KAYNE ANDERSON RUDNICK

INVESTMENT MANAGEMENT

AN IN-DEPTH ANALYSIS

- SUPPLY AND DEMAND
- NATURAL GAS
- ALTERNATIVE ENERGY
- ENERGY AS INVESTMENTS

ENERGY INDEPENDENCE

IDEAL VS. REALITY

OCTOBER 2009

CER • E • BRATE

To use the mind: think

Executive Summary

Energy independence is an idea that works well during periods of crisis and high energy prices, such as the oil embargo in the 1970s, the fear of 9/11, and soaring oil prices near $150 a barrel in 2008. This paper examines what it means to be energy independent, the reality of achieving this long sought after objective in an increasingly global world, the meaning of "green" and the potential of renewable energy sources, and how quality investors can invest in both traditional and alternative energy companies.

Supply and Demand

The supply and demand equation is no longer driven by just developed countries. Global growth dynamics have added the developing nations to the energy consumption equation. With few significant domestic oil discoveries over the past decade and the majority of the world's proven oil reserves residing in the hands of countries "unfriendly" to the U.S., the issue of energy security has become even more important. However, what will be the driver of this issue over the longer term as past oil embargos were unable to keep the issue alive long enough to find a proper resolution? Demand for energy is growing with the development of the BRIC nations (Brazil, Russia, India, and China) and this will increasingly become the global challenge if one subscribes to peak oil theory.

Natural Gas

One possible near-term solution to oil is natural gas. The U.S. is one of the top countries in terms of global natural-gas production. We also have storage capacity for natural gas while there is little means currently for oil storage. Technology again plays into the supply and demand equation as it has increased short-term natural-gas supplies. But, just as we experienced with oil, near-term supplies do not guarantee long-term solutions. What happens when natural-gas discoveries start to dissipate? Further, natural gas is not a great substitute for oil in transportation vehicles due to infrastructure limitations.

Alternative Energy

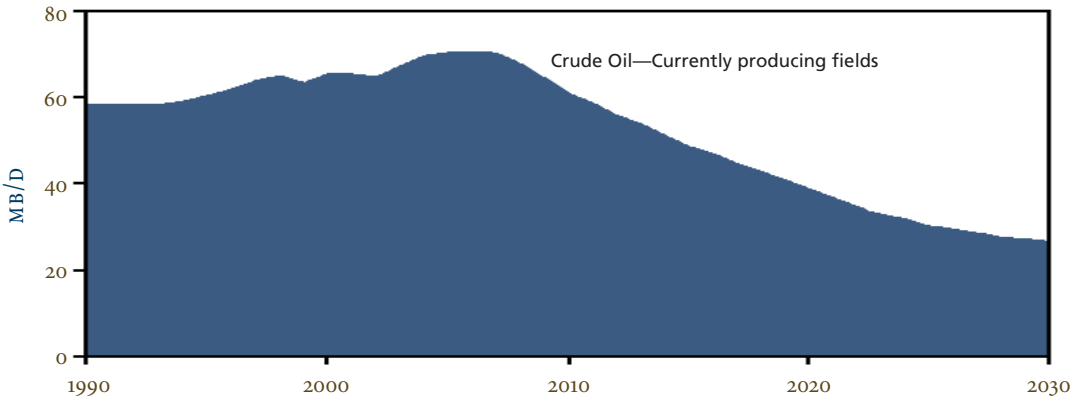
Ultimately, to be truly energy independent, the U.S. will need to find viable alternative energy sources. Alternative energy is a minor portion of current power generation in the U.S. The majority of investments are being made into wind, solar, and nuclear. Each has its merits and drawbacks. It is likely that a combination of all would be needed to fully substitute for fossil fuels. Being fully committed to alternative energy, however, requires that American taxpayers be fully committed in both mind and pocketbook.

Energy as Investments

Given the changes in the energy industry today, a segmented approach to the sector is needed that examines both traditional energy and new alternative energy companies. While finding investments in high-quality traditional energy companies can be challenging, at Kayne Anderson Rudnick we look for companies that offer proprietary products, technology, or return on capital and distinguish themselves from other commodity-oriented business models. Similarly, investments in quality alternative energy companies can be found in other sectors, such as industrial and technology companies, that will be at the forefront of research and development.

WORLD OIL PRODUCTION BY SOURCE

2008



Data is obtained from World Energy Outlook 2008 and is assumed to be reliable.

For decades, we have heard President after President call for energy independence in this country, but for decades, we have fallen short. Well it's time to call on ourselves. We shouldn't wait for the next time gas hits $3 a gallon—and we shouldn't accept any more headlines that talk about a dying auto industry or a terrorist plot to use oil as a weapon against America. We should act—and we should act now.
– Barack Obama on the campaign trail

INTRODUCTION

Energy has been a key source of human development throughout history. Beginning with prehistoric man and the discovery of fire, man's standard of living has been elevated by our ability and desire to harness energy. While Benjamin Franklin discovered electricity, Thomas Edison invented the light bulb replacing gas and oil lamps. Combustible engines led to the automobile and replaced the horse and wagon. Airplanes eventually replaced steamships and railroads as the preferred mode of long-distance travel. All of these important discoveries have forever changed our way of life.

Nearly every major energy innovation of the last century was built upon cheap energy prices. However, with the global population explosion, the next major energy innovation will come at the expense of higher energy costs. This will be particularly true as citizens of developed nations grow more concerned about the environmental impact of our energy choices.

Ever since the energy crisis in the late 1970s, the United States has strived to wean itself off of foreign energy dependence. Based on the oil price shock last year, however, it does not seem as if much progress has been made over the past four decades. Or has it? Just how much better off are we today than during previous oil shocks? Can we truly become energy independent and, if so, how long will it take?

Energy Independence is a two-word phrase that trumps all other issues in that a solution could address many of America's biggest fears—the Iraq War, peak oil, global warming, and terrorism. These are some of the topics, questions, potential answers, and investment opportunities that we will explore.

Oil Supplies

Energy independence, while an important political agenda item today, is not a new concept. Beginning in 1973 with the Arab oil embargo, motorists were forced to endure long lines at the gas pump despite government mandated even and odd license plate number days. Citizens and government officials alike ballyhooed for energy independence. The rally cry became that America was going to change its ways and not be beholden to foreign entities for its energy. This was a new wave of independence much like the Boston Tea Party. Indeed, the embargo exposed America's growing dependence on foreign entities for its oil and gave the American people their first warning of the price they would pay for continued dependence on imported oil.

During this same period, oil was discovered at Prudhoe Bay on the North Slope of Alaska, which offered the U.S. a significant new source of competitive domestic oil supply on a world-class scale. Initially, progress on the development of the North Slope was stalled by the lack of agreement on a pipeline destination. In a dramatic vote in the Senate (following approval of the measure in the House of Representatives), Senators reached a deadlock on a vote to clear the way for the project. Vice President Spiro Agnew cast the deciding vote to approve the Alaska Pipeline Authorization Act. Construction of the Alaska Pipeline began in the winter of 1973 and was completed by the summer of 1977. Over 28,000 people worked on the project, which cost $7.7 billion, way beyond the industry's $900 million estimate in 1970.

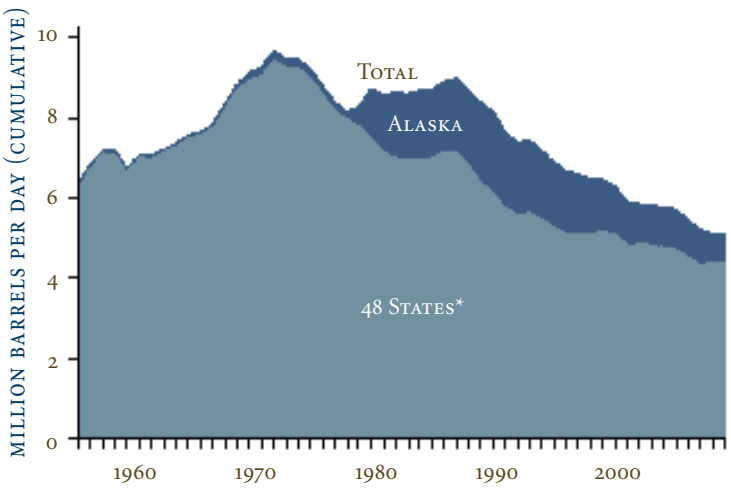
Despite the high costs, hostile climate, untested technology, unsettled land claim issues, and major environmental challenges, supply from Prudhoe Bay came online in 1977, offsetting most of the supply previously produced by the "Lower 48." With the increase in supply from Alaska, oil prices declined and Americans once again enjoyed the cheap energy. This oil supply became especially important in 1979 as the fear of oil dependence once again was brought to the forefront as the Iranian Revolution cut off key oil supplies to the Western world.

There would be two more price jumps in the early 1990s with the Iraq invasion of Kuwait and in 1998 with the Asian Economic Crisis, but each time the price of oil did not stay high for long. Many believed that with new found oil supplies and through renewed conservation efforts, it would be unlikely to see a repeat of the 1970s oil crisis. Additionally, the accumulated effect of increased automobile fuel efficiency combined with increased global oil production and conservation efforts had reversed OPEC's (Organization of the Petroleum Exporting Counties) influence and threats. The urgency of energy independence faded to the background for most Americans.

