Corporate Greenings

A Sustainable Energy Future

by Carol Stoner

Corporate Greenings offer inspirations and insights about what people in organizations are doing to pursue the triple bottom line (i.e., people, planet, profit) of sustainability.

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A Sustainable Energy Future

Daily life in the U.S. and other developed countries has become entirely dependent on a connection to an energy source – actually, multiple energy sources. Energy provides us with mobility, which in many ways we equate with freedom. Energy makes things more convenient and comfortable; we use it to entertain and educate, as well as for essential needs such as heating and cooking. Energy provides us with the goods and services we are accustomed to, but we often don't question or wonder where our power is coming from, how much a particular item or activity uses, and what its real costs are. Yet the resource we use to fuel many of our energy needs – hydrocarbon – is finite. Although it took hundreds of millions of years to form, in less than 150 years we have used up much of this supply.

Energy efficient home

This article outlines where and how the bulk of the world's energy is being consumed, and then presents a number of potential renewable energy solutions that could ultimately replace the need for non-renewable fossil fuels. To reach this sustainable future, some strategies that have been suggested by U.S. energy experts are presented, such as federal and state policies and regulations that would support and encourage our energy independence. Two major oil corporations are highlighted within the paper: Shell (formerly known as Royal Dutch/Shell) and BP (formerly known as British Petroleum). Of the majors, these two have consistently been recognized for their awareness of the need to develop new, renewable energy supplies and they are both investing a significant amount of capital in finding and developing these abundant resources. While they are not model citizens on all fronts, we believe they are more forward-thinking than other energy corporations and are striving toward a more sustainable business model. Finally, the paper concludes with some suggested action steps that each of us as energy consumers can take to both reduce our oil use and support the use of renewable energy instead.

Energy Consumption

Some sobering statistics help to illustrate the world's consumptive energy habits:

- Current (2006) U.S. energy use is derived from 40% oil, 23% coal & natural gas, 8% nuclear, and only 6% from renewable sources.
- By approximately 2035, world energy use will double; oil consumption will increase from 80 million barrels per day to about 140 million.
- The U.S. has less than 5% of the world's population but uses 25% of the world's energy.

- The average U.S. citizen consumes nearly 13 times the energy of the average citizen of Africa or Asia.
- Of the 6.2 billion people on the planet, 1.2 billion are high energy consumers while more than 5 million use little energy.

Much of the developing world is in a state of energy poverty. Lacking energy for basic needs leads to a host of problems and creates a deep divide between the haves and the have-nots. In these countries, people and governments are often willing to accept the environmental problems associated with energy extraction and use, as well as the costs of energy dependence, since availability of cheap energy is in many ways deemed necessary to economic growth and progress. In the short-term, it is quicker and cheaper to provide stove oil to a community starving for basic energy, than to provide solar panels or wind turbines. This quest for energy by the developing world will impact all nations, as their demand is expected to increase more than 250% by 2020.

Transportation

There are 750 million vehicles on the planet and this number is projected to increase by 50 million per year, in part due to the burgeoning auto market in China. Cars, trucks, trains, planes and other vehicles use 7 out of every 10 barrels of oil consumed in the USA. Most of these vehicles have internal combustion engines which use the gasoline we're all familiar with, largely because this type of fuel has been the most economically appealing. Low U.S. fuel prices combined with high personal incomes and low U.S. auto efficiency standards have not served to encourage U.S. automakers to aggressively design, build and market vehicles that are fuel efficient. One of the biggest steps we can take to reduce our fuel usage is to make cars that get better fuel economy.

Bike lane in New York City

Hybrid vehicles, although gaining market share, still only account for 2-3% of new car sales. Hybrids combine an electric motor with a small, super-efficient gasoline or diesel engine. Since it uses oil-based fuel, the infrastructure to support hybrids already exists. Hybrid cars can also be reconfigured to burn natural gas, ethanol or even hydrogen if those fuels become economically preferable in the near future. And many companies are developing kits that would give standard hybrids a plug-in option, enabling the car to run solely on electricity for a longer range before the gasoline engine kicks in. In his book *Winning the Oil Endgame*, Amory Lovins at the Rocky Mountain Institute (RMI) outlines a strategy for U.S. automakers to bring even SUVs to market with 64-78 mpg using new manufacturing processes and materials.

Hydrogen bus
(Photo Courtesy of DOE/NREL)

In a 2006 survey conducted by *Consumer Reports*, more than a third of American drivers reported that they are considering getting rid of their current vehicle and replacing it with a more fuel efficient one. Half of those said they would consider a hybrid and less than 5% would consider a large SUV.

Perhaps the most effective way we can personally reduce our energy footprint is to reduce our transportation needs by driving less, using public transportation, or choosing a fuel efficient vehicle, such as a hybrid.

Public Transit:

On a passenger per mile basis, public transportation uses far less energy than private automobiles, particularly since in the U.S. people frequently commute alone in their vehicles. Many newer public transit buses are being fueled by alternative fuels such as compressed natural gas, liquefied natural gas, propane and hydrogen fuel cells, which helps improve air quality and reduces our reliance on oil-based fuels.

The American Public Transit Association (APTA) estimates that about 14 million Americans ride on public transportation each weekday. APTA reports the following key facts about public transportation:

- More than half, or 54% of all public transportation trips are made to commute to work.
- Nearly 20% of all trips are taken by people over the age of 65 or under 18.
- The need for public transportation is great. One in four households have no access to public transportation, and one-half have limited service.
- Every $1 invested in public transportation projects generates from $4 to $9 in local economic activity.
- Every $1 billion invested by the federal government in public transportation infrastructure supports approximately 47,500 jobs.
- For every mile traveled, public transportation uses about one-half of the fuel consumed by automobiles, and about a third of that used by sport utility vehicles and light trucks.
- Riding a transit bus is 79 times safer than car travel.

