**Life after the Oil Crash**

Civilization as we know it is coming to an end soon. This is not the wacky proclamation of a doomsday cult, apocalypse bible prophecy sect, or conspiracy theory society. Rather, it is the scientific conclusion of the best paid, most widely-respected [geologists](http://www.peakoil.net), [physicists,](http://www.msnbc.msn.com/id/4287300/) and [investment bankers](http://www.simmonsco-intl.com/research.aspx?Type=msspeeches) in the world. These are rational, professional, conservative individuals who are absolutely terrified by a phenomenon known as global "Peak Oil."

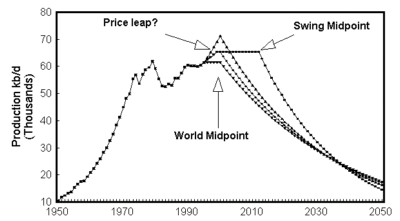
**"Are We 'Running Out'? I Thought**

**There Was 40 Years of the Stuff Left"**

Oil will not just "run out" because all oil production follows a bell curve. This is true whether we're talking about an individual field, a country, or on the planet as a whole.

Oil is increasingly plentiful on the upslope of the bell curve, increasingly scarce and expensive on the down slope. The peak of the curve coincides with the point at which the endowment of oil has been 50 percent depleted. Once the peak is passed, oil production begins to go down while cost begins to go up.

In practical and considerably oversimplified terms, this means that if 2000 was the year of global Peak Oil, worldwide oil production in the year 2020 will be the same as it was in 1980. However, the world’s population in 2020 will be both much larger (approximately twice) and much more industrialized (oil-dependent) than it was in 1980. Consequently, [worldwide demand for oil will outpace worldwide production](http://money.cnn.com/2005/03/21/commentary/column_hays/hays/) of oil by a significant margin. As a result, the price will skyrocket, oil-dependant economies will crumble, and [resource wars will explode.](http://www.financialsense.com/series3/intro.htm)



The issue is not one of "running out" so much as it is not having enough to keep our economy running. In this regard, the ramifications of Peak Oil for our civilization are similar to the ramifications of dehydration for the human body. The human body is 70 percent water. The body of a 200 pound man thus holds 140 pounds of water. Because water is so crucial to everything the human body does, the man doesn't need to lose all 140 pounds of water weight before collapsing due to dehydration. A loss of as little as 10-15 pounds of water may be enough to kill him.

In a similar sense, an oil-based economy such as ours doesn't need to deplete its entire reserve of oil before it begins to collapse. A shortfall between demand and supply as little as 10-15 percent is enough to wholly shatter an oil-dependent economy and reduce its citizenry to poverty.

The effects of [even a small drop in production can be devastating.](http://www.washingtonpost.com/wp-dyn/content/article/2005/06/23/AR2005062301896.html) For instance, during [the 1970s oil shocks](http://en.wikipedia.org/wiki/1979_energy_crisis), shortfalls in production as small as 5% caused the price of oil to nearly quadruple. The same thing happened in California a few years ago with natural gas: a production drop of less than 5% caused prices to skyrocket by 400%.

Fortunately, previous price shocks were only temporary.

The coming oil shocks won't be so short-lived. They represent the onset of [a new, permanent condition.](http://www.geologie.tu-clausthal.de/Campbell/lecture.html) Once the decline gets under way, production will drop (conservatively) by 3% per year, every year. That estimate comes from [numerous sources](http://www.peakoil.net), not the least of which is Vice President Dick Cheney himself. [In a 1999 speech](http://www.peakoil.net/Publications/Cheney_PeakOil_FCD.pdf) he gave while still CEO of Halliburton, Cheney stated:

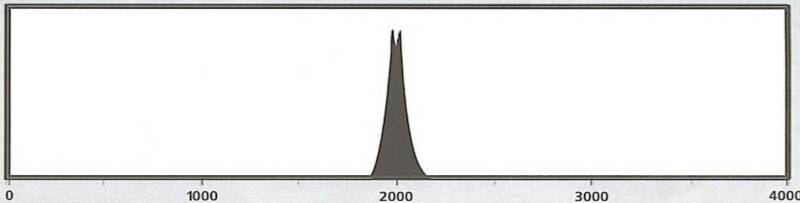
*By some estimates, there will be an average of two-percent annual growth in global oil demand over the years ahead, along with,* ***conservatively****, a three-percent natural decline in production from existing reserves. That means by 2010 we will need on the order of an additional 50 million barrels a day.*



Cheney's assessment is supported by the estimates of numerous non-political, retired, and now disinterested scientists, many of whom believe [global oil production will peak and go into terminal decline within the next five years](http://www.energybulletin.net/997.html).

Some geologists expect  [2005  to be the last year of the cheap-oil bonanza](http://www.energybulletin.net/3792.html), while estimates coming out of the oil industry indicate ["a seemingly unbridgeable supply-demand gap opening up after 2007,"](http://www.odac-info.org/bulletin/documents/MegaProjRelease16-11-04.pdf) which will lead to major fuel shortages and [increasingly severe blackouts beginning around 2008-2012](http://www.oilcrash.com/articles/olduvai.htm).

The [long-term ramifications](http://www.museletter.com/archive/110.html) of Peak Oil on your way of life [are nothing short of mind blowing.](http://www.energycrisis.com/uk/planNow.htm) As we slide down the downslope slope of the global oil production curve, we may find ourselves slipping into what some scientists are calling a ["post-industrial stone age."](http://dieoff.org/page125.htm)



**Graph: The Energy Curve of History?**

***Source:*** [***Community Solution***](http://www.communitysolution.org)

Peak Oil is also called ["Hubbert's Peak,"](http://www.hubbertpeak.com) named for the Shell geologist [Dr. Marion King Hubbert.](http://www.hubbertpeak.com/hubbert/) In 1956, Hubbert accurately predicted that [US domestic oil production would peak in 1970.](http://mobjectivist.blogspot.com/2005/05/our-petroleum-predicament.html) He also predicted global production would peak in 1995, which it would have had the politically created oil shocks of the 1970s not delayed the peak for about 10-15 years.

**"Big deal. If gas prices get high, I’ll just  drive less. Why should I give a damn?"**

**Because petrochemicals are key components to much more than just the gas in your car!**

As geologist Dale Allen Pfeiffer points out in his article entitled, ["Eating Fossil Fuels,"](http://www.fromthewilderness.com/free/ww3/100303_eating_oil.html) approximately 10 calories of fossil fuels are required to produce every 1 calorie of food eaten in the US.

The size of this ratio stems from the fact that [every step of modern food production is fossil fuel and petrochemical powered:](http://www.energybulletin.net/5045.html)

1.  Pesticides are made from oil;



2.  Commercial fertilizers are made from ammonia, which is made from natural gas, [which will peak about 10 years](http://www.hubbertpeak.com/gas/) [after oil peaks;](http://www.hubbertpeak.com/gas/)



3.  With the exception of [a few experimental prototypes](http://www.renewables.com/Permaculture/ElectricTractor.htm), all farming implements such as tractors and trailers are constructed and powered using oil;



4.  Food storage systems such as refrigerators are manufactured in oil-powered plants, distributed across oil-powered transportation networks and  usually run on electricity, which most often comes from natural gas or coal;



5.   In the US, the average piece of food is transported [almost 1,500 miles before it gets to your plate.](http://www.washingtonfreepress.org/15/Farm.html) In Canada, [the average piece of food is transported 5,000](http://www.japantimes.co.jp/cgi-bin/getarticle.pl5?fe20050421a1.htm) miles from where it is produced to where it is consumed.



In short, [people gobble oil like two-legged SUVs.](http://www.countercurrents.org/po-church0700405.htm)

It's not just transportation and agriculture that are entirely dependent on abundant, cheap oil. [Modern medicine](http://mysite.verizon.net/vze495hz/id19.html), [water distribution,](http://www.iags.org/n0813043.htm) and [national defense](http://www.commondreams.org/views04/1008-23.htm) are each entirely powered by oil and petroleum derived chemicals.

In addition to transportation, food, water, and modern medicine, mass quantities of oil are required for [all plastics](http://www.energybulletin.net/2620.html), all computers and all high-tech devices.

Some specific examples may help illustrate the degree to which our technological base is dependent on fossil fuels:

1.  The construction of an average car consumes the energy equivalent of [approximately 27-54 barrels](http://www.lifeaftertheoilcrash.net/Research.html), which equates to 1,100-2,200 gallons, of oil. Ultimately, the construction of a car will consume an amount of fossil fuels equivalent [to twice the](http://www.enviroliteracy.org/article.php/322.html) [car’s](http://www.enviroliteracy.org/article.php/322.html) [final weight.](http://www.enviroliteracy.org/article.php/322.html)



2.  The production of one gram of microchips consumes 630 grams of fossil fuels. According to the American Chemical Society, the construction of single 32 megabyte DRAM chip [requires 3.5 pounds of fossil fuels](http://www.eurekalert.org/pub_releases/2002-11/acs-ttp110502.php) in addition to 70.5 pounds of water.



3.  The construction of the average desktop computer consumes [ten times its weight in fossil fuels.](http://www.un.org/apps/news/story.asp?NewsID=10007&Cr=computer&Cr1=)



4.  The [Environmental Literacy Council](http://www.enviroliteracy.org/article.php/322.html) tells us that due to the "purity and sophistication of materials (needed for) a microchip, . . . the energy used in producing nine or ten computers is enough to produce an automobile."



When considering the role of oil in the production of modern technology, remember that most alternative systems of energy — including solar panels/solar-nanotechnology, windmills, hydrogen fuel cells, biodiesel production facilities, nuclear power plants, etc. — rely on sophisticated technology.

In fact, all electrical devices make use of silver, copper, and/or platinum, each of which is discovered, extracted, transported, and fashioned using oil-powered machinery.  For instance, in his book, *The Lean Years: Politics of Scarcity*, author Richard J. Barnet writes:

*To produce a ton of copper requires 112 million BTU's or the equivalent of 17.8 barrels of oil. The energy cost component of aluminum is twenty times higher.*



Nuclear energy requires uranium, which is also discovered, extracted, and transported using oil-powered machinery.

Most of the feedstock (soybeans, corn) for biofuels such as biodiesel and ethanol are grown using the high-tech, oil-powered industrial methods of agriculture [described above.](http://www.lifeaftertheoilcrash.net/#anchor_66#anchor_66)

In short, the so called "alternatives" to oil are actually "derivatives" of oil. Without an abundant and reliable supply of oil, we have no way of scaling these alternatives to the degree necessary to power the modern world.

*(Note: alternatives to oil are discussed in depth on* [*Page Two*](http://www.lifeaftertheoilcrash.net/SecondPage.html)*)*

**"Is the Modern Banking System**

**Entirely Dependent on Cheap Oil?"**

**Yes.**

The global financial system [is entirely dependent on a constantly **increasing** supply of oil.](http://www.museletter.com/archive/149.html) Since, [as explained above](http://www.lifeaftertheoilcrash.net/#anchor_89#anchor_89), all modern economic activity from transportation to [food production](http://www.energybulletin.net/5045.html) to manufacturing is dependent on oil supplies, money is really just a symbol for oil. [Commentator Robert Wise observes:](http://www.democrats.us/editorial/wise041105.shtml)

*It's not physics, but it's true: money equals energy. Real, liquid wealth represents usable energy. It can be exchanged for fuel, for work, or for something built by the work of humans or fuel-powered machines. Real cost reflects the energy cost of doing something; real value reflects the energy expended to build something.*



*Nearly all the work done in the world economy -- all the manufacturing, construction, and transportation -- is done with energy derived from fuel. The actual work done by human muscle power is miniscule by comparison. And, the lion's share of that fuel comes from oil and natural gas, the primary sources of the world's wealth.*



As Dr. Colin Campbell writes in ["The Financial Consequences of Peak Oil,"](http://www.energybulletin.net/5944.html) the continued expansion of this wealth is only possible so long as the oil supply continues to expand:

*It is becoming evident that the financial and investment community begins to accept the reality of Peak Oil, which ends the First Half of the Age of Oil. They accept that banks created capital during this epoch by lending more than they had on deposit, being confident that Tomorrow’s Expansion, fueled by cheap oil-based energy, was adequate collateral*



*or Today’s Debt.*



*The decline of oil, the principal driver of economic growth, undermines the validity of that collateral which in turn erodes the valuation of most entities quoted on Stock Exchanges.*



What the average layman typically fails to recognize is that the oil driven "economic growth" Dr. Campbell speaks of is absolutely necessary for individuals, businesses, and governments to pay off their debts. Commentator John La Grou writes [on page six of his 11 page report on Peak Oil:](http://www.mil-media.com/pdf/JLASPO2005Summary.pdf)

*. . . debt service requires economic growth in proportion to the size of the debt. Today's industrialized debt is at its highest "real dollar" value in human history. Personal debt, corporate debt, government debt -* [*all are at or nearhistorical highs,*](http://www.alternet.org/story/23195/) *and growing at historically unparalleled rates. Hence, the level of economic growth required to sustain such debt is at an all time high.*



The connections between the oil supply and the financial system are almost universally overlooked/ignored by persons concerned about Peak Oil. It's simple: when you take out a loan, you do so with the expectation that there will be more money available to you in the future than there is now. This is what enables you to pay back both the principal and the interest.

