alcohol, Inc.
ESE Alcohol, Inc. of Leoti, Kansas is a family owned fuel ethanol production facility that was established in 1980. Production has been continuous since its inception. The ethanol facility has been and continues to be an intricate part of the family farming operations contributing to its crop nutrient program. For more information contact:
Duane Berning, President • 620-375-4904 • deberning@esealcohol.com • P.O. Box 848
Leoti, Kansas 67861

Ethanol Across America
Ethanol Across America is a unique grassroots education campaign of the Clean Fuels Foundation. It is a partnership between industry and government leaders that are committed to advancing the production and use of renewable transportation fuels that can reduce oil imports, reduce pollution, and stimulate the economy. Through its publications, workshops, radio broadcasts, and cooperative programs, Ethanol Across America is sustaining a comprehensive education and outreach program to help consumers learn more about how crude oil imports and use impact their lives and the benefits of developing and using alternative fuels. The Ethanol Across America education campaign works cooperatively with the U.S. Departments of Agriculture and Energy, and the U.S. Environmental Protection Agency. Its bipartisan Congressional Board of Advisors is co-chaired by U.S. Senators Ben Nelson (D-NE) and Richard Lugar (R-IN). For further more information, contact:
Douglas A. Durante, Director • 301-718-0077 • 4641 Montgomery Avenue, Suite 350
Bethesda, MD 20814 • DougDurante@aol.com

Fagen, Inc.
Fagen, Inc. is the leading design-build construction firm in ethanol plant construction. Since 1988, Fagen, Inc. has been involved in the development and construction of over 80 ethanol plants nationwide from grass roots construction through expansions. With the addition of Fagen Engineering LLC, Fagen offers total plant services. Fagen, Inc. has the experience and a 3,000 person workforce that can take any size project from conception to operation. With the addition of Fagen Engineering, our customers have a single-source for every civil, structural, mechanical, and electrical aspect of their project's scope. In short, there is no project we can't perform with excellence. For more information contact:
Ron Fagen, President & C.E.O, Steve Core, Vice President, or Nick Bowdish, Project Developer
320-564-3324 • dfagen@@fageninc.com • P.O. Box 159 • 501 West Highway 212 • Granite Falls, MN 56241 • www.fageninc.com

Farm Credit Services of America
Farm Credit Services of America is proud to finance the growth of rural America, including the special needs of young and beginning producers. With over 76,000 customers, a cash patronage program and assets of $13.5 billion, FCSAmerica is one of the region's leading providers of credit and insurance services to farmers, ranchers, agribusiness and rural residents in Iowa, Nebraska, South Dakota and Wyoming. For more information contact:
Kathy Frahm Vice President/Credit • 402-348-3669 • Frahmk@fcsamerica.com
Ron Brandt Vice President/Credit • 402-348-3606 • brandtr@fcsamerica.com
P.O. Box 2409 • Omaha, NE 68103 • www.fcsamerica.com

FlexFuel Vehicle Awareness Campaign
The FFV Awareness Campaign is part of the broad array of outreach and education efforts of the Clean Fuels Foundation and the Ethanol Across America program. It is a joint effort by public and private interests to increase the demand for and use of high level ethanol blends. Endorsed by the U.S. Environmental Protection Agency, the campaign is working to locate and educate owners of FlexFuel Vehicle (FFVs) and encourage them to use these higher blends of ethanol. As a comprehensive public education program, the campaign coordinates and leverages the interests of the federal and state governments such as working with Governors and their departments of motor vehicles, transportation, energy, and fleet managers to develop and execute outreach activities. Other efforts will collaborate with agriculture organizations, local FFV dealerships, and other biofuel stakeholders to reach their customers. The elements of the campaign also include web-based information, FFV awareness decals, information cards, and various public service announcements in designated market areas. In addition, the FFV Awareness campaign supports the FlexFuel Vehicle Club where consumers can actively participate. The campaign goal is to make "FlexFuel Vehicle and FFV" household words synonymous with economic, environmental, and national security. Contact:
Burl Haigwood • 301-718-0077 • burl.haigwood@cleanfuelsdc.org
www.cleanfuelsfoundation.org • www.flexfuelvehicleclub.org