By the mid 1980s, the Alaskan North Slope was supplying about a quarter of U.S. oil production. However, the current realities of North Slope development have been falling increasingly short of demand. North Slope production peaked in 1988; by 1998, it had fallen nearly 40%. This decline is widely attributed to the depletion of the major initial discoveries at Prudhoe Bay.

CRUDE OIL PRODUCTION BY GEOGRAPHIC LOCATION

1954–2007



*United States excluding Alaska and Hawaii.
Data is obtained from Energy Information Administration / Annual Energy Review 2007 and is assumed to be reliable.

Since the opening of Prudhoe Bay, there have been few new significant oil discoveries in the U.S. There have been a few small discoveries onshore and in shallow waters, but these have not been enough to offset the increase in global demand. More recently, there have been a few larger discoveries, particularly in deep water (both in the Gulf of Mexico and off-shore Brazil) leading to the conclusion that deepwater drilling could be a short-term solution for oil. But, because it is economically unproven and the recent oil discoveries rest in the hands of national oil companies (NOCs), political ramifications exist.

Some would argue that the lack of new discoveries or oil opportunities we have experienced is because the world may have already seen peak oil supply, also known as the Hubbert Peak Theory. M. King Hubbert is best known for his studies on the capacities of oil fields and natural-gas reserves. He predicted that, for any given geographical area from an individual oil field, to the planet as a whole, the rate of petroleum production of the reserve over time would resemble a bell curve. Based on his theory, he presented a paper at the 1956 meeting of the American Petroleum Institute that predicted that overall petroleum production would peak in the United States between the late 1960s and the early 1970s. Initially, his prediction received much criticism, for the most part because many other predictions of oil capacity had been made over the preceding half century, but these had been based purely on reserve and production data rather than past discovery trends, and had proven false. However, Hubbert's prediction proved correct in 1970.

In 1975, with the United States still suffering from high petroleum prices, the National Academy of Sciences confirmed their acceptance of Hubbert's calculations on oil and natural-gas depletion, and acknowledged that their earlier, more optimistic estimates had been incorrect.

Additionally, in 1974, Hubbert projected that global oil production would peak in 1995 "if current trends continue." Optimistic estimations of peak production forecast the global decline will begin by 2020 or later, and assume major investments in alternatives will occur before a crisis without requiring major changes in the lifestyle of heavy oil-consuming nations. These models show the price of oil at first escalating and then retreating as other types of fuel and energy sources are used. Pessimistic predictions of future oil production operate on the thesis that either the peak has already occurred or we are on the cusp of the peak.

Whether one believes in peak oil theory or not, the fact still remains that today over 80% of world petroleum reserves are state owned—meaning they are controlled by countries that have the power to manipulate supply and price with impunity. This fact goes directly to the heart of energy security. As evidenced by the table, List of Countries by Proven Oil Reserves, the U.S. is not in the top 10 and only has 1.5% of the world's proven oil reserves, but we consume multiple amounts of the domestically available proven oil reserves. The table also highlights the number of countries "unfriendly" to the U.S. that control the world's oil supplies.

List of Countries By Proven Oil Reserves

COUNTRY	RESERVES (BBL)	SHARE
Saudi Arabia	266,800,000,000	19.66%
Canada	178,600,000,000	13.16%
Iran	138,400,000,000	10.20%
Iraq	115,000,000,000	8.47%
Kuwait	104,000,000,000	7.66%
United Arab Emirates	97,800,000,000	7.21%
Venezuela	87,040,000,000	6.41%
Russia	79,000,000,000	5.82%
Libya	41,460,000,000	3.05%
Nigeria	36,220,000,000	2.67%
Kazakhstan	30,000,000,000	2.21%
United States	20,970,000,000	1.54%
Republic of China	16,000,000,000	1.18%
Qatar	15,210,000,000	1.12%
Algeria	12,200,000,000	0.90%
Brazil	12,180,000,000	0.90%
Mexico	11,650,000,000	0.86%
Angola	9,035,000,000	0.67%
Azerbaijan	7,000,000,000	0.52%
Norway	6,865,000,000	0.51%

Data is obtained from Wikipedia, the free encyclopedia, and is assumed to be reliable. This is a list of countries by proven reserves of oil based on The World Factbook for January 1, 2008.

Energy security is imperative to the U.S., and most countries globally, due to the uncertainty of future supplies. The importance of energy independence for every country could likely result in most of the aforementioned offshore projects going forward, even in a low-price environment for commodities. Unlike public companies that have public shareholders, NOCs focus more on political job security and populist issues and less on return on capital. However, because supply is ultimately controlled by the NOCs, any oil importation will have political implications. In addition, it does not address the long-term issue of energy independence or the environment. Ultimately, oil is a finite natural resource and supply will "peak" at some point in time.

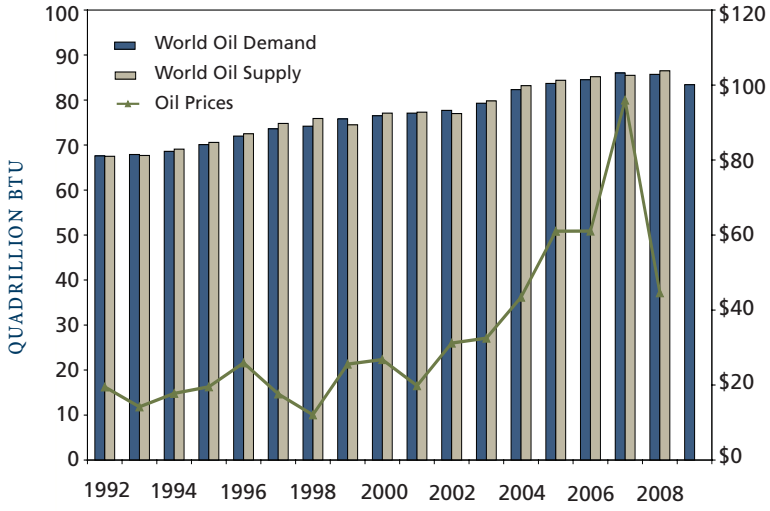
Although development of Prudhoe Bay peaked 10 years after initial production, there was plenty of political will to further develop the North Slope. However, discussions to further support development of the area all but stopped in March 1989 as the Exxon Valdez ran aground and spilled its oil content into Prince William Sound. While it was not the largest volume spill in history, the images splashed across all media devastated the argument for further development. Not until the recent energy crisis would the topic of further Alaskan development come to the forefront of political debate once again.

World Demand

Aside from recessionary periods, the thirst for oil is growing globally. Basic economic theory dictates that the underlying force for prices is ultimately supply and demand. Global economic growth can drive demand up during boom times and conversely lower demand during recessionary times, such as the world experienced during the most recent global economic downturn. However, never in past years has the energy market seen the incredible rise and the subsequent fall of oil prices as that experienced in 2008.

WORLD OIL

1992–2009E

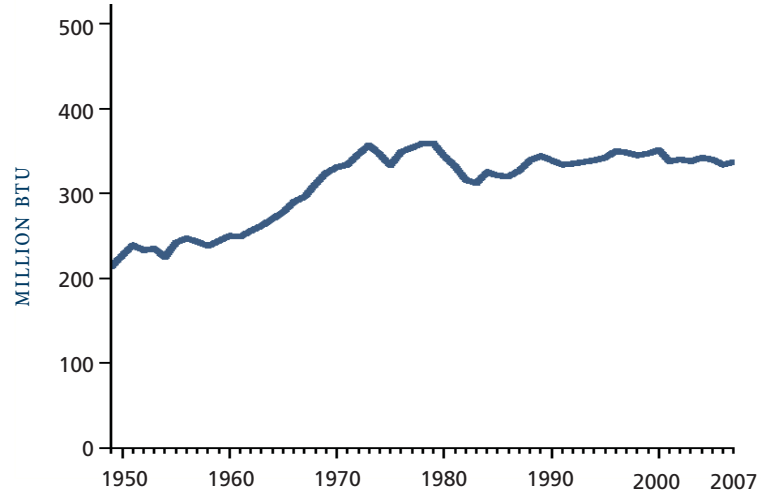


Data is obtained from International Energy Agency Oil Market Report March 13, 2009 and is assumed to be reliable.

So what is driving this higher demand and, thus, higher prices? In the U.S., the consumption of energy has seen a steady increase over the past decades but, with conservation efforts, energy consumption per person has actually been fairly flat over the past three decades.