Since, [as explained above](http://www.lifeaftertheoilcrash.net/#anchor_88#anchor_88), money is really just a symbol for oil, you are actually taking out the loan with the expectation - whether you realize it or not - that there will be more oil available to you in the future than there is now.

If this ends up not being the case - if the money/oil supply has actually decreased by the time it comes for you to pay back the loan - you default on your loan. If more than a small percentage of individuals, businesses, or nations begin defaulting on their loans at roughly the same time *- as they will once the economy begins to contract due to skyrocketing energy prices -* the banks will be unable to make new loans without spiraling the economy into a hyperinflationary meltdown. (See the Weimar Republic of Germany, circa 1920s)

Without the banks making enough new loans, businesses that are attempting to pay back their current loans will be unable to do so since they won't be able to find enough paying customers. The computer store owner, for instance, will not be able to find enough customers to buy his computers since most personal computers are bought on credit (i.e., a loan). As a result, he goes bankrupt. The same principles apply for the car dealership owner, the home builder, etc.

Since most of our economy revolves around selling or servicing items such as cars, computers, cell phones, or homes, all of which are constructed with fossil fuels, powered by fossil-fuels and most often bought/sold on credit or with loans, the dots begin connecting to form the word ["financial collapse"](http://www.culturechange.org/financialmonsters.html) rather quickly.

This financial collapse will, in turn, further devastate our ability to implement alternative systems of energy. Any crash program to develop new sources of energy will require a tremendous amount of capital, which is exactly what will not be available [once the global monetary system has collapsed.](http://www.silverbearcafe.com/private/economiccollapse.html)

Don't think for a moment that the central banks aren't fully aware of the severity of what we are facing. For instance, on June 28, 2005, Gary Duncan, the economics editor for the UK based [*Sunday Times*](http://business.timesonline.co.uk), reported that the Bank of International Settlements (BIS), aka "the central banker's central bank", [had issued the following warnings](http://business.timesonline.co.uk/article/0,,8209-1671957,00.html) regarding the economic fallout of further rises in the price of oil:



*Oil prices may well remain high for a prolonged period of time . . . Further rises — if they materialize — may have more severe consequences than currently anticipated . . .*



*Everyone needs to commit to some unpleasant compromises now, in order to avoid even more unpleasant alternatives in the future . . .*



Duncan goes on to summarize [the bank's report as follows:](http://business.timesonline.co.uk/article/0,,8209-1671957,00.html)

*The US current account deficit meant that a further slide in the dollar was "almost inevitable", while the BIS sounded a warning that the deficit could yet lead to "a disorderly decline of the dollar, associated turmoil in other financial markets, and even recession."*



Make no mistake: a bank as crucially important to the world economy and as influential to the markets as the BIS doesn't  just casually toss out terms like "unpleasant compromises", "severe consequences", "even more unpleasant alternatives", "turmoil," and "disorderly decline" in relation to the oil markets  and the dollar (which is [the reserve currency for all oil transactions in the world](http://www.mapleleafweb.com/features/economy/loonie_rebounds/pressures.html)) unless something very nasty is brewing in the background.

*(Note: to read the full text of the bank's report,* [*click here*](http://www.bis.org/events/agm2005.htm)*.)*

On a similar note, Warren Buffet, the world's second richest man, recently warned of ["mega-catastrophic risks" and "investment time bombs"](http://news.bbc.co.uk/2/hi/business/2817995.stm) currently threatening the global economy. Add those to a mix of [sky-high energy prices](http://www.fromthewilderness.com/free/ww3/060805_380_oil.shtml), [destabilizing resource wars](http://news.bbc.co.uk/2/hi/in_depth/middle_east/2002/conflict_with_iraq/default.stm), [less than inspiring leadership,](http://news.bostonherald.com/opinion/view.bg?articleid=95929) [a possible currency collaps](http://www.dissidentvoice.org/Apr05/Whitney0411.htm)e, more ["petrodollar warfare"](http://www.petrodollarwarfare.com/PDFs/PetrodollarWarfareAndTheIranianOilBourseWebsite.pdf), and well, the picture begins to look pretty grim, pretty quick.

What all of this means, in short, is that t[he aftermath of Peak Oil will extend far beyond how much you will pay for gas.](http://www.energybulletin.net/4740.html) If you are focusing solely on the price at the pump, more fuel-efficient forms of transportation, or alternative sources of energy, you aren’t seeing the bigger picture.

**"Is the Bush Administration**

**Aware of This Situation?"**

**Of course they are.**

As mentioned previously, [Dick Cheney made the following statement in late 1999:](http://www.peakoil.net/Publications/Cheney_PeakOil_FCD.pdf)

*By some estimates, there will be an average of two-percent annual growth in global oil demand over the years ahead, along with, conservatively, a three-percent natural decline in production from existing reserves. That means by 2010 we will need on the order of an additional 50 million barrels a day.*



To put Cheney’s statement in perspective, remember that the oil producing nations of the world are currently pumping at full capacity but are unable to produce much more than 80 million barrels per day. Cheney’s statement was a tacit admission of the severity and imminence of Peak Oil as the possibility of the world raising its production by such a huge amount is borderline ridiculous.

A report commissioned by Cheney and released in April 2001 [was no less disturbing:](http://www.counterpunch.org/everest12132003.html)

*The most significant difference between now and a decade ago is the extraordinarily rapid erosion of spare capacities at critical segments of energy chains. Today, shortfalls appear to be endemic. Among the most extraordinary of these losses of spare capacity is in the oil arena.*



Not surprisingly, George W. Bush has echoed Dick Cheney’s sentiments.  [In May 2001, Bush stated,](http://www.reason.com/rb/rb072104.shtml) "What people need to hear loud and clear is that we’re running out of energy in America."

One of George W. Bush's energy advisors, energy investment banker Matthew Simmons, [has spoken at length about the impending crisis.](http://www.simmonsco-intl.com/research.aspx?Type=msspeeches)

*(Note: Although he has advised Bush/Cheney, Simmons considers* [*himself strongly non-partisan on energy issues.*](http://www.emagazine.com/view/?2574) *His writings are highly regarded amongst the energy and banking community for their grounding in nonpartisan, heavily documented, and virtually infallible research & analysis.)*

Simmons' investment bank, [Simmons and Company International](http://www.simmonsco-intl.com), is considered the most reputable and reliable energy investment bank in the world.

Given Simmons' background, what he has to say about the situation is truly terrifying. For instance, [i](http://www.fromthewilderness.com/free/ww3/082103_blackout_summary.html)[n an August 2003 interview](http://www.fromthewilderness.com/free/ww3/082103_blackout.html) with *From the Wilderness* publisher Michael Ruppert, Simmons was asked if it was time for Peak Oil to become part of the public policy debate. He responded:



*It is past time. As I have said, the experts and politicians have no Plan B to fall back on. If energy peaks, particularly while 5 of the world’s 6.5 billion people have little or no use of modern energy, it will be a tremendous jolt to our economic well-being and to our health — greater than anyone could ever imagine.*



When asked if there is a solution to the impending natural gas crisis, Simmons responded:

*I don’t think there is one. The solution is to pray. Under the best of circumstances, if all prayers are answered there will be no crisis for maybe two years. After that it’s a certainty*.



In May 2004, Simmons explained that in order for demand to be appropriately controlled, the price of oil [would have to reach $182 per barrel](http://news.bbc.co.uk/1/hi/business/3777413.stm)[.](http://news.bbc.co.uk/1/hi/business/3777413) Simmons explained that with oil prices at $182 per barrel, gas prices would likely rise to $7.00 per gallon.

Simmons predictions are downright tame compared to what other analysts in the world of investment banking are preparing themselves for. For instance, in April 2005, French investment bank Ixis-CIB warned, ["crude oil prices could touch $380 a barrel by 2015."](http://english.aljazeera.net/NR/exeres/73CE8286-740C-482B-8150-DA57696BC02F.htm)

If you want to ponder just how devastating oil prices in the $200-$400/barrel range will be for the US economy, consider the fact that one of Osama Bin-Laden's primary [goals has been to force oil prices into the $200 range](http://www.nationalreview.com/robbins/robbins200406020835.asp).

Oil prices that far north of $100/barrel would almost certainly trigger [massive, last-ditch global resource wars](http://www.fromthewilderness.com/free/ww3/012505_ftw_maps.shtml) as the industrialized nations of the world scramble to grab what little of the black stuff is remaining. This may explain why the director of the Selective Service recently recommended [the military draft be expanded to include both genders, ages 18-to-35](http://www.fromthewilderness.com/free/ww3/050304_women_draft.html).

A March 2005 report prepared for the US Department of Energy confirmed dire warnings of the investment banking community. Entitled ["The Mitigation of the Peaking of World Oil Production,"](http://www.peakoil.net/USDOE.html) the report observed:

*Without timely mitigation, world supply/demand balance will be achieved through massive demand destruction (shortages), accompanied by huge oil price increases, both of which would create a long period of significant economic hardship worldwide.*



*Waiting until world conventional oil production peaks before initiating crash program mitigation leaves the world with a significant liquid fuel deficit for two decades or longer.*



[The report went on to say:](http://www.energybulletin.net/4673.html)

*The problems associated with world oil production peaking will not be temporary, and past 'energy crisis' experience will provide relatively little guidance. The challenge of oil peaking deserves immediate, serious attention, if risks are to be fully understood and mitigation begun on a timely basis.*



*. . . the world has never faced a problem like this. Without massive mitigation more than a decade before the fact, the problem will be pervasive and will not be temporary. Previous energy transitions were gradual and evolutionary. Oil peaking will be abrupt and revolutionary.*



As one commentator recently observed, the reason our leaders are acting like desperados [is because we have a desperate situation on our hands](http://www.altpr.org/modules.php?op=modload&name=News&file=article&sid=403&mode=thread&order=0&thold=0).

If you've been wondering why the Bush administration has been spending money, cutting social programs, and starting wars like there's no tomorrow, now you have your answer: as far as they are concerned, there is no tomorrow.

What is particularly disturbing is, that from a purely Machiavellian standpoint, they are probably correct in their thinking.

[**Click Here to Go to Page Two of LATOC**](http://www.lifeaftertheoilcrash.net/SecondPage.html)

**Topics Covered on Page Two Include**: Increased Discovery/Exploration for Oil, Oil Sands and Oil Shale, Oil Industry Reactions to Peak Oil, Abiotic Oil Theory, Drilling in ANWR, Laws of Supply and Demand/Market Forces, Alternative Energy, Solar, Wind, Geothermal, Wave, Hydrogen, Nuclear, Coal, Ethanol, Biodiesel, Thermal Depolymerization, Solar-Nanotechnology, Space-Based Solar Arrays, Hybrid Vehicles, Conservation and Energy Efficiency, Jevon's Paradox, Wars in Iraq, Iran, Syria, and Venezuela, the Military Draft, Possible Solutions and Ways to Prepare

If you remove the machine's internal inefficiencies, the extra energy is simply reinvested into the petroleum supply side of the machine. The machine then consumes petroleum and spits out garbage at an even faster rate.

The only way to get the machine to consume less petroleum is for whoever owns/operates the machine to press the button that says "slow-down." However, since we are all dependent on the machine for jobs, food, affordable health care, subsidies for alternative forms of energy, etc., nobody is going to lobby the owners/operators of the machine to press the "slow-down" button until it's too late.

Eventually (sooner than later) the petroleum plug will get pulled and the machine's production will sputter before grinding to a halt. At that point, those of us dependent on the machine (which means all of us) will have to fight for whatever scraps it manages to spit out.

**To be clear: conservation will benefit you as an individual**. If, for instance, you save $100/month on your energy bills, you can roll that money into acquiring skills or resources that will benefit you as we slide down the petroleum-production downslope. But since your $100 savings will result in a net increase in the energy consumed by society as a whole, it will actually cause us to slide down the downslope faster.

