

CLOSEOUT FILES



Resolved: That, by 2040, the federal government should mandate that all new passenger vehicles and light trucks sold in the United States be powered by alternative fuels.

Introduction

As the federal auto bailout comes closer to being resolved, the one guarantee that will come from this timely legislation is that there will be major changes to the auto-industry. Undoubtedly, a restructuring will be necessary but it will be interesting to see if there are any stipulations pertaining to alternative fuel systems or at the very least emission requirements. Given this is the most prominent news that could possibly be linked to the topic, it may have been the inspiration for the topic committee to settle on Resolved: That, by 2040, the federal government should mandate that all new passenger vehicles and light trucks sold in the United States be powered by alternative fuels.

There are a few peculiarities in the wording of the topic, including the timeline. At first glance the topic reads that the U.S. government should mandate that all passenger vehicles and light trucks sold in the U.S. should be using alternative fuels from, at the latest, 2040. On the other hand, the actual wording states that the U.S. government should pass legislation by 2040 to require all passenger vehicles and light trucks sold to use alternative fuels. Under both interpretations of the resolution if either the passing of legislation or vehicles running on alternative fuels occurs before 2040 then the resolution is affirmed. There are slight differences to how you would debate the topic under each interpretation. If the United States mandated now that passenger vehicles and light trucks had to use alternative fuels by 2040, then that would give the car companies adequate time and incentive to be able to develop the most efficient cars that run on alternative fuels. Mandating by 2040 does not give car companies that opportunity; however, by that time it can be assumed that manufacturers will produce at least one car in their fleet that would run on alternative fuel so the mandate would just mean that they can only sell the cars they already produce that run on alternative fuels.

While there is a section on definitions, let us go over the spirit of the topic. The resolution states that the mandate would only apply to new passenger vehicles and light trucks sold in the U.S. This would allow for current petroleum run cars to stay on the road until they basically fall apart. While the mandate won't faze out carbon emissions immediately, it's a step in the right direction and will have a bigger impact over time. Passenger vehicles should not be defined to include such things as trains, airplanes, or space shuttles. Yes they do transport passengers, but they are not what the topic is addressing; for the sake of a good debate, stay away from abusive definitions. The inclusion of light trucks will not play a major role in rounds; the main purpose of it is to make sure that whichever type of alternative fuel you advocate can also run heavier vehicles. The most important concept to understand about alternative fuels is that they can contain petroleum and still be considered alternative fuel. Specifically, ethanol contains 85% ethanol and 15% gasoline; however, it is an alternative fuel.

Thank you for purchasing the Closeout Files and please e-mail us at closeoutfiles@yahoo.com with any questions or suggestions. Also make sure you join our facebook account for updates regarding the Closeout Files. Good luck debating.

Definitions

Alternative Fuel

<http://www.afdc.energy.gov/afdc/fuels/index.html>

U.S Department of Energy, Energy Efficiency and Renewable Energy

Alternative Fuels:

These fuels are defined as alternative fuels by the Energy Policy Act of 1992 and are currently, or have been, commercially available for vehicles.

- Biodiesel
- Electricity
- Ethanol
- Hydrogen
- Methanol
- Natural Gas
- Propane

Other Fuels:

Several emerging fuels are currently under development. Many of these fuels are also considered alternative fuels and may have other benefits such as reduced emissions or increased energy security.

- Biobutanol
- Biogas
- Biomass to Liquids (BTL)
- Coal to Liquids (CTL)
- Fischer-Tropsch Diesel
- Gas to Liquids (GTL)
- Hydrogenation-Derived Renewable Diesel (HDRD)
- P-Series
- Ultra-Low Sulfur Diesel

<http://www.ci.austin.tx.us/cleancities/afterms.htm#EPACT>

Energy Policy Act of 1992 (EPACT)

Alternative Fuel - As defined according to EPACT, methanol, denatured ethanol and other alcohols, separately or in mixtures of 85% by volume or more with gasoline or other fuels, CNG, LNG, LPG, hydrogen, fuels (other than alcohols) derived from 'biological materials', electricity, neat biodiesel, or any other fuel determined to be 'substantially not petroleum' and yielding 'substantial energy security benefits and substantial environmental benefits'.

<http://www.pbs.org/strangedays/glossary/index.html>

National Geographic's Strange Days on Planet Earth

Public Broadcasting Service

Alternative fuel: a fuel used in vehicles that comes from a source other than petroleum, such as ethanol made from corn and biodiesel made from vegetable oil.

Passenger Vehicle

<http://law.justia.com/us/cfr/title23/23-1.0.2.14.7.0.1.3.html>

United States Code of Federal Regulations, Title 23-Highways

Passenger vehicle means a motor vehicle which is designed for transporting 10 individuals or less, including the driver, except that such term does not include a vehicle which is constructed on a truck chassis, a motorcycle, a trailer, or any motor vehicle which is not required on the date of the enactment of this section under a Federal motor vehicle safety standard to be equipped with a belt system.

RITA 93 (Research and Innovative Technology Administration. Bureau of Transportation Statistics.) Summary of Medium & Heavy Truck Crashes in 1993)

Passenger Vehicle: A vehicle with a Gross Vehicle Weight Rating (GVWR) of 10,000 pounds or less which includes passenger cars, light pickup trucks, light vans, and utility vehicles.

<http://www-nrd.nhtsa.dot.gov/Pubs/809979.PDF>

National Highway Traffic Safety Administration

Passenger Vehicle Classification Guide.

Vehicle Type Size Criteria

Passenger Cars:

Subcompact Wheelbase: Under 100 in.

Compact Wheelbase: 100-104 in.

Midsize Wheelbase 105-109 in.

Full-size Wheelbase > 109 inches

Vans:

Minivans: Unibody Vans

Large Vans: Frame based Vans

SUVs:

Midsize Wheelbase > 88 inches Width: 66-75 inches

Full-size Wheelbase > 88 inches Width: 75+ inches

Pickup Trucks:

Compact: Under 4,500 lbs.

Standard: Over 4,500 lbs.

American Public Transportation Association

<http://www.apta.com/research/stats/vehicles/definitions.cfm>

Passenger Vehicle is a vehicle used to carry passengers in transit service.

Light Truck

Code of Federal Regulations]

[Title 40, Volume 18]

[Revised as of July 1, 2008]

From the U.S. Government Printing Office via GPO Access

Light-duty truck means any motor vehicle rated at 8,500 pounds GVWR or less which as a vehicle curb weight of 6,000 pounds or less and which has a basic vehicle frontal area of 45 square feet or less, which is:

(1) Designed primarily for purposes of transportation of property or is a derivation of such a vehicle, or

(2) Designed primarily for transportation of persons and has a capacity of more than 12 persons, or

(3) Available with special features enabling off-street or off-highway operation and use.

Light-duty vehicle means a passenger car or passenger car derivative capable of seating 12 passengers or less.

Peak oil

Vermont Peak Oil Network:

http://www.vtpeakoil.net/community/files/0007/peakoilintro_VPON200711.pdf

The expression “peak oil” refers to the global peak in oil production, and occurs when the amount of oil produced worldwide reaches a peak and starts a permanent decline. That such a peak will occur is not controversial: production from oil fields follows a bell-shaped curve, with production starting off slowly, increasing rapidly to a plateau, and then entering a terminal decline. The concept of peak oil is merely an extension of this trend to regions, countries (most of which have already reached their peak), and finally the entire world.

<http://www.csa.com/discoveryguides/china/gloss.php>

Proquest and CSA Information

peak oil: The point at which half of global oil reserves have been used, at which point scarcity will gradually increase and prices rise. When this will happen is not known. In 1956 geologist M. King Hubbert came up with the principle of peak oil, and predicted, accurately, that the United States would hit peak oil in the 1970s.

Carbon Counting Toolkit

<http://www.epaw.co.uk/carbon/glossary.html>

Peak Oil refers to the maximum rate of the production of oil in any area under consideration, recognizing that it is a finite natural resource, subject to depletion.

Background

Inspiration for 2040

Liberal Democrats to outlaw petrol-driven cars by 2040

By Ben Russell, Political Correspondent

Tuesday, 18 September 2007

Far-reaching proposals to transform Britain into a carbon-neutral economy within 40 years won overwhelming backing from the Liberal Democrat rank and file yesterday. Delegates at the party's annual conference in Brighton approved a series of measures, including plans to remove petrol-driven cars from the roads by 2040, invest billions in the railways and pour resources into renewable power to give Britain a network of non-carbon emitting electricity generators. Mr Huhne, the party's environment spokesman, said the party planned a sharp increase in vehicle excise duty on "gas-guzzling" cars, before an eventual ban on petrol-powered vehicles. "The EU Commission wants to set limits on car emissions but it should state clearly that no car can be sold in the EU if it still belches carbon by 2040," he added. "It can be electric. It can be fueled by a hydrogen cell, but we have to get tough with car makers about emissions."

About Ethanol

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

Ethanol is an alcohol-based fuel produced by fermenting plant sugars. Currently, most ethanol in the United States is made from corn, but ethanol also can be made from cellulosic matter from a variety of agricultural products, including trees, grasses, and forestry residues. Corn ethanol has been used as an additive to gasoline for many years, but it is also available as a primary fuel, most commonly as a blended mix of 85 percent ethanol and 15 percent gasoline. As a primary fuel, corn ethanol is not currently available on a large national scale and federal agencies do not consider it to be cost-competitive with gasoline or diesel. The cost of corn feedstock, which accounts for approximately 75 percent of the production cost, is not projected to fall dramatically in the future, in part, because of competing demands for agricultural land use and competing uses for corn, primarily as livestock feed, according to DOE and USDA.

The technology for producing ethanol, at least from certain feedstocks, is generally well established, and ethanol is currently produced in many countries around the world. In Brazil, the world's largest producer, ethanol is produced from sugar cane. In the United States, more than 90

percent of ethanol is produced from corn, but efforts are under way to develop methods for producing ethanol from other biomass materials, including forest trimmings and agricultural residues (cellulosic ethanol). Currently, corn ethanol is primarily produced and used across the Midwest.

DOE and USDA project that more cellulosic ethanol could ultimately be produced than corn ethanol because cellulosic ethanol can be produced from a variety of feedstocks, but more fundamental reductions in production costs will be needed to make cellulosic ethanol commercially viable. Production of ethanol from cellulosic feedstocks is currently more costly than production of corn ethanol because the cellulosic material must first be broken down into fermentable sugars that can be converted into ethanol. The production costs associated with this additional processing would have to be reduced in order for cellulosic ethanol to be cost-competitive with gasoline at today's prices.

Cellulosic ethanol is in the demonstration phase, but it is projected to be demonstrated by 2010.

About Methanol

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

Methanol is methyl alcohol, commonly called wood alcohol; M85 is a blend of 85 percent methanol and 15 percent gasoline. Methanol is produced through a steam and catalyst process that reconstitutes methane gas as methanol. Currently, virtually all methanol produced in the States uses methane derived from natural gas. However, methane also can be obtained from coal and from biogas, which is generated by fermenting organic matter--including byproducts of sewage and manure.

About Biodiesel

<http://www.gao.gov/new.items/d07283.pdf>

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Biodiesel is a renewable fuel that has similar properties to petroleum diesel, but it can be produced from vegetable oils or animal fats. Like petroleum diesel, biodiesel operates in

compression-ignition engines. Blends of up to 20 percent biodiesel (B20) can be used in nearly all diesel equipment and are compatible with most storage and distribution equipment. These low-level blends generally do not require any engine modifications. Higher blends and 100 percent biodiesel (B100) may be used in some engines with little or no modification, although transportation and storage of B100 requires special management. Biodiesel is currently produced and used as a transportation fuel around the world. In the United States, the biodiesel industry is small but growing rapidly, and refueling stations with biodiesel can be found across the country.

About Biomass Gas-to-Liquid

<http://www.gao.gov/new.items/d07283.pdf>

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Gas-to-liquid (GTL) alternatives include the production of liquid fuels from a variety of feedstocks, via the Fisher-Tropsch process. In the Fischer-Tropsch process, feedstocks such as coal and biomass are converted into a syngas, before the gas is converted into a diesel-like fuel. The diesel-like fuel is low in toxicity and is virtually interchangeable with conventional diesel fuels. Although these technologies have been available in some form since the 1920s, and coal GTL was used heavily by the German military during World War II, GTL technologies are not widely used today.

Biomass gas-to-liquid (biomass GTL) is a fuel produced from biomass feedstocks by gasifying the feedstocks into an intermediary product, referred to as syngas, before converting it into a diesel-like fuel. This fuel is not commercially produced, and a number of technological and economic challenges would need to be overcome for commercial viability.

Currently, there is no commercial production of biomass GTL and the only commercial production of coal GTL occurs in South Africa, where the Sasol Corporation currently produces 150,000 barrels of fuel from coal per day. Extensive research and development, however, is currently under way to further develop this technology because automakers consider GTL fuels viable alternatives to oil without compromising fuel efficiency or requiring major infrastructure changes.

About Coal Gas-to-Liquid

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

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Coal gas-to-liquid (coal GTL) is a fuel produced by gasifying coal into a syngas before being converted into a diesel-like fuel. This fuel is commercially produced outside the United States, but none of the production facilities are considered profitable.

Gas-to-liquid (GTL) alternatives include the production of liquid fuels from a variety of feedstocks, via the Fischer-Tropsch process. In the Fischer-Tropsch process, feedstocks such as coal and biomass are converted into a syngas, before the gas is converted into a diesel-like fuel. The diesel-like fuel is low in toxicity and is virtually interchangeable with conventional diesel fuels. Although these technologies have been available in some form since the 1920s, and coal GTL was used heavily by the German military during World War II, GTL technologies are not widely used today.

About Natural Gas and Natural Gas Vehicles

<http://www.gao.gov/new.items/d07283.pdf>

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Natural gas is an alternative fuel that can be used as either a compressed natural gas or a liquefied natural gas. Natural gas vehicles are currently available in the United States, but their use is limited, and production has declined in the past few years.

Natural gas is an alternative fuel that can be used as either heavy-duty compressed natural gas or liquefied natural gas to power natural gas vehicles. These vehicles require pressurized tanks, which have been designed to withstand severe impact, high external temperatures, and environmental exposure. Natural gas can be used by either retrofitting an existing gasoline or diesel engine or purchasing a natural gas vehicle. Natural gas vehicles are in use in many countries, totaling more than 5 million natural gas vehicles and over 9,000 refueling stations. The United States has about 130,000 natural gas vehicles and 1,340 refueling stations.

About Advanced Vehicle Technologies

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

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CRUDE OIL

Advanced vehicle technologies that we considered included lightweight materials and improvements to conventional engines that increase fuel economy, as well as hybrid vehicles and plug-in hybrid electric vehicles that use an electric motor/generator and a battery pack in conjunction with an internal combustion engine. Hybrid electric vehicles are commercially available in the United States, but these are not yet considered competitive with comparable conventional vehicles. DOE experts report that demand for such vehicles is predicated on their cost-competitiveness with comparable conventional vehicles. Hybrid electric vehicles, for example, cost \$2,000 to \$3,500 more to buy than comparable conventional vehicles and currently constitute around 1 percent of new vehicle registrations in the United States.