U.S. ENERGY CONSUMPTION PER PERSON

1949–2007

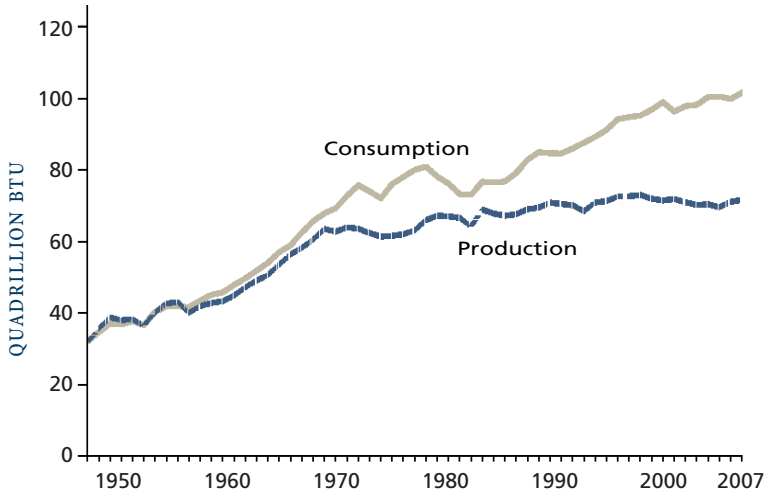


Data is obtained from Energy Information Administration / Annual Energy Review 2007 and is assumed to be reliable.

Let's give the credit to energy conservationists. Yet, total consumption in the U.S. is higher than it was before the oil crisis of the 1970s on an absolute basis due to the overall population increase.

U.S. PRODUCTION AND CONSUMPTION

1949–2007

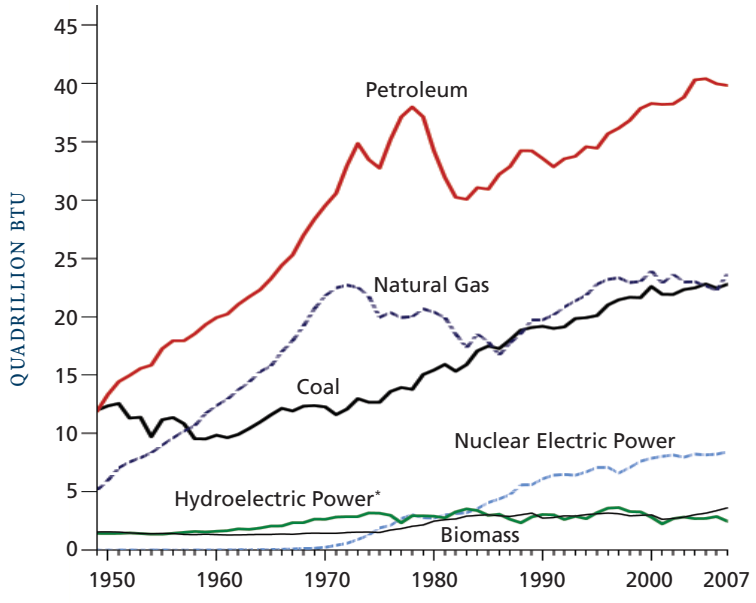


Data is obtained from Energy Information Administration / Annual Energy Review 2007 and is assumed to be reliable.

The chart below accurately depicts the aforementioned importance of energy independence post 1973 and 1979 as new global oil production came on line and oil became cheap again. As illustrated, there was a sharp drop in petroleum usage in the U.S. from the mid 1970s to 1980. However, we have returned to our dependence on oil as the primary energy source post 1980s. In fact, by the end of 2007, petroleum usage in this country eclipsed the previous high level.

U.S. ENERGY BY MAJOR SOURCE

1949–2007



*Conventional hydroelectric power.
Data is obtained from Energy Information Administration / Annual Energy Review 2007 and is assumed to be reliable.

Today the U.S., as it has been since the 1970s, is still the biggest energy consuming country in the world. The world consumes over 85 million barrels of oil every day (over 30 billion barrels per year); the U.S. alone consumes over 21 million barrels per day (over 7 billion barrels per year).

TOTAL ENERGY CONSUMPTION

By Country, 2007

	Equivalent Oil	% of World	Kg. Per Capita	% 5 year Change
USA	2,377.5	22.8%	7,870.0	3.6%
CHINA	1,861.2	17.8%	1,406.7	75.8%
RUSSIA	771.4	7.4%	5,418.9	15.7%
JAPAN	543.3	5.2%	4,262.7	6.1%
INDIA	450.8	4.3%	406.0	33.4%
CANADA	351.8	3.4%	10,688.7	10.3%
GERMANY	346.4	3.3%	4,194.5	0.0%
FRANCE	268.7	2.6%	4,359.4	4.2%
UNITED KINGDOM	234.1	2.2%	3,839.0	2.0%
BRAZIL	212.2	2.0%	1,120.8	19.1%
MEXICO	189.0	1.8%	1,738.7	21.4%
SPAIN	161.7	1.5%	3,577.4	18.6%
AUSTRALIA	127.7	1.2%	6,247.5	13.8%
HUNGARY	31.0	0.3%	3,108.7	13.4%
REST OF WORLD	2,523.1	24.1%	n/a	n/a
WORLD	10,449.8	100.0%	2,090.0	18.0%

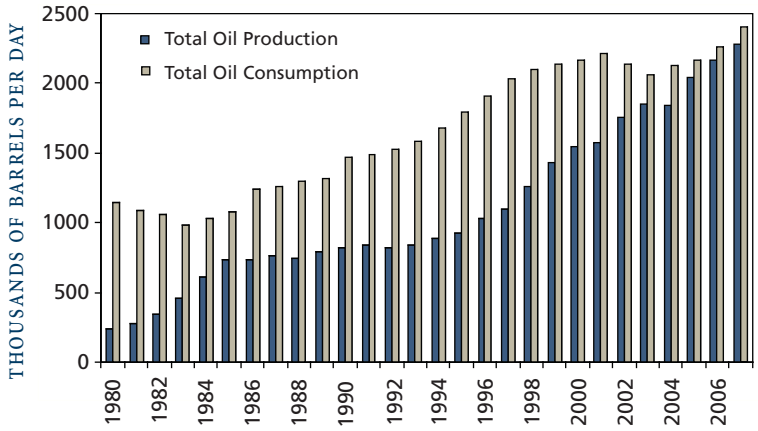
Data is obtained from Greendex 2008, a research project by National Geographic and Globe Scan and is assumed to be reliable.

However, as globalization has truly taken hold over the past decade, energy consumption by other countries is growing exponentially. The Asian crisis in 1998 may have temporarily stalled development in that area, but since then it has been the driving force behind global economic growth. And further growth by Brazil, Russia, India, and China, otherwise known as the BRIC countries, will have a definite impact on energy consumption. One day China will supplant the U.S., becoming the largest absolute consumer of energy. One has to wonder what the effect will be globally on energy prices if China's per-capita energy usage starts to equal that of the top 10 developed nations. Even more alarming is that many experts predict that India will become the most populous country over the ensuing decades yet currently has the lowest per-capita energy usage among the BRIC countries. The only conclusion one can draw is that global demand is still on the rise and will continue to rise over the near and medium term.

Any drop in energy demand from developed countries is expected to be easily consumed by developing nations. Congress and State governments can pass new emission and better automobile miles-per-gallon regulations or financially support "cash for clunkers" programs. But even with higher emission standards and despite renewed conservation efforts, it is feasible that Americans will still have to pay over $4 per gallon due to the high consumption rate in developing nations, such as China and India.