**"So What's Going to**

**Happen to the Economy?"**

Even if you can currently afford the latest in alternative energy technologies, it won't help you much since the majority of the population can't. Got solar panels on your roof and a brand-new hybrid car? Great, but since most people can't afford those things, and the global industrial base hasn't been retrofitted to run on them, the economy is still going to implode.

The US economy is particularly vulnerable to the coming oil shortages. As the most indebted nation in the world, the US is completely dependent on strong economic growth just to pay the interest on its debts. This is as true for individual citizens as it is for corporations and governments. A declining oil/energy supply means the economy can't grow which means individuals, corporations, and governments can't pay off their debt, which means economic anarchy is on the way.

Furthermore, unlike nations in Europe, the US has built its entire infrastructure and way of life [under the assumption oil would always be cheap and plentiful](http://www.kunstler.com/spch_hudson.htm). Since that is no longer the case, the US economy is in even more trouble than the economies of nations like the UK, Germany, Spain, and France.

So even in the best-case scenario, [we're looking at an international financial meltdown](http://www.financialsense.com/series3/main.htm) and a [collapse of the value of US dollar so severe](http://www.museletter.com/archive/149.html) that the Great Depression will look like the "good ole days."

That's if we manage to avoid the  ["economic Armageddon" recently predicted by the chief economist at investment banking giant Morgan Stanley.](http://www.fromthewilderness.com/free/ww3/112304_economic_armageddon.shtml)

The end of cheap oil also means [the elimination of Great Depression era social programs such as Social Security and Medicare](http://www.thesocialcontract.com/cgi-bin/showarticle.pl?articleID=1094&terms=). Pensions too will soon to be [a thing of the past](http://www.newsday.com/news/columnists/ny-vpcoc184045294nov18,0,622084.column?coll=ny-news-columnists).

On the international front, the financial dislocations wrought by the coming oil shocks will plunge the world into a series of resource wars and ["currency insurgencies"](http://www.globalresearch.ca/articles/ENG408A.html) unlike anything we can imagine. The international destabilization and devaluing of the US dollar will further exacerbate the economic collapse at home while impeding our physical & financial ability to pump whatever oil is left in the ground and then bring it to the market.

As the US economy begins to rapidly disintegrate, massive civil unrest may break out as the various factions of the divided American citizenry seek to blame the economic situation on whoever their favorite scapegoat is. Liberals and blue-states will blame "Bush, Big-Oil and the Neocons" while conservatives and red-staters will blame "Bin-Laden, Big-Government, and the Extreme Left."

Both groups will likely gravitate to and rally around reactionary political demagogues who promise to bring back the good days by eliminating whatever domestic or foreign group(s) they have decided are at fault for the economic and geopolitical unraveling.

Put simply, [the end of oil may result in the end of America as we know it.](http://www.commondreams.org/views04/0301-12.htm)

**"How Can I Be Sure This Isn't Just**

**More 1970s Doom-and-Gloom?"**

The oil shocks of the 1970s were created by political events. In 1973, OPEC cut its production in retaliation for US support of Israel. In 1979, Iran cut its production in hopes of crippling "the great Satan."  In both cases, the US was able to turn to other oil producing nations such as Venezuela to alleviate the crisis.

Once globalproduction peaks, there won't be anybody to turn to. The crisis will just get worse and worse with each passing year.

The evidence of an [imminent peak in global oil production](http://www.energybulletin.net/997.html) is now overwhelming:

1. Ninety-nine percent of the world's oil comes from 44 oil producing nations. At least 24 of these nations are past their peak and now in terminal decline.



2. The entire world - with the exception of the Middle East peaked in 1997. The US peaked in 1970, Russia in 1987, the UK in 1999. Even Saudi Arabia - the famed 1.["producer](http://www.iags.org/n0331043.htm) [for all seasons"](http://www.iags.org/n0331043.htm) [may be on the verge of](http://www.iags.org/n0331043.htm) [seeing it](http://www.iags.org/n0331043.htm) [production collapse.](http://www.iags.org/n0331043.htm)



3.Global production of conventional oil has essentially plateaued since the year 2000.



As far as "doom-and-gloom" consider what widely respected Deutsche Bank had to say about Peak Oil in a recent report entitled, [*Energy Prospects After the Petroleum Age*:](http://www.peakoil.net/DB.html)

*The end-of-the-fossil-hydrocarbons scenario is not therefore a doom-and-gloom picture painted by pessimistic end-of-the world prophets, but a view of scarcity in the coming years and decades that must be taken seriously.*



The Australian Financial Review echoed the sentiments of Deutsche Bank in a January 2005 article entitled, ["Staring Down the Barrel of a Crisis":](http://www.energybulletin.net/4044.html)

*The world's oil production may be about to reach its peak, forever. Such apocalyptic prophecies often surface in the middle of the northern hemisphere winter. What is unusual is that this time the doomsday scenario has gained serious credibility among respected analysts and commentators.*



On a similar note, as mentioned previously, the chief economist at Morgan Stanley recently predicted that [we have a 90% chance of facing "Economic Armageddon,"](http://www.fromthewilderness.com/free/ww3/112304_economic_armageddon.shtml) while stating, ["I fear modern day central banking is on the brink of systemic failure."](http://www.morganstanley.com/GEFdata/digests/20040217-tue.html)

When somebody like the chief economist at one of the world's biggest banks makes a statement like that, it's not a surprise somebody like investment banker and Bush-consultant Matt Simmons has stated ["the only solution is to pray."](http://www.fromthewilderness.com/free/ww3/082103_blackout_summary.html)

In April 2005, investment bank [Goldman Sachs recently released a report](http://www.energybulletin.net/5069.html) predicting a global oil price "super spike" that would (conservatively) send prices to $105/barrel, while [French investment bank Ixis-CIB has warned,](http://english.aljazeera.net/NR/exeres/73CE8286-740C-482B-8150-DA57696BC02F.htm) "crude oil prices could touch $380 a barrel by 2015."

While not specifically mentioning Peak Oil, [Warren Buffet has warned of impending financial chaos](http://www.newsmax.com/archives/articles/2004/12/27/100204.shtml). Similarly, *Forbes Magazine* recently ran an article explaining that the ["world is on the brink of financial ruin."](http://www.forbes.com/home/strategies/2005/01/07/cx_da_0107topnews.html)

Given the credentials of those sounding the alarm the loudest, it is extremely unwise for you to causally dismiss this as just more "1970s doom-and gloom."

**"Do World Governments Have**

**Plans to Deal With This?"**

**Absolutely.**

[The US government has been aware of Peak Oil since at least 1977](http://www.museletter.com/archive/cia-oil.html) and has been [actively planning for this crisis for over 30 years.](http://www.motherjones.com/news/feature/2003/03/ma_273_01.html)

Three decades of careful, plotting analysis has yielded a comprehensive, sophisticated, and multi-faceted plan in which military force will be used to secure and control the globe's energy resources. This plan is simplistically, but not altogether inaccurately - known as[**"Go to War to Get Oil."**](http://www.tomdispatch.com/index.mhtml?pid=1888)

This strategy was publicly announced in April 2001, when a report commissioned by Dick Cheney was released. According to the report, entitled [*Strategic Energy Policy Challenges For The 21st Century*](http://www.sundayherald.com/28224)*,* the US is facing the biggest energy crisis in history and that the crisis requires "a reassessment of the role of energy in American foreign policy."

That's a diplomatic way of saying [we are going to be fighting oil wars for a very long time.](http://www.smh.com.au/articles/2003/05/19/1053196528488.html?oneclick=true)

James Woolsey, the former Director of the CIA, [practically admitted as much at a recent conference on renewable energy](http://renewableenergyaccess.com/rea/news/story?id=19841):

*I fear we're going to be at war for decades, not years . . . Ultimately we will win it, but one major component of that war is oil.*



Recent statements by Henry Kissinger echo those of Woolsey. In a June 2005 *Financial Times* article entitled, ["Kissinger Warns of Energy Conflict,"](http://news.ft.com/cms/s/76aea598-d302-11d9-bead-00000e2511c8.html) Kissinger was quoted as saying:

*The amount of energy is finite, up to now in relation to demand, and competition for access to energy can become the life and death for many societies.*



Kissinger distinguished these energy conflicts from previous conflicts such as the Cold War:

*When nuclear weapons spread to 30 or 40 countries and each conducts a calculation, with less experience and different value systems, we will have a world of permanent imminent catastrophe.*



The war in Iraq, [which has been 23 years in the making](http://www.commondreams.org/headlines03/0309-04.htm), is just the beginning of a worldwide war that "will not end in our lifetime." The reason our leaders are telling us the "[war on terror will last 50 years](http://news.bbc.co.uk/1/hi/uk/1623036.stm)" and that the US engagement in the Middle East is now a ["generational commitment"](http://www.thenation.com/doc.mhtml?i=20050221&s=vest) is two-fold:

1.  All the countries accused of harboring terrorists - Iraq, [Iran](http://www.commondreams.org/views05/0411-21.htm), Syria, [West Africa](http://www.fromthewilderness.com/free/ww3/051503_saudi_africa.html), [Saudi Arabia](http://www.fromthewilderness.com/free/ww3/051503_saudi_africa.html) - also happen to harbor large oil reserves.



2.  Within 40-50 years, even these countries will see their oil reserves almost entirely depleted. At that point, the "war on terror" will come to an end.



While the Middle East countries find themselves targets in the "war on terror", China, Russia, and Latin America find themselves targets in [the recently declared and much more expansive "war on tyranny."](http://www.truthout.org/docs_04/110804E.shtml)

Whereas the "war on terror" is really a war for control of the world's oil reserves, this newly declared "war on tyranny" is really [a war for control of the world's oil distribution and transportation chokepoints.](http://www.321energy.com/editorials/engdahl/engdahl021305.html)

China and Russia have taken notice of these declarations and [seem to be making preparations to defend themselves.](http://www.guardian.co.uk/worldlatest/story/0,1280,-5222683,00.html)

[China has also strengthened it's ties to oil-rich Venezuela](http://news.bbc.co.uk/2/hi/business/4123465.stm) while engaging in an [undeclared oil-war with long time rival and US ally Japan.](http://www.washingtonpost.com/ac2/wp-dyn/A10714-2004Jun27?language=printer)

This type of large-scale, long-term warfare will likely [require a massive expansion of the military draft.](http://www.fromthewilderness.com/free/ww3/022704_draft_goff.html) It's probably not a coincidence that the director of the Selective Service recently gave a presentation to Congress in which [he recommended the military draft be extended to both genders, ages 18-35.](http://www.fromthewilderness.com/free/ww3/050304_women_draft.html)

The strategy - as distasteful as it may be - is characterized by a Machiavellian logic. Given the thermodynamic deficiencies of the alternatives to oil, the complexity of a large scale switch to these new sources of energy, and the wrenching economic and social effects of a declining energy supply, you can see why our leaders view force as the only viable way to deal with the coming crisis.

Of course, the US is not the only nation that needs affordable oil. Not by a long shot. France, Germany, Russia, and China all need it also. While these countries may not be able or willing to directly confront the US on the battlefield, [they are more than willing to attack the US financially](http://www.axisoflogic.com/artman/publish/article_14458.shtml). The US may have the world's most deadly cluster bombs, but [the EU has the world's most valuable currency,](http://www.feasta.org/documents/review2/nunan.htm) and intends to wield it as a strategic economic weapon to offset US firepower. This is known as ["petrodollar warfare"](http://www.petrodollarwarfare.com/)

**"Is There Any Reason to**

**Remain Optimistic/Hopeful?"**

If what you really mean is, "Is there any way technology or the market or brilliant scientists or comprehensive government programs are going to hold things together or solve this for me or allow for business to continue as usual?", the answer is no.

On the other hand, if what you really mean, "Is there any way I can still have a happy, fulfilling life in spite of some clearly grim facts?", the answer is yes, but it's going to require a lot of work, a lot of adjustments, and probably a bit of good fortune on your part.

**"What Can I do to Prepare?"**

**Five things:**

1.  Inform others; many people have found that showing their friends/relatives the documentary film, [*End of*](http://www.lifeaftertheoilcrash.net/Purchase.html)[*Suburbia: Oil Depletion and the Collapse of the American*](http://www.lifeaftertheoilcrash.net/Purchase.html)[*Dream*](http://www.lifeaftertheoilcrash.net/Purchase.html)to be an effective introduction to Peak Oil.



[Global Public Media](http://www.globalpublicmedia.com) has a large archive of Peak Oil related multimedia you might want to show them.

    An index of audio interviews with the author of this article is available [here.](http://www.lifeaftertheoilcrash.net/Appearances.html)



2.  Get your financial house in order. Jim Puplava's website [Financial Sense](http://www.financialsense.com) is as good a place to start as you're going to find for information about oil and the economy.