KL Energy Corporation
A first mover in the global commercialization of cellulosic ethanol using its proprietary, patent pending, thermal-mechanical pre-treatment process that takes wood and herbaceous feedstock and reduces them to their main components, hemicelluloses and lignin. Our highly efficient process is built around our 'mild' pre-treatment technology that can effectively prepare multiple feedstocks for enzymatic hydrolysis and subsequent co-fermentation. Our capability of freeing up most cellulose and hemicelluloses polymers while minimizing the formation of inhibitors translates into low enzyme and yeast dosage as well as short processing times. The KL Energy process allows for the cost competitive production of second generation ethanol and bio-lignin and is particularly suited for the integration into a wide variety of industrial facilities and power plants. We develop for our customers, energy efficient, individually tailored solutions for both stand alone and fully integrated facilities with biomass processing capacities starting at 100,000 dry metric tons per year. For more information contact:
Dave Litzen, Chief Technical Officer • 605-718-0372 • 306 East Saint Joseph Street, Suite 200 • Rapid City, SD 57701 • www.lkenergycorp.com

Maryland Grain Producers Utilization Board
The Maryland Grain Producers Utilization Board (MGPUB) was established by referendum in 1991 to administer the Maryland Grain Checkoff Program and distribute the annual revenue primarily to expand grain utilization and open up new markets for grain. MGPUB collects half of one percent of the net value of grain grown in Maryland. These funds are used to increase the profitability of Maryland grain production and to improve public understanding of agriculture using checkoff funds to support promotion, education, and research. Expanding the production and use of ethanol is a high priority of MGPUB. For more information contact:
Lynne Hoot, Executive Director • 410-956-5771 • Maryland Grain Producers Association (MGPA) • Maryland Grain Producers Utilization Board (MGPUB)
53 Slama Road • Edgewater, MD 21037 • www.marylandgrain.com

Nebraska Corn Board
The mission of the Nebraska Corn Board is to develop, carry out and participate in programs of research, education, market development and promotion to enhance profitability (viability) and expand the demand and value of Nebraska corn and value added corn products. Our vision: Nebraska Corn is the first choice for a consistent supply of quality corn that is fed, processed and consumed by an expanding base of Nebraska, domestic and global customers. For more information contact:
Don Hutchens, Executive Director • 800-632-6761 (NECORN1) • 402-471-2676 (CORN)
301 Centennial Mall South, 4th Floor • P.O. Box 95107 • Lincoln, NE 68509
don.hutchens@nebraska.gov • www.nebraskacorn.org

Nebraska Ethanol Board
Established in 1971, the Ethanol Board assists ethanol producers with programs and strategies for marketing ethanol and related co-products. The Board supports organizations and policies that advocate the increased use of ethanol fuels and administers public information, education and ethanol research projects. The Board also assists companies and organizations in the development of ethanol production facilities in Nebraska. For more information contact:
Todd Sneller, Administrator • 402-471-2941 • P.O. Box 94922 • Lincoln, NE 68509-4922 • billy.defrain@nebraska.gov • www.ne-ethanol.org

Nebraska Ethanol Industry Coalition
The NEIC is a 501(c)(3) non-profit educational foundation established to foster a better understanding of the impact of ethanol production and use. The NEIC hosts the annual Ethanol: Emerging Issues Forum and supports educational efforts related to biofuels generally and ethanol specifically. For more information contact:
Nebraska Ethanol Industry Coalition • PO Box 94843 • Lincoln, NE 68509-4843

Nebraska Public Power District
Nebraska Public Power District (NPPD) is Nebraska's largest electric utility, with a chartered territory including all or parts of 91 of Nebraska's 93 counties. NPPD is committed to the growth and economic development of rural Nebraska. NPPD works to provide economic development assistance to value-added agriculture including the ethanol production industry and its suppliers. Nebraska offers significant cost and other competitive advantages, including industrial electric rates below the national average. NPPD provides electrical energy to 22 operating fuel ethanol refineries in Nebraska. For more information contact:
Brian Wilcox, Senior Engineer - Biofuels • bkwilco@nppd.com • 402-563-5347
800-282-6773
Dennis G. Hall, CEcD, Economic Development Manager • dghall@nppd.com
402-563-5534 • 800-282-6673, Ext. 5534 • 1414 15th Street • Columbus, NE 68602-0499 • www.nppd.com/