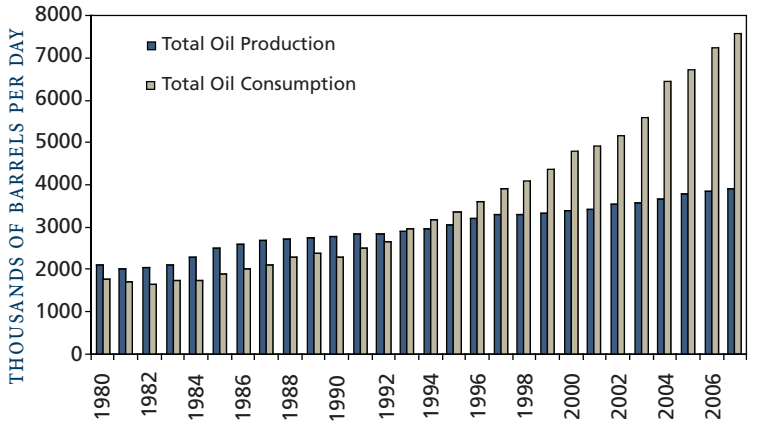
BRAZIL

Oil Production



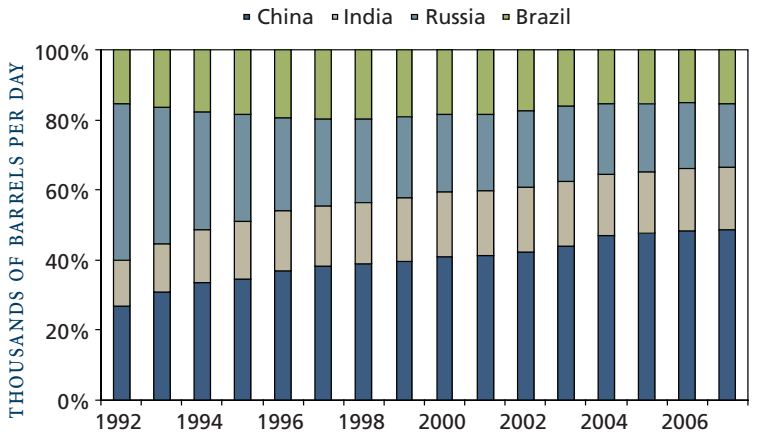
CHINA

Oil Production



BRIC

Oil Consumption

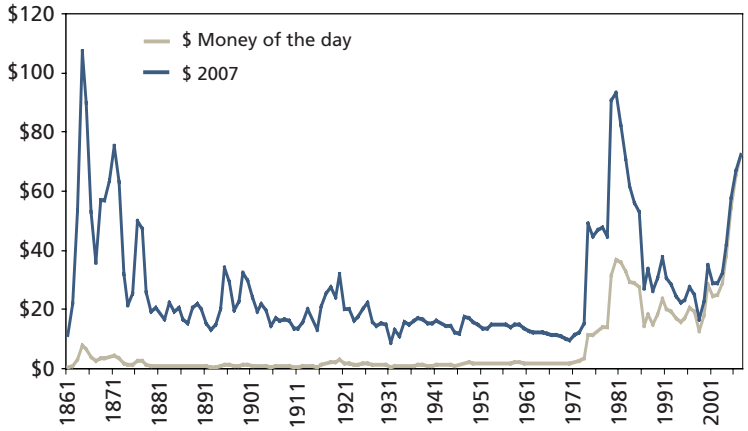


Data is obtained from Energy Information Administration (EIA), International Energy Annual, Short Term Energy Outlook, Table 3a, Table 3b (Forecast values) and is assumed to be reliable.

Some argue that higher energy prices and conservation should curtail consumption, lowering demand and, thus, result in lower prices. That may be true at the extreme end of price movements but, over time, the data supports the fact that global energy consumption has increased despite oil prices being in the $70 range, which is higher than during the oil crisis in the 1970s. Even adjusting for inflation, nominal oil prices today are near the high end of the historical range.

CRUDE OIL PRICES

1861–2007



Data is obtained from BP Statistical Review of World Energy June 2008 and is assumed to be reliable.

While it is not surprising that worldwide exploration and development spending has risen and fallen along with energy prices, it is interesting to note that peak spending in the current cycle (with oil prices at $150 and natural-gas prices at $14) did not exceed the previous high cycle back in the 1980s.

Have We Made Any Progress?

There are about 6.7 billion people today on this planet and projections are for the world population to hit 9 billion by 2050. Yes, 2050 is four decades forward. But how much progress has the world made in energy policies over the past 40 years? Many nations look to the United States for leadership. Yet, over the past four decades, the U.S. has remained the top power-consuming nation despite all of our conservation efforts.

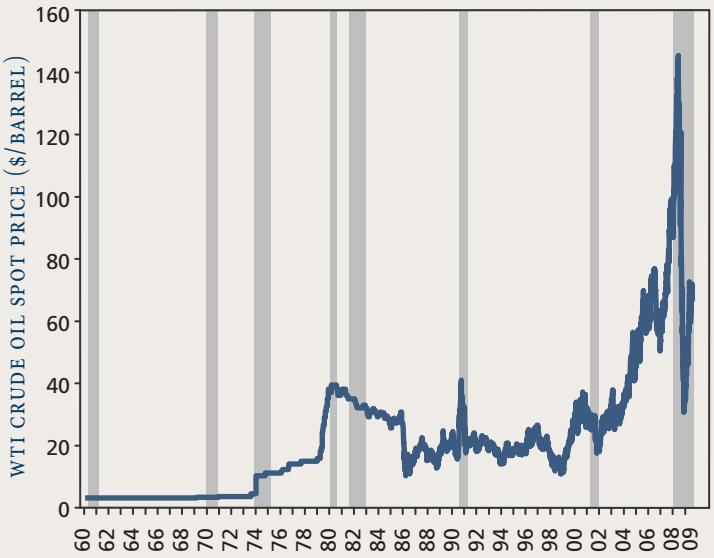
While other developed nations, particularly Japan and in Europe, have moved away from oil as their main source of energy consumption, the U.S. has only made small strides. One of the primary reasons why we have been behind other G-7 nations is that we have more plentiful natural energy resources and, even today, still pay less taxes at the gasoline pump. The higher taxes in Europe and Japan have served as encouragement to buy smaller, more fuel-efficient cars. In certain countries in Europe, gasoline was about $5 a gallon while Americans were paying $2 to $3 a gallon. In the U.S., we have more cars on the road and they are much bigger than one would find anywhere else in the world. SUVs and light trucks became so popular and profitable for domestic automakers that the Japanese felt compelled to produce SUVs and light trucks specifically for the U.S. market. But, look at what happened–once gas rose above $4 per gallon, the miles driven were decisively lower. High prices alone cannot sustain lower consumption, as we have seen over time in global consumption trends.

Other measures are needed to help reduce consumption. The current thesis has been to further the idea of climate change and the "green" principles. This tactic may work well in developed nations with higher standards of living; however, it does not play well in developing countries. The U.S. cannot expect China to reduce carbon emissions, advocate domestic pollution control, and use less fossil fuel because mitigating climate change is the right thing to do. If the population estimates are right, how do we as a planet increase nearly 50% in population without incurring higher energy demands or prices? Is it fair to ask China and India to use less cheap energy sources?

It is interesting to note that from 1973 to the Asian economic crisis in 1998, nearly all of the oil price spikes have been due to political reasons that affected short-term supply. As noted in the chart, Oil Prices and Recessions, strong upward movement in oil prices likely results in a recessionary period each time. This certainly has been true in the latest recessionary period as well.

OIL PRICES AND RECESSIONS

1960–2009



Data is obtained from FactSet Research systems and is assumed to be reliable.

What Are Our Options Beyond Oil?

Natural Gas

One possible near-term substitute source of energy that has already supplanted oil in certain industries and modes of usage is natural gas. Domestic energy production today is dominated by natural gas. Higher prices realized for natural gas has led to the development of many unconventional fields where previously it was not economical or there was lack of technology to be able to prove out the reserves and drill. One of the benefits of a lack of discovery of new oil fields was a focus on new technology (in rig equipment, 3-D seismic mapping, and new well fracturing technologies), which has led to the discovery of new fields, horizontal drilling, and fewer dry holes. All of this new innovation generated stronger initial production of wells and a significant jump in rig count, which is an important measure of energy activity worldwide. Nearly all of the rig increases have gone toward natural-gas exploration and development. Further, this technology is proving that unconventional plays, such as shale and coal bed methane, have become economically feasible.

Horizontal Drilling: Sometimes referred to as directional drilling; the process of drilling a curved well in order to reach a target that is not directly beneath the drill site. For many decades, the only way to drill a well was straight down into the ground (known as vertical wells). Modern horizontal drilling can make a 90-degree turn in only a few feet. The advances in technology and increasing focus on accessing less reachable reservoirs to meet rising demand have allowed for a proliferation of horizontal drilling. Horizontal drilling allows for increases in production in fields previously thought of as marginal or mature.

Rig Count: Since 1944, Baker Hughes (NYSE: BHI) has issued rotary rig counts as a service to the petroleum industry for U.S. and Canadian drilling activities. The monthly international rig count began in 1975. BHI rig counts are an important business barometer for the drilling industry and its suppliers. The active rig count acts as a leading indicator of demand for products used in the energy industry.

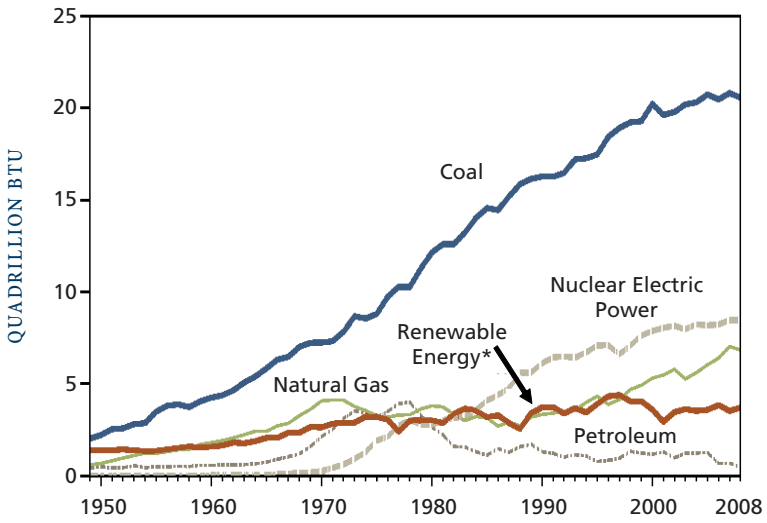
Shale and Coal Bed Methane: Most shales are not commercial sources of natural gas because they ordinarily have insufficient permeability to allow significant fluid flow to a well bore. Shale gas and coal bed methane are just two of a number of unconventional sources of natural gas. Shale and coal bed methane gas have become an increasingly more important source of natural gas in the U.S. over the past decade as technology, such as hydraulic fracturing, has improved production rates.