    The [*Solari Series*](http://www.lifeaftertheoilcrash.net/Purchase.html#anchor_164) by Catherine Austin Fitts is, in my opinion, the best source of financial information out there. Free interviews with Fitts are [available here.](http://www.financialsense.com/Experts/2004/AustinFitts.html)



3.  Get as self-sufficient as possible as soon as possible. See the [news and updates](http://www.lifeaftertheoilcrash.net/BreakingNews.html) for more information. To discuss practical preparations for a post-petroleum world, check out the Yahoo group, ["Running on Empty 2."](http://groups.yahoo.com/group/RunningOnEmpty2/)



4.  If you're feeling a bit terrified or shocked, please realize that feelings of anxiety, depression, etc. are pretty much par-for the course when it comes to learning about this. See the [letters](http://www.lifeaftertheoilcrash.net/Letters.html) section for some examples. If you're looking for a place to talk to others about this stuff, consider the Yahoo group ["Running on Empty 3"](http://groups.yahoo.com/group/RunningOnEmpty2/), the [PeakOil.com forums,](http://www.peakoil.com/forums.html) or see if there is an [Oil Awareness](http://www.oilawareness.meetup.com) Group or [Post Carbon outpost](http://www.postcarbon.org) in your area.



5.  If you're religious, pray.



Best of luck,

***Matthew David Savinar, Esq.***

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**III. Issue of Scale and Environmental Catastrophe:**

The environmental consequences of a huge increase in coal production would be truly catastrophic. [Caltech physics professor Dr. David Goodstein explains:](http://www.fromthewilderness.com/free/ww3/111704_end_oil.shtml)

*We use now about twice as much energy from oil as we do from coal, so if you wanted to mine enough coal to replace the missing oil, you’d have to mine it at a much higher rate, not only to replace the oil, but also because the conversion process to oil is extremely inefficient. You’d have to mine it at levels at least five times beyond those we mine now—a coal-mining industry on an absolutely unimaginable scale.*



In his book, *Out of Gas*: *The End of the Oil Age*, Dr. Goodstein tells us that a large scale switch to coal could produce such severe global warming that life on planet Earth would cease to exist.

**"Can't We Use a Combination of**

**the Alternatives to Replace Oil?"**

**Absolutely.**

Despite their individual shortcomings, it is still possible for the world economy to run on a basket of alternative sources of energy - so long as we immediately get all of the following:

1. A few dozen technological breakthroughs;



2. Unprecedented political will and bipartisan cooperation;



3. Tremendous international collaboration;



4. Massive amounts of investment capital,



5. [Fundamental reforms to the banking](http://www.museletter.com/archive/149.html) system;



6. No interference from the oil-and-gas industries;



7. About 25-50 years of general peace and prosperity to retrofit the world's $45 trillion dollar per year economy, including transportation and telecommunications networks, manufacturing  industries, agricultural systems, universities, hospitals, etc. , to run on these new sources of energy.



8. A generation of engineers, scientists, and economists trained to run a global economy powered by new sources of energy.



If we get all of the above, we might be able to get the energy equivalent of 3-5 billion barrels of oil per year from alternative sources.

That's a tremendous amount of oil - about as much as the entire world used per year during the 1950s, but it's nowhere near enough to keep our currently mammoth-sized yet highly volatile global economic system going. The world currently requires over **30 billion barrels/1.2 trillion gallons** of oil per year to support economic growth. That requirement will only increase as time goes on due to population growth, debt servicing, and the industrialization of nations such as China and India.

So even if the delusional optimistic 8-step scenario described above is somehow miraculously manifested, we're still facing a 70-90% reduction in the amount of energy available to us. A 70-90% reduction would be extremely painful, but not the "end of the world" if it wasn't for the fact that, as explained above, the monetary system will collapse in the absence of a **constantly increasing** energy supply. If a shortfall between demand and supply of 5% is enough to send prices up by 400%, what to you think a shortfall of 70-90% is going to do?

To make matters worse, even if the all of the above obstacles are assumed away, we are still faced with the problem of "economic doubling time."  If the economy grows at a healthy clip of 3.5% per year, it doubles in size every 20 years. That growth must be fueled by an energy supply that doubles just as quickly. Thus, our total "energy debt" will have compounded itself by the time we have made any major strides in switching to alternative sources of energy.

**"What About Amazing New Technologies Such As Thermal Depolymerization, Solar Nanotech, Space Based Solar Arrays, and other 'Energy-Miracles'?"**

[Thermal depolymerization](http://en.wikipedia.org/wiki/Thermal_depolymerization) is an intriguing solution to our landfill problems, but since most of the feedstock (such as tires and turkey guts) requires high-grade oil to make in the first place, it is more "high-tech recycling" than it is a solution to a permanent oil shortage.

While the following analogy is certainly a bit disgusting, it should clearly illustrate why thermal depolymerization won't do much to soften the coming collapse:

1. Expecting thermal depolymerization to help solve our long term energy problems makes as much sense as expecting the consumption of our own feces to help solve a long-term famine.



1. In both cases, the energy starved party is simply recycling a small portion of the energy they had previously consumed.



On a less grotesque note, the technology is besieged by several fundamental shortcomings that those desperately hoping for a techno-messiah tend to overlook:

First, there is the problem of production costs. According to a recent article in *Fortune Magazine*, [a barrel of oil produced via the thermal depolymerization process costs $80 to produce as of January 2005.](http://www.fortune.com/fortune/smallbusiness/articles/0,15114,1018747,00.html) To put that figure in perspective, consider the fact that oil pulled out of the ground in Saudi Arabia costs less than $2.50 per barrel, while [oil pulled out of the ground in Iraq costs only $1.00 per barrel.](http://www.time.com/time/archive/preview/0,10987,450939,00.html)

This means that with spot oil prices in the $50/barrel range, a barrel of oil produced via thermal depolymerization in January 2005 would have to sell for between $1,600-$4,000 per barrel to have a return on investment comparable to oil produced from Saudi Arabia or Iraq.

Oil prices of $1,600-$4,000 per barrel would put gas prices at roughly $80-$200 per gallon.

If the technology was the miracle many people are desperately hoping for, [the company would likely not have needed a grant from the Department of Energy to keep its head above water.](http://www.fortune.com/fortune/smallbusiness/articles/0,15114,1018747,00.html) Nor would it have been the subject of an April 2005 *Kansas City Star* article appropriately entitled, ["Innovative Turkey-to-Oil Plant Eats Money, Spits Out Fowl Odor."](http://www.mindfully.org/Air/2005/Changing-World-Technologies12apr05.htm)

Sky-high production costs and horrific odor problems aside, a look at the history of thermal depolymerization tends to show it will never amount to more than a tiny drop in the giant barrel that is our oil appetite. [The technology was first developed for commercial use in 1996.](http://en.wikipedia.org/wiki/Thermal_depolymerization) Here we are, ten years later and there is only one thermal depolymerization plant online and it [is producing less than 500 barrels of oil per day,](http://www.kansascity.com/mld/kansascity/news/local/11370598.htm) despite record high oil prices. Even if oil production from thermal depolymerization is upscaled by a factor of 1,000, and the cost of production brought down by a factor of 10, it will still only be producing 500,000 barrels of oil per day. While that may make a tremendous amount of money for the company, it won't make much difference in our overall situation as the global need for oil is projected to reach 120,000,000 barrels per day by 2020.

If thermal depolymerization sounded "too good to be true" when you first heard about it, [now you know why.](http://www.kansascity.com/mld/kansascity/news/local/11370598.htm)  Again, as with other alternatives, we shouldn't let these challenges discourage continued research, development, and investment into the technology.  However, we have to be realistic about what the technology can and can't do. If you're a big agribusiness or energy company, you may want to look into thermal depolymerization.

If, on the other hand, you're just a regular person trying to figure out how you're going to acquire things like food, water, and shelter in a post-cheap oil world, you may as well forget about thermal depolymerization. It is never going to make a discernable contribution to your standard of living.

As disappointing as thermal depolymerization has been to those hoping for a techno-savior, at least it has produced a small amount of commercially available energy. The same cannot be said for space-based solar arrays, [which according to NASA](http://abcnews.go.com/Technology/story?id=98547&page=1), are plagued by "major technical, regulatory and conceptual hurdles" and won't see the light of day for several decades.

Even if these major hurdles are somehow cleared inside of 5 years instead of 50 years, there is still the not-so-minor problem of rewiring all of industrial civilization - including agriculture, communications, transportation, defense, health care, education, industry, government, finance/banking, etc. to run on space-derived solar energy.

Of course, before the global rewiring can begin, we have to find the energy, raw materials, political willingness, financial capital, etc. to get such a project off the ground.

We also have to find a way to prevent China's million man standing army from snapping up all the raw materials necessary to make the transition.

While there are some promising technological advancements in solar-nanotechnology, [even Dr. Richard Smalley, the scientist at the forefront of these technologies, admits we need a series of **"miracles"**](http://www.alternet.org/envirohealth/19812/) to prevent a total collapse of industrial civilization.

In the February 2005 issue of Discover Magazine, [Dr. Smalley gave the following prognosis:](http://www.discover.com/issues/feb-05/departments/discover-dialogue/)

*There will be inflation as billions of people compete for insufficient resources. There will be famine. There will be terrorism and war.*



He went on to say that it will take "presidential leadership" to inspire us to pursue technologies that might alleviate this crisis.

In other words, the chances of technology saving you from the coming economic collapse are about the same as the chances of another virgin-birth taking place.

For you or any other "average" person to expect high-tech solutions to save you from the economic effects of Peak Oil is akin to a person living in sub-Saharan Africa to expect high-tech medical treatments to save their community from the effects of AIDS. These treatments are only available and affordable for super-wealthy people like Magic Johnson, not the average people in Africa.

Likewise, many of the recent technological advancements in energy production and efficiency may be available and affordable to [extraordinarily wealthy people](http://msnbc.msn.com/id/6954665/) or [agencies like the Department of Defense,](http://www.wired.com/news/technology/0,1282,64021,00.html) but they aren't going to be available or affordable to you.

Adaptation by the wealthy does not necessarily equal survival for you.

**"What About Hybrids and**

**Super Fuel Efficient Cars?"**

Hybrids or so called "hyper-cars" aren't the answer either because [the construction of an average car consumes approximately 27-54 barrels (1,110-2,200 gallons) of oil.](http://www.lifeaftertheoilcrash.net/Research.html) Thus, a crash program to replace the 700 million internal combustion vehicles currently on the road with super fuel-efficient or alternative fuel-powered vehicles would consume approximately 18-36 billion barrels of oil, which is the amount of oil the world currently consumes in six-to-twelve months. Consequently, such a program (while well-intentioned) would actually bring the collapse upon us even sooner.

On a similar note, [the construction of an average car also consumes 120,000 gallons of **fresh water**](http://www.fromthewilderness.com/free/ww3/091704_beyond_peak.shtml). Unfortunately, [the world is in the midst of a severe water crisis](http://news.bbc.co.uk/hi/english/static/in_depth/world/2000/world_water_crisis/default.stm) that is only going to [get worse](http://news.bbc.co.uk/2/hi/science/nature/3747724.stm) in the years to come. Scientists are already warning us to [get ready for massive "water wars."](http://www.planetark.com/dailynewsstory.cfm/newsid/26728/story.htm)

Thus, the  only way for us to replace our current fleet of gas-guzzling SUVs with fuel-efficient hybrids is to seize control of the world's reserves of both oil and fresh water and then divert those resources away from the billions of people who rely on them.

Even if were willing to undertake such an endeavor, the problem will still not be solved due to a phenomenon known as ["Jevon's Paradox,"](http://en.wikipedia.org/wiki/Jevons_paradox) whereby increases in energy efficiency are obliterated by corresponding increase in energy consumption.

The US economy is a good example of Jevon's Paradox in action. Since 1970, we have managed to cut in half the amount of oil necessary to generate a dollar of GDP. At the same time, however, we have doubled our level of consumption. Thus, despite massive increases in the energy efficiency over the last 30 years, we are more dependent on oil than ever. This trend is unlikely to be abated in a market economy.

The widespread use of technologies such as the internal combustion engine and the air conditioner is what got us into this situation. It is thus unlikely that even more technology will get us out of it.

**"What About Large-Scale Efforts at Conserving Energy or Becoming More Energy Efficient?"**

Amazingly, such efforts will actually make our situation worse. This probably makes absolutely no sense unless you understand how the modern day banking and monetary system works. To illustrate, let's revisit [Jevon's Paradox](http://en.wikipedia.org/wiki/Jevons_paradox), explained above, with an example:

Pretend you own a computer store and that your monthly energy bill, as of December 2004, is $1,000. You then learn about the coming energy famine and decide to do your part by conserving as much as possible. You install energy efficient lighting, high quality insulation, and ask your employees to wear sweaters so as to minimize the use of your store's heating system.