About our Sponsors

Novozymes North America, Inc.
Novozymes is the world leader in bioinnovation. Together with customers across a broad array of industries, we create tomorrow's industrial biosolutions, improving our customers' business and the use of our planet's resources. With over 700 products used in 130 countries, Novozymes' bioinnovations improve industrial performance and safeguard the world's resources by offering superior and sustainable solutions for tomorrow's ever-changing marketplace. Novozymes' natural solutions enhance and promote everything from removing trans-fats in food, to advancing biofuels to power the world tomorrow. Novozymes is committed to developing specific and economical process solutions for liquefaction, saccharification (SSF), and fermentation. We are also devoted to developing the next generation of cellulases for economical glucose production from cellulosic feedstocks. For more information contact:
Jack Rogers • 919-494-3127 • jckr@novozymes.com
Novozymes North America, Inc. (reg. no.: 13-2639630) • P.O. BOX 576
77 Perry Chapel Church Road • Franklinton, NC 27525, United States • www.novozymes.com

Patriot Renewable Fuels, LLC
Patriot Renewable Fuels, LLC is committed to providing an energy solution which is renewable, environmentally friendly and domestically produced. Our nation and the world face difficult decisions in terms of meeting our energy needs with traditional fossil fuels. Our objective is to contribute to resolving these problems. Patriot operates a 100-million gallon per year facility producing ethanol, an oxygenate that can be blended with gasoline in order to make gasoline burn more completely and cleanly. The facility also produces 320,000 tons per year of dried distillers grains. This bi-product is primarily used as a high-quality livestock feed. Ethanol may not be a complete solution to our nation's energy needs, but it is clearly a viable option that can be domestically produced, transported, stored and utilized today. Patriot Renewable Fuels is proud to assist in addressing the nation's energy requirements. For more information contact:
Gene Griffith ggriffith@patriotethanol.com • Judd Hulting jhulting@patriotethanol.com
101 Patriot Way, Annawan, IL 61234 • 309-935-5700 • 309-935-5702 fax
www.patriotrenewablefuels.com.

Phibro Ethanol Performance Group
Phibro Ethanol Performance Group (EPG) is a division of Phibro Animal Health Corporation (PAHC). Phibro Animal Health Corporation is a global leader in the fields of animal health and performance products, with thousands of customers worldwide and a global workforce of 1200 hardworking employees. Phibro EPG provides specialty products and technical services that are focused on optimizing the natural fermentation of ethanol. As the exclusive producer and marketer of LACTROL® antimicrobial, Phibro helps to reduce the amount of resources needed to reach energy independence by safe guarding ethanol production from yield robbing infections. Lactrol is generally regarded as safe for use in ethanol production. For more information contact:
www.Lactrol.com • www.PAHC.com

Projects Plus Consulting LLC
Projects Plus Consulting has more than 25 years experience in the ethanol space and specializes in business development, focusing primarily on ethanol project business plans including permitting, site quantification, logistics plans, feedstock origination, risk mitigation, product offtake contracts and public presentations. Projects Plus offers turnkey project management experience which allows the company to spur new business development while managing the execution of large-scale initiatives, from initial concept to final completion; including operations management planning supported by hands-on experience in launching, managing, and growing enterprises in response to changing industry needs. For more information contact
Terry A. Ruse • Projects Plus Consulting LLC • 8527 S. 68th E Avenue • Tulsa, OK 74133-4147
918-764-8007 • terryruse@aol.com • www.linkedin.com/in/terryruse

Reeve Agri Energy
Reeve Agri Energy of Garden City, Kansas is one of the longest running, and most innovative fuel ethanol production facilities in the United States. The Reeve facility has received numerous awards for being the first integrated facility in the U.S. to combine a cattle feedlot with an ethanol facility and a fish farm, utilizing waste heat from the ethanol fermenters. For years the Reeve facility has been a tourist site in Kansas due to the unique aspects of the facility. Reeve continues to sell high quality ethanol products today. For more information contact:
Lee Reeve, President • 620-275-7541 • P.O. Box 1036 • Garden City, KS 67846

Renova Energy
Renova is a well established fuel grade ethanol production, marketing and distribution business which is currently focused on the Rocky Mountain Region of the U.S. Renova occupies a niche position in the Rocky Mountain Region and neighboring states of the U.S. for the supply and distribution of ethanol. The company has eleven ethanol terminals located throughout SD, WY, CO and ID selling directly to fuel marketers for blending with gasoline in addition to its production facility in Torrington, WY. The group's well established marketing and distribution infrastructure offers significant growth prospects in the Rocky Mountain Region of the U.S. For more information contact:
Terry Oldfield • 950 W. Bannock St., Ste. 500 • Boise, Idaho 83702 • P. 208-472-7300
F. 208-472-7301 • terry.oldfield@renovaenergy.com • www.renovaenergy