Natural gas has become the near-term "cleaner" solution for many electrical power generation plants and industrial uses. It is attractively priced today given current excess storage and new potential development of unconventional fields. Typically, natural-gas prices and oil prices trade in tandem and experience a spread, or ratio (oil price divided by the natural-gas price), that has ranged from six times to 14 times. Today, this same ratio is near, or has exceeded, the higher end of the range, indicating that natural gas is cheap, relative to oil.

Most important, however, is that the real substitution opportunity is not between natural gas and oil, but between natural gas and coal. It is amazing that the "green" topic is top of mind in American consciousness today, yet coal is still one of the primary sources of fuel for power generation and in many domestic industries. The U.S. has one of the biggest coal reserves in the world, with China not far behind. Therefore, you have one of the biggest power consumption countries and one of the most populous countries in the world having the two biggest coal reserves. And both countries utilize this coal reserve extensively, despite the environmental unfriendliness. It is interesting that many legislators in the U.S. scold the Chinese for its lack of environmental concerns and low emission standards yet, in the U.S., coal is still the largest fuel source for industries, such as electric power generation.

U.S. ELECTRIC POWER SECTOR

1949–2008



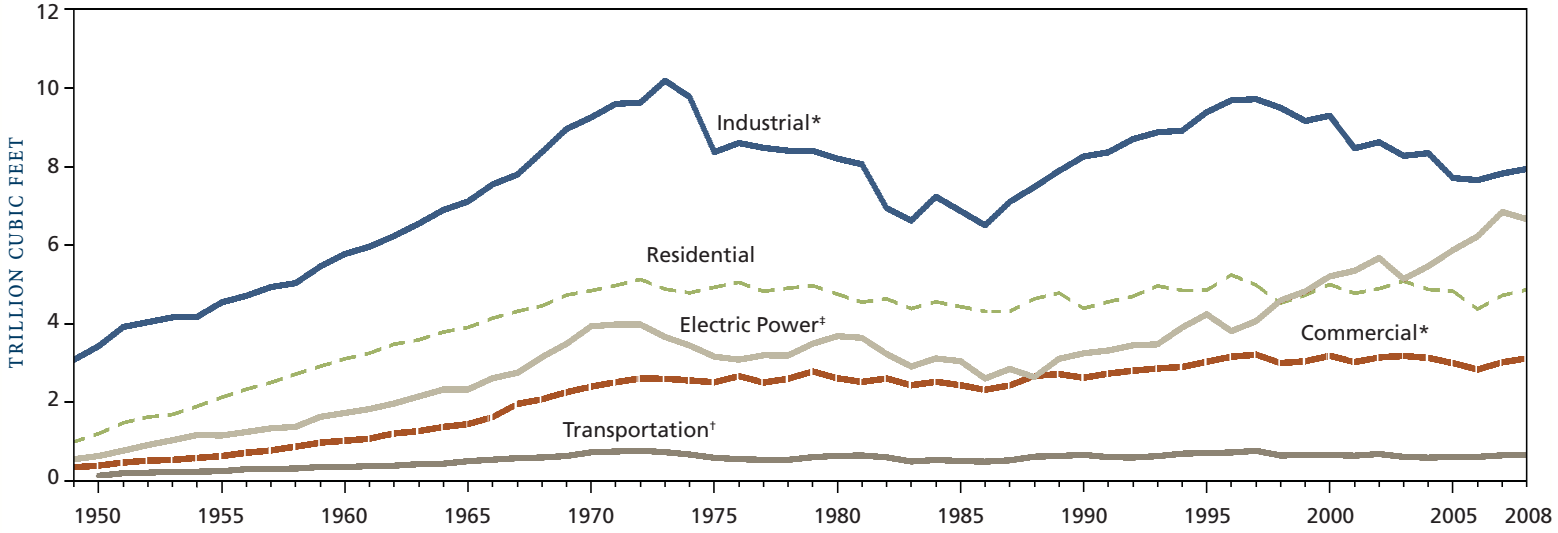
*Conventional hydroelectric power, geothermal, solar/photovoltaic, wind, and biomass.
Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

To be fair, there is a wide cry from environmental groups for fewer coal-fired power generation plants (and few, if any, new coal-fired plants are being built today). Natural-gas fired plants can be more expensive depending on the underlying natural-gas commodity price. At current prices, natural gas is an attractive candidate for substitution and switching away from coal-fired plants. However, when natural gas was above $10 per thousand cubic feet, as it has been several times over the past five years, it was not even close to being as economical as coal-fired plants. Higher cost power generation will effectively be passed through to you and me—the end consumers. Californians, so fed up with higher electrical bills and frequent brownouts, forced a Governor out of office through a recall even though he did not create the higher prices. No politician would want to mandate the building of natural-gas power plants only to see natural-gas prices skyrocket as they have in the past.

Volatile prices are only one of the drawbacks of natural gas. Natural gas is not a direct substitute for oil. In the U.S., it is mainly utilized by power generators or for industrial consumption. A look at the chart, U.S. Natural Gas Consumption by Sector, shows that there is little used for transportation. Some cities may have compressed natural gas (CNG) bus fleets and a couple of automobile manufacturers have sold CNG vehicles, but, for the most part, it has not gathered mass adoption. While CNG vehicles are cleaner burning and better for the environment than gasoline-based vehicles, there are inherently still some long-term problems with CNG.

Nonetheless, utilizing more of our natural-gas resources could make economic sense in the near term. One key differentiation between oil and natural gas is that while oil is a global commodity with very little differential in prices, natural gas is primarily a regional product. Most of the natural-gas production in the U.S. is used domestically with any excess stored for future use. The U.S. is currently one of the few countries that has the ability to store natural gas. This storage capability provides a cushion of supply that has kept natural-gas prices low in the current environment. Lower prices are a good thing for consumers and businesses alike.

U.S. NATURAL GAS CONSUMPTION BY SECTOR
1949–2008



*Includes combined-heat-and-power plants and a small number of electricity-only plants.
†Natural gas consumed in the operation of pipelines (primarily in compressors), and as fuel in the delivery of natural gas to consumers; plus a small quantity used as vehicle fuel.
‡ Electricity-only and combined-heat-and-power plants whose primary business is to sell electricity, or electricity and heat, to the public.
Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

The first problem is the need for larger fuel tanks to equal the same total mileage of comparable gasoline vehicles, which does not translate into smaller cars. Second, natural gas is subject to volatile pricing due to possible disruption of supply, such as when Hurricane Katrina struck. Third, natural gas is even more seasonal than oil and is typically more expensive during winter months as there is less drilling and supply needs to be taken from storage. Finally, the biggest impediment is the lack of existing infrastructure for consumers to refill CNG vehicles; it would be costly to build out such an infrastructure like the current gasoline station network. If there is an overwhelming demand for the infrastructure, then surely there would be companies willing to spend the money to build natural-gas filling stations. But consumers would need to be assured that there are enough convenient locations to fill up a CNG vehicle before making mass purchases of such vehicles. It is the classic chicken and egg dilemma. There are currently kits available whereby consumers can fill up at home since many homes already have a natural-gas infrastructure for water heaters or cook-top stoves. However, that still does not solve the problem of filling up a CNG vehicle while driving out on the road, particularly during a vacation or in remote spots.

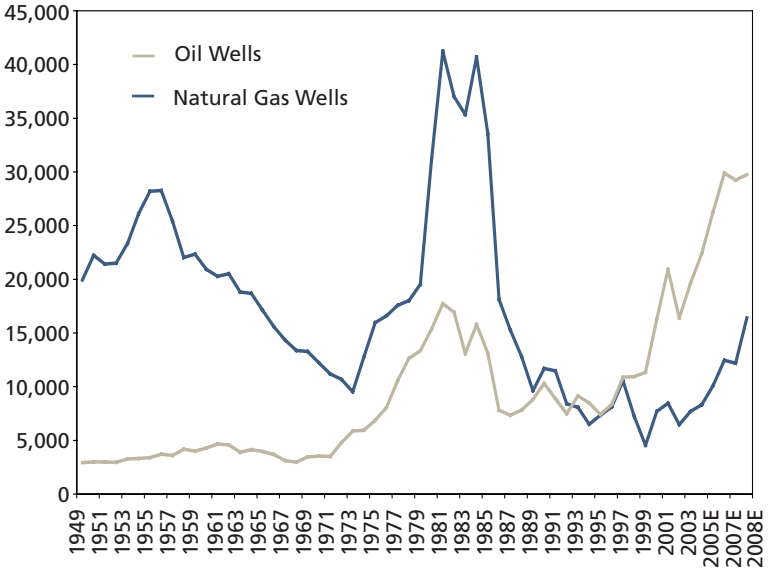
Additionally, the notion of regional natural-gas pricing is starting to change with the concept of Liquid Natural Gas (LNG), whereby natural gas is super cooled into a liquid for easier transport. Due to multiple factors, LNG is still in its infancy and not yet fully developed. Given the high capital expenditure needed to build out an LNG infrastructure and low natural-gas prices today, it is likely that the future of LNG has been pushed out in time and may not meaningfully develop for over a decade. As capital starts to flow again, LNG could become a global reality and offer other nations, like China, the prospect of becoming less dependent on oil and more reliant on natural gas, which has a nice reserve potential. Lastly, LNG could have a longer term effect of keeping natural-gas prices in check as more countries, including the U.S., start to develop their natural-gas fields and utilize LNG as export opportunities.