After implementing these conservation measures, you manage to lower your energy bill by 50% - down to $500 per month.

While you certainly deserve a pat-on-the-back and while your business will certainly become more profitable as a result of your conservation efforts, you have in no way helped reduce our overall energy appetite.  In fact, you have actually increased it.

At this point, you may be asking yourself, "How could I have possibly increased our total energy consumption when I just cut my own consumption by $500/month? That doesn't seem to make common sense . . .?"

Well think about what you're going to do with that extra $500 per month you saved. If you're like most people, you're going to do one of two things:

1. You will reinvest the $500 in your business. For instance, you might spend the $500 on more advertising. This will bring in more customers, which will result in more computers being sold. Since, as mentioned previously, the average desktop computer [consumes 10X](http://www.undp.org.vn/mlist/ksdvn/032004/post9.htm) [it's](http://www.undp.org.vn/mlist/ksdvn/032004/post9.htm) [weight in](http://www.undp.org.vn/mlist/ksdvn/032004/post9.htm) [fossil-fuels just during its construction](http://www.undp.org.vn/mlist/ksdvn/032004/post9.htm), your individual effort at conserving energy has resulted in the consumption of more energy.



2. You will simply deposit the $500 in your bank account where it will accumulate interest. Since you're not using the money to buy or sell anything, it can't possibly be used to facilitate an increase in energy consumption, right?



Wrong. [For every dollar a bank holds in deposits, it will loan out](http://www.wealth4freedom.com/truth/17/banks.htm)

[between six and twelve dollars](http://www.wealth4freedom.com/truth/17/banks.htm). These loans are then used by the bank's customers to do everything from starting businesses to making down payments on vehicles to purchasing computers.

Thus, your $500 deposit will allow the bank to make between $3,000 and $6,000 in loans - most of which will be used to buy, build, or transport things using fossil fuel energy.

Typically, Jevon's Paradox is one of the aspects of our situation that people find difficult to get their minds around. Perhaps one additional example will help clarify it:

Think of our economy as a giant petroleum powered machine that turns raw materials into consumer goods which are later turned into garbage:

**The Economy "How Do I Know This Isn't Just Fear - Mongering by Loony-Environmentalists?"**

If you think what you are reading on this page is the product of a loony-left nut, consider what Representative Roscoe Bartlett (Republican, Maryland) has had to say in [speeches to Congress](http://www.lifeaftertheoilcrash.net/FloorOfTheHouse.html).

[On March 14, 2005](http://www.lifeaftertheoilcrash.net/FloorOfTheHouse.html) Bartlett gave an extremely thorough presentation to Congress about the frightening ramifications of Peak Oil. During his presentation Representative Bartlett, [who may be the most conservative member of Congress](http://www.issues2000.org/House/Roscoe_Bartlett.htm), quoted from this site extensively, citing the author (Matt Savinar) by name on numerous occasions,while employing several analogies and examples originally published on this site. You can read the full congressional record of Representative Bartlett's presentation by [clicking here.](http://www.lifeaftertheoilcrash.net/FloorOfTheHouse.html)  You can view a video of Bartlett recommending the article you are now reading to [Resources for the Future,](http://www.rff.org/rff/About/RFFat50/Index.cfm) an extremely influential DC think tank, by [clicking here.](http://nmmstream.net:8080/ramgen/rff/210605/bartlett.rm)

On April 19, 2005 Representative Bartlett was interviewed on national television. Again, [he referenced the article you are now reading](http://www.energybulletin.net/5429.html):

*One of the writers on this, by the way, starts his article by saying, 'Dear Reader, Civilization as we know it will end soon.' Now your first impulse is to put down the article. This guy's a nut. But if you don't put it down and read through the article, you're hard-pressed to argue with his*



*conclusions*.



On May 2, 2005 Representative Bartlett gave [another presentation](http://www.lifeaftertheoilcrash.net/FloorOfTheHouseAgain.html) about Peak Oil on the floor of the House of Representatives, stating that this website "galvanized" him.

In subsequent speeches, Representative Bartlett read large excerpts of this site verbatim [into the official US Congressional record.](http://www.lifeaftertheoilcrash.net/FloorOfTheHouse.html)

**"Can't We Just Explore More for Oil?"**

Global oil discovery peaked in 1962 and has declined to virtually nothing in the past few years. [We now consume 6 barrels of oil for every barrel we find.](http://www.guardian.co.uk/comment/story/0,3604,1233533,00.html)

***Oil Discovery: (3 Year Average, Past and Projected)***

***Source:*** [***Association for the Study of Peak Oil***](http://www.peakoil.net)

According to an October 2004 *New York Times* article entitled ["Top Oil Groups Fail to Recoup Exploration Costs:"](http://www.energybulletin.net/2470.html)

*. . . the top-10 oil groups spent about $8bn combined on exploration last year, but this only led to commercial discoveries with a net present value of slightly less than $4bn. The previous two years show similar, though less dramatic, shortfalls.*



In other words, significant new oil discoveries are so scarce that looking for them is a monetary loser. Consequently, many major oil companies now find themselves [unable to replace their rapidly depleting reserves.](http://www.tomdispatch.com/index.mhtml?pid=2277)

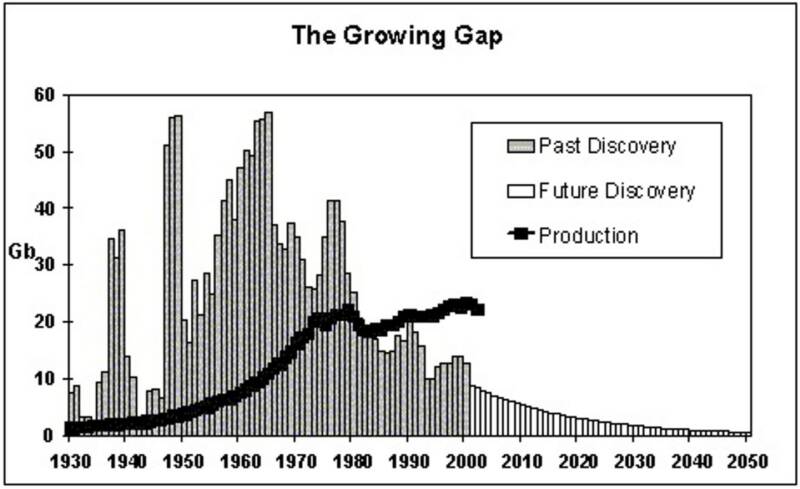
Take a look at the above chart. During the 1960s, for instance, we consumed about 6 billion barrels per year while finding about 30-60 billion per year. Given those numbers, it is easy to understand [why fears of "running out" were so often dismissed as unfounded.](http://www.energybulletin.net/6429.html)

Unfortunately, those consumption/discovery ratios have nearly reversed themselves in recent years. We now consume close to 30 billion barrels per year but find less than 4 billion per year.

In light of these trends, it should come as little surprise that the energy analysts at John C Herold Inc. - the firm that that foretold Enron's demise - [recently confirmed industry rumors that we are on the verge of an unprecedented crisis.](http://www.energybulletin.net/4718.html)

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**"What About the Oil Sands in Canada and the Oil Shale in the American West?"**

The good news is that we have a massive amount of untapped "non conventional" oil located in [the oil sands up in Canada.](http://www.energybulletin.net/1894.html)

The bad news is that, unlike conventional sources of oil, oil derived from these oil sands [is extremely financially and energetically intensive to extract.](http://www.energybulletin.net/1191.html) Whereas conventional oil has enjoyed a rate of ["energy return on energy invested"](http://www.eclipsenow.org/Facts/alternateenergy.html) (EROEI) of about 30 to 1, the oil sands rate of return hovers around 1.5 to 1.

This means that we would have to spend **20 times as much money** to generate the same amount of oil from the oil sands as we do from conventional sources of oil.

Where to find such a huge amount of capital is largely a moot point because, even with massive improvements in extraction technology, the oil sands in Canada are projected to only [produce a paltry 2.2 million barrels per day by 2015.](http://www.energybulletin.net/358.html) This doesn't even account for any [unexpected production decreases](http://www.energybulletin.net/962.html) or [cost overruns](http://www.energybulletin.net/2997.html), both of which have been endemic to many of the oil sands projects.

More optimistic reports anticipate [4 million barrels per day of oil coming from the oil sands by 2020.](http://www.thebulletin.org/article.php?art_ofn=mj05cavallo) Even if the optimists are correct, 4 million barrels per day isn't that much oil when you consider the following:

1. We currently need 83.5 million barrels per day;



2. We are projected to need 120 million barrels per dayby 2020;



3. We will be losing over 1 million barrels per day ofproduction per year, every year, once we hit thebackside of the global oil production curve.



4. The general consensus among [now disinterested](http://www.peakoil.net) [scientists](http://www.peakoil.net) is that oil production peak by 2010 at thelatest.



The huge reserves of oil shale in the American west suffer from similar problems. Although high oil prices have prompted the US government to [take another look at oil shale](http://msnbc.msn.com/id/6569046/), it is not the savior many people are hoping for. As [geologist Dr. Walter Youngquist points out](http://egj.lib.uidaho.edu/egj09/youngqu1.html):

*The average citizen . . . is led to believe that the United States really has no oil supply problem when oil shales hold "recoverable oil" equal to "more than 64 percent of the world's total proven crude oil reserves." Presumably the*



*United States could tap into this great oil reserve at any time. This is not true at all. All attempts to get this "oil" out of shale have failed economically. Furthermore, the "oil" (and, it is not oil as is crude oil, but this is not stated) may be recoverable but the net energy recovered may not equal the energy used to recover it. If oil is "recovered" but at a net energy loss, the operation is a failure.*



This means any attempt to replace conventional oil with oil shale will actually make our situation worse as the project will consume more energy than it will produce, regardless of how high the price goes.

**"How is the Oil Industry**

**Reacting to Peak Oil?"**

If you want to know the harsh truth about the future of oil, simply look at the actions of the oil industry.  As [a recent article in M.I.T.'s *Technology Review* points out:](http://www.technologyreview.com/articles/05/02/issue/review_oil.asp?p=0)

*If the actions - rather than the words - of the oil business's major players provide the best gauge of how they see the future, then ponder the following. Crude oil prices have doubled since 2001, but oil companies have increased their budgets for exploring new oil fields by only a small fraction. Likewise, U.S. refineries are working close to capacity, yet*



*no new refinery has been constructed since 1976. And oil tankers are fully booked, but outdated ships are being decommissioned faster than new ones are being built.*



Some people believe that [no new refineries have been built](http://www.corpwatch.org/article.php?id=12227) due to the efforts of environmentalists. This belief is silly when one considers how much money and political influence the oil industry has compared to the environmental movement. You really think Ronald Reagan and George H. Bush were going to let a bunch of pesky environmentalists get in the way of oil refineries being built if the oil companies had wanted to build them?

The real reason no new refineries have been built for almost 30 years is simple: any oil company that wants to stay profitable isn't going to invest in new refineries when they know there is going to be less and less oil to refine.

In addition to lowering their investments in oil exploration and refinery expansion, [oil companies have been merging as though the industry is living on borrowed time:](http://www.nytimes.com/2005/02/02/business/02place.html)

**December 1998:** BP and Amoco merge;



**April 1999:** BP-Amoco and Arco agree to merge;

**December 1999:** Exxon and Mobil merge;

**October 2000:** Chevron and Texaco agree to merge;

**November 2001:** Phillips and Conoco agree to merge;

**September 2002:** Shell acquires Penzoil-Quaker State;

**February 2003:** Frontier Oil and Holly agree to merge;

**March 2004**: Marathon acquires 40% of Ashland;

**April 2004**: Westport Resources acquires Kerr-McGee;

**July 2004:** [Analysts suggest BP and Shell merge;](http://www.guardian.co.uk/business/story/0,3604,1261452,00.html)

**April 2005:** [Chevron-Texaco and Unocal merge;](http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2005/04/08/BUGA4C50P61.DTL)

**June 2005:** [Royal Dutch and Shell merge;](http://news.bbc.co.uk/2/hi/business/4628983.stm)

**July 2005:** [China begins trying to acquire Unocal](http://www.chron.com/cs/CDA/ssistory.mpl/business/3215957)

While many people believe talk of a global oil shortage is simply a conspiracy by "Big Oil" to drive up the prices and create "artificial scarcity," the rash of mergers listed above tells a different story. [Mergers and acquisitions](http://www.lawforum.net/areas/mergers_and_acquisitions/index.asp) are the corporate world's version of cannibalism. When any industry begins to contract/collapse, the larger and more powerful companies will cannibalize/seize the assets of the smaller, weaker companies.