About Hydrogen Fuel Cell Vehicles

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

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A hydrogen fuel cell vehicle is powered by the electricity produced from an electrochemical reaction between hydrogen from a hydrogen-containing fuel and oxygen from the air. A fuel cell power system has many components, the key one being the fuel cell “stack,” which is many thin, flat cells layered together. Each cell produces energy and the output of all of the cells is used to power a vehicle. Currently, hydrogen fuel cell vehicles are still under development in the United States, and a number of challenges remain for them to become commercially viable. In the United States, government and industry are working on research and demonstration efforts, to facilitate the development and commercialization of hydrogen fuel cell vehicles.

A hydrogen fuel cell vehicle is powered by the electricity produced from an electrochemical reaction between hydrogen from a hydrogen-containing fuel and oxygen from the air. In the United States, these vehicles are still in the development stage, and making these vehicles commercially feasible presents a number of challenges.

Public Forum Article

Having statistics, strong arguments, and comprehensive responses are not enough to win you rounds. Just as important as your content in your cases is your presentation of that information. The outcomes of rounds would be much different if there wasn't a factor of human subjectivity within judging; however, there is so time needs to be spent improving your ability to effectively communicate.

Your first speech is obviously the easiest one to prepare for considering it's pre-written, and you have plenty of time to practice presenting. Personally, my view is that you should be able to give your speech without having to look at the paper that often so as to spend more time making eye contact with your judge. The ability to do this comes with practicing many times hopefully before the tournament begins; just think about how much better you are presenting the last round as opposed to your first. I am not advocating that you have your case memorized word for word but that you can take your eyes off the paper and still know what to say. As you practice you will be able to use either the first phrase or word of a sentence as a cue to remember the entire sentence. If you really know your cases, then you can do the same for the first line or word of a paragraph, but overall you should be able to use your case mainly as an outline for speaking rather than content for reading.

Let us first go over what constitutes effective presentation and communication. The most important factor for any speech or interaction in general is confidence. Judges want to see that you know what you are talking about, so a way to foster confidence is to actually know what you are talking about. This comes more from a comprehensive understanding of the topic rather than just specific arguments and I can honestly say this is what separates teams who break to teams who win most of the time. Even when you might not have full grasp of what you are saying, especially if you are thinking of a response on the fly, if you present it with confidence your opponents and judge will view your idea with more credibility.

Since your job is to try to convince a judge of your case, you need to speak to them rather than to your opponents. While your competitors will be able to keep up with fast speaking or will know what you are talking about when you say a tag of your argument, your judge will most likely not be as well versed on the topic as you are nor will they be able to track what you are saying if you do not give them adequate time to record your points. You should not try to do too much in your cases, as in do not include so much information and too many points so that you can not spend adequate time explaining each point. When presenting there should be a rhythm and speed to your voice that makes listening an enjoyable experience. Do not underestimate this because it is likely that you will get a few lay judges who have spent an entire day listening to boring and lifeless presentations. To add a little flair to your speech, make sure to include expressive inflection to our voice to emphasis particular words and points.

This is only a beginners guide to effective speaking so we will delve into more specifics later but for the time being there are a few practice exercises that will greatly help your speaking skills. Try talking with a pen clenched between your teeth, yes you will feel ridiculous but you will be learning valuable muscles memory. This forces your lips to move more to be able to get the sounds out of your mouth and when you remove the pen there will be much more clarity to

your voice. Public forum is different from LD and Policy in the fact that it stresses effective communication, do not overlook that fundamental aspect of the division of debate in which you participate.

Pro Analysis

It should serve as no surprise that the United States' current oil consumption is not going to be sustainable forever. Peak oil is just around the corner and if it were to occur today the repercussions would be felt negatively throughout the entire economy. The current recession is nothing compared to what would happen in the event of such an energy crisis. With all this in mind, it should go without saying that we need change and that is exactly what this mandate represents, change. Perhaps the mandate isn't the only change we need, but it is a good start. You can also mention the ecological reasons why we need change.

The United States as the biggest consumer of oil has also become one of the most dependent on the Middle East for oil. Not only is this bad for the economy importing so much more than we export, but it also takes away from the United States' hegemony. A mandate would help lessen our dependence in the long run and thus help the economy and give the US more leverage throughout the world.

The United States currently does not have the best green image throughout the world. A mandate would serve as a message to the rest of the world that the US is making changes when it comes to consumption. A bad image does nothing to help the US gain allies. A good team could argue the benefit of the mandate as a "grand and transformative gesture." If done well it could be very effective because it is more philosophical and hard to refute. In addition, if the con tries to argue that alternative fuels won't be practical by 2040, you can disagree and then point to the benefits of having a mandate anyway. If we institute a mandate and send a positive message to the rest of the world and work hard towards solving our oil dependence problem and don't quite reach it by 2040 (no matter how unlikely) then we can make changes to the law and cross that bridge when we get to it. Laws are fluid, and it doesn't change the fact that the mandate would have a positive effect now before the ban even gets close to going into effect. It is analogous to being told all semester that you have to be out of the dorm by December __. I think most people would agree that it is necessary to have some deadline and there were very specific repercussions if you were still in the dorm past that day at 2 pm. Well when it finally rolled around, there was a horrible snow storm and kids were stranded because their flights were canceled. Was the mandate/deadline enforced as a result? No. Does that change the fact that most people would agree a deadline should be set in the first place? No.

It is important that you make the point (maybe in your constructive maybe not) that technologically alternative fuels are practical. It shouldn't be hard to show that it is probable that we will have working alternative fuels by the year 2040 especially considering we have sub par (but still existent) one's now. If you can't prove this, it is near impossible to win the round, because then what would happen once 2040 rolled around, would we just stop driving anywhere?

Con Analysis

The feasibility of alternative fuels to take over the market for passenger vehicles must be taken into account when the pro tries to affirm the resolution. As of right now, alternative fuels do not have the capability to replace petroleum run cars as can be seen by the fact that alternative fuel cars do not have a large market share of vehicles on roads currently. As the con it will be essential for you to explain that there are no alternative fuels available that can be substituted for gasoline, but you need to extend that argument to state that there are no alternative fuels with the potential to replace the petroleum run cars. As you will see in the evidence even with optimistic expectations of current ideas for alternative fuels, they still do not have the capacity to entirely replace the amount of gasoline consumed in the United States for transportation. Not only can not enough alternative fuel be produced but there are numerous problems associated with implementing said alternative fuel throughout the market. The specifics of these problems are explained in the evidence, but the main issues concern the amount of capital required to shift from gas to another alternative fuels. Infrastructure costs are the most prominent; an upfront cost of a \$100,000 per gas station to get a tank to hold the alternative fuel will deter many gas stations from doing exactly that. Another important concern has to do with the chicken and the egg conundrum. People are not going to buy cars if they cannot refuel them, and gas stations are not going to supply fuel unless people are driving alternative fuel vehicles.

Even if a mandate is in fact implemented, that doesn't necessarily mean that intended effects will take place. A mandate cannot be passed with such broad language as alternative fuel without singling one out. The competition that will arise from saying that alternative fuel needs to be used will lead to massive amounts of economic waste that do not benefit the government, business, or the consumer. Think about the Blu-ray and HD-DVD struggle in the past year, but extrapolate that to billions of wasted dollars in competing research and development, infrastructure changes, and consumer costs. To give any hope for success, a single alternative fuel must be chosen, but then the question must be asked, which one? On the con, the evidence is expansive on how to rebut any alternative fuel proposition your opponents bring up. Since we can not pick an alternative fuel to rally behind currently, there is no benefit to mandating this change when a beneficial outcome can not be guaranteed. What happens when we are 30 years down the line and alternative fuel is not the best option available? Should we be confined to an unachievable mandate when there are other options? Since we have no guarantee on the potential for alternative nor should we rely on speculative technology advancements in the future, we shouldn't be affirming the resolution.

Given a current shift in consumer demand, more and more people are opting for alternative fuel vehicles and hybrids. This consumer sentiment will only grow stronger in the future as gas prices rise over time given the decrease of availability. A mandate does not need to be put in place to decrease carbon emissions and less dependence on foreign oil; people will do that on their own. The fact of the matter is that we should not be forcing consumers to buy a certain type of vehicle when there is still the likely chance that petroleum run cars will be more cost-effective.

On the Con don't let your opponents try to paint alternative fuels as a cure-all that will fix global warming, decrease dependence on other countries, create jobs in the U.S., or decrease economic costs to the country and consumers. Alternative fuel has just as many expected problems and many more unexpected consequences than does petroleum use. We will just be substituting current issues for different problems resulting in no net benefit. If the Pro tries to claim that the reason for the mandate is to stop carbon emissions, then bring up how much petroleum is still used in the process of creating and distributing alternative fuels. This will not eliminate our need for petroleum, although it will decrease it, we can achieve that same effect through other methods, including hybrid cars or production of alternative fuel vehicles in tandem with petroleum cars. Keep in mind, there are a few alternative fuels that are non-renewable so the current problems will still exist in the future. Even if those might be a quick fix, we should not be changing our system to a fuel that will eventually run out just like oil. To produce bio-fuels, America will not be able to grow enough crops at a competitive price so the country will turn to importing the needed resources from other countries. Overall, the con needs to show that there will still be problems associated with alternative fuels and until we find the best choice we should not be limiting the country.

Pro Blocks

Should Expand Incentives

Expanding Incentives and issuing a mandate by 2040 are not mutually exclusive. We can easily and perhaps should do both. The reason why we specifically need the mandate is because simply expanding incentives may encourage research and development in alternative fuels but it does not ensure that we make the full transition like a mandate would ensure. It is essential that we make a full transition because of the consequences peak oil would have on our economy and our lives if we are not ready. An energy crisis would have dire consequences.

Unnecessary/Free Market Will Solve

It is debatable as to whether or not the free market alone will be able to solve the problem, because the fact is gasoline powered vehicles are the most cost effective vehicles to create. As a result, there is no incentive for companies to make cars that are powered by alternative fuels because they can't compete in the market considering their prices. Also the mandate doesn't really do anything to inhibit the free market. If as the con advocates the free market solves the problem naturally in the next thirty years then there is no problem/downside to implementing such a mandate. I disagree that it's unnecessary but even if it were unnecessary then there is no real harm with issuing such a mandate. Overall, the mandate doesn't interfere with the free market, but instead serves as a step to insure that we're ready when we hit peak oil. I think almost everyone agrees the consequences would be drastic if we were to run out of oil and didn't have a stable alternative in place. The mandate serves to avoid this worst case scenario.

Alternative Fuels Not Practical

While it may or may not be true that alternative fuels are not practical at the moment, it is irrelevant. It might be relevant if the topic called for a mandate to be signed today preventing the creation of gasoline powered vehicles but that is a different topic. Alternative fuels become more and more practical everyday as the technology gets better and gas gets more expensive (in general maybe not this month though). I think it would be very tough to effectively make the argument that scientists will not have created a practical alternative fuel in the next ten years let alone over thirty like the resolution requires.

Alternative Fuel and Production Still Uses Petroleum

This is somewhat true of some but not all alternative fuels; however, the important thing to realize is that they use less petroleum and thus it is a step in the right direction. Also that statement deals primarily with current alternative fuels when the resolution is concerned more with the research and development of alternative fuels down the road when the technology naturally will have improved along the same trend we've seen in the past few years where the alternative fuels use less and less petroleum.

It Will Hurt the Economy Because Alternative Fuel is Expensive

It would no more hurt the economy than any other form of research. On a superficial scale, it might hurt the economy; however, it completely ignores the much bigger benefits that would result in the long term. Look at it this way, we are investing in our future.

People Should Still Have the Choice to Consume as They Wish

No. People are often allowed to exercise their own free will and do things potentially destructive to themselves like eat fast food everyday, because it is victimless. Creating a situation where we remain heavily dependent on oil when its production starts to decrease isn't victimless. It hurts everyone and thus ceases to be a question of an individual's free will.

If There are Still Oil Reserves Past 2040 Why Not Use Them?

Just because the mandate would prevent the creation of new vehicles doesn't mean there wouldn't be gas powered vehicles still. In addition, it is not like the oil is going to go to waste. While some people often lose sight of this, oil is used in myriad other compounds/products ranging from makeup to asphalt.

Con Blocks

Mandate Serves as a Safeguard for Economy

There are other more efficient ways to safeguard against a hypothetical catastrophe following peak oil that may or may not occur before 2040, such as a free market solution. This mandate is just a further extension of “big government” and inserts politics into the equation where it shouldn’t be. It is all just rhetoric that won’t even help the current situation. If the government is going to do anything, expanding the incentives for automakers to research and develop alternative fuels would yield benefits in the present.

Climate Change

First, this resolution isn’t really about climate change. The more pressing issue relates to peak oil and what is going to happen once oil production begins its decline, that is why the writers of the resolution made reference to 2040. Second, the damage done to the environment by alternative fuels has comparable if not worse consequences depending on the alternative fuel in question. With all that in mind, the bigger question is how do we work to ensure that the United State’s productivity is kept up and protect against the consequences of suddenly running out of oil.

Not Going to Happen Without Intervention (No Incentive)

Even if you believe that we are not going to be able to solve our current oil dependence problem without some intervention, it does not inherently mean this mandate is the answer. There are other better solutions to the problem. Just because at the moment, the most cost efficient means of producing a vehicle is with gasoline does not mean it is going to be that way in thirty years or necessarily three years for that matter. As gasoline becomes scarcer and thus more expensive, it is going to naturally encourage manufacturers to create vehicles run by alternative fuels. Critics question what the incentive is however if you look towards the great success of the Prius you’ll see that there is a potential for astronomical profits for the company that develops a practical vehicle run by alternative fuels. Buying a Prius at the moment doesn’t even make sense yet from a strictly financial perspective. The technology is getting better each and every day. It is only a matter of time. Just because something may or may not be practical now doesn’t mean it won’t be in the near future. The first computer wasn’t all that practical either, and look how far we’ve come in a short period of time. In addition, Intel, IBM, Microsoft, etc. were some of the most successful companies of the past century, and it all happened without a government mandate.

Will Reduce Dependence on Other Countries

Nothing about the resolution inherently says we will reduce our dependence on other countries. It's just a tradeoff. We'll start importing less petroleum and start importing more energy in the form of _____. It doesn't really change the fact that we're dependent. It would just change who and what we're dependent on which is a negligible difference.

U.S. Would be Increasing Stature in the World

It is hard to say. One thing is for sure it would make a lot of countries that already don't really like us in the Middle East that much angrier if we were to suddenly stop importing what their economies rely most on. It's probably not in our best interests to anger them.

Crossfire

On the pro, I would probably start right off the bat with “Wouldn’t you agree most studies show peak oil occurring sometime between now and 2040?” You want to make sure everyone is on the same page and understands the importance of having such a mandate. On the con, I would probably respond “Not necessarily there is a lot of uncertainty as to when peak oil is going to occur and that’s precisely why we can’t limit ourselves so much to a specific date, 2040 like you on the pro are advocating. Also even after we hit peak oil, we are going to be producing about the same amount of oil. Most scientists speculate it’s a bell curve not a cliff.” One can’t deny that “most studies” do show it occurring by then and make that clear if you’re on the pro.