Standard Ethanol, LLC
Standard Ethanol, LLC ("Standard") was formed on September 8, 2006 by Mid America Bio Energy & Commodities, L.L.C. ("MABE") of North Platte, Nebraska. MABE manages / maintains Standard's assets, which include 100% ownership of the 44 MGY Ethanol Plant in Madrid, Nebraska, called Mid America Agri Products/Wheatland, LLC. For more information contact:
Robert Lundeen • P. 308-532-8298 • F. 308-696-0964 • PO Box 1655
1900 East State Farm Road • North Platte, NE 69103 • info@standard-ethanol.com
www.standard-ethanol.com

Verenium Corporation
Verenium Corporation is a leader in the development and the commercialization of cellulosic ethanol, an environmentally-friendly and renewable transportation fuel, as well as higher performance specialty enzymes for applications within the biofuels, industrial, and animal nutrition and health markets. The Company possesses integrated, end-to-end capabilities in pre-treatment, novel enzyme development, fermentation, engineering, and project development and is moving rapidly to commercialize its proprietary technology for the production of cellulosic ethanol from a wide array of feedstocks, including sugarcane bagasse, dedicated energy crops, agricultural waste, and wood products. For more information contact:
John B. Howe, Vice President, Public Affairs • 55 Cambridge Parkway • Cambridge, MA 02142
P: 617.674.5318 • F: 617.674.5353 • john.howe@verenium.com

Vogelbusch USA, Inc.
Vogelbusch, founded in Austria in 1921 to develop and market inventions for yeast and alcohol fermentations, is known throughout the world for expertise in ethanol production from grain starches and sugars, biotechnology, continuous fermentation, distillation, and energy conservation. Since establishing a presence in the U.S. over 30 years ago, Vogelbusch USA has become a premier supplier of process engineering packages for the fuel ethanol industry. Vogelbusch-designed facilities in North America produce nearly 1.5 billion gallons of ethanol annually. Vogelbusch places importance on reliable, efficient, and environmentally-clean designs. Our plants are designed to operate with minimal downtime, and, as a result, all Vogelbusch-designed plants regularly exceed nameplate capacities. We strive to provide the most value for the investment and avoid shortcuts and cheap designs which, inevitably, affect profitability in the long run. For more information contact:
Dan Mahon • 713-461-7374 • office@vbusa.com • 1810 Snake River Road
Katy, TX 77449-7747 • www.vogelbusch.com