*(Note: for recent examples of this phenomenon outside the oil industry, see the airline and automobile industries.)*

If you suspect the oil companies are conspiring amongst themselves to create artificial scarcity and thereby artificially raise prices, ask yourself the following questions:

1.  Are the actions of the oil companies the actions of friendly rivals who are conspiring amongst each other to drive up prices and keep the petroleum game going?



or

2.  Are the actions of the oil companies the actions of rival corporate desperados who, fully aware that their source of income is rapidly dwindling, are now preying upon each other in a game of ["last man standing"?](http://usa.mediamonitors.net/content/view/full/9427/)



You don't have to contemplate too much, as recent disclosures from oil industry insiders indicate we are indeed ["damn close to peaking](http://www.bloomberg.com/apps/news?pid=10000087&sid=a3Iz1vRFvXuI&refer=top_world_news)" while independent industry analysts are now concluding that [large oil companies believe Peak Oil is at our doorstep.](http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2005/04/08/BUGA4C50P61.DTL)

As the Bulletin of Atomic Scientists recently observed, even ExxonMobil is now "[sounding the silent Peak Oil alarm."](http://www.thebulletin.org/article.php?art_ofn=mj05cavallo) In their 2005 report entitled, ["The Outlook for Energy"](http://www.thebulletin.org/article.php?art_ofn=mj05cavallo), ExxonMobil suggests that increased demand be met first through greater fuel efficiency. The fact that ExxonMobil - one of the largest oil companies in the world - is now recommending increased fuel efficiency should tell you how imminent a crisis is at this point. Equally alarming is the fact that Chevron has now [started a surprisingly candid campaign](http://www.willyoujoinus.com) to publicly address these issues. While the campaign fails to mention "Peak Oil" per se, it does acknowledge that, while it took 125 years to burn through the first half of our oil endowment, [it will only take 30 years to burn through the second half.](http://www.willyoujoinus.com/advertising/print/)

**"What About this Theory that Oil is**

**Actually a Renewable Resource?"**

A handful of people believe oil is actually a renewable resource continually produced by an "abiotic" process deep in the Earth. As emotionally appealing as this theory may be, [it ignores most common sense and all scientific fact.](http://www.energybulletin.net/2423.html) While many of the people who believe in this theory consider themselves "mavericks," r[espected geologists consider them crackpots.](http://www.museletter.com/archive/150b.html)

Moreover, the oil companies don't give this theory the slightest bit of credence even though they are more motivated than anybody to find an unlimited source of oil as each company's shareholder value is based largely on how much oil it holds in reserve. Any oil company who wants to make a ridiculous amount of money (which means all of them) could simply find this unlimited source of oil but refuse to bring it to the market. Their stock value would skyrocket as a result of the huge find while they could simultaneously maintain artificial scarcity by not bringing it to the market.

Even if the maverick/crackpot theories of "unlimited oil" are true, [they aren't doing us much good out here in the real world](http://www.fromthewilderness.com/free/ww3/100404_abiotic_oil.shtml) as production is declining in pretty much every nation outside the Middle East.

It certainly isn't doing us any good here in the United States. Our domestic oil production peaked in October 1970 at 10 million barrels per day. It has since declined a little bit each year and now stands at about 5 million barrels per day.

If oil is a renewable resource, why isn't it renewing itself here in the good ole' US of A?

**"If the Environmentalists Would Get Out**

**of the Way, Can't We Just Drill in ANWR?"**

While some folks desperately cling to the belief that oil is a renewable resource, others hold on to the equally delusional idea that tapping the Arctic National Wildlife Reserve will solve, or at least delay, this crisis. While drilling for oil in ANWR will certainly make a lot of money for the companies doing the drilling, [it won't do much to help the overall situation for three reasons:](http://www.msnbc.msn.com/id/4542853/)

1.  According of the Department of Energy, drilling in ANWR will only lower oil prices by less than fifty cents;



2.  ANWR contains 10 billion barrels of oil - or about the amount the US consumes in a little more than a year.



3.  As with all oil projects, ANWR will take about 10 years to come online. Once it does, its production will peak at 875,000 barrels per day - but not till the year 2025. By then the US is projected to need a whopping 35 million barrels per day while the world is projected to need 120 million barrels per day.



**"Won't the Market and the Laws of**

**Supply and Demand Address This?"**

Not enough to prevent an economic meltdown.

As economist Andrew Mckillop explains in a recent article entitled, ["Why Oil Prices Are Barreling Up,"](http://www.atimes.com/atimes/Global_Economy/GB16Dj02.html) oil is nowhere near as "elastic" as most commodities:

*One of the biggest problems facing the IEA, the EIA and a host of analysts and "experts" who claim that "high prices cut demand" either directly or by dampening economic growth is that this does not happen in the real world.*



*Since early 1999, oil prices have risen about 350%. Oil demand growth in 2004 at nearly 4% was the highest in 25 years. These are simple facts that clearly conflict with received notions about "price elasticity". World oil demand, for a host of easily-described reasons, tends to be bolstered*



*by "high" oil and gas prices until and unless "extreme" prices*



*are attained.*



As mentioned previously, this is exactly what happened during the oil shocks of the 1970s - shortfalls in supply as little as 5% drove the price of oil up near 400%. Demand did not fall until the world was mired in the most severe economic slowdown since the Great Depression.

While many analysts claim the market will take care of this for us, they forget that [neoclassic economic theory is besieged by several fundamental flaws](http://www.dieoff.org/page241.htm) that will prevent the market from appropriately reacting to Peak Oil until it is too late. To illustrate, as of April 2005, a barrel of oil costs about $55. The amount of energy contained in that barrel of oil would cost between $100-$250\* dollars to derive from alternative sources of energy. Thus, the market won't signal energy companies to begin aggressively pursuing alternative sources of energy until oil reaches the $100-$250 mark.

*\*This does not even account for the amount of money it would take to locate and refine the raw materials necessary for a large scale conversion, the construction and deployment of the alternatives, and finally the retrofitting of the world's $45 trillion dollar infrastructure to run on these alternative sources.*

Once they do begin aggressively pursuing these alternatives, there will be a 25-to-50 year lag time between the initial heavy-duty research into these alternatives and their wide-scale industrial implementation.

However, in order to finance an aggressive implementation of alternative energies, we need a tremendous amount of investment capital - in addition to affordable energy and raw materials - that we absolutely will not have once [oil prices are permanently lodged in the $200 per barrel neighborhood.](http://quote.bloomberg.com/apps/news?pid=10000039&refer=columnist_pesek&sid=aoP8MaxIzWb8)

While we need 25-to-50 years to retrofit our economy to run on alternative sources of energy, we may only get 25-to-50 days once oil production peaks.

Within a few months of global oil production hitting its peak, it will become impossible to dismiss the decline in supply as a merely transitory event. Once this occurs, you can expect traders on Wall Street to quickly bid the price up to and possibly over, the $200 per barrel range as they realize the world is now in an era of permanent oil scarcity.

With oil at or above $200 per barrel, gas prices will reach $10 per gallon inside of a few weeks. This will cause a rapid breakdown of trucking industries and transportation networks. Importation and distribution of food, medicine, and consumer goods will grind to a halt.

The effects of this will be frightening. As Jan Lundberg, founder of the *Lundberg Survey*, aka "the bible of the oil industry" [recently pointed out:](http://www.energybulletin.net/4404.html)

*The scenario I foresee is that market-based panic will within a few days, drive prices up skyward. And as suppliescan no longer slake daily world demand of over 80 millionbarrels a day, the market will become paralyzed at prices too high for the wheels of commerce and even daily living in "advanced" societies. There may be an event that appears*



*to trigger this final energy crash, but the overall cause will be the huge consumption on a finite planet.*



*The trucks will no longer pull into Wal-Mart or Safeway or other food stores. The freighters bringing packaged techno -toys and whatnot from China will have no fuel. There will be fuel in many places, but hoarding and uncertainty will trigger outages, violence and chaos. For only a short time will the police and military be able to maintain order, if at all.*



The collapse will be hastened by the fact that [the US national debt will become completely unsustainable](http://www.thenation.com/doc.mhtml?i=20020923&s=greider) once the price of oil gets into the $100 range. Once this mark is passed, the nations of the world will have no choice but to pull their investments out of the US while simultaneously switching [from the dollar to the euro](http://www.feasta.org/documents/papers/oil1.htm) as the reserve currency for oil transactions. Along with the breakdown of domestic transportation networks, the global financial shift away from the dollar will wholly shatter the US economy.

If you're wondering why the mainstream media is not covering an issue of this magnitude 24/7, now you know. Once the seriousness of situation is generally acknowledged, [a panic will spread on the markets and bring down the entire house of cards](http://deconsumption.typepad.com/deconsumption/2005/03/the_most_import.html) even if production hasn't actually peaked.

In summary, we are a prisoner of our own dilemma:

1. Right now, [we have no economically scalable](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_83#anchor_83) [alternatives](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_83#anchor_83)[to oil.](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_84#anchor_84)  (Emphasis placed on economic scalability, not technical viability.)



2. We won't get motivated to aggressively pursue economically scalable alternatives until oil prices are sky high;



3. Once oil prices are sky-high, our economy will be shattered, and we won't be able to finance an aggressive switch-over to whatever modest alternatives are available to us.



4. An aggressive conservation program will bring down the price of oil, thereby removing the incentive to pursue alternatives until it is too late.



5. The raw materials (silicon, copper, platinum) necessary for many sources of alternative energy are already in short supply. Any attempt to secure enough of these resources to power a large scale transition to alternative energies is likely to be met with fierce [competition, if not outright warfare, with China](http://news.ft.com/cms/s/454b9d94-7fbf-11d9-8ceb-00000e2511c8.html).



**"What About All the Various Alternatives**

**to Oil? Can't We Find Replacements?"**

Many politicians and economists insist that there are alternatives to oil and that we can "invent our way out of this."

[Physicists](http://www.physicstoday.org/vol-57/iss-7/p47.html) and [geologists](http://www.hubbertpeak.com/youngquist/altenergy.htm) tell us [an entirely different story](http://www.lifeaftertheoilcrash.net/PageTwo.html).

The politicians and economists are selling us [30-year old economic and political fantasies,](http://www.energybulletin.net/1181.html) while the physicists and geologists are telling us scientific and mathematical truth. Rather than accept the [high-tech myths](http://www.fromthewilderness.com/free/ww3/081803_hydrogen_answers.html) proposed by the politicians and economists, its time for you to [start asking critical questions about the so called "alternatives to oil"](http://www.fromthewilderness.com/free/ww3/052703_9_questions.html) and [facing some hard truths about energy.](http://www.energybulletin.net/newswire.php?id=624)

While there are many technologically viable alternatives to oil, there are none (or combination thereof) that can supply us with anywhere near the amount of net-energy required by our modern monetary system and industrial infrastructure.

People tend to think of alternatives to oil as somehow independent from oil. In reality, the alternatives to oil are more accurately described as "derivatives of oil." It takes massive amounts of oil and other scarce resources to locate and mine the raw materials (silver, copper, platinum, uranium, etc.) necessary to build solar panels, windmills, and nuclear power plants. It takes more oil to construct these alternatives and even more oil to distribute them, maintain them, and adapt current infrastructure to run on them.

Each of the alternatives is besieged by numerous fundamental physical shortcomings that have, thus far, received little attention:

**"What About Green Alternatives like**

**Solar, Wind, Wave, and Geothermal?"**

Solar and wind power suffer from four fundamental physical shortcomings that prevent them from ever being able to replace more than a tiny fraction of the energy we get from oil: lack of energy density, inappropriateness as transportation fuels, energy intermittency, and inability to scale.

**I. Lack of Energy Density/Inability to Scale:**

Few people realize how much energy is concentrated in even a small amount of oil or gas. A barrel of oil contains the energy-equivalent of [almost 25,000 hours of human labor.](http://www.lifeaftertheoilcrash.net/Research.html) A single gallon of gasoline contains [the energy-equivalent of 500 hours of human labor.](http://www.lifeaftertheoilcrash.net/Research.html) Most people are stunned to find this out, [even after confirming the accuracy of the numbers for themselves](http://www.lifeaftertheoilcrash.net/Research.html), but it makes sense when you think about it. It only takes one gallon of gasoline to propel a three ton SUV 10 miles in 10 minutes. How long would it take you to push a three ton SUV 10 miles?