Now that the pro has established that we’re going to run out of oil, they should get con to concede that running out of oil and undergoing a large energy crisis would be catastrophic to the US. This shouldn’t be too hard to accomplish. The clash should now occur in answering the question how do we best prepare for and prevent this potential crisis? The pro obviously answers with a mandate by 2040 and the con looks elsewhere.

Personally, I don’t think such a mandate would do much based on the recent trend in the past few years and perhaps an overly optimistic view of scientific progress. If it doesn’t do much, it could be argued that it’s unnecessary, so I believe the pro should ask ad absurdum “but what’s the harm?” If the con keeps saying “the mandate won’t do ____, we need this instead,” come back with “they’re not mutually exclusive and what’s the harm? All the mandate does is put peak oil on the radar and serves as a precaution against the worst.” The mandate also sends a good message to the rest of the developed world. The government isn’t really involving themselves that much and a little government oversight is a good thing. The results of too little can be seen currently in the banking crisis. On the con, I would emphasize how little the mandate does (especially in the present/short term) and reference some better alternatives (no pun intended).

On the con, I might suggest going down a specific line of argument that includes alternative fuels and less carbon emissions but excludes an encompassing mandate that all passenger vehicles have to use alternative fuels. You need to come across that you understand changes need to be made in regards to oil consumption but that doesn't mean that we should ban all petroleum cars.

C: The year 2040 is quite a ways down the road and doesn’t really help us now in 2009. Wouldn’t an incentive program put into place this year yield benefits sooner?

P: It is hard to say but the two aren’t mutually exclusive. Couldn’t we easily have both?

C: What if a practical alternative fuel can’t be developed by 2040 then what? Isn’t a mandate too restrictive and petroleum powered cars would then become a “necessary evil?”

C: What's to say that this mandate is going to be a cure-all? Won't we still have equally difficult problems that just concern something other than oil?

P: While some problems will occur they won't include a non-renewable resource (hopefully) that we have to import from other countries.

P: Do you agree that the U.S. should try to decrease their consumption of petroleum considering it's going run out at some point? With that in mind, wouldn't the U.S. be sending a beneficial message to the rest of the world that they are taking steps to decrease their carbon emissions?

P: Despite the current state of alternative energy, don't you think that technological advancements will make alternative energy widely available and inexpensive?

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Pro Evidence

When Will Peak Oil Occur?

<http://www.gao.gov/new.items/d07283.pdf>

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Most studies estimate that oil production will peak sometime between now and 2040, although many of these projections cover a wide range of time, including two studies for which the range extends into the next century.

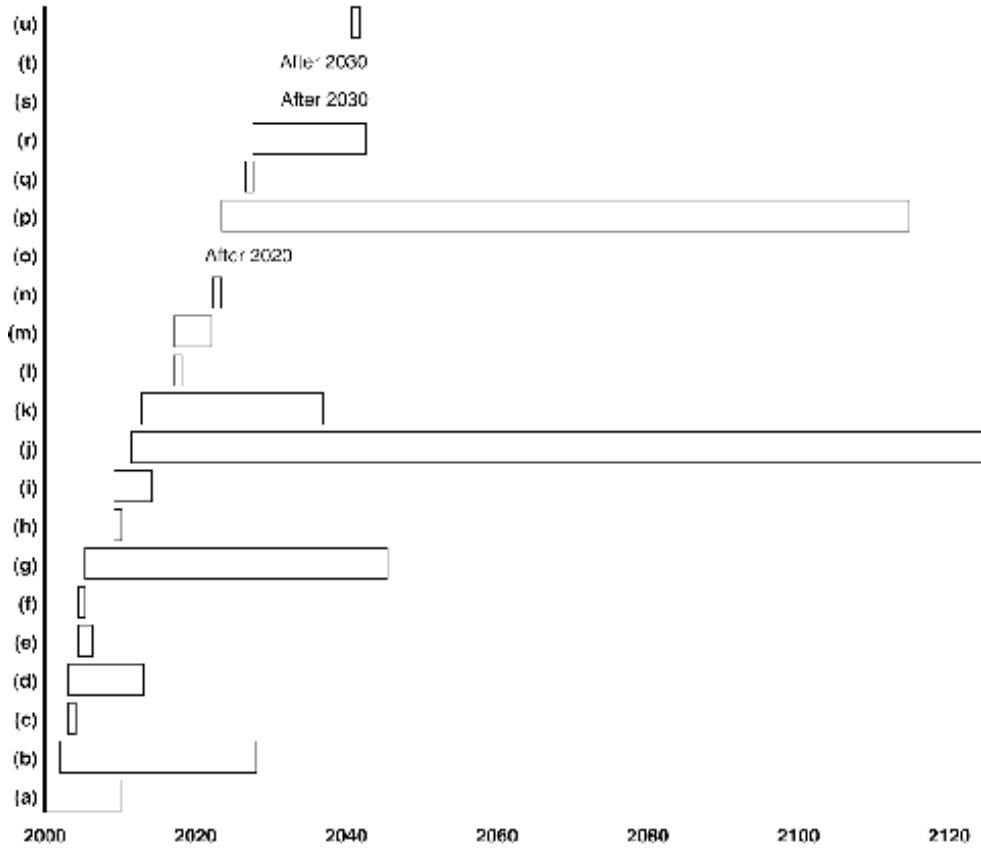
Federal agency efforts that could reduce uncertainty about the timing of peak oil production or mitigate its consequences are spread across multiple agencies and generally are not focused explicitly on peak oil. For example, efforts that could be used to reduce uncertainty about the timing of a peak include USGS activities to estimate oil resources and DOE efforts to monitor current supply and demand conditions in global oil markets and to make future projections. Similarly, DOE, the Department of Transportation (DOT), and the U.S. Department of Agriculture (USDA) all have programs and activities that oversee or promote alternative transportation technologies that could mitigate the consequences of a peak. However, officials of key agencies we spoke with acknowledge that their efforts—with the exception of some studies—are not specifically designed to address peak oil.

Studies Predict Widely Different Dates for Peak Oil.

Most studies estimate that oil production will peak sometime between now and 2040, although many of these projections over a wide range time, including two studies for which the range extends into the next century. Figure 5 shows the estimates of studies we examined.

When Will Peak Oil Occur? (Cont'd)

Figure 5: Key Estimates of the Timing of Peak Oil (p.13)



Source: GAO study.

Amount of Oil is Uncertain

<http://www.gao.gov/new.items/d07283.pdf>

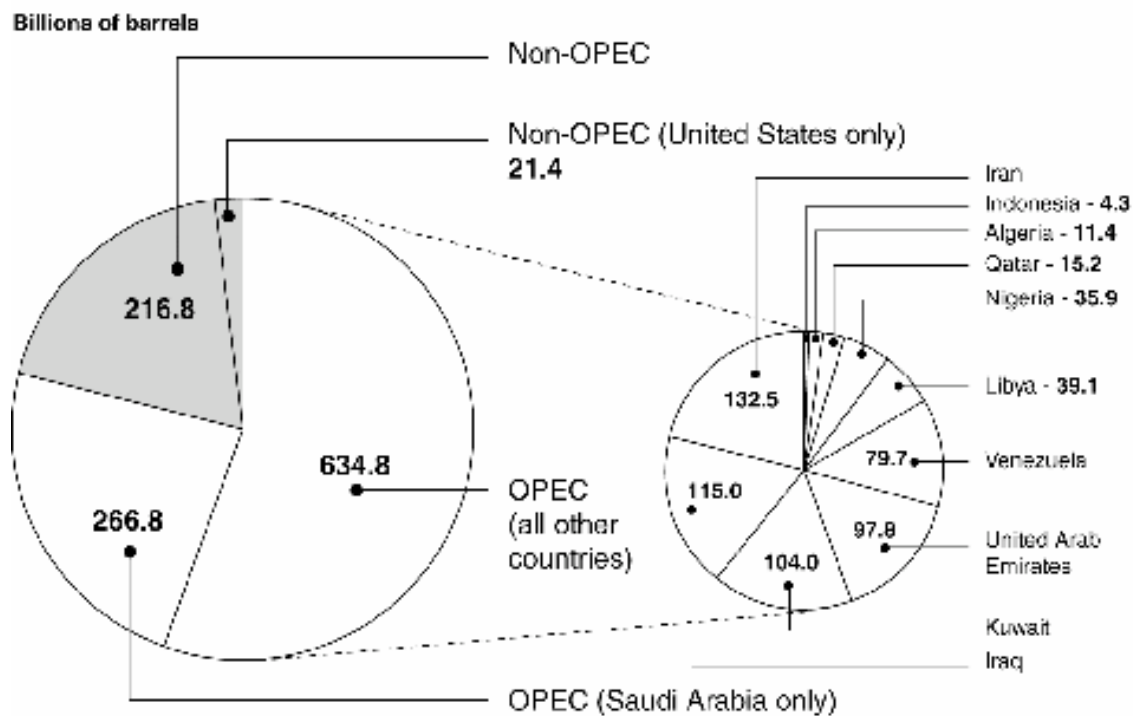
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...Some experts believe OPEC estimates of proven reserves to be inflated. For example, OPEC estimates increased sharply in the 1980s, corresponding to a change in OPEC’s quota rules that linked a member country’s production quota in part to its remaining proven reserves. In addition, many OPEC countries’ reported reserves remained relatively unchanged during the 1990s, even as they continued high levels of oil production. For example, IEA reports that reserves estimates in Kuwait were unchanged from 1991 to 2002, even though the country produced more than 8 billion barrels of oil over that period and did not make any important new oil discoveries. (p.14)

Limited information on oil-producing regions worldwide also leads USGS to base its estimate of reserves growth on how reserves estimates have grown in the United States. However, some experts criticize this methodology; they believe such an estimate may be too high because the U.S. experience overestimates increases in future worldwide reserves. In contrast, EIA believes the USGS estimate may be too low. (p.17)

Figure 6: World Oil Reserves, OPEC and non-OPEC, 2006 (p.16)



Source: GAO analysis of Oil and Gas Journal data.

Oil Production

<http://www.gao.gov/new.items/d07283.pdf>

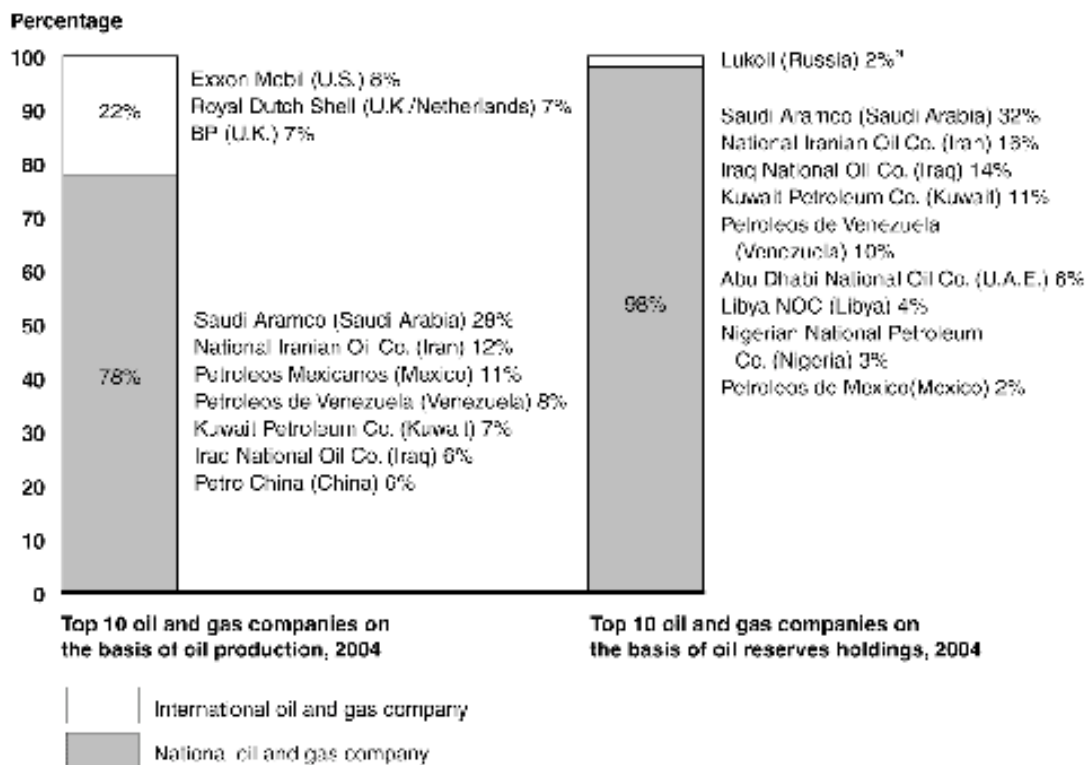
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It is unclear how much oil can be recovered from nonconventional sources. Expert sources disagree concerning the significance of the role these nonconventional sources will play in the future. Currently, production of oil from key nonconventional sources of oil—oil sands, heavy and extra-heavy oil deposits, and oil shale—is more costly and presents environmental challenges. (p.19).