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References

1 P.L. 95-618
2 At the time the fuel ethanol excise tax incentive was created, the federal motor fuel excise tax was four cents per gallon for gasoline.
3 Presidential Quotes are courtesy of the Presidential Public Policy Papers, Library of Congress.
4 P.L. 96-223
5 P.L. 96-294
6 U.S. National Alcohol Fuels Commission Report: A Summary: Alcohol Fuels Provisions of the Crude Oil Windfall Profit Tax Act.
7 This exemption is coordinated with an income tax credit equal to 54 cents per gallon for ethanol. Ethanol blenders are allowed three methods for realizing this incentive: (1). in whole or in part as an income tax credit; (2). blenders that register with the IRS may purchase gasoline to be blended with alcohol at a special reduced rate so that the tax paid on the gasoline is reduced by the portion of the alcohol tax incentive; and (3). blenders may purchase gasoline bearing the full 18.4 cents/gallon tax rate, blend that gasoline with alcohol, and apply for a refund.
8 P.L. 97-424
9 P.L. 99-198
10 P.L. 101-508
11 P.L. 100-494
12 P. L. 101-549, Nov. 15, 1990, 104 Stat. 2399
13 Ethanol: Economic and Policy Issues, Tom Capehart, April 2, 2009 www.nationalaglawcenter.org/assets/crs/R40488.pdf
14 P.L. 108-357, Oct. 22, 2004, 118 Stat. 1418
15 42 USC CHAPTER 134 - ENERGY POLICY
16 www.thomas.gov
17 August 2006. www.americanprogress.org/issues/2006/08/b2018413.html
18 www.ethanolrfa.org/objects/documents/2771/2009_ethanol_economic_contribution.pdf
19 CFDC Memo, "ONGOING ANALYSIS OF RFS2 REGULATIONS" Feb. 24 2010
20 www.ethanolrfa.org/industry/statistics/#EIO
21 www.flexiblefuelvehicleclub.org/faqs.asp
22 Steve Seabrook PDF, pg 14. www.ne-ethanol.org/forum2010/media/pdf/Seabrook.pdf
23 U.S. Alternative Fuel Information Center, March, 1997, Biodiesel is available on a limited basis, capacity estimated at 5,792 b/d
24 U.S. Alternative Fuel Information Center, March, 1997, Biodiesel is available on a limited basis, capacity estimated at 5,792 b/d. Biofuels for Transportation: The Road From Research to the Marketplace, USDOE, January 1995
25 Senator John Glenn (D-OH), Ranking member Government Affairs, member Armed Services Committee, member Select Committee on Intelligence, McNeil/Lehrer, 1998
26 GAO, Southwest Asian: Cost of Protecting U.S. Interests, GAO/NSIAD-91-250, August 1991
27 ENERGETICS, for the Western Regional Biomass Energy Program, National Security Costs of Petroleum, June 1994; Howard Moreland, "A Few Billion for Defense: Plus $250 Billion More for Overseas Military Intervention", "New Policy Papers #1, Coalition for a New Foreign Policy, 1985, p.4; Terry Sabonis-Chafee (Rocky Mountain Institute), "Projection U.S. Military Power: External Cost and Alternatives to the Gulf," Presented to the 37th Pugwesh Conference on Science and World Affairs, Gmunden, Austria, September 6, 1987; Hubbard, Harold, M. "The Real Cost of Energy," Scientific America, 264(4), April 1991, pp. 38-39
28 Daniel Yergin and Robert Stobaugh, Energy Future, Random House, July 1979, p. 60; The Center for Defense Information; Dr. Joseph J. Romm, Principal Deputy Assistant Secretary of Energy Efficiency and Renewable Energy, U.S. Department of Energy, before the Committee on Agriculture, Nutrition and Forestry, U.S. Congress, October 2, 1992
29 International Energy Outlook 2005, Energy Information Agency, Department of Energy
30 Senator John McCain (R-AZ), McNeil/Lehrer News Hour, 1998
31 New York Times, Fuels for the Future News, May 16, 1997
32 U.S. DOE, EIA Annual Energy Review, 2005
33 Southwest Asia: Cost of Protecting U.S. Interests, GAO Report # NSIAD – 91 – 250, August 1991
34 International Energy Outlook 2005, Energy Information Agency, Department of Energy
35 Department of Defense, United States Security Strategy for the Middle East, May 1995
36 Hwang, "Money Down the Pipeline: Uncovering the Subsidies to the Oil Industry" Union of Concerned Scientists, Sept. 12, 1995
37 Milton Copulos, 703-836-3443, or visit www.ndcf.org
38 Clean Fuels Development Coalition estimates, based on environmental costs associated with crude oil between ALA's $50 billion estimate to UCS's $182 billion estimate, divided by the Energy Information Administration's 6.655 billion barrels per year crude oil consumption estimate for the United States in 1996
39 Floor Statement by Senator Tom Harkin (D-IA), March 29, 1990
40 Liska et al., Improvements in Energy Efficiency and Greenhouse Gas Emissions of Corn-Ethanol. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1000&context=ncesrpub
41 U.S. Census Bureau, Foreign Trade Division, 2006
42 U.S. Census Bureau, Foreign Trade Division, 2006
43 http://tonto.eia.doe.gov/dnav/pet/pet_cons_psup_dc_nus_mbblpd_a.htm
44 www.fhwa.dot.gov/policyinformation/statistics/2007/dlchrt.cfm
45 http://tonto.eia.doe.gov/dnav/pet/pet_cons_psup_dc_nus_mbbl_a.htm [(finished motor gasoline + distillate fuel oil * 42 gallons per barrel)/247M cars]
46 http://tonto.eia.doe.gov/dnav/pet/pet_cons_psup_dc_nus_mbbl_a.htm [(finished gasoline + aviation gas)-(gas+diesel+aviation gas+kerosene jet fuel)]
47 http://tonto.eia.doe.gov/dnav/pet/pet_cons_psup_dc_nus_mbblpd_m.htm
48 Joe Richter, Bloomberg News, February 11, 2006
49 Petroleum & Ethanol: A Trade Deficit Analysis, Energetics, June 1994; Dept. of Commerce Data, 2003
50 Federal Highway Administration
51 David E. Gushee, "Alternative Fuels: Are They Reducing Oil Imports?," Congressional Research Service, April 9, 1993
52 White House Press Release, "Obama Announces Steps to Boost Biofuels, Clean Coal", 2/3/2010.
53 Information Resources, Inc., May 1997
54 GAO, report #GAO/RCED-90-156, July 1990
55 GAO, report #GAO/RCED-96-121, June 1996
56 www.ethanolrfa.org/industry/statistics/#EIO
57 Urbanchuck, John. "Contribution of the Ethanol Industry to the Economy of the United States." (page 4) February 23, 2009. www.ethanolrfa.org/objects/documents/2187/2008_ethanol_economic_contribution.pdf
58 EAA Issue Brief "Economic Impacts of Ethanol Production"
59 John Urbanchuck, LECG "Contribution of the Ethanol Industry to the Economy of the United States" www.ethanolrfa.org/objects/documents/2187/2008_ethanol_economic_contribution.pdf
60 www.ethanolrfa.org/objects/documents/2187/2008_ethanol_economic_contribution.pdf
61 www.api.org/Newsroom/api-biofuels-bill.cfm
62 USDA Analysis of Withdrawing Ethanol Tax Incentives, May 1997
63 Kruse, John, and Patrick Westhof, Seth Meyer and Wyat Thompson. "Economic Impacts of Not Extending Biofuel Subsidies." The Journal of AgBiotechnology Management & Economics, v10 n2. 2007. http://agbioforum.org/v10n2/v10n2a04-kruse.htm
64 GAO, Report #GAO/RCED-95-273R, September 1995