Most people drastically overestimate the density and scalability of solar, wind, and other renewables. Some examples should help illustrate the limited capacity of these energy sources as compared to fossil fuels:



1. [According to author Paul Driessen](http://canadafreepress.com/2005/driessen012905.htm), it would take all of California's [13,000 wind turbines](http://canadafreepress.com/2005/driessen012905.htm) to generate as much electricity as a single 555-megawatt natural gas fired power plant.



2. According to the European Wind Energy Association's [Wind Force 12 report issued in May of 2004](http://www.ewea.org/documents/WF12-2004_eng.pdf), the United States has 6,361 megawatts of installed wind energy.

This means that if every wind turbine in the United States was spinning at peak capacity, all at the exact same time, their combined electrical output would equal that of six coal fired power plants. Since wind turbines typically operate at about 30% of their rated capacity, the combined output of every wind turbine in the US is actually equal to less than two coal fired power plants. To replace the amount of energy produced by a single offshore drilling platform that pumps only 12,000 barrels of oil per day we would need to build [706 Vesta"V82" wind turbines.](http://www.lifeaftertheoilcrash.net/Research.html)

The numbers for solar power are ever poorer. For instance, on 191 of his book [*The End of Oil: On the Edge of a*](http://www.atimes.com/atimes/Global_Economy/GA15Dj01.html)[*Perilous New World,*](http://www.atimes.com/atimes/Global_Economy/GA15Dj01.html)author Paul Roberts writes:



*" . . . if you add up all the solar photovoltaic cells now running worldwide (2004), the combined output - around 2,000 megawatts - barely rivals the output of two coal-fired power plants."*



Robert's calculation assumes the solar cells are operating at 100% of their capacity. In the real world, the average solar cell operates at about 20% of its rated capacity. This means that the combined output of all the solar cells in the world is equal to less than 40% of the output of a single coal fired power plant.



[According to ExxonMobil,](http://www.energybulletin.net/3624.html) the amount of energy distributed by a single gas station in a single day is equivalent to the amount of energy that would be produced by four Manhattan sized city blocks of solar equipment.

With 17,000 gas stations just in the United States, you don't need to be a mathematician to realize that solar power is incapable of meeting our urgent need for a new energy source that - like oil - is dense, affordable, and transportable.



[According to Dr. David Goodstien](http://msnbc.msn.com/id/4287300/), professor of physics at Cal Tech University, it would take close to 220,000 square kilometers of solar panels to power the global economy via solar power. This may sound like a marginally manageable number until you realize that the total acreage covered by solar panels in the entire world right now is a paltry 10 square kilometers.

According a recent MSNBC article entitled, ["SolarPower City Offers 20 Years of Lessons:](http://www.energybulletin.net/648.html)"



*By industry estimates, up to 20,000 solar electricity units and 100,000 heaters have been installed in the United States — diminutive numbers compared to the country’s 70 million single-family houses.*



This means that even if the number of American households equipped with solar electricity is increased **by a factor of 100**, less than two million American households will be equipped with solar electric systems. Assuming we are even capable of scaling the use of household solar electric systems by that huge a factor, we must ask ourselves two questions:

A. What do the other 68 million households do?



B. What about the millions of companies, nations, and industries around the world on which we in the industrialized world are dependent?



C. Since it is oil, not electricity that is our primarytransportation fuel (providing the base for over 90% of all transportation fuel) what good will this do us when it comes to keeping our global network of cars, trucks, airplanes, and boats going?



**II. Energy Intermittency:**



Unlike an oil pump, which can pump all day and all night under most weather conditions, or coal fired/natural gas fired power plants which can also operate 24/7, wind turbines and solar cells

only produce energy at certain times or under certain conditions. This may not be that big of a deal if you simply want to power your household appliances or a small scale, decentralized economy, but if you want to run an industrial economy that relies on airports, airplanes, 18-wheel trucks, millions of miles of highways, huge skyscrapers, 24/7 availability of fuel, etc., an intermittent source of energy will not suffice.

Consequently, in order to produce energy during times when the wind is no blowing or the sun is not shining, large scale solar/wind farms must be backed up by things like . . .  oil pumps or natural gas/coal fired powered plants.

**III. Inappropriateness as Transportation Fuels:**

Approximately 2/3 of our oil supply is used for transportation. Over ninety percent of our transportation fuel comes from petroleum fuels (gasoline, diesel, and jet-fuel). Thus, even if you ignore the challenges catalogued above, there is still the problem of how to use the electricity generated by the solar cells or wind turbines to run fleets of food delivery trucks, ocean liners, airplanes, etc.

Unfortunately, solar and wind cannot be used as industrial-scale transportation fuels unless they are used t[o crack hydrogen from water via electrolysis.](http://www.fromthewilderness.com/free/ww3/052703_9_questions.html) Hydrogen produced via electrolysis is great for small scale, village level, and/or experimental projects. However, in order to power a significant portion of the global industrial economy on it, we would need the following:

1. [Hundreds of trillions of dollars](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_135#anchor_135) to construct fleets of hydrogen powered cars, trucks, boats, and airplanes;



2. Hundreds, if not thousands, of oil-powered factories to accomplish number one;



3. The construction of a ridiculously expensive global [refueling and maintenance network](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_136#anchor_136) for number one;



4. [Mind-bogglingly huge amounts of platinum,](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_137#anchor_137) silver, and copper, and other raw materials that have already entered [permanent states of scarcity](http://www.rff.org/rff/rff_press/bookdetail.cfm?outputID=7369)



**IV. Painfully Low Starting Point:**

Finally, most people new to this issue drastically overestimate the amount of energy we will be able to realistically derive from these sources inside of the next 5-25 years. If the examples in [Part I](http://www.lifeaftertheoilcrash.net/SecondPage.html#anchor_152#anchor_152) didn't convince you that solar and wind are incapable of replacing oil and gas on more than a small scale/supplemental level, consider the following, easily verifiable facts:

In 2003, [the US consumed 98 quadrillion BTU's of energy.](http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/table1.html) A whopping [171 quadrillion came from solar and wind combined.](http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/table1.html) Do the math (.171/98) and you will see that a total of less then one-sixth of one percent of our energy appetite was satisfied with solar and wind combined. Thus, just to derive a paltry 2-3 percent of our current energy needs from solar and wind, we would need to double the percentage of our energy supply derived from solar/wind, then double it again, then double it again, and then double it yet again.

Unfortunately, the odds of us upscaling our use of solar and wind to the point where they provide even just 2-3 percent of our total energy supply are about the same as the odds of Michael Moore and Dick Cheney teaming up to win a 5K relay race. Despite jaw-dropping levels of growth in these industries, coupled with practically miraculous drops in price per kilowatt hour (95% drop in two decades), along with increased interest from the public in alternative energies, the percentage of our total energy supply [derived from solar and wind](http://www.energybulletin.net/3624.html) i[s projected to grow by only 10 percent per year.](http://www.energybulletin.net/3624.html)

Since we are starting with only one-sixth of one percent of our energy coming from solar and wind, a growth rate of 10 percent per year isn't going to do much to soften a national economic meltdown. Twenty-five years from now, we will be lucky if solar and wind account for [one percent of our total energy supply.](http://www.thisislondon.co.uk/news/business/articles/timid398113?source=)

While other alternative energy sources, such as wave and geothermal power, are fantastic sources of energy in and of themselves, they are incapable of replacing more than a fraction of our petroleum usage for the same reasons as solar and wind: they are nowhere near as energy dense  as petroleum and they are inappropriate as transportation fuels. In addition, they are also limited by geography - wave power is only technically viable in coastal locations. Only a handful of nations, such as Iceland, have access to enough geothermal power to make up for much of their petroleum consumption.

This is by no means reason not to invest in these alternatives. We simply have to be realistic about what they can and can't do. On a household or village scale, they are certainly worthy investments. But to hope/expect they are going to power more than a small fraction of our forty-five trillion dollar per year (and growing) global industrial economy is woefully unrealistic.

On a related note, even if solar, wind, and other green alternatives could replace oil, we still wouldn't escape the evil clutches of so called "Big Oil." The biggest maker of solar panels is British Petroleum with Shell not too far behind. Similarly, the second biggest maker of wind turbines is General Electric, [who obtained their wind turbine business from that stalwart of corporate social responsibility, Enron](http://www.uswindforce.com/default.asp?pg=news&pg2=17). As these examples illustrate, the notion that "Big Oil is scared of the immerging renewable energy market!" is silly. "Big Oil" already owns the renewable energy market.

**"What About the Hydrogen Economy?"**

Hydrogen isn'[t the answer either.](http://www.popsci.com/popsci/generaltech/article/0,20967,927469-3,00.html) As of 2003, the average hydrogen fuel cell costs close to $1,000,000. Unlike other alternatives, [hydrogen fuel cells have shown little sign of coming down in price](http://www.energybulletin.net/2401.html?ENERGYBULL=3f111b51386b890bdf16abbd3c38e150).

Even if the cost is lowered by 98%, placing the price at $20,000 per cell,  hydrogen or hydrogen fuel cells will never power more than a handful of cars due to the following reasons:

**I.  Worldwide Shortage of Platinum**

A single hydrogen fuel cell requires 20 grams of platinum. If the cells are mass-produced, it may be possible to get the platinum requirement down to 10 grams per cell. The world has 7.7 billion grams of proven platinum reserves. There are approximately 700 million internal combustion engines on the road. Ten grams of platinum per fuel cell x 700 million fuel cells = 7 billion grams of platinum, or practically every gram of platinum in the earth.

Unfortunately, [as a recent article in *EV World* points out, the average](http://groups.yahoo.com/group/energyresources/message/52194) [fuel cell lasts only 200 hours](http://groups.yahoo.com/group/energyresources/message/52194). Two hundred hours translates into just 12,000 miles, or about one year’s worth of driving at 60 miles per hour. This means all 700 million fuel cells (with 10 grams of platinum in each one) would have to be replaced every single year.

Thus replacing the 700 million oil-powered vehicles on the road with fuel cell-powered vehicles, for only 1 year, would require us to mine every single ounce of platinum currently in the earth and divert all of it for fuel cell construction only.

Doing so is absolutely impossible as platinum is astonishingly energy intensive (expensive) to mine, is already in short supply, and is indispensable to thousands of crucial industrial processes.

Even if this wasn't the case, the fuel cell solution would last less than one year. As with oil, platinum production would peak long before the supply is exhausted.

What will we do, when less than 6 months into the "Hydrogen Economy," we hit Peak Platinum? Perhaps Michael Moore will produce a movie documenting the connection between the President’s family and foreign platinum companies while following the plight of a mother whose son died in the latest platinum war?

If the [hydrogen economy was anything other than a total red herring,](http://www.fromthewilderness.com/free/ww3/081803_hydrogen_answers.html) such issues would eventually arise as 80 percent of the world’s proven [platinum reserves are located in that bastion of geopolitical stability, South Africa](http://www.southafrica.info/doing_business/economy/infrastructure/energy-fuelcell.htm).

Even if an economically affordable and scalable alternative to platinum is immediately located and mined in absolutely massive quantities, the ability of hydrogen to replace even a small portion of our oil consumption is still handicapped by several fundamental limitations. NASA, [which fuels the space shuttle with hydrogen](http://www.nrel.gov/clean_energy/hydrogen.html), may be able to afford to get around the following challenges, but there is a big difference between launching the space shuttle and running a global economy with a voracious and constantly growing appetite for energy:

**II.  Inability to Store Massive Quantities at Low Cost:**

Hydrogen is the smallest element known to man. This makes it virtually impossible to store in the massive quantities and to transport across the incredibly long distances at the low costs required by our vast global transportation networks. In her February 2005 article 1.entitled "[Hydrogen Economy: Energy and Economic Black hole](http://www.energypulse.net/centers/article/article_display.cfm?a_id=940)," Alice Friedemann writes:

*Hydrogen is the Houdini of elements. As soon as you’ve gotten it into a container, it wants to get out, and since it’s the lightest of all gases, it takes a lot of effort to keep it from escaping. Storage devices need a complex set of seals, gaskets, and valves. Liquid hydrogen tanks for vehicles boil off at 3-4% per day.*



**III. Massive Cost of Hydrogen Infrastructure:**

A hydrogen economy would require massive retrofitting of our entire global transportation and fuel distribution networks. At a million dollars per car, it would cost 350,000,000,000,000 to replace half of our current automotive fleet (700 million cars) with hydrogen fuel cell powered cars.

That doesn't even account for replacing a significant fraction of our oil-powered airplanes or boats with fuel cells.