Despite the limitations of LNG, many would argue that the U.S. has enough natural-gas resources to justify further dependence on another fossil-based source. The benefits of natural gas, however, may not justify the long-term costs. Natural-gas production, like that of oil, has a natural decline rate (the flow of oil and gas is always greatest in the first year of production and subsequently the rate of flow declines over time), meaning that, over time, more wells need to be drilled just to keep overall total domestic production growing. Unconventional wells, such as shales and coal bed methane, experience even higher decline rates of as much as 60% to 80% post year

one. This phenomenon is illustrated in the chart, Number of Development Wells Drilled in U.S. Over the past decade, despite the higher number of absolute wells, the level of natural-gas production has only increased slightly and has not yet surpassed the peak production level seen back in the 1970s.

NUMBER OF DEVELOPMENT WELLS DRILLED IN U.S.

1949–2008E

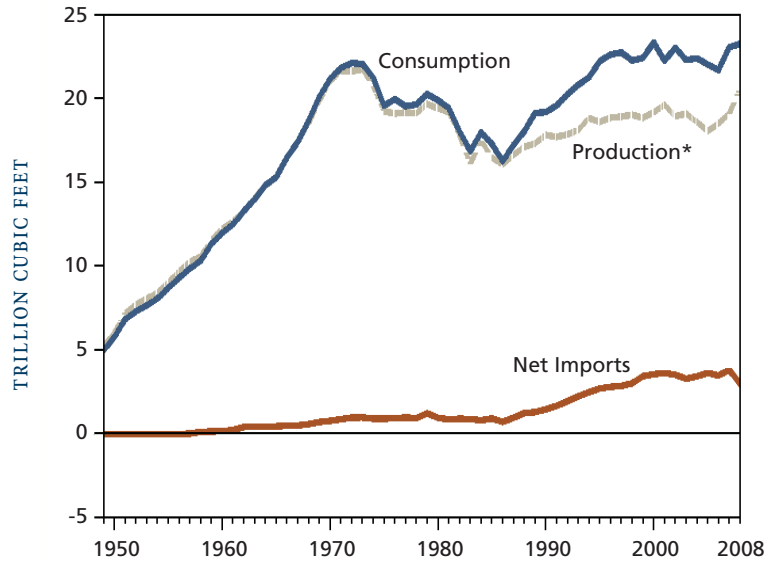


Data is obtained from Energy Information Administration (EIA) March 2009 monthly energy review, and is assumed to be reliable.

The difference between production and consumption has been made up only through the importation of natural gas. Therefore, while natural-gas discoveries are currently still viable, there could come a time, like what we experienced with oil, that natural gas could be harder to find and more costly to produce. This would send the entire energy independence debate back to square one (with the need for imports and continued foreign dependency).

U.S. NATURAL GAS OVERVIEW

1949–2008

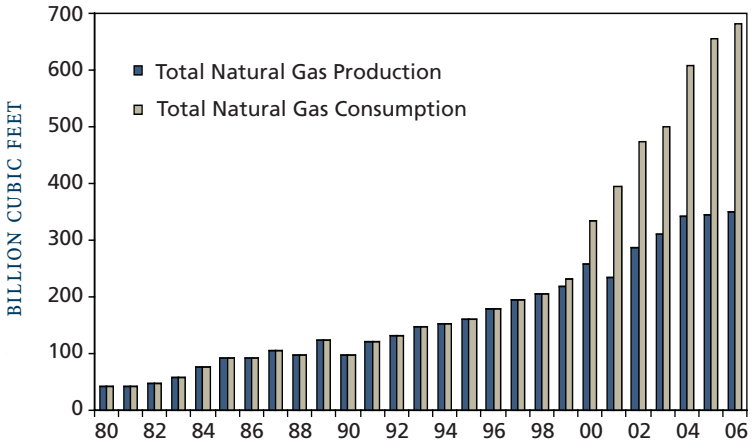


*Dry gas.

Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

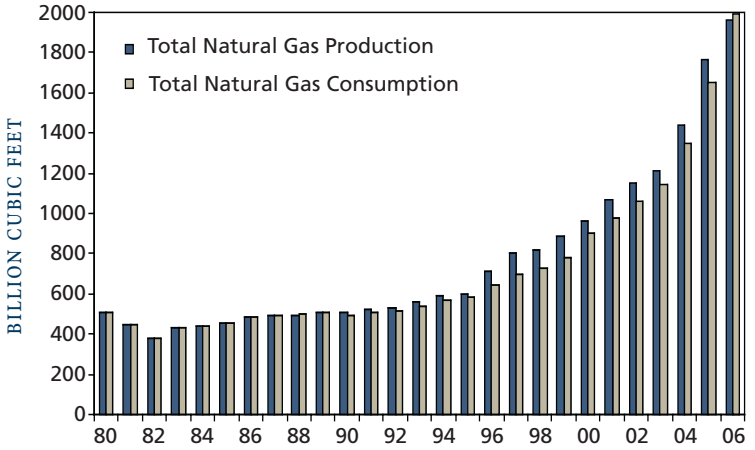
BRAZIL

Natural Gas Production



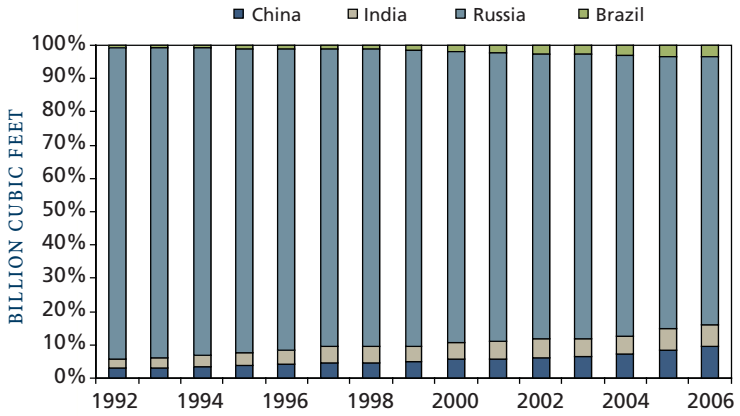
CHINA

Natural Gas Production



BRIC

Natural Gas Consumption



Data is obtained from Energy Information Administration (EIA), International Energy Annual, Short Term Energy Outlook, Table 3a, Table 3b (Forecast values) and is assumed to be reliable.

Alternative Energy Sources

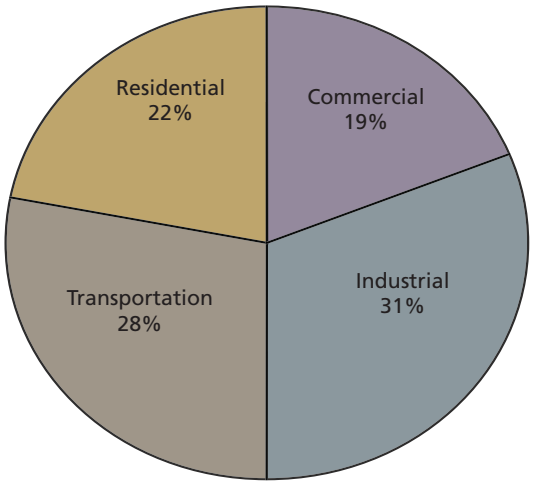
If oil and natural gas are not the long-term solutions, what are the energy sources of the future? Energy is something that is not easily substitutable and consumers must pay market price. There are some meaningful opportunities on the horizon that could make substitution more of a reality. The challenge continues to be finding an alternative source of dependable energy that can be cleaner, just as convenient, and, most of all, cheaper for consumers.

Transportation

Today, energy consumption by end-users for transportation accounts for approximately 28% of total energy demand in the U.S. If we were to fundamentally shift from gasoline-powered vehicles to biofuels or plug-in vehicles, power demand would shift towards electric power generation. If non-gasoline vehicles were adopted en masse, then we could become more energy independent and shift away from our dependence on foreign oil.