References

[65] Urbanchuck, John. "Economic Contribution of the Partial Exemption for Ethanol From Federal Excise Tax on Motor Fuel." November 18, 2008. www.ethanolrfa.org/objects/documents/2053/excise_tax_exemption_analysis_2008.pdf
[66] "Economic Impacts of Increasing the Ethanol Blend Limit" www.growthenergy.org/images/reports/EconBenefits-Jobs_Study09.pdf
[67] http://bennelson.senate.gov/press/speeches/092809-01.cfm
[68] http://grassley.senate.gov/news/Article.cfm?customel_dataPageID_1502=13992
[69] http://tonto.eia.doe.gov/energyexplained/index.cfm?page=oil_home#tab2
[70] www.ethanolrfa.org/industry/statistics/#B
[71] http://tonto.eia.doe.gov/energyexplained/index.cfm?page=oil_home#tab2. (This assumes 9 billion gallons etoh in 2008 displacing 214,8285,714.3 barrels of oil @ $94.04/barrel.)
[72] http://select.nytimes.com/2006/04/24/opinion/24krugman.html?_r=1&hp
[73] http://curiouscapitalist.blogs.time.com/2008/05/29/the_trade_deficit_has_turned_v/#ixzz0eJy0z858
[74] New York Times. www.nytimes.com/2009/11/14/business/economy/14econ.html
[75] AFL-CIO Executive Council , Statement on U.S. Trade Deficit, February 20, 1995, Bal Harbour, Florida
[76] www.berkshirehathaway.com/letters/growing.pdf
[77] http://dorgan.senate.gov/newsroom/record.cfm?id=231970
[78] www.bea.gov/newsreleases/international/trade/tradnewsrelease.htm
[79] www.ethanol.org/pdf/contentmgmt/lecgworldoilpriceimpactupdate.pdf
[80] www.ethanolrfa.org/resource/facts/economy/ (321M barrels of oil displaced in 2008*$94.04(avg. '08 barrel price)
[81] Milton Copulos, Natural Gas Vehicles: Helping Ensure America's Energy Security, National Defense Council Foundation, October 24, 1995
[82] J. Adler, P. Carey, "Air Toxics Emissions and Health Risks from Mobile Sources," EPA Paper 89-34A.6 presented at the 82nd Annual Meeting of the Air and Waste Management Association, Anaheim, CA, June 25, 1989
[83] Edwin S. Rothschild, "Oil Imports, Taxpayer Subsidies and The Petroleum Industry," Citizen Action, May 1995
[84] Letter to the Editor, Journal of Commerce, December 3, 1980
[85] U.S. E.P.A, www.epa.gov, Concerned Citizens: On The Road
[86] U.S. E.P.A, Nonattainment Area Gasoline Survey, March 1997
[87] U.S. E.P.A., Office of Mobile Sources
[88] J. Adler, P. Carey, "Air Toxics Emissions and Health Risks from Mobile Sources," EPA Paper 89-34A.6 presented at the 82nd Annual Meeting of the Air and Waste Management Association, Anaheim, CA, June 25, 1989
[89] U.S. E.P.A., National Air Pollutant Emission Trends, 1990-1995, October 1996
[90] U.S.D.A., Ethanol: Economic and Policy Tradeoffs, January 1988
[91] U.S.D.A., Ethanol: Economic and Policy Tradeoffs, January 1988
[92] American Lung Association (www.lungusa.org).
[93] Auto/Oil Air Quality Improvement Research Program, see, also Oil & Gas Journal, May 12, 1997, p. 21
[94] www.cleanairchoice.org/fuels/e85.cfm. Retrieved March 5, 2010.
[95] U.S. EPA Website, May 1997, http://www.epa.gov/globalwarming/home.htm
[96] www.eia.doe.gov/oiaf/ieo/emissions.html
[97] EPA Regulatory Impact Analysis: Renewable Fuel Standard Program, April 2007
[98] http://yosemite.epa.gov/opa/admpress.nsf/8d49f7ad4bbcf4ef852573590040b7f6/70ba33a218b8f22f852576e0006b2a53!OpenDocument
[99] http://boxer.senate.gov/en/press/releases/102709.cfm
[100] www.afdc.energy.gov/afdc/vehicles/flexible_fuel_emissions.html. Retrieved March 11, 2010.
[101] www.transportation.anl.gov/pdfs/TA/345.pdf
[102] R. Gelbspan, "Hot Air, Cold Truth," Washington Post, Sunday, May 25, 1997, quoting Harvard Earth Scientist, James McCarth
[103] L. Wales, American Energy Crop Association, April 17, 1995
[104] GAO, report #GAO/RCED-00-301R, September 2000
[105] Speech before the Center For International Studies
[106] http://www.khoslaventures.com/resources.html
[107] The Constant Gardener, By John Heilemann, December 1, 2005, Business 2.0