The numbers don't get any prettier if we scrap the fuel cells and go with straight hydrogen. According to a recent article in *Nature,* entitled ["Hydrogen Economy Looks Out of Reach:"](http://www.energybulletin.net/2437.html)

*Converting every vehicle in the United States to hydrogen power would demand so much electricity that the country would need enough wind turbines to cover half of California or 1,000 extra nuclear power stations.*



Unfortunately, even if we managed to get this ridiculously high number of wind turbines or nuclear power plants built, we would still need to build the hydrogen powered cars, in addition to a hydrogen distribution network that would be mind-bogglingly expensive. The construction of a hydrogen pipeline network comparable to our current natural gas pipeline network, for instance, [would cost 200 trillion dollars.](http://www.energybulletin.net/4541.html) That's twenty times the size of the US GDP in the year 2002.

How such capital intensive endeavors will be completed in the midst of massive energy shortages is anybody's guess;

**IV. Hydrogen's "Energy Sink" Factor:**

As mentioned previously, solar, wind, or nuclear energy can be used to "crack" hydrogen from water via a process known as electrolysis. The electrolysis process is a simple one, but unfortunately it [consumes more energy than it produces](http://www.fromthewilderness.com/free/ww3/052703_9_questions.html). This has nothing to do with the costs and everything to do with the immutable laws of thermodynamics. Again, Alice Friedemann weighs in:

*The laws of physics mean the hydrogen economy will always be an energy sink. Hydrogen’s properties require you to spend more energy to do the following than you get out of it later: overcome waters’ hydrogen-oxygen bond, to move heavy cars, to prevent leaks and brittle metals, to transport hydrogen to the destination. It doesn’t matter if all of the problems are solved, or how much money is spent. You will use more energy to create, store, and transport hydrogen than you will ever get out of it.*



Even if these problems are ignored or assumed away, you are still faced with jaw-dropping costs of a renewable derived hydrogen economy. In addition to the [200 trillion dollar pipeline network](http://www.energybulletin.net/4541.html) that would be necessary to move the hydrogen around, we would need to deploy about [40 trillion dollars of solar panels.](http://www.therant.info/archive/000519.html) If the hydrogen was derived from wind (which is usually more efficient than solar) the cost might be lowered considerably, but that's not saying much when you are dealing with numbers as large as $40 trillion.

Even if the costs of these projects are cut in half, that makes little difference over the course of a generation, as our economy doubles in size approximately every 25-30  years. In other words, by the time we will have made any real headway in constructing a "hydrogen economy", the problem will have already compounded itself.

If the "hydrogen economy" is such a hoax, why then do we hear so much about it?  The answer is simple when you ["follow the money"](http://www.washingtonpost.com/wp-dyn/articles/A38168-2004Nov9.html) and ask ["who benefits?"](http://news.bbc.co.uk/1/hi/business/2880975.stm)  (Hint: GM, Shell, et al.)



**"What About Nuclear Energy?"**

Nuclear energy requires uranium - of which the US has enough to power **existing reactors** for 25-40 years. As with oil, the extraction of uranium follows a bell-curve. If a large scale nuclear program was undertaken the supply of US domestically derived uranium would likely peak in under 15 years.

Even if such a program is undertaken, there is no guarantee the energy generated from nuclear sources would be any cheaper than energy generated from fossil fuels. Attempts by China and India to scale up their use of nuclear energy, for instance, [have already caused uranium prices to skyrocket.](http://www.iht.com/bin/print_ipub.php?file=/articles/2005/01/04/bloomberg/sxnuke.html)

Uranium supply issues aside, a large scale switch over to nuclear power is not really an option for an economy that requires as much energy as ours does. [It would take 10,000 of the largest nuclear power plants to produce the energy we get from fossil fuels.](http://www.energybulletin.net/2311.html) At $3-5 billion per plant, it's not  long before we're talking about "real money" - especially since the $3-5 billion doesn't even include the cost of decommissioning old reactors, converting the nuclear generated energy into a fuel source appropriate for cars, boats, trucks, airplanes, and the not-so-minor problem of handling nuclear waste.

Speaking of nuclear waste, [it is a question nobody has quite answered yet.](http://www.commondreams.org/views05/0415-23.htm) This is especially the case in countries such as China and Russia, where safety protocols are unlikely to be strictly adhered to if the surrounding economy is in the midst of a desperate energy shortage. It may also be true in the case of the US because, as James Kunstler points out in his recent book, [*The Long Emergency:*](http://www.lifeaftertheoilcrash.net/TheLongEmergency.html)

*. . . reactors may be  beyond the organizational  means of the society we are apt to become in the future, mainly one with much weaker central authority, less police power, and reduced financial resources . . .  in the absence of that (cheap) oil we can't assume the complex social organization needed to run nuclear energy safely.*



Assuming we find answers to all questions regarding the cost and safety of nuclear power, we are still left with the most vexing question of all:

*Where are we going to get the massive amounts of oil necessary to build hundreds, if not thousands, of these reactors, especially since they take 10 or so years to build and we won't get motivated to build them until after oil supplies have reached a point of permanent scarcity?*



Remember, once we get the reactors built, we still have the not-so-inexpensive task of retrofitting a significant portion of the following to run on nuclear-derived electricity:

1. 700 million oil-powered cars traversing the world's roads;



2. Millions of oil-powered airplanes crisscrossing the world's skies;



3. Millions of oil-powered boats circumnavigating the world's oceans.



Scientists have made some [progress in regards to nuclear fusion](http://www.ens-newswire.com/ens/apr2005/2005-04-28-03.asp), but the road from success in tabletop laboratory experiments to use as an industrial scale replacement for oil is an extremely long one that, even in the most favorable of circumstances, will take decades to traverse.

Again, as with other alternatives to petroleum, all forms of nuclear energy should certainly "be on the table." But if you're hoping that it's going to save you from the ramifications of Peak Oil, you are sorely mistaken.

**"What About Biofuels Such**

**as Ethanol and Biodiesel?"**

Biofuels such as biodiesel, ethanol, methanol etc. are great, but only in small doses. Biofuels are all grown with massive fossil fuel inputs (pesticides and fertilizers) and suffer from horribly low, sometimes negative, EROEIs. [The production of ethanol, for instance, requires six units of energy to produce just one.](http://www.energybulletin.net/5062.html) That means it consumes more energy than it produces and thus will only serve to compound our energy deficit.

In addition, there is the problem of where to grow the stuff, as we are rapidly  r[unning out of arable land on which to grow food](http://www.dieoff.com/page40.htm), let alone fuel. This is no small problem as the amount of land it takes to grow even a small amount of biofuel is quite staggering. As journalist Lee Dye points out in a July 2004 article entitled ["Old Policies Make Shift From Foreign Oil Tough:"](http://abcnews.go.com/Technology/story?id=99487&page=4)

*. . . relying on corn for our future energy needs would devastate the nation's food production. It takes 11 acres to grow enough corn to fuel one automobile with ethanol for 10,000 miles, or about a year's driving, Pimentel says. That's the amount of land needed to feed seven persons for the same period of time.*



*And if we decided to power all of our automobiles with ethanol, we would need to cover 97 percent of our land with corn, he adds.*



[Biodiesel is considerably better than ethan](http://www.biofuels.coop/archive/eroei.php)ol, but with an EROEI of three, it still doesn't compare to oil, which has had an EROEI of about 30

While any significant attempt to switch to biofuels will work out great for giant agribusiness companies (political campaign contributors) such as Archer Daniels Midland, ConAgra, and Monsanto, it won't do much to solve a permanent energy crisis for you.

The ghoulish reality is that if we wanted to replace even a small part of our oil supply with farm grown biofuels, we would need to turn most of Africa into a giant biofuel farm.

Obviously many Africans - who are already starving - would not take kindly to us appropriating the land they use to grow their food to grow our fuel. As author George Monbiot points out, [such an endeavor would be a](http://www.energybulletin.net/3288.html) [humanitarian disaster.](http://www.energybulletin.net/3288.html) Any attempt to turn Africa into a large-scale biofuel farm will likely result in a continental-sized insurgency that would make the current disaster in Iraq look like a cakewalk.

Assuming the conversion of Africa into a large scale biofuel farm is even economically, technically, and militarily viable, and putting the humanitarian concerns of such a project aside for a moment, we would simply be replacing our "dependence on foreign oil" with "dependence on foreign grown biodiesel."

Some folks are doing research into alternatives to soybeans such as biodiesel [producing pools of algae.](http://www.unh.edu/p2/biodiesel/article_alge.html) As with every other project that promises to "replace all petroleum fuels," the project has yet to produce a single drop of commercially available fuel. This hasn't prevented many of its most vocal proponents from insisting that algae grown biodiesel will solve our energy problems.

The fact that so many people in the green/environmental movement refuse to acknowledge the fundamental inability of fuels like biodiesel to replace more than a tiny portion of our petroleum consumption underscores why a complete collapse of the petroleum powered world may now be unavoidable. As Dr. Ted Trainer explains in a recent article on [the thermodynamic limitations of biomass fuels:](http://www.energybulletin.net/3389.html)

*This is why I do not believe consumer-capitalist society can save itself. Not even its "intellectual" classes or green leadership give any sign that this society has the wit or the will to even think about the basic situation we are in. As the above figures make clear, the situation cannot be solved without huge reduction in the volume of production and consumption going on.*



The current craze surrounding biodiesel is a good example of what Dr. Trainer is talking about. While folks who have converted their personal vehicles to run on vegetable oil should certainly be given credit for their noble attempts at reducing our reliance on petroleum, the long-term viability of their efforts is questionable at best. Once [our system of food production collapses due to the effects of Peak Oi](http://www.energybulletin.net/5045.html)l, vegetable oil will likely become far too precious/expensive a commodity to be burned as transportation fuel for anybody but the super-rich. As James Kunstler points out in [an April 2005 update to his blog "Cluster Fuck Nation",](http://www.energybulletin.net/5261.html) many biodiesel enthusiasts are dangerously clueless as to this reality:

*Over in Vermont last week, I ran into a gang of biodiesel enthusiasts. They were earnest, forward-looking guys who would like to do some good for their country. But their expectations struck me as fairly crazy, and in a way typical of the bad thinking at all levels of our society these days.*



*For instance, I asked if it had ever occurred to them that biodiesel crops would have to compete for farmland that would be needed otherwise to grow feed crops for working animals. No, it hadn't. (And it seemed like a far-out suggestion to them.) Their expectation seemed to be that the future would run a lot like the present, that bio-diesel was just another ingenious, innovative, high-tech module that we can "drop into" our existing system in place of the previous, obsolete module of regular oil.*



Kunstler goes on to explain that when policies or living/working arrangements are set up around such unexamined expectations, the result is usually a dangerous deepening of our reliance on cheap energy and "easy motoring."

**"What About Using Coal**

**to Make Synthetic Oil?"**

Coal can be used to make synthetic oil via a process known as gasification. Unfortunately, synthetic oil will be unable to do all that much to soften the coming energy crash for the following reasons:

**I. Insufficiency of Supply/"Peak Coal":**

The coal supply is not as great as many assume.  According to a [July 2004 article published by the American Institute of Physics:](http://www.physicstoday.org/vol-57/iss-7/p47.html)

*If demand remains frozen at the current rate of consumption, the coal reserve will indeed last roughly 250 years. That prediction assumes equal use of all grades of coal, from anthracite to lignite. Population growth alone reduces the calculated lifetime to some 90−120 years. Any new uses of coal would further reduce the supply. . . .The use of coal for conversion to other fuels would quickly reduce the lifetime of the US coal base to less than a human lifespan.*



Even a 50-75 year supply of coal is not as much as it sounds because coal production, like oil production, will peak long before the total supply is exhausted. Were we to liquefy a large portion of our coal endowment in order to produce synthetic oil, [coal production would likely peak within 2 decades.](http://www.fromthewilderness.com/free/ww3/052504_coal_peak.html)

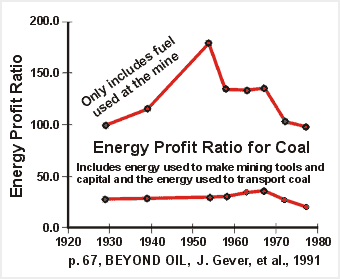
**II. Falling "Energy Profit Ratio":**

As John Gever explains in his book, *Beyond Oil: The Threat to Food and Fuel in Coming Decades*, the production of coal will be in energy-loser within a few decades:

*. . . the energy profit ratio for coal slips to 20 in 1977, comparable to that of domestic petroleum. While an energy profit ratio of 20 means that only 5 percent of coal's gross energy is needed to obtain it, the sharp decline since 1967 is alarming. If it continues to drop at this rate, the energy profit ratio of coal will slide to 0.5 by 2040.*



In other words, with an EPR of 5, it will take twice as much energy to produce the coal than the coal actually contains. It will thus be of no use to us as an energy source.



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