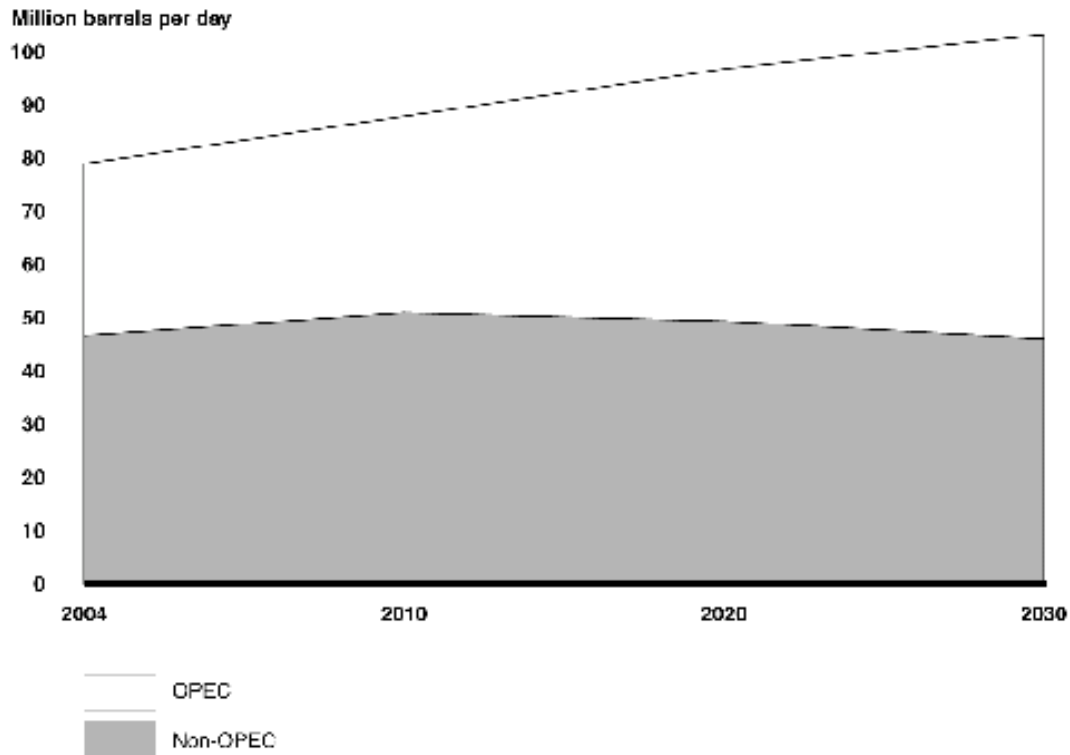
Production from oil sands, however, presents significant environmental challenges. The production process uses large amounts of natural gas, which generates greenhouse gases when burned. In addition, large-scale production of oil sands requires significant quantities of water, typically produce large quantities of contaminated wastewater, and alter the natural landscape. These challenges may ultimately limit production from this resource, even if sustained high oil prices make production profitable. (p.20)

Figure 9: Top 10 Companies on the Basis of Oil Production and Reserves Holdings, 2004 (p.25)



Source: GAO analysis of data from *Petroleum Intelligence Weekly* (Dec. 12, 2005)

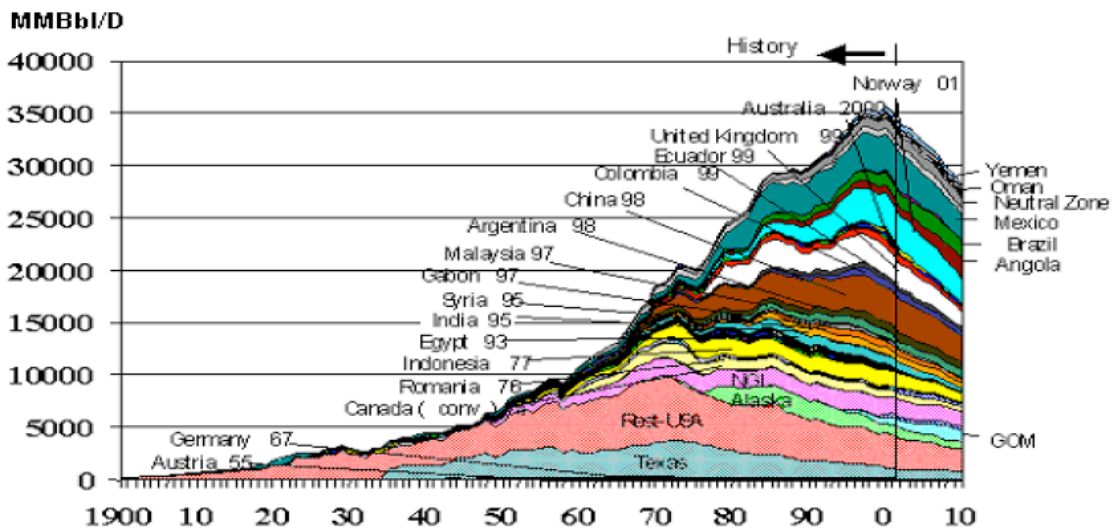
Figure 10: World Oil Production, by OPEC and Non-OPEC Countries, 2004 Projected to 2030 (p.26)



Source: International Energy Agency

http://www.evworld.com/library/Oil_Shale_Statgic_Significant.pdf

Non-OPEC, non-FSU Oil Production Has Peaked and is Declining



Why Will Peak Oil Occur?

<http://www.gao.gov/new.items/d07283.pdf>

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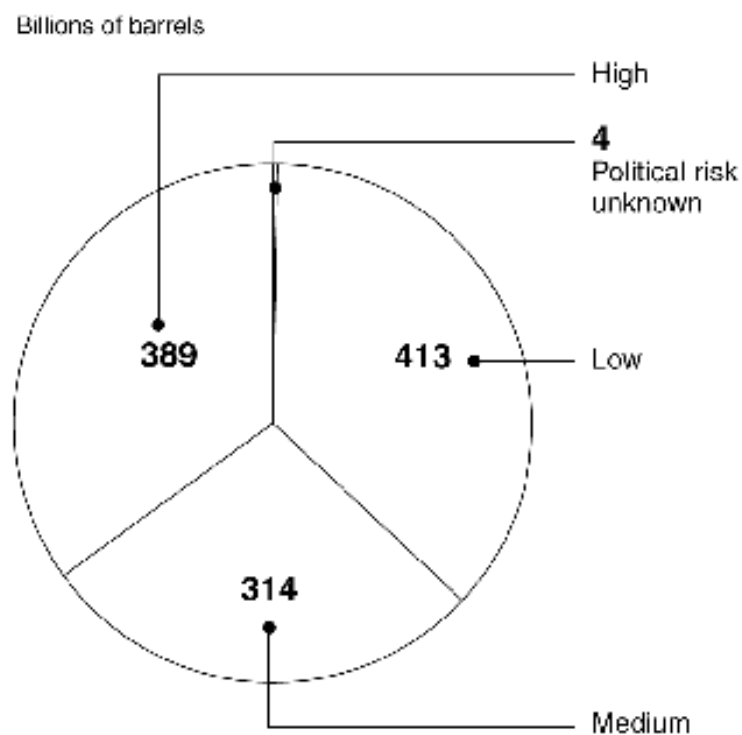
There is also great uncertainty about the amount of oil that will ultimately be produced, given the technological, cost, and environmental challenges. For example, some of the oil remaining in the ground can be accessed only by using complex and costly technologies that present greater environmental challenges than the technologies used for most of the oil produced to date.

Using a measure of political risk that assesses the likelihood that events such as civil wars, coups, and labor strikes will occur in a magnitude sufficient to reduce a country's gross domestic product (GDP) growth rate over the next 5 years, we found that four countries—Iran, Iraq, Nigeria, and Venezuela—that possess proven oil reserves greater than 10 billion barrels (high reserves) also face high levels of political risk. These four countries contain almost one-third of worldwide oil reserves. Countries with medium or high levels of political risk contained 63 percent of proven worldwide oil reserves, on the basis of Oil and Gas Journal estimates of oil reserves. (p.21).

According to our analysis, 85 percent of the world's proven oil reserves are in countries with medium-to-high investment risk or where foreign investment is prohibited, on the basis of Oil and Gas Journal estimates of oil reserves. (p.24)

Why Will Peak Oil Occur? (Cont'd)

Figure 7: Worldwide Proven Oil Reserves, by Political Risk (p.22)



Source: GAO analysis of Oil and Gas Journal and Global Insight data.

Other important sources of uncertainty about future oil production are potentially unfavorable political and investment conditions in countries where oil is located. For example, more than 60 percent of world oil reserves, on the basis of Oil and Gas Journal estimates, are in countries where relatively unstable political conditions could constrain oil exploration and production.

Finally, future world demand for oil also is uncertain because it depends on economic growth and government policies throughout the world. For example, continued rapid economic growth in China and India could significantly increase world demand for oil.

Consequences of Peak Oil

<http://www.gao.gov/new.items/d07283.pdf>

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Under these circumstances, an imminent peak and sharp decline in oil production could have severe consequences, including a worldwide recession. If the peak comes later, however, these technologies have a greater potential to mitigate the consequences.

Federally sponsored studies we reviewed have expressed a growing concern over the potential for a peak and officials from key agencies have identified some options for addressing this issue. For example, DOE and USGS officials told us that developing better information about worldwide demand and supply and improving global estimates for nonconventional oil resources and oil in “frontier” regions that have yet to be fully explored could help prepare for a peak in oil production by reducing uncertainty about its timing. Agency officials also said that, in the event of an imminent peak, they could step up efforts to mitigate the consequences by, for example, further encouraging development and adoption of alternative fuels and advanced vehicle technologies.

While the consequences of a peak would be felt globally, the United States, as the largest consumer of oil and one of the nations most heavily dependent on oil for transportation, may be particularly vulnerable.

According to IEA, most countries outside the Middle East have reached their peak in conventional oil production, or will do so in the near future.

If the decline in oil production exceeded the ability of alternative technologies to displace oil, energy consumption would be constricted, and as consumers competed for increasingly scarce oil resources, oil prices would sharply increase. In this respect, the consequences could initially resemble those of past oil supply shocks, which have been associated with significant economic damage. For example, disruptions in oil supply associated with the Arab oil embargo of 1973-74 and the Iranian Revolution of 1978-79 caused unprecedented increases in oil prices and were associated with worldwide recessions. In addition, a number of studies we reviewed indicate that most of the U.S. recessions in the post-World War II era were preceded by oil supply shocks and the associated sudden rise in oil prices.

Consequences of Peak Oil (Cont'd)

Ultimately, however, the consequences of a peak and permanent decline in oil production could be even more prolonged and severe than those of past oil supply shocks. Because the decline would be neither temporary nor reversible, the effects would continue until alternative transportation technologies to displace oil became available in sufficient quantities at comparable costs. Furthermore, because oil production could decline even more each year following a peak, the amount that would have to be replaced by alternatives could also increase year by year. (p. 33-4).

The prospect of a peak in oil production presents problems of global proportion whose consequences will depend critically on our preparedness. The consequences would be most dire if a peak occurred soon, without warning, and were followed by a sharp decline in oil production because alternative energy sources, particularly for transportation, are not yet available in large quantities. Such a peak would require sharp reductions in oil consumption, and the competition for increasingly scarce energy would drive up prices, possibly to unprecedented levels, causing severe economic damage. While these consequences would be felt globally, the United States, as the largest consumer of oil and one of the nations most heavily dependent on oil for transportation, may be especially vulnerable among the industrialized nations of the world. (p. 38)

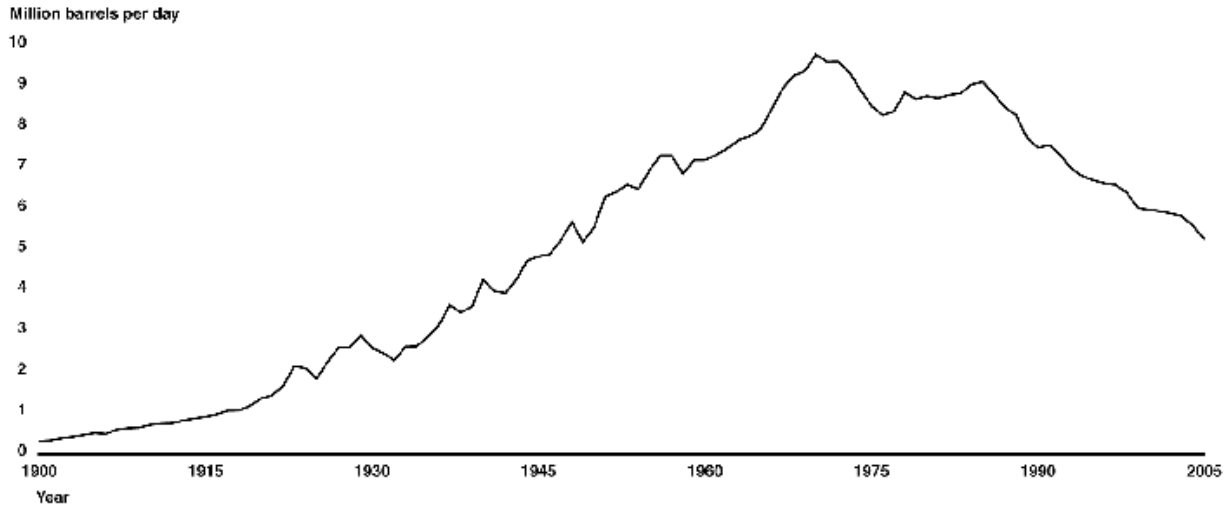
U.S. Oil Production Is Down with Increasing Need

<http://www.gao.gov/new.items/d07283.pdf>

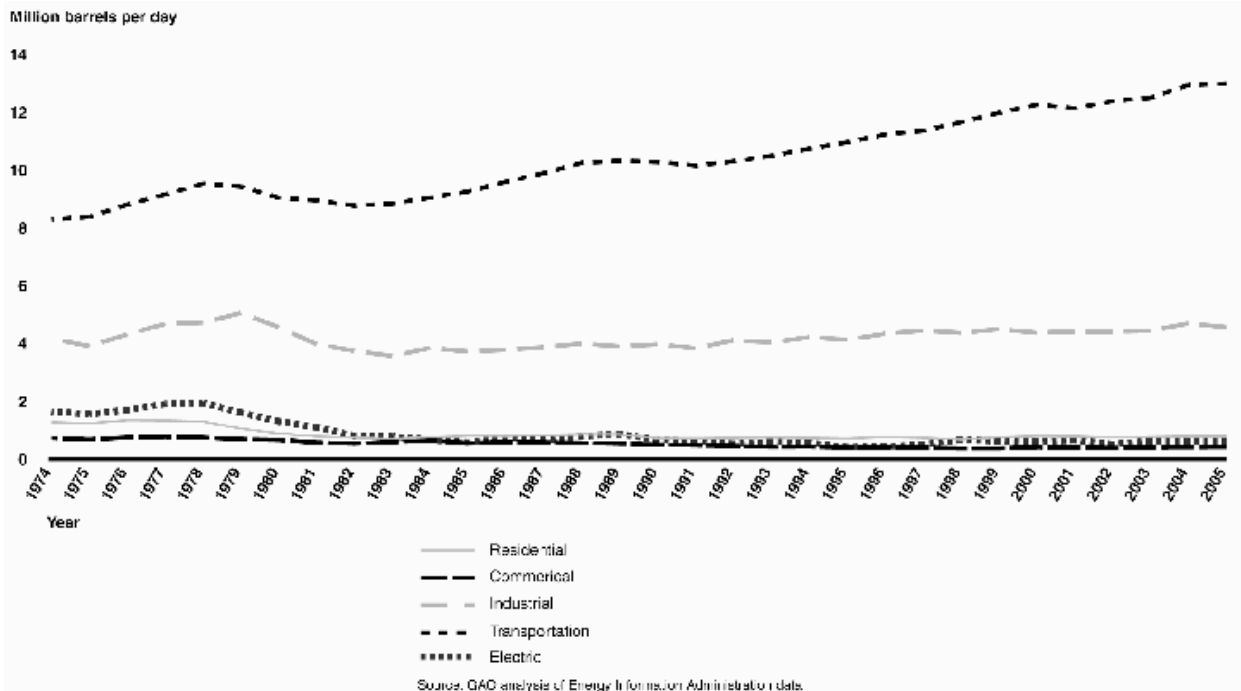
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The United States is a case in point. Even though the United States is currently the third-largest, oil-producing nation, U.S. oil production peaked around 1970 and has been on a declining trend ever since. See Figure 1. (p.7)



Source: GAO analysis of Energy Information Administration data.