[108] Branson with the Stars, Virgin founder's $3 billion climate pledge heralds new era in philanthropy, Amanda Griscom Little, September 28, 2006, Grist.org
[109] USDA/DOE study "Biomass As Feedstock For a Bioenergy and Bioproducts Industry: The Technical Feasibility Billion Ton Annual Supply"
[110] http://www1.eere.energy.gov/biomass/news_detail.html?news_id=10603
[111] NREL study. www.springerlink.com/content/1448777258112615/fulltext.html
[112] Brent Erickson, Biotechnology Industry Organization, March 2006. http://bioconversion.blogspot.com/2006/03/bio-panel-supports-cellulosic-ethanol.html
[113] Nastari, P.M., "Economic Viability of Sugar Cane Ethanol in Brazil Considering its Social Cost of Production", presented at the IX International Symposium on Alcohol Fuels, November 12-15, 1991, Florence, Italy. Rask, K., "The Economic Efficiency of the Brazilian Ethanol Industry: A Cost-Benefit Analysis 1978-1987," presented at the IX International Symposium on Alcohol Fuels, November 12-15, 1991, Florence, Italy
[114] Plinio Mario Nastari, DATAGRO, "What the U.S. Can Learn from The Brazilian Ethanol Experience", Governors Biofuels Coalition Meeting, February 23, 2010, Washington, D.C.
[115] Luis Fernando Furlan, Brazil's Minister of Economic Development and International Trade, Info Brazil, September 17, 2005
[116] Testimony before the Senate Energy and Natural Resources Committee, April 12, 2007
[117] Needed oil refineries could languish amid ethanol push, by H. Josef Hebert, Associated Press, Wednesday, April 18, 2007
[118] Rask, K., "The Economic Efficiency of the Brazilian Ethanol Industry: A Cost-Benefit Analysis 1978-1987," presented at the IX International Symposium on Alcohol Fuels, November 12-15, 1991, Florence, Italy
[119] James Hamilton, "Causes and Consequences of the Oil Shock of 2007-2008." Feb. 3 2009. www.brookings.edu/economics/bpea/~/media/Files/Programs/ES/BPEA/2009_spring_bpea_papers/2009_spring_bpea_hamilton.pdf
[120] Global Oil Demand/ Gasoline Prices, Mr. John Dowd, Senior Research Analyst, Sanford C. Bernstein & Co., LLC, September 6, 2005, before the Senate Committee on Energy and Natural Resources
[121] Peak Oil, http://www.hubbertpeak.com
[122] Dr. Walter McManus, Director, Automotive Analysis Division, Univ. of Michigan May 1, 2007
[123] Report: World oil demand to increase sharply, Lisa Bryant, www.chinadaily.com, October 24, 2004
[124] Alliance of Automobile Manufacturers, http://www.autoalliance.org/about
[125] New Future Fuels Conference Presentation, December 27, 2006
[126] www.fhwa.dot.gov/policyinformation/statistics/2007/dlchrt.cfm
[127] www.afdc.energy.gov/afdc/vehicles/flexible_fuel.html
[128] www.e85refueling.com/states.php
[129] United States Department of Energy, "Biofuels: At the Crossroads," Biofuels Systems Division, July 1994
[130] www.eia.doe.gov/oiaf/aeo/overview.html
[131] http://feedstockreview.ornl.gov/pdf/billion_ton_vision.pdf
[132] http://yosemite.epa.gov/opa/admpress.nsf/e51aa292bac25b0b85257359003d925f/3a91d20f44b4b2d2852576bf00711782!OpenDocument
[133] 21st Century Fuels, Hart Publications, May, 1997, p. 2
[134] National Corn Growers Association
[135] Renewable Fuels Association, http://www.ethanolrfa.org/pr020397.html, Jerry Weigel, Director of Nutrition and Regulatory Affairs at ExSeed Genetics, L.L.C.
[136] Lucy Norton, Domestic Market Development Director, Iowa Corn Promotion Board
[137] University of Minnesota
[138] University of Minnesota
[139] Hosein Shapouri, James Duffield, Michael Graboski, U.S. Department of Agriculture, "Estimating Net Energy Balance of Corn Ethanol", Agricultural Economic Report Number 721, July 1995
[140] Hosein Shapouri, James Duffield, Michael Graboski, U.S. Department of Agriculture, "Estimating Net Energy Balance of Corn Ethanol", Agricultural Economic Report Number 721, July 1995, Revised 2002
[141] "How Much Energy Does it Take to Make a Gallon of Ethanol?" Institute for Local Self-Reliance. December 1992