U.S. END-USE SECTOR SHARES OF TOTAL CONSUMPTION

2008



Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

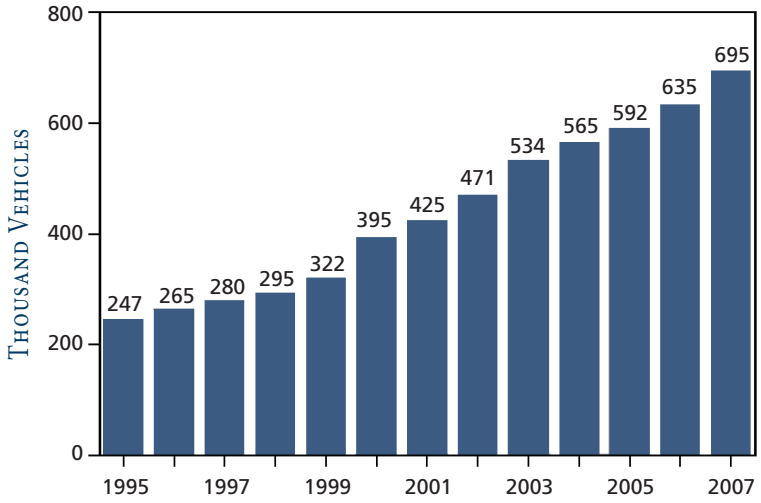
The U.S. has experimented with such alternative energy sources in the past. One such example in the late 1970s and early 1980s involved a demonstration program in which 100% of gasoline requirements were replaced with methanol fuel made from coal and other heavy "unconventional" hydrocarbons, of which this country has an abundance. The technology to make methanol from natural gas and coal had a proven track record and methanol cars were successfully developed by Ford and GM in the 1980s. The methanol program in California was successful, but it was not pursued because, by the mid-1980s, the price of oil had once again fallen to near $10 a barrel and subsequently traded between the $10 and $20 level for rest of the decade. Aside from a brief oil price spike when Iraq invaded Kuwait, oil prices never really ventured outside of this range until after the Asian Economic Crisis in 1998. There was no consumer demand or political will to make an alternative energy source necessary for transportation.

Biofuels have also long been considered a likely substitute for oil for use in transportation. Brazil is leading the world in ethanol usage and, together with the U.S., accounts for nearly 90% of all ethanol production in the world. Consider that statistic—the U.S. is number two in the world in ethanol use. Ask any American about ethanol and the likely response would be where can I get that and would I need a special car? There is no widespread use or knowledge of ethanol in this country. This alone highlights the challenge for biofuels. It is a complex issue and most of the world is not focused on this being the ultimate replacement for oil. Perhaps technology can change that perception and make it a reality, but it is a long shot. Debate already exists about whether corn-based ethanol actually consumes more energy and exacts a higher economic and environmental cost than oil itself.

Today, the preference is towards electric vehicles. Electric vehicles have been in existence since the 1980s but, because of lack of demand, the technology was never furthered. Fast forward 30 years and here we are still talking about electric vehicles with no assurance of range or infrastructure to back the concept. Will it work this time? In 2011, GM is slated to introduce the Volt, an all-electric (plug-in hybrid) car. It remains to be seen if consumers will accept such a concept. Honda has had an electrical vehicle in the market for years now with little success.

ALTERNATIVE FUEL VEHICLES IN USE

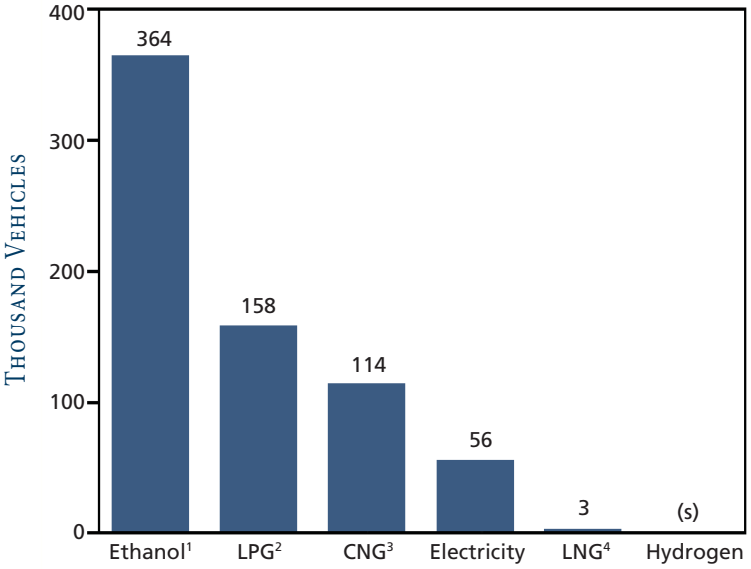
1995–2007



Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

ALTERNATIVE VEHICLES IN USE BY FUEL TYPE

2007



[1]Ethanol, 85 percent (E85). Includes only those E85 vehicles believed to be used as alternative-fueled vehicles, primarily fleet-operated vehicles; excludes other vehicles with E85-fueling capability.
[2]Liquefied petroleum gases.
[3]Compressed natural gas.
[4]Liquefied natural gas.
(s)=Fewer than 0.5 thousand vehicles.
Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

Much blame is placed on the fact that past electric vehicle technology was not very good. Add in the limitations of a lack of infrastructure for recharging the vehicles and limited range with poor battery technology, and that equates to limited consumer interest. Which public company is willing to shoulder the heavy capital investment needed to develop a vehicle or build an infrastructure without high public demand? Also, consider that with electric vehicles the energy burden would shift to the electric power sector and the preponderance of coal-fired plants. Economically, coal works well but, environmentally, it is possibly worse than gasoline.

More money is being spent today on alternative energy sources, thanks in part to government intervention. Will this last as long as oil remains expensive or is this country truly converted to the idea of energy independence? The one constant is that consumers are and always have been ready to adopt a more environmentally friendly energy source, as long as it is just as convenient and cheaper than existing sources.

Renewable Energy

Renewable energy accounts for only 7% of total U.S. primary energy consumption today; petroleum accounts for 37% of the total. To shift the entire petroleum source to renewable energy would be an enormous undertaking that seems nearly impossible at the current time. However, Rome was not built in a day and small incremental steps are needed to achieve a long-term goal.

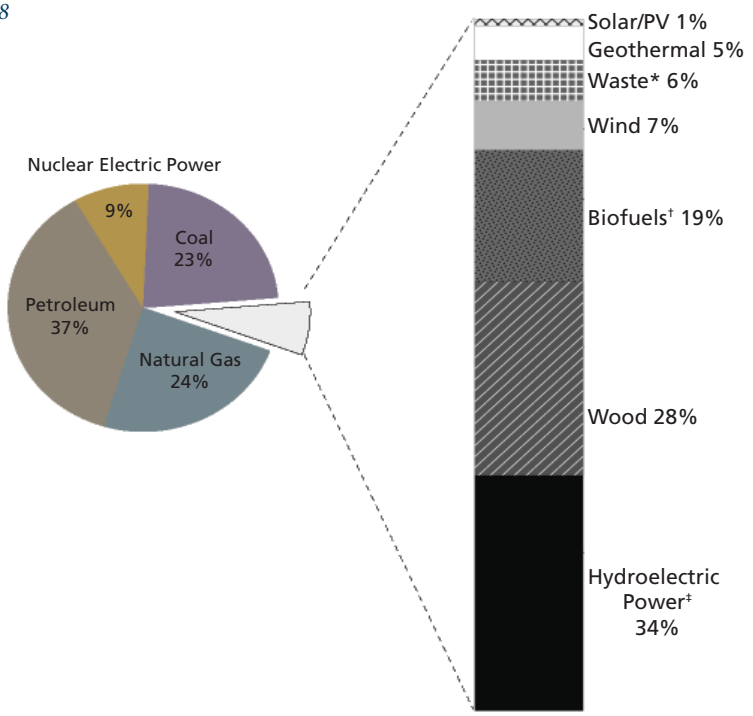
Wind and solar are the two most discussed renewable sources today. *Time* magazine quotes a new study that shows that current technology could harness enough wind power (including offshore) to supply more than 40 times the planet's present-day levels of electricity consumption. However, the problem is not supply, it's distribution. In the U.S. and elsewhere, some of the richest wind resources tend to be far from the densely populated coastal areas that need the most electricity. Further, power from wind is expensive. Though cost has dropped in recent years and will likely continue to decline as the technology gets better and manufacturing gets more efficient, it is still far more expensive (excluding tax credits) than most electricity generated from coal or natural gas.

Solar faces similar hurdles, but seems to be gathering faster cost advantages. The main advantage of solar is that it can be used in smaller spaces, including private residence rooftops. The cost of solar has come down but still needs to drop further in order to compete effectively with coal in large scale power generation usage. Large solar farms also face similar hurdles to that of wind in terms of proximity to distribution and locations served.

None of the renewable energy sources are perfect solutions. For example, the need for storage is an unintended consequence of renewable energy. Wind and solar farms take vast amounts of land and, therefore, are likely to be sourced in rural areas and need longer transport distances. Currently, there are a number of firms working on such technology. Solar cell manufacturing is also chemically intensive, similar to the current semiconductor manufacturing process. Nuclear has safety and security issues with which to contend. Ethanol (at least corn-based) can be disruptive to the food economy, as we have seen recently, even in the startup phase. Synthetic coal, if technologically feasible, still needs to be mined.

U.S. RENEWABLE ENERGY AS SHARE OF TOTAL PRIMARY ENERGY CONSUMPTION

2008



*Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.
†Fuel ethanol and biodiesel consumption, plus losses and co-products from the production of fuel ethanol and biodisel.
‡Conventional hydroelectric power.
Data is obtained from Energy Information Administration / Annual Energy Review 2008 and is assumed to be reliable.

Conclusion

Milton Friedman said that "there is no such thing as a free lunch." This aptly applies to the development of alternative energy sources. There is no doubt that future technologies could come along to provide a catalyst to speed the development of alternatives. But at what price? And who pays for it? Ultimately, the cost is always borne by the consumers—in this case, taxpayers. Federal subsidies will likely continue to increase during the Obama administration, which may lead to great opportunities for the right companies at the taxpayers' expense. But how long will taxpayers be willing to fund the switch to renewable sources? If past history is a judge, taxpayers typically are not a patient bunch. So far, most of the investment being made is in the form of tax credits, which only have an indirect effect for taxpayers. However, if utilities start to upgrade and expand their electrical grid to accommodate the increase in electrical power generation from renewable sources, those capital expenditures will be directly passed on to taxpayers. And, as mentioned previously, such an example did not fare well for the politicians in California.

Nonetheless, President Obama has publicly stated that he would like to see renewable energy reach 25% of the U.S. energy mix by 2025. We are far from that goal and it is hard to fathom how we can get there so quickly. Globally, Exxon Mobil estimates that, even with good growth in biofuels and solar power production, these two alternatives would only produce 2% of primary energy production by 2030. This is because the demand for fossil fuel in developing countries, such as the BRICs, far outstrips the substitution of solar, wind, and biofuels for fossil fuels.

There is no doubt that this country will continue down the road of renewable energy sources. The combination of energy independence and being "green" is forcing the energy sector to reassess and change. Energy independence is a noble concept—but it is just a concept. The public rhetoric may be a national concern but, like most things, it comes down to economics. If oil prices were back to $10 a barrel today, there would be less public outcry. Environmental groups have also done a good job of utilizing scare tactics. Whether the message or the facts are correct is not relevant. Just as conservatives would argue the noble concept of national security in the form of energy independence, liberals believe that the noble concept of a greener planet is worth fighting for. These two opposing forces are now joined at the hip on the issue of oil. The ultimate solution between the two is vastly different, but there is optimism that it could end up being a win-win situation.

Technology advancement will, and needs to, play a large part in minimizing the cost differential between current and future energy sources. Just as Internet technology has allowed developing nations to mirror the communications of developed nations, advancement in renewable sources needs global participation, given population growth demographics and potential per-capita energy usage in those countries.

In the end, consumers will still be the driving force. Consumers will drive hybrids or plug-in vehicles only as long as there are economic benefits. Consumers will install and use home solar panels only if they are affordable. There is no doubt that we should be exploring and investing in renewable sources of energy. Cheap energy is good for economic growth and while renewable sources are not competitive with fossil fuel today, they will be down the road. Even if we achieve President Obama's aggressive goal by 2025, that still means that 75% of the energy mix would be from non-renewable sources. Of that 75%, a good portion will likely continue to be fossil fuels. Unless we make a quantum leap in technology, it would be hard to replace conventional energy entirely. Ultimately, while it may not be true energy independence, the prospect of renewable energy will definitely make this country less foreign energy dependent.

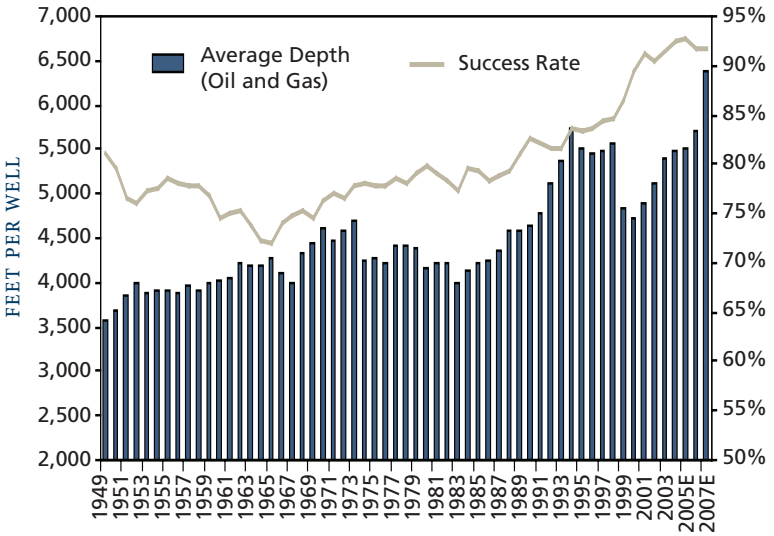
Investments in Energy (Both Traditional and Alternative)

At Kayne Anderson Rudnick, we have always had a high-quality investment philosophy that frames our investment objectives. While investing in the energy sector is more challenging, from a quality objective, there are opportunities to find such quality candidates. It may take more time and drilling (pardon the pun) into the fundamentals of the companies, but we have been able to find such gems and believe that there will continue to be such opportunities.

One example in conventional energy (i.e., oil and natural-gas industries) is an investment in CARBO Ceramics (NYSE: CRR). CARBO is the world's leading producer of ceramic proppants, tiny, high-strength, spherical pellets used in the hydraulic fracturing of oil and natural-gas wells to accelerate rates of production. High oil and gas depletion rates are forcing exploration and production (E&P) companies to drill deeper. Drilling technologies have improved, but have also made fracturing and completion more complicated and demanding. This has created a growing business for CARBO in an overall energy industry that struggles to keep production volume from declining. The company's broad range of products gives it an advantage in acceptance of CARBO's brand. For example, when the company introduced its new lightweight proppant, it gained traction very quickly. CARBO is also much less capital intensive than the typical oil and gas producers that it serves. The company generates roughly $1.60 in sales for every dollar in property, plant, and equipment while the average oil and gas producers average roughly $0.40 in sales for every dollar invested. This has allowed the company to generate high operating profit margins and solid free cash flow from a debt-free balance sheet in an industry that is highly dependent on credit for capital investment.

DEVELOPMENT WELLS

2007E



Data is obtained from Energy Information Administration and is assumed to be reliable.

Like all of our investments, our thesis for alternative or renewable energy is focused on quality businesses. However, investing in renewable energy companies means one needs to also look at industrial and technology companies. While oil and gas are natural resources, renewable energy investments follow more of a manufacturing model. In order to have wind power, wind towers need to be manufactured, installed, and serviced. In that respect, we have an investment in Lincoln Electric (NASDAQ: LECO), a leading welding equipment and consumables company that should benefit from the buildout of "green" infrastructure.

With regard to solar energy, there could be opportunities in panel manufacturers but we would like to see a bit more seasoning of the companies in that space unless we can be convinced that one company has a decided cost advantage or product differentiation that is sustainable over the long term.

Otherwise, as history has shown in the dynamic random access memory (DRAM) semiconductor business, little differentiation among competitors ultimately leads to intense price competition where losses abound among all companies. Further, with the nascent technology being used today, there could be "game changing" technology around the corner that could dramatically alter the solar industry. In general, we would prefer to look for the companies that provide the "picks and shovels" as we hark back to the gold rush days. We do believe that there is tremendous growth potential for the solar industry and are closely monitoring the various participants.

Other "pick and shovel" companies in which to invest in the renewable energy area, whether wind, solar, or nuclear, are those that can help upgrade the infrastructure of the electrical grid. As discussed above, if renewable energy were to dominate power generation sources, there are companies that could help provide infrastructure enhancement through storage solutions, compression technologies, engineering services, or manufacturing equipment. We own several of these companies, such as Jacobs Engineering (NYSE: JEC), an engineering and construction company or National Instruments (NASDAQ: NATI), a leading supplier of measurement and automation products used in design, control, and test applications. These are examples of companies that participate in building the energy infrastructure and could likely be beneficiaries as renewable energy industries continue to grow.

The key is to find an investment in the right company that has the ability to develop a proprietary business model that can garner high returns on capital without taking on substantial balance-sheet risk. We are not looking for companies that can grow exponentially one year and fade quickly as changing technology makes the company's business model obsolete. We always strive to find the right balance between fundamental and forward-looking analysis. We believe that it is quality businesses, including those in the energy and renewable resource industries, that can generate high enduring returns on capital that translate into excess returns with less risk.

Data included in this paper was obtained from a variety of sources, including World Energy Outlook 2008, Energy Information Administration / Annual Energy Review 2007, International Energy Agency Oil Market Report March 13, 2009, Wikipedia, FactSet Research Systems, Energy Information Administration, Greendex 2008, a research project by National Geographic and Globe Scan, Energy Information Administration / Annual Energy Review 2008, and BP Statistical Review of World Energy June 2008. All data is assumed to be reliable.

The opinions expressed are those of the portfolio manager as of the date of publication. This report is based on the assumptions and analysis made and believed to be reasonable by Advisor. However, no assurance can be given that Advisor's opinions or expectations will be correct. This report is intended for informational purposes only and should not be considered a recommendation or solicitation to purchase securities. Past performance is no guarantee of future results. The principal value and return of an investment will fluctuate with changes in market conditions.

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