Demand For Oil in the Future

<http://www.gao.gov/new.items/d07283.pdf>

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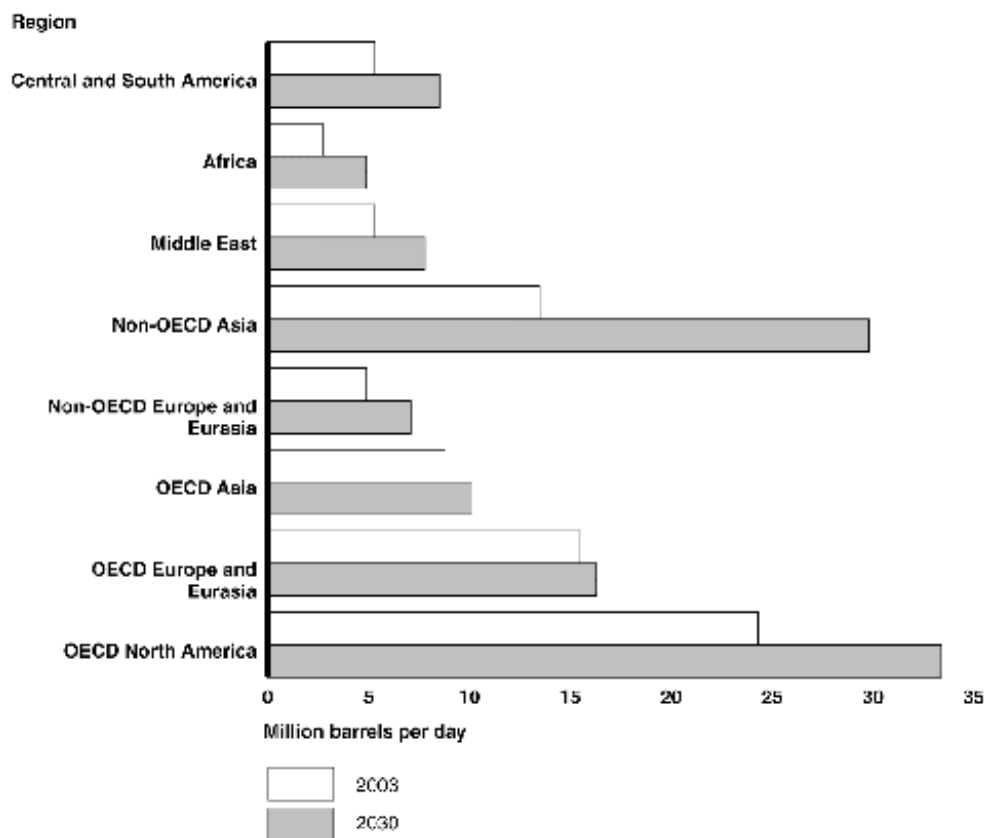
Uncertainty about future demand for oil—which will influence how quickly the remaining oil is used—contributes to the uncertainty about the timing of peak oil production. EIA projects that oil will continue to be a major source of energy well into the future, with world consumption of petroleum products growing to 118 million barrels per day by 2030. Figure 11 shows world petroleum product consumption by region for 2003 and EIA's projections for 2030. As the figure shows, EIA projects that consumption will increase across all regions of the world, but members of the Organization for Economic Cooperation and Development (OECD) North America,²² which includes the United States, and non-OECD Asia, which includes China and India, are the major drivers of this growth.

Future world oil demand will depend on such uncertain factors as world economic growth, future government policy, and consumer choices. Specifically:

- Economic growth drives demand for oil. For example, according to IEA, in 2003 the world experienced strong growth in oil consumption of 2.0 percent, with even stronger growth of 3.6 percent in 2004, from 79.8 million barrels per day to 82.6 million barrels per day and China accounted for 30 percent of this increase, driven largely by China's almost 10 percent economic growth that year. EIA projects the Chinese economy will continue to grow, but factors such as the speed of reform of ineffective state-owned companies and the development of capital markets adds uncertainty to such projections and, as a result, to the level of future oil demand in China.

Demand For Oil in the Future (Cont'd)

- Future government policy can also affect oil demand. For example, environmental concerns about gasoline's emissions of carbon dioxide, which is a greenhouse gas, may encourage future reductions in oil demand if these concerns are translated into policies that promote biofuels.
- Consumer choices about conservation also can affect oil demand and thereby influence the timing of a peak. For example, if U.S. consumers were to purchase more fuel-efficient vehicles in greater numbers, this could reduce future oil demand in the United States, potentially delaying a time at which oil supply is unable to keep pace with oil demand.



Source: Energy Information Administration.

Need for Alternative Fuels

http://aqp.engr.ucdavis.edu/Documents/AFV%20SCENARIO_June.pdf

THE FUTURE DEMAND FOR ALTERNATIVE FUEL PASSENGER VEHICLES:

A DIFFUSION OF INNOVATION APPROACH

UC Davis – Caltrans Air Quality Project

June 30, 2004

The United States is heavily and increasingly dependent on foreign oil. The net importation of oil accounted for 21.5% (3.16 million barrels net importation per day) of the U.S. energy use in 1970, and steadily increased to 55.5% (10.90 million barrels net importation per day) in 2001.

Among all sectors, transportation constituted more than two-thirds of energy consumption in the U.S. in 2001, of which petroleum accounted for an overwhelming proportion (96.9%) of energy demand (Davis and Diegel, 2002). The continued growth in the amount of imported oil required to meet our demand for petroleum products threatens national and economic security, and is not sustainable in the long term.

Benefits of Ethanol

Not Your Father's Ethanol. Business Week. February 21, 2005.

A 2005 Business Week report states:

"Last December the bipartisan National Commission on Energy Policy released a report, Ending the Energy Stalemate, that analyzed the potentials of various alternative fuels, including both types of ethanol (which is just an industrial grade of alcohol). Only cellulosic ethanol got a decisive thumbs-up. By 2020, the commission predicts, its production cost could be less than 80 cents a gallon. In stark contrast, after 20 years producing grain ethanol, it still costs \$1.40 a gallon to produce — roughly twice as much as gasoline.

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

Case For: Ethanol is an excellent, clean-burning fuel, potentially providing more horsepower than gasoline. In fact, ethanol has a higher octane rating (over 100) and burns cooler than gasoline. However, pure alcohol isn't volatile enough to get an engine started on cold days, hence E85. Much smaller quantities of ethanol are also added to around 30 percent of the gasoline sold in the States to meet EPA requirements for oxygenated fuels in metropolitan areas with the country's worst ozone air pollution.

According to the National Ethanol Vehicle Coalition (NEVC), E85 currently is available in 36 states. The Environmental Protection Agency (EPA) lists 34 models of flex-fuel vehicles (FFV)--cars and trucks that can burn pure gasoline, E85 or any ratio of gas/ethanol in between--available in the 2006 model year. The NEVC estimates that 6 million FFVs have been sold in the States to date. The performance of E85 vehicles is potentially higher than that of gasoline vehicles because E85's high octane rating allows a much higher compression ratio, which translates into higher thermodynamic efficiency. However, FFVs that retain the capacity to run on gasoline alone can't really take advantage of this octane boost since they also need to be able to run on pump-grade gasoline.

Cynics claim that it takes more energy to grow corn and distill it into alcohol than you can get out of the alcohol. However, according to the DOE, the growing, fermenting and distillation chain actually results in a surplus of energy that ranges from 34 to 66 percent. Moreover, the carbon dioxide (CO₂) that an engine produces started out as atmospheric CO₂ that the cornstalk captured during growth, making ethanol greenhouse gas neutral. Recent DOE studies note that using ethanol in blends lowers carbon monoxide (CO) and CO₂ emissions substantially. In 2005, burning such blends had the same effect on greenhouse gas emissions as removing 1 million cars from American roads.

Benefits of Ethanol (Cont'd)

<http://www.usnews.com/usnews/news/articles/070204/12ethanol.htm>

U.S. News and World Report

Is Ethanol the Answer? By Marianne Lavelle and Bret Schulte

Posted 2/4/07

In 2006, production skyrocketed, and Washington is poised to push it still higher. What's not to like? Every gallon theoretically means more money for the iconic American farmer and less cash lining the pockets of foreign sheiks. "There's almost a sense," says Iowa State University political scientist Steffen Schmidt, "that ethanol is morally better than oil."

Benefits of Methanol

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

Methanol is a potent fuel with an octane rating of 100 that allows for higher compression and greater efficiency than gasoline. Pure methanol isn't volatile enough to start a cold engine easily and when it does burn, it does so with a dangerously invisible flame. Blending gasoline with methanol to create M85 solves both problems.

Benefits of Bio-Diesel

<http://www.gao.gov/new.items/d07283.pdf>

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In 2005, U.S. production of biodiesel was 75 million gallons, and DOE projects about 3.6 billion gallons per year by 2015.

- Under a more speculative scenario requiring major changes in land use and price supports, experts project it would be possible to produce 10 billion gallons of biodiesel per year.

Experts project that, with adequate resources, key remaining developments could be resolved in the next 5 years.

Figure 7. Western Governor's Association Energy Policy Resolution. June 14, 2005.

http://www.angtl.com/pdfs/IGFCC_APPENDIX_V.pdf.

Biodiesel, another alternative fuel, has a couple of advantages over ethanol. The first is that it has over 1.6 times the energy content of ethanol.

Hagen, John P. and Yu, Dan. Ternary phase diagram biodiesel fuel – 2-propanol – water, Poster presented at The 40th Western Regional Meeting of the American Chemical Society. January 22-25, 2006.

The second is that the energy balance for biodiesel is significantly better than that for ethanol, because water is not miscible in biodiesel and therefore does not have to be removed via an energy intensive distillation step.

Monahan, Patricia and Friedman, David. DIESEL OR GASOLINE? Fuel for Thought. Union of Concerned Scientists. 2005. <http://www.grinningplanet.com/2005/04-12/diesel-vs-gasoline-article.htm>.

Finally, diesel engines are far more efficient than spark-ignition engines, leading to greater gas mileage.

Briggs, Michael. Widescale Biodiesel Production from Algae. August 2004. Paper Accessed May 2006 at http://www.unh.edu/p2/biodiesel/article_alge.html.

Michael Briggs from the University of New Hampshire has argued that biodiesel produced from high-yielding algae has the potential to replace our current usage of fossil fuels.

Benefits of Bio-Diesel (Cont'd)

http://www.unh.edu/p2/biodiesel/article_alge.html

Widescale Biodiesel Production from Algae

Michael Briggs, University of New Hampshire, Physics Department (revised August 2004)

One of the biggest advantages of biodiesel compared to many other alternative transportation fuels is that it can be used in existing diesel engines without modification, and can be blended in at any ratio with petroleum diesel. This completely eliminates the "chicken-and-egg" dilemma that other alternatives have, such as hydrogen powered fuel cells.

<http://italy.usembassy.gov/pdf/other/IB10128.pdf>

Congressional Research Service Issue Brief for Congress

Alternative Fuels and Advanced Technology Vehicles: Issues in Congress

Updated May 8, 2006

Further, because it can be produced from agricultural products, there is keen interest in its development by farmers (especially soybean and canola farmers) and some environmentalists as a way to promote rural economies, reduce agricultural wastes, and limit greenhouse gas emissions.

Benefits of Biomass Gas-to-Liquid

<http://www.gao.gov/new.items/d07283.pdf>

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Biomass. Some experts project biomass GTL to have the potential to produce up to approximately 1.4 million barrels-of-oil-equivalent per day by 2030.

Benefits of Coal Gas-to-liquid

<http://www.gao.gov/new.items/d07283.pdf>

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Coal. Experts project that, at most, 80,000 barrels per day could be produced by 2015 and 1.7 million barrels per day by 2030.

Benefits of Electric Cars

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

Vehicles that operate only on electricity require no warmup, run almost silently and have excellent performance up to the limit of their range. Also, electric cars are cheap to "refuel." At the average price of 10 cents per kwh, it costs around 2 cents per mile. Electric cars can be recharged at night, when generating plants are under-utilized. Vehicles that run on electricity only part of the time and on internal-combustion power at other times--hybrids--have even greater promise. As hybrids gain in popularity, there is a growing interest in plug-in hybrids that allow owners to fully recharge the vehicle's batteries overnight. A strong appeal of the electric car--and of a hybrid when it's running on electricity--is that it produces no tailpipe emissions. Even when emissions created by power plants are factored in, electric vehicles emit less than 10 percent of the pollution of an internal-combustion car.

Benefits of Natural Gas

Syntroleum Corporation. <http://www.syntroleum.com>. Acquiring and Developing Stranded Reserves. Accessed May 2006 at <http://www.syntroleum.com/pdf/brochure.pdf>.

There are enormous reserves of natural gas throughout the world. Worldwide reserves of natural gas are estimated to be 6,200 trillion cubic feet, of which 3,000 trillion cubic feet are estimated to be stranded. This is enough stranded natural gas to produce 300 billion barrels of fuel.

<http://www.technologyreview.com/energy/21261/page1/>

Technology Review Published by MIT, Friday, August 15, 2008, Natural Gas to Gasoline
A firm claims to have a cheaper way to harness natural gas.

"We're able to produce a barrel of gasoline for much cheaper than Fischer-Tropsch can," says [Kenneth Hall](#), coinventor of the process and former head of Texas A&M University's department of chemical engineering. Hall says that a Fischer-Tropsch plant is lucky to produce a barrel of gasoline for \$35 but that a much smaller Synfuels refinery could produce the same barrel for \$25. Under current fuel prices, such a plant could pay for itself in as little as four years, the company says.

Fischer, P. A. Ending blackouts? An underground technology resurfaces " WorldOil.com, September 2001.

The gas-to-liquids (GTL) process can turn this gas into fuels, and "has the potential to be planet-changing."

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics , Crunching the Numbers on Alternative Fuels By Mike Allen
Published in the May 2006 issue

With an octane rating of up to 130, CNG has the potential to optimize an engine's thermodynamic efficiency through a high compression ratio. However, many CNG vehicles are able to run on either CNG or gasoline, which obviates the octane advantage. According to the DOE, a CNG-fueled Honda Civic GX--the sole widely available CNG-only vehicle in the United States--produces 90 percent less CO and 60 percent less nitrogen oxides (NOx) than its gas-powered counterpart. And, CO₂ is reduced by 30 to 40 percent. According to the company, then car's exhaust is cleaner than the air in some high-pollution areas.

Currently available in nine states to Civic GX owners is a compressor/refueler called Phill that uses 2 kilowatt-hours (kwh) of electricity to compress the equivalent of 1 gal. of gasoline. With electricity averaging 10 cents per kwh nationwide, the price of CNG goes up 20 cents per gallon over the cost of the natural gas itself. Still, CNG is a bargain compared to gasoline. A gallon of gas equivalent (GGE) costs about \$1.20, including the cost of compression--thanks in part to the lack of taxes added to gasoline.

Overcoming the Problems of Natural Gas

http://assets.opencrs.com/rpts/RS22971_20081020.pdf

Congressional Research Service Report for Congress

Natural Gas Passenger Vehicles: Availability, Cost, and Performance

October 20, 2008

Currently, natural gas vehicles are significantly more expensive than comparable conventional vehicles. For example, the incremental price between a conventional Honda Civic EX and a natural gas-powered Honda Civic GX is nearly \$6,000,⁶ although some of this difference is made up through a tax credit for the purchase of new alternative fuel vehicles. If a taxpayer qualifies, he or she may claim a credit of up to \$4,000 for the purchase of a new Honda Civic GX. It should be noted that with higher production, this incremental cost should decrease, but the likely extent of that decrease is unclear.