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The Ethanol Fact Book is a compilation of hundreds of technical summaries and research reports from across the scientific, academic, and technical community which offer support for the expansion of the ethanol industry through continuation and extension of the federal fuel ethanol tax incentive and the expansion of the nation's Renewable Fuel Standard (RFS). This exhaustive research is representative of government, industry, and academic opinion on the benefits of fuel ethanol production to the nation, the environment and the public. When contemplating the merits of fuel ethanol, please consider the subject in its entirety, as provided in this book. Our goal is to provide you with context and perspectives to consider as you sort through various claims about ethanol in the media. We hope you find this information useful and informative. We also hope it helps increase your use of ethanol by selecting ethanol blends at the pump and considering a flexible fuel vehicle as your next vehicle purchase.

We extend a special thanks to our Chairman Todd Sneller, Editor Burl Haigwood, and our long time design and publishing partner David and Associates for their dedication and commitment to getting this project into print.

If you have any questions, or need additional information, call us at the Clean Fuels Development Coalition in the Washington, DC area at (301) 718-0077, or email us at cfdcinc@aol.com.

CFDC CLEAN FUELS DEVELOPMENT COALITION

The Clean Fuels Development Coalition is a non-profit organization dedicated to the development of alternative fuels and technologies to improve air quality and reduce dependence on imported oil. The broad CFDC membership includes ethanol producers, agricultural interests, automobile manufacturers, state/government agencies, and engineering and new technology companies. Since its beginning in 1988, CFDC has become a respected source of information for state, local, and federal policy makers as well as private industry on a range of transportation, energy, and environmental issues.

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