Suburbia

Since the U.S. is a relatively new country, its cities look and feel very different than most in the "Old World." European cities were established long before the automobile was born, while many U.S. cities were designed with the car in mind. Suburbs

were created on the outskirts of the city proper, creating a commuter culture requiring transportation to and from jobs and shopping. Today, the average daily round-trip commute for Americans is one hour per day, which results in more burning of fuels.

Although some U.S. cities have well-designed public transportation systems, enabling those living in suburbs to commute in to their workplaces, many cities do not have efficient systems in place. Some believe that rather than seeking energy solutions to run suburbia, a better response is to rethink how and where we choose to live. Designing traditional, walkable communities close to workplace and shopping needs would reduce our energy use significantly. This is the thinking behind a growing movement called New Urbanism.

Renewable Future

Author James Howard Kunstler (*The Long Emergency*) believes there is a general ignorance on the part of the American people about the coming end of cheap oil. This ignorance or denial leads us to a kind of mass complacency – we're comfortable and prefer the delusion that we will continue to enjoy the comforts and conveniences we are accustomed to, even if it costs us more money for those comforts in the future. There are compelling reasons to reduce our energy needs, such as global warming and energy independence. In fact, there aren't enough fossil fuels to feed the world's growing energy demands. Alternatives must be found.

This next energy revolution will likely consist of a combination of many new technologies and alternative fuels. Most experts agree that there is no silver bullet – we will need to draw from a multiplicity of resources, preferably renewable ones. The revolution will not be driven by technology alone, but also on whether it's economically viable. If a new technology can't provide energy both more efficiently and cheaply, it won't last. Progress toward a completely renewable future will likely be made in incremental steps that build upon each other. But we must begin building those steps now.

Renewable energies currently supply about 1% of global demand. Dan Kammen, Director of the Renewable and Appropriate Energy Laboratory, says that rather than constantly scouting for new fossil fuel sources, we should be more like energy farmers. Finding ways to efficiently harvest and store earth's abundant renewable energy resources is a longer term solution, and one that will enable each country or region to manage their own energy security.

Solar photovoltaic panels
(Photo Courtesy of DOE/NREL)

Energy Solutions

Solar:

Solar energy may be our best hope for supplying our future energy needs. Harnessing the energy from sunlight falling on just 1% of the earth's surface would be sufficient to power most of the world's demands, but some technological breakthroughs are needed to make this possible. Both the efficiency of harvesting solar energy from photovoltaic devices (PVs) and the costs associated with the manufacture of solar panels and PV cells need improvements before solar power can become truly competitive on a global scale. Although solar energy costs about 30¢ per kilowatt hour (kwh) today, that's still not cost competitive with local utility companies that can provide energy at 8-9¢/kwh. Experts say solar likely won't reach this competitive threshold until 2020, but when it does, it could make the deserts in the Middle East more valuable for their sun harvest than for the oil underneath. Thinking even further into the future, it's plausible that a large array of solar cells could be put into orbit, transmitting electrical energy to earth in the form of microwaves collected at receiving stations on earth.

Wind turbines
(Photo Courtesy of DOE/NREL)

Wind:

Wind power is probably the energy source closest to being commercially viable. The U.S. government is providing some incentives to the wind industry. Wind turbine technology has improved and brought down operating costs. Both of these developments have enabled this industry to grow rather rapidly. Projected growth of the wind power industry is 20% per year for the next decade. A watt of wind power costs twice as much as a watt of coal power presently and four times as much as natural gas power. However, both coal and gas-fired power plants use fuel to operate, while wind does not. With the escalating cost of fuel, this makes wind power even more attractive.

For both solar and wind power to effectively provide massive amounts of energy, however, there is still not an economically feasible way to store the large surpluses generated. Once some of these technological and economic hurdles are surpassed, solar and wind together could meet one-fifth of the power demand in the industrialized world. Meanwhile, transportable renewable energy systems could provide an effective way to get electricity to remote communities in the developing world.

Fuel Cells/Hydrogen:

Many energy experts believe that our energy future will be

hydrogen-based, probably in fuel-cell form. In 1999, Shell formed a hydrogen division and BP soon followed. Once the oil companies revealed their interest in hydrogen research, fuel cells were no longer seen as a fringe possibility, but one with great potential. Even though fuel cells are probably ten years away from being viable on a massive scale, they hold great promise. Hydrogen exists in abundance in our atmosphere and planet resources. Once it is separated from molecules it typically pairs with, it can be harvested for its energy. The cons of using hydrogen are that it is hard to handle and store due to its large volume, so it must be concentrated to be more useable, plus it's highly flammable. Fuel cell vehicles would require a totally new infrastructure for supply – new fuel tanks, pumps and nozzles for delivery. A huge advantage of hydrogen-based energy is that the only waste produced after harvesting is water vapor, a harmless and natural by-product.

Biofuels:
Shifting from hydrocarbon to carbohydrates to fuel our energy needs would be potentially the easiest and most quickly attainable shift because the infrastructure we have in place now for oil-based fuels would not have to change radically to deliver biofuels. Ethanol, the most widely known biofuel, is primarily corn-based and ranges from a mixture with a 10% gasoline additive to E85 which is just 15% gasoline. But growing corn typically requires oil products in the form of fertilizers and tractor diesel used to farm the fields. And if we're talking about growing fuel crops, the quantity of fuel generated is limited by the amount of land available for crops. Some argue against using our land to grow fuel rather than food crops.

Cellulosic biofuel uses corn husks and other plant-based crop waste for converting to fuel, while biomass is a term that would include both plant and animal