Since the number of natural gas refueling stations is limited — only about 400 to 500 publicly available nationwide,⁸ compared to roughly 120,000 retail gasoline stations — the purchaser of a new NGV would likely also install a home refueling system. According to Consumer Reports, a FuelMaker Phill system costs \$3,400 plus roughly \$500 for installation.¹⁰ Natural Gas Vehicles for America (NGVAmerica) estimates that the Phill system costs roughly \$4,500 plus installation. However, a taxpayer can offset \$1,000 of this by claiming a tax credit for installing new alternative fuel refueling infrastructure.

Offsetting the higher up-front costs are likely annual fuel savings in switching from gasoline to natural gas. Using recent average retail gasoline and residential natural gas prices, annual fuel cost savings could be nearly \$800.¹³ Between July 2008 and October 2008, the price of both gasoline and natural gas have declined substantially, but the spread between them has remained relatively steady. Assuming a 7% discount rate, the current payback period for the CNG vehicle is just over eight years. Depending on how long a consumer keeps a new vehicle, this payback period may or may not be acceptable to that consumer.

Assuming a smaller differential between natural gas and gasoline prices, or the expiration of the existing tax incentives can significantly increase this payback period; assuming a larger difference in fuel prices, assuming a smaller discount rate, or assuming incremental natural gas vehicle prices decrease in the future, this payback period could be shorter.

Benefits of Hydrogen

http://www.afdc.energy.gov/afdc/fuels/hydrogen_benefits.html

U.S. Department of Energy
Energy Efficiency and Renewable Energy

Hydrogen can be produced from diverse domestic resources, with the potential for near-zero greenhouse gas emissions. Once produced, it generates power without exhaust emissions in fuel cells. It holds promise for economic growth in both the stationary and transportation energy sectors.

No matter how efficient conventional vehicles become, some of the gasoline and diesel needed to fuel them will need to be imported. Hydrogen can be [produced](#) domestically from resources such as natural gas, coal, solar energy, wind, biomass, and nuclear energy. Used to power highly efficient [fuel cell vehicles](#), hydrogen holds the promise of an end to the nation's "addiction to oil." View President George W. Bush's January 2006 [State of the Union Speech](#) related to this topic.

About half of the U.S. population lives in areas where air pollution levels are high enough to negatively impact public health or the environment. Emissions from gasoline and diesel vehicles—such as nitrogen oxides, hydrocarbons, and particulate matter—are a major source of this pollution. Hydrogen-powered fuel cell vehicles emit none of these harmful substances. Their only emission is H₂O—water.

The environmental and health benefits are even greater when hydrogen is produced from low- or zero-emission sources such as solar, wind, and nuclear energy and fossil fuels with advanced emission controls and carbon sequestration. Because the transportation sector accounts for about one third of U.S. carbon dioxide emissions, which contribute to climate change, using these sources to produce hydrogen for transportation can slash greenhouse gas emissions. Learn more about [Hydrogen Emissions](#).

The potential market for hydrogen vehicles is enormous, but the opportunities don't stop there. Hydrogen and fuel cells can power stationary applications such as backup generators, and grid electricity production. They can also compensate for the intermittency of renewable energy production. For example, wind generators can produce hydrogen when winds are high and electricity demand is low (learn more by going to the National Renewable Energy Laboratory's [Wind to Hydrogen](#) page). When the wind slackens or electricity demand peaks, fuel cells consume the stored hydrogen to provide grid electricity.

The United States stands to profit from hydrogen technologies. A recent study projected global annual demand for stationary and transportation fuel cell products to reach \$46 billion by 2011 and more than \$2.5 trillion by 2021. Government and industry [investment](#) in hydrogen and fuel cell technologies has positioned the United States as a leader in this rapidly growing market.

Examples of Hydrogen Cars Already Available

<http://carenthusiast.com/news.html?mode=article&id=264>

| World's first production hydrogen fuel cell | Honda FCX Clarity |

Honda has claimed the title of the world's first car maker to make a production car with hydrogen fuel cell power. A limited run of 200 examples is rolling off the Japanese factory line right now and will be supplied to key customers in Japan and California, both locations where there are hydrogen gas filling stations to supply the cars with fuel.

The Honda FCX Clarity uses a hydrogen fuel cell to create electricity, which then powers a 134bhp electric motor. When the hydrogen is combined with oxygen the only by-product that is emitted is water vapour, which makes the FCX Clarity a zero-emissions vehicle.

With a range of 270 miles, the FCX Clarity will be trialled by 200 selected customers over a three-year period. During this time, these customers will pay a lease of around £300 per month to use the car.

Honda is studying the results of the 200 cars and will use the details to refine further hydrogen-powered cars.

Bio-Diesel to Replace Fossil Fuel

http://www.unh.edu/p2/biodiesel/article_alge.html

Widescale Biodiesel Production from Algae, Michael Briggs, University of New Hampshire, Physics Department (revised August 2004)

First, we need to understand exactly how much biodiesel would be needed to replace all petroleum transportation fuels. So, we need to start with how much petroleum is currently used for that purpose. Per the Department of Energy's statistics, each year the US consumes roughly 60 billion gallons of petroleum diesel and 120 billion gallons of gasoline. First, we need to realize that spark-ignition engines that run on gasoline are generally about 40% less efficient than diesel engines. So, if all spark-ignition engines are gradually replaced with compression-ignition (Diesel) engines for running biodiesel, we wouldn't need 120 billion gallons of biodiesel to replace that 120 billion gallons of gasoline. To be conservative, we will assume that the average gasoline engine is 35% less efficient, so we'd need 35% less diesel fuel to replace that gasoline. That would work out to 78 billion gallons of diesel fuel. Combine that with the 60 billion gallons of diesel already used, for a total of 138 billion gallons. Now, biodiesel is about 5-8% less energy dense than petroleum diesel, but its greater lubricity and more complete combustion offset that somewhat, leading to an overall fuel efficiency about 2% less than petroleum diesel. So, we'd need about 2% more than that 138 billion gallons, or 140.8 billion gallons of biodiesel.

The main issue that is often contested is whether or not we would be able to grow enough crops to provide the vegetable oil (feedstock) for producing the amount of biodiesel that would be required to completely replace petroleum as a transportation fuel. So, that is the main issue that will be addressed here. The point of this article is not to argue that this approach is the only one that makes sense, or that we should ignore other options (there are some other very appealing options as well, and realistically it makes more sense for a combination of options to be used). Rather, the point is merely to look at one option for producing biodiesel, and see if it would be capable of meeting our needs.

One of the important concerns about wide-scale development of biodiesel is if it would displace croplands currently used for food crops. In the US, roughly 450 million acres of land is used for growing crops, with the majority of that actually being used for producing animal feed for the meat industry. Another 580 million acres is used for grassland pasture and range, according to the USDA's Economic Research Service. This accounts for nearly half of the 2.3 billion acres within the US (only 3% of which, or 66 million acres, is categorized as urban land). For any biofuel to succeed at replacing a large quantity of petroleum, the yield of fuel per acre needs to be as high as possible. At heart, biofuels are a form of solar energy, as plants use photosynthesis to convert solar energy into chemical energy stored in the form of oils, carbohydrates, proteins, etc.. The more efficient a particular plant is at converting that solar energy into chemical energy, the better it is from a biofuels perspective. Among the most photosynthetically efficient plants are various types of algae.

Bio-Diesel to Replace Fossil Fuel (Cont'd)

From the results of the Aquatic Species Program², algae farms would let us supply enough biodiesel to completely replace petroleum as a transportation fuel in the US (as well as its other main use - home heating oil) - but we first have to solve a few of the problems they encountered along the way.

NREL's research showed that one quad (7.5 billion gallons) of biodiesel could be produced from 200,000 hectares of desert land (200,000 hectares is equivalent to 780 square miles, roughly 500,000 acres), if the remaining challenges are solved (as they will be, with several research groups and companies working towards it, including ours at UNH). In the previous section, we found that to replace all transportation fuels in the US, we would need 140.8 billion gallons of biodiesel, or roughly 19 quads (one quad is roughly 7.5 billion gallons of biodiesel). That 15,000 square miles works out to roughly 9.5 million acres - far less than the 450 million acres currently used for crop farming in the US, and the over 500 million acres used as grazing land for farm animals.

Algae farms could also be constructed to use waste streams (either human waste or animal waste from animal farms) as a food source, which would provide a beautiful way of spreading algae production around the country. Nutrients can also be extracted from the algae for the production of a fertilizer high in nitrogen and phosphorous. By using waste streams (agricultural, farm animal waste, and human sewage) as the nutrient source, these farms essentially also provide a means of recycling nutrients from fertilizer to food to waste and back to fertilizer. Extracting the nutrients from algae provides a far safer and cleaner method of doing this than spreading manure or wastewater treatment plant "bio-solids" on farmland.

Bio-Diesel can Easily be Adopted in the US

http://www.unh.edu/p2/biodiesel/article_alge.html

Widescale Biodiesel Production from Algae

Michael Briggs, University of New Hampshire, Physics Department (revised August 2004)

With biodiesel, since the same engines can run on conventional petroleum diesel, manufacturers can comfortably produce diesel vehicles before biodiesel is available on a wide scale - as some manufacturers already are (the same can be said for flex-fuel vehicles capable of running on ethanol, gasoline, or any blend of the two). As biodiesel production continues to ramp up, it can go into the same fuel distribution infrastructure, just replacing petroleum diesel either wholly (as B100, or 100% biodiesel), or blended in with diesel. Not only does this eliminate the chicken-and-egg problem, making biodiesel a much more feasible alternative than hydrogen, but also eliminates the huge cost of revamping the nationwide fuel distribution infrastructure.

Global Warming

http://aqp.engr.ucdavis.edu/Documents/AFV%20SCENARIO_June.pdf

THE FUTURE DEMAND FOR ALTERNATIVE FUEL PASSENGER VEHICLES:

A DIFFUSION OF INNOVATION APPROACH

UC Davis – Caltrans Air Quality Project

June 30, 2004

Global warming is another major worldwide concern associated with petroleum consumption. The surface temperature of the earth has risen by 0.6 degrees Celsius since the late 19th century (IPCC, 2001). Carbon dioxide (CO₂), the main greenhouse gas (GHG), greatly contributes to the climate change. The U.S. is the largest emitter of CO₂ in the world, accounting for about 23% of the world's CO₂ emissions (compared to 4.6% of its population (Census Bureau, 2002) but 32.5% of the global total gross domestic product, or GDP (World Bank, 2002)). In 2000, the transportation sector accounted for 33% of the U.S. total CO₂ emissions from fossil energy consumption (Davis and Diegel, 2002).

Climate Protection

http://www.wind-energie.de/fileadmin/dokumente/Themen_A-Z/Europa/EREC_Scenario_2040.pdf

European Renewable Energy Council

Renewable Energy Scenario to 2040

An average global temperature change of more than 2 degrees relative to pre-industrialised levels and a mean long-term rate of global temperature change exceeding 0.2 per decade are intolerable parameters of global climate change. It will only be possible to remain within this climate window if energy systems are converted from the present use of fossil fuels to climateneutral energy sources. Renewable energies will need to play the main role in this context.

Keeping risks within a normal range

http://www.wind-energie.de/fileadmin/dokumente/Themen_A-Z/Europa/EREC_Scenario_2040.pdf

European Renewable Energy Council

Renewable Energy Scenario to 2040

A sustainable energy system needs to build upon technologies whose operation remains within the normal range of environmental risks. Energy by nuclear fission fails to meet this requirement, particularly because of its accident risks and unresolved waste management, but also because of the risks of proliferation and terrorism.

Security of Supply

http://www.wind-energie.de/fileadmin/dokumente/Themen_A-Z/Europa/EREC_Scenario_2040.pdf

European Renewable Energy Council
Renewable Energy Scenario to 2040

Humankind is approaching the exhaustion of conventional energy reserves. Renewable sources of energy have a considerable potential for increasing security of supply worldwide. Developing their use, however, will depend on extremely substantial political and economic efforts. In the medium term, renewables are the only source of energy in which the world has a certain amount of room for manoeuvre aimed at increasing supply in the current circumstances. In the long run renewable energy sources are the only energy source available.

Bio-Fuels and Ethanol are Better for the Environment

http://www1.umn.edu/umnnews/Feature_Stories/Ethanol_fuel_presents_a_cornundrum.html

University of Minnesota
Ethanol fuel presents a corn-undrum
Sept. 18, 200

The researchers also compared greenhouse gas emissions from the two biofuels with emissions caused by producing and burning enough gasoline or diesel to yield the same amount of energy. Emissions from the production and use of corn grain ethanol were 12 percent lower than the net emissions from gasoline; the reduction was 41 percent for biodiesel from soybeans. These figures show that biofuels have the potential to provide significant environmental benefits.

Alternative Fuel Vehicles are Better for the Environment

http://aqp.engr.ucdavis.edu/Documents/AFV%20SCENARIO_June.pdf

THE FUTURE DEMAND FOR ALTERNATIVE FUEL PASSENGER VEHICLES:
A DIFFUSION OF INNOVATION APPROACH
UC Davis – Caltrans Air Quality Project
June 30, 2004

Replacing gasoline-based vehicles with alternative fuel vehicles (AFVs) is expected to significantly reduce CO₂ emissions from the transportation sector. Further, AFVs offer tailpipe emission benefits, especially with respect to ozone-forming pollutants such as carbon monoxide (CO) and nitrogen oxides (NO_x).

Greenhouse Gasses from Hydrogen is Negligible

http://www1.eere.energy.gov/hydrogenandfuelcells/did_you_know.html

The U.S. Department of Energy

Hydrogen fuel cell vehicles (FCVs) emit approximately the same amount of water per mile as vehicles using gasoline-powered internal combustion engines (ICEs).

Union of Concerned Scientists.

Winter 06-07 issue of Earthwise

<http://www.ucsusa.org/publications/earthwise/fuel-cells-water.html>

The impact these emissions have on our climate depends in large part on their atmospheric lifetimes. Water vapor remains in the atmosphere only a few days or weeks, and hydrogen gas about two years, but carbon dioxide lingers more than a century. Transitioning to a transportation system based on hydrogen would therefore have essentially no long-term impact on climate due to short-lived water vapor exhaust or minor hydrogen gas leaks, but would dramatically reduce our emissions of long-lasting carbon dioxide—the key factor driving global warming. We must be sure, however, that the technology we use to produce hydrogen does not contribute to global warming. Fossil fuel-based production methods would release carbon dioxide (and heat-trapping methane) into the atmosphere, whereas production fueled by renewable energy would not.”

Con Evidence

When Will Peak Oil Occur?

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

Such uncertainties that lead to changes in future oil demand ultimately make estimates of the timing of a peak uncertain, as is illustrated in an EIA study on peak oil. Specifically, using future annual increases in world oil consumption, ranging from 0 percent, to represent no increase, to 3 percent, to represent a large increase, and out of the various scenarios examined, EIA estimated a window of up to 75 years for when the peak may occur.

Amount of Oil is Uncertain

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

The amount of oil remaining in the ground is highly uncertain, in part because the Organization of Petroleum Exporting Countries (OPEC) controls most of the estimated world oil reserves, but its estimates of reserves are not verified by independent auditors. In addition, many parts of the world have not yet been fully explored for oil.

Studies that predict the timing of a peak use different estimates of how much oil remains in the ground, and these differences explain some of the wide ranges of these predictions. Estimates of how much oil remains in the ground are highly uncertain because much of these data are self-reported and unverified by independent auditors; many parts of the world have yet to be fully explored for oil; and there is no comprehensive assessment of oil reserves from nonconventional sources. (p.14)

Oil Production

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

It is also difficult to project the timing of a peak in oil production because technological, cost, and environmental challenges make it unclear how much oil can ultimately be recovered from (1) proven reserves, (2) hard-to-reach locations, and (3) nonconventional sources.

To increase the recovery rate from oil reserves, companies turn to enhanced oil recovery (EOR) technologies, which DOE reports has the potential to increase recovery rates from 30 to 50 percent in many locations. These technologies include injecting steam or heated water; gases, such as carbon dioxide; or chemicals into the reservoir to stimulate oil flow and allow for increased recovery. ... EOR technologies currently contribute approximately 12 percent to U.S. production, and carbon dioxide EOR alone is projected to have the potential to provide at least 2 million barrels per day by 2020. (p.18)

Recovery from these sources could delay a peak in oil production or slow the rate of decline in production after a peak. DOE officials we spoke with emphasized the belief that nonconventional oil will play a significant role in the very near future as conventional oil production is unable to meet the increasing demand for oil. However, IEA estimates of oil production have conventional oil continuing to comprise almost all of production through 2030.

In 2005, worldwide production of oil sands, largely from Alberta, contributed approximately 1.6 million barrels of oil per day, and production is projected to grow to as much as 3.5 million barrels per day by 2030. Oil sand deposits are also located domestically in Alabama, Alaska, California, Texas, and Utah.

Why Will Peak Oil Occur?

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

The timing of the peak depends on multiple, uncertain factors that will influence how quickly the remaining oil is used, including the amount of oil still in the ground, how much of the remaining oil can be ultimately produced, and future oil demand.

Finally, future world demand for oil also is uncertain because it depends on economic growth and government policies throughout the world. Environmental concerns, including oil's contribution to global warming, may spur conservation or adoption of alternative fuels that would reduce future demand for oil.

What Will Happen After Peak Oil?

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

Factors that create uncertainty about the timing of the peak—in particular, factors that affect oil exploration and production—also create uncertainty about the rate of production decline after the peak. For example, IEA reported that technology played a key role in slowing the decline and extending the life of oil production in the North Sea. Uncertainty about the rate of decline is illustrated in studies that estimate the timing of a peak. IEA, for example, estimates that this decline will range somewhere between 5 percent and 11 percent annually. Other studies assume the rate of decline in production after a peak will be the same as the rise in production that occurred before the peak. Another methodology, employed by EIA, assumes that the resulting decline will actually be faster than the rise in production that occurred before the peak. The rate of decline after a peak is an important consideration because a decline that is more abrupt will likely have more adverse economic consequences than a decline that is less abrupt.

The rate of decline after a peak is an important consideration because a decline that is more abrupt will likely have more adverse economic consequences than a decline that is less abrupt. (p.29).

Problems with Alternative Energy

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

In the United States, alternative transportation technologies face challenges that could impede their ability to mitigate the consequences of a peak and decline in oil production, unless sufficient time and effort are brought to bear.

For example:

- Ethanol from corn is more costly to produce than gasoline, in part because of the high cost of the corn feedstock. Even if ethanol were to become more cost-competitive with gasoline, it could not become widely available without costly investments in infrastructure, including pipelines, storage tanks, and filling stations.
- Advanced vehicle technologies that could increase mileage or use different fuels are generally more costly than conventional technologies and have not been widely adopted. For example, hybrid electric vehicles can cost from \$2,000 to \$3,500 more to purchase than comparable conventional vehicles and currently constitute about 1 percent of new vehicle registrations in the United States.
- Hydrogen fuel cell vehicles are significantly more costly than conventional vehicles to produce. Specifically, the hydrogen fuel cell stack needed to power a vehicle currently costs about \$35,000 to produce, in comparison with a conventional gas engine, which costs \$2,000 to \$3,000.

Given these challenges, development and widespread adoption of alternative transportation technologies will take time and effort. Key alternative technologies currently supply the equivalent of only about 1 percent of U.S. consumption of petroleum products, and DOE projects that even under optimistic scenarios, by 2015 these technologies could displace only the equivalent of 4 percent of projected U.S. annual consumption.

Projections for Alternative Fuel Use

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

Given these challenges, development and widespread adoption of alternative transportation technologies will take time and effort. Key alternative technologies currently supply the equivalent of only about 1 percent of U.S. consumption of petroleum products, and DOE projects that even under optimistic scenarios, by 2015 these technologies could displace only the equivalent of 4 percent of projected U.S. annual consumption.

DOE projects that these technologies could displace up to the equivalent of 34 percent of projected U.S. annual consumption of petroleum products in the 2025 through 2030 time frame, assuming the challenges the technologies face are overcome. However, DOE also considers these projections optimistic—it assumes that sufficient time and effort are dedicated to the development of these technologies to overcome the challenges they face. (p.34). The level of effort dedicated to overcoming challenges to alternative technologies will depend in part on the price of oil; without sustained high oil prices, efforts to develop and adopt alternatives may fall by the wayside.

Problems with Ethanol

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

In addition, corn and cellulosic ethanol are more corrosive than gasoline, and the widespread commercialization of these fuels would require substantial retrofitting of the refueling infrastructure—pipelines, storage tanks, and filling stations. To store ethanol, gasoline stations may have to retrofit or replace their storage tanks, at an estimated cost of \$100,000 per tank. DOE officials also reported that some private firms consider capital investment in ethanol refineries to be risky for significant investment, unless the future of alternative fuels becomes more certain. Finally, widespread use of ethanol would require a turnover in the vehicle fleet because most current vehicle engines cannot effectively burn ethanol in high concentrations.

- Key infrastructure costs associated with ethanol include retrofitting refueling stations to accommodate E85 (estimated at between \$30,000 and \$100,000) and constructing or modifying pipelines to transport ethanol.

The 2005 production of ethanol in the United States was approximately 4 billion gallons. By 2014-15, corn ethanol production is expected to peak at approximately 9 billion to 18 billion gallons annually.

Assuming success with cellulosic ethanol technologies, experts project cellulosic ethanol production levels of over 60 billion gallons by 2025-30.

For corn ethanol, key challenges include the necessary infrastructure changes to support ethanol distribution and the ability and willingness of consumers to adapt to ethanol.

- For cellulosic ethanol, several technical challenges still remain, including improving the enzymatic pretreatment, fermentation, and process integration.
- For cellulosic ethanol, economic challenges are high feedstock and production costs and the initial capital investment.

Problems with Ethanol (Cont'd)

http://www.omninerd.com/articles/What_You_Need_to_Know_about_Peak_Oil#fn42

Patzek, T.W. Thermodynamics of the Corn-Ethanol Biofuel cycle UC Berkeley Report, June 2004.

To put the problem in perspective, ethanol is by far the largest volume alternative fuel produced in the U.S. Total ethanol production in the United States in 2005 was approximately 4 billion gallons, and consumed 14% of the entire corn crop. Because ethanol contains a lower energy density than gasoline, this is the energy equivalent of about 2.8 billion gallons of gasoline. In other words we are using 14% of our corn crop to produce an alternative fuel equivalent to 2% of our gasoline consumption. If we turned 100% of the corn crop into ethanol, we would produce the equivalent of less than 15% of our annual gasoline consumption. And this analysis doesn't even take into consideration that ethanol requires substantial fossil fuel inputs in order to produce it, reducing the net energy produced even more.

<http://www.usnews.com/usnews/news/articles/070204/12ethanol.htm>

U.S. News and World Report, Is Ethanol the Answer? By Marianne Lavelle and Bret Schulte

And as ethanol becomes a larger part of the energy mix, it is not clear that Washington is prepared for the fallout. Ethanol already consumes so much corn that signs of strain on the food supply and prices are rippling across the marketplace. Environmental impacts will multiply as more land and water are devoted to the prized yellow grain. And, even if these problems were overcome, ethanol's potential growth could be stunted by an energy system currently tailored to gasoline.

A new ethanol surge could cause more problems than it solves. Last year's astounding growth in ethanol gobbled up 20 percent of the U.S. corn crop. That surpasses all the corn Americans consumed last year—whether in cereal, corn-syrup-sweetened soda, or on the cob. And the strain has become severe on the nation's primary use of corn—as feed for dairy and beef cattle, pigs, and chickens. Meat, dairy, and egg producers are reeling from corn prices that have doubled in one year—now trading above \$4 a bushel for the first time in more than a decade.

The frenzy for the new yellow gold is not without environmental consequences, either. Plenty of greenhouse-gas emitting fossil fuels are used to produce ethanol—tractors in the field, trucks on the road, and nitrogen-based fertilizer born of natural gas. A Congressional Research Service analysis last year concluded that "most studies give corn-based ethanol a slightly positive energy balance." A tepid endorsement, at best.

Because of its lower energy content, it takes 1.5 gallons of ethanol to drive as far as 1 gallon of gasoline. Consumer Reports calculates E-85 ended up costing motorists about a dollar extra per gallon last year because of the need to buy more fuel.

Problems with Ethanol (Cont'd)

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics , Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

Outlook: Hopeful--to a point. According to the Renewable Fuels Association, 95 ethanol refineries produced more than 4.3 billion gal. of ethanol in 2005. An additional 40 new or expanded refineries slated to come on line in the next 18 months will increase that to 6.3 billion gal. That sounds like a lot--and it is--but it represents just over 3 percent of our annual consumption of more than 200 billion gal. of gasoline and diesel. One acre of corn can produce 300 gal. of ethanol per growing season. So, in order to replace that 200 billion gal. of petroleum products, American farmers would need to dedicate 675 million acres, or 71 percent of the nation's 938 million acres of farmland, to growing feedstock. Clearly, ethanol alone won't kick our fossil fuel dependence--unless we want to replace our oil imports with food imports.

Ethanol mileage penalty, E85 and gas mileage: Where lies the truth?, Gene Johnston

Managing Editor, Successful Farming, 5/08/2006, 9:27 AM CDT

<http://www.agriculture.com/ag/story.jhtml?storyid=/templatedata/ag/story/data/1147098565893.xml>

Ethanol supporters and detractors agree that ethanol reduces gas mileage, because of its lower energy content. But by how much? The Iowa Corn Growers E85 Web site says that if you have a flex-fuel vehicle and burn E85 (85% ethanol, 15% regular gasoline), you'll experience a gas mileage drop of 5-15% compared with regular gasoline. Taking the middle, a car that gets 25 mpg on regular gas would get 22.5 mpg on E85.

Others say the gas mileage penalty for E85 is more severe. For instance, a story in USA Today this week told its millions of readers that the E85 mileage penalty is 28%. That means your 25 mpg car now only gets 18 mpg if you flex to E85.

While many consumers might willingly sacrifice 2.5 mpg in order to burn American-produced renewable ethanol, will they sacrifice 7 mpg? At that rate, a tank full (about 15 gallons) of regular gasoline would take you 100 miles farther than a tank of E85.

As with most issues, the truth on this one may lie somewhere in the middle. We called Dale Schroeder, administrator of fleet vehicles for the Iowa Department of Administrative Services. That state has over 1,000 E85 cars in its vehicle fleet (mandated by the governor and the state legislature). Iowa started using E85 vehicles in 1991. So, we asked Schroeder, what is the impact on gas mileage of E85 in real-world conditions?

"In the first few years, I kept very close track of this," says Schroeder. "We had a 17% reduction in fuel economy with E85."

Negatives of Methanol

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

Methanol is extremely corrosive, requiring special materials for delivery and storage. Methanol, in addition, has only 51 percent of the BTU content of gasoline by volume, which means its [fuel economy](#) is worse than ethanol's. As with ethanol, any potential increase in efficiency from methanol's high octane is negated by the need for FFVs to remain driveable on gasoline only. The lower energy content and the higher cost to build methanol refineries compared with ethanol distilleries have relegated methanol and M85 to the back seat. Moreover, producing methanol from natural gas results in a net increase of CO₂, hastening global warming. Unlike ethanol, the process liberates buried carbon that otherwise wouldn't reach the atmosphere.

Problems with Biomass Gas-to-liquid

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters

February 2007

CRUDE OIL

This fuel is not commercially produced, and a number of technological and economic challenges would need to be overcome for commercial viability. These challenges include identifying biomass feedstocks that are suitable for efficient conversion to a syngas and developing effective methods for preparing the biomass for conversion into a syngas. Furthermore, DOE researchers report that significant work remains to successfully gasify biomass feedstocks on a large enough scale to demonstrate commercial viability. In the absence of these developments, DOE reported that the costs of producing biomass GTL will be very high and significant uncertainty surrounding its ultimate commercial feasibility will exist.

- *Biomass*. Potential costs associated with biomass GTL are uncertain, given the early stage of the technology.
- Infrastructure costs associated with both biomass and coal GTLs are expected to be substantial, given the necessary modifications to pipelines, refueling centers, and storage facilities.

Problems with Natural Gas and Natural Gas Vehicles

<http://www.gao.gov/new.items/d07283.pdf>

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According to DOE, large-scale commercialization of natural gas vehicles is complicated by the widespread availability and lower cost of gasoline and diesel fuels. Furthermore, demand for natural gas in other markets, such as home heating and energy generation, presents substantial competitive risks to the natural gas vehicle industry. Production costs for natural gas vehicles are also higher than for conventional vehicles because of the incremental cost associated with a high-pressure natural gas tank. For example, light-duty natural gas vehicles can cost \$1,500 to \$6,000 more than comparable conventional vehicles, while heavy-duty natural gas vehicles cost \$30,000 to \$50,000 more than comparable conventional vehicles. Regarding infrastructure, retrofitting refueling stations so that they can accommodate natural gas could cost from \$100,000 to \$1 million per station, depending on the size, according to DOE. Although refueling at home can be an option for some natural gas vehicles, home refueling appliances are estimated to cost approximately \$2,000 each.

- Currently, natural gas vehicles displace approximately 65 million gallons of diesel fuel per year.
- There is a potential niche market in heavy-duty vehicles for natural gas, which could displace 1,500 million gallons of gasoline per year.

Annual Energy Outlook 2006. EIA.DOE.gov. Energy Information Administration. 2006.

Finally, although GTL has the potential to meet some of our fuel needs, there is a significant potential downside. The conversion of natural gas to liquid fuels continues the trend of burning fossil fuels, which release greenhouse gases into the atmosphere.

If the use of natural gas for transportation (whether directly, or as hydrogen extracted from natural gas) increases dramatically, the time it will take before we use up all of our reserves will decrease correspondingly. One of the primary reasons for looking for alternatives to petroleum is to decrease our dependence on foreign fuels. If we spend trillions of dollars converting to using natural gas, only to use up our own reserves in a decade or two, we would find ourselves back in the exact same position of being dependent on foreign sources.

Problems with Natural Gas and Natural Gas Vehicles (Cont'd)

http://assets.opencrs.com/rpts/RS22971_20081020.pdf

Congressional Research Service Report for Congress

Natural Gas Passenger Vehicles: Availability, Cost, and Performance

October 20, 2008

But, there are also several potential and measurable drawbacks to natural gas vehicles, many related to vehicle performance and acceptability. For example, CNG engines tend to generate less power for the same size engine than gasoline engines. Thus, NGVs tend to have slower acceleration and less power climbing hills. Also, because CNG has a lower energy density than gasoline, CNG vehicles tend to have a shorter range than comparable gasoline vehicles. In addition, for passenger vehicles, the larger natural gas storage tanks often occupy space that would otherwise be used for cargo — generally in the trunk of a sedan and in the bed of a pickup truck. Again, these considerations may or may not play into a individual purchaser's decision, but could affect the overall marketability of the vehicles.

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

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For a vehicle to carry enough CNG to travel a reasonable distance, the gas has to be compressed to 3000 to 3600 psi. At 3600 psi, CNG has about one-third as much energy as gasoline--about 44,000 BTU per unit volume--and the tank must be far larger, heavier and more expensive than a conventional one.

Even though 85 percent of our natural gas is produced domestically, and there's already a distribution network in place, CNG faces a limited future as a gasoline or diesel replacement. For one thing, like petroleum, it is nonrenewable. More critically, perhaps, there's already a great demand for natural gas--and CNG requires major retooling of both cars and fuel-station infrastructure.

Problems with Electric Cars

http://www.unh.edu/p2/biodiesel/article_alge.html

Widescale Biodiesel Production from Algae

Michael Briggs, University of New Hampshire, Physics Department (revised August 2004)

In addition, electric batteries in hybrid electric vehicles face technical challenges associated with their performance and reliability when exposed to extreme temperatures or harsh automotive environments. Plug-in hybrid electric vehicles are not yet commercially feasible because of cost, technical, and infrastructure challenges facing their development. For example, plug-in electric hybrids cost much more to produce than conventional vehicles, they require significant upgrades to home electrical systems to support their recharging, and researchers have yet to develop a plug-in electric with a range of more than 40 miles on battery power alone.

http://findarticles.com/p/articles/mi_qn4188/is_20080625/ai_n27518172/pg_1?tag=artBody:coll

Salt Lake City

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Please don't build electric cars. If electric cars require recharging from your home, the additional demand will cause the cost of electricity to skyrocket. In our present state of electrical supply, there are brownouts, blackouts and barely enough electricity to cook our foods, light our homes and cool our bodies. If electric cars become the solution to the oil problem, we may have to give up a lot of good parts of the good life just to be able to drive to work. Then again we may feel good to use \$5-a-gallon gas to run the generator so we can have toast and coffee as we recharge our car.

<http://www.popularmechanics.com/science/earth/2690341.html?page=1>

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

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Pure electric cars still have limited range, typically no more than 100 to 120 miles. In addition, electrics suffer from slow charging, which, in effect, reduces their usability. When connected to a dedicated, high-capacity recharger, some can be recharged in as little as an hour, but otherwise such cars are essentially not drivable while they sit overnight for charging.

Problems with Hydrogen Fuel Cell Vehicles

<http://www.gao.gov/new.items/d07283.pdf>

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While a conventional gas engine costs \$2,000 to \$3,000 to produce, the stack of hydrogen fuel cells needed to power a vehicle costs \$35,000 to produce. Furthermore, DOE researchers have yet to develop a method for feasibly storing hydrogen in a vehicle that allows a range of at least 300 miles before refueling. Fuel cell vehicles also are not yet able to last for 120,000 miles, which DOE believes to be the target for commercial viability. In addition, developing an infrastructure for distributing hydrogen—either through pipelines or through trucking—is expected to be complicated, costly, and time-consuming. Delivering hydrogen from a central source requires a large amount of energy and is considered costly and technically challenging. DOE has determined that decentralized production of hydrogen directly at filling stations could be a more viable approach than centralized production in some cases, but a cost-effective mechanism for converting energy sources into hydrogen at a filling station has yet to be developed.

http://www.unh.edu/p2/biodiesel/article_alge.html

Widescale Biodiesel Production from Algae

Michael Briggs, University of New Hampshire, Physics Department (revised August 2004)

For hydrogen vehicles, even when (and if) vehicle manufacturers eventually have production stage vehicles ready (which currently cost around \$1 million each to make), nobody would buy them unless there was already a wide scale hydrogen fuel production and distribution system in place. But, no companies would be interested in building that wide scale hydrogen fuel production and distribution system until a significant number of fuel cell vehicles are on the road, so that consumers are ready to start using it. With a single hydrogen fuel pump costing roughly \$1 million, installing just one at each of the 176,000 fuel stations across the US would cost \$176 billion.

The first, and most obvious, is that hydrogen gas is extremely explosive. To store hydrogen at high pressures for as a transportation fuel, it is essential to have tanks that are constructed of rust-proof materials, so that as they age they won't rust and spring leaks. Hydrogen has to be stored at very high pressures to try to make up for its low energy density. A hydrogen vehicle would need a fuel tank roughly 14 times as large to yield the same driving range as a biodiesel powered vehicle.

Problems with Hydrogen Fuel Cell Vehicles (Cont'd)

National Hydrogen Energy Roadmap, from the results of the National Hydrogen Energy Roadmap Workshop. Washington D.C. April 2-3, 2002. United States Department of Energy. http://www.hydrogen.energy.gov/pdfs/national_h2_roadmap.pdf.

Hydrogen has a very low energy density, is difficult to transport and store, and hydrogen fuel cells are very expensive. In addition, at present 95% of all hydrogen is produced from fossil fuels, which is why it is listed as "nonrenewable," even though the potential exists for creating it from renewable sources. Due to the substantial challenges, hydrogen can't be counted on at this time to mitigate the effects of Peak Oil.

Problems with Coal Gas-to-Liquid

<http://www.gao.gov/new.items/d07283.pdf>

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DOE reported that high capital investments—both in money and time—deter the commercial development of coal GTL in the United States. Specifically, DOE estimates that construction of a coal GTL conversion plant could cost up to \$3.5 billion and would require at least 5 to 6 years to construct. Furthermore, potential investors are deterred from this investment because of the risks associated with the lengthy, uncertain, and costly regulatory process required to build such a facility. An expert at DOE also expressed concern that the infrastructure required to produce or transport coal may be insufficient. For example, the rail network for transporting western coal is already operating at full capacity and, owing to safety and environmental concerns, there is significant uncertainty about the feasibility of expanding the production capabilities of eastern coal mines. Coal GTL production also faces serious environmental concerns because of the carbon dioxide emitted during production. To mitigate the effect of coal GTL production, researchers are considering options for combining coal GTL production with underground injection of sequestered carbon dioxide to enhance oil recovery in aging oil fields.

- *Coal.* Construction of a precommercial coal GTL plant is estimated at \$1.7 billion, while construction of a commercial coal GTL is estimated at \$3.5 billion.
- Infrastructure costs associated with both biomass and coal GTLs are expected to be substantial, given the necessary modifications to pipelines, refueling centers, and storage facilities.

Problems with Biodiesel

<http://www.gao.gov/new.items/d07283.pdf>

United States Government Accountability Office

Report to Congressional Requesters, February 2007 , CRUDE OIL

The cost of biodiesel feedstocks—which in the United States largely consist of soybean oil—are the largest component of production costs. The price of soybean oil is not expected to decrease significantly in the future owing to competing demands from the food industry and from soap and detergent manufacturers. These competing demands, as well as the limited land available for the production of feedstocks, also are projected to limit biodiesel's capacity for large-volume production, according to DOE and USDA. As a result, experts believe that the total production capacity of biodiesel is ultimately limited compared with other alternative fuels.

- In 2005, U.S. production of biodiesel was 75 million gallons, and DOE projects about 3.6 billion gallons per year by 2015.
- Under a more speculative scenario requiring major changes in land use and price supports, experts project it would be possible to produce 10 billion gallons of biodiesel per year.

Cost of Bio-Diesel

http://www.unh.edu/p2/biodiesel/article_alge.html

Widescale Biodiesel Production from Algae

Michael Briggs, University of New Hampshire, Physics Department (revised August 2004)

In "The Controlled Eutrophication process: Using Microalgae for CO₂ Utilization and Agricultural Fertilizer Recycling"³, the authors estimated a cost per hectare of \$40,000 for algal ponds. In their model, the algal ponds would be built around the Salton Sea (in the Sonora desert) feeding off of the agricultural waste streams that normally pollute the Salton Sea with over 10,000 tons of nitrogen and phosphate fertilizers each year. The estimate is based on fairly large ponds, 8 hectares in size each. To be conservative (since their estimate is fairly optimistic), we'll arbitrarily increase the cost per hectare by 100% as a margin of safety. That brings the cost per hectare to \$80,000. Ponds equivalent to their design could be built around the country, using wastewater streams (human, animal, and agricultural) as feed sources. We found that at NREL's yield rates, 15,000 square miles (3.85 million hectares) of algae ponds would be needed to replace all petroleum transportation fuels with biodiesel. At the cost of \$80,000 per hectare, that would work out to roughly \$308 billion to build the farms.

The operating costs (including power consumption, labor, chemicals, and fixed capital costs (taxes, maintenance, insurance, depreciation, and return on investment) worked out to \$12,000 per hectare. That would equate to \$46.2 billion per year for all the algae farms, to yield all the oil feedstock necessary for the entire country. Compare that to the \$100-150 billion the US spends each year just on purchasing crude oil from foreign countries, with all of that money leaving the US economy.

Bio-Fuels and Ethanol are Harmful to the Environment

http://www1.umn.edu/umnnews/Feature_Stories/Ethanol_fuel_presents_a_cornundrum.html

University of Minnesota

Ethanol fuel presents a corn-undrum

Sept. 18, 200

The analysis showed that growing both corn and soybeans caused soil and water pollution from such chemicals as the nitrogen and phosphorus in fertilizer and from pesticides, with the pesticides used in corn production being especially harmful. But biodiesel used, per unit of energy gained, only 1 percent of the nitrogen, 8.3 percent of the phosphorus and 13 percent of the pesticide (by weight) of corn production.

Not Enough Crop Availability for Biofuel

http://www1.umn.edu/umnnews/Feature_Stories/Ethanol_fuel_presents_a_cornundrum.html

University of Minnesota

Ethanol fuel presents a corn-undrum

Sept. 18, 200

A major challenge is getting enough biofuel. Already, 14.3 percent of corn grown in the United States is converted to ethanol, replacing just 1.72 percent of gasoline usage. Even if all the remaining corn were converted to ethanol, the total ethanol would only offset 12 percent of gasoline. The entire soybean crop would replace a much smaller proportion of transportation fuels--only 6 percent of current diesel usage, which itself amounts to a tiny fraction of gasoline usage.

Reasons for Lack of Alternative Fuel Success

http://aqp.engr.ucdavis.edu/Documents/AFV%20SCENARIO_June.pdf

THE FUTURE DEMAND FOR ALTERNATIVE FUEL PASSENGER VEHICLES:

A DIFFUSION OF INNOVATION APPROACH

UC Davis – Caltrans Air Quality Project

June 30, 2004

The General Accounting Office (GAO) concluded that “the goals in the act for fuel replacement are not being met principally because alternative fuel vehicles have significant economic disadvantages compared to conventional gasoline vehicles. Fundamental economic impediments — such as the relatively low price of gasoline, the lack of refueling stations for alternative fuels, and the additional cost to purchase these vehicles — explain much of why both mandated fleets and the general public are disinclined to acquire alternative fuel vehicles and use alternative fuels” (GAO, 2000, p. 4).

In addition to these obstacles, the extent of AFVs’ penetration in the market depends on a variety of endogenous and exogenous factors, such as their performance, their benefits and limitations, consumer acceptances, the regulatory environment, and so on (Leiby and Rubin, 2001; Schulte, et al, 2004; Spitzley, et al, 2000;). Therefore, it is not easy to forecast the market penetration of various AFVs.

Ethanol will be Imported

<http://italy.usembassy.gov/pdf/other/IB10128.pdf>

Congressional Research Service Issue Brief for Congress

Alternative Fuels and Advanced Technology Vehicles: Issues in Congress

Updated May 8, 2006

There is growing concern among some stakeholders over ethanol imports. Because of lower production costs and/or government incentives, ethanol prices in Brazil and other countries can be significantly lower than in the United States. To offset the U.S. tax incentive that all ethanol (imported or domestic) receives, most imports are subject to a 54- cent-per-gallon tariff. This tariff effectively negates the tax incentive for covered imports, and has been a significant barrier to fuel ethanol imports.

However, under certain conditions imports of ethanol from Caribbean Basin Initiative (CBI) countries are granted duty-free status. This is true even if the ethanol was produced in a non-CBI country. In this scenario the ethanol is produced in another country (historically Brazil or a European country), dehydrated in a CBI country, then shipped to the United States. This avenue for imported ethanol to avoid the tariff has been criticized by some stakeholders, including some Members of Congress. In the spring and summer of 2004, two companies announced plans to construct new dehydration facilities in CBI countries and shipping ethanol from Brazil. With the establishment of a renewable fuel standard, as well as high U.S. gasoline and ethanol prices, there may be more interest in importing ethanol, either through CBI countries or directly from ethanol producers.

Hydrogen Cars Release Greenhouse Gasses

http://www.associatedcontent.com/article/34027/the_problem_with_alternative_fuel.html?page=2&cat=9

Associated Content

The Problem with "Alternative Fuel" Alternative Fuel Vehicles Are All the Rage, but Some of the Most Promising Alternatives Have Some Serious Flaws

By [JR Milton](#), published May 25, 2006

The second vehicle type, hydrogen-powered cars, has a more substantial drawback, which could have dire economic consequences. Scientific research suggests that the only by-product from these vehicles would be plain, ordinary, safe water. This, of course, thrills environmentalists, because if these vehicles replace gasoline-powered cars or even ethanol-fueled vehicles, there would be far less carbon dioxide in our air, and thus, less threat of global warming from the greenhouse effect.

The problem is that water vapor, the gaseous form of water, is also a greenhouse gas, and, in fact, it is a far more powerful greenhouse gas than CO₂. This means that, essentially, we would be replacing one dangerous greenhouse gas with the same or greater amounts of a more powerful one. It doesn't take a climatologist to see that this would aggravate the effects of global warming upon our planet.

Visual Representation of the Actual Costs and Performance of Alternative Fuels

Popular Mechanics

Crunching the Numbers on Alternative Fuels By Mike Allen

Published in the May 2006 issue

http://media.popularmechanics.com/documents/Fuel_of_the_Future-e852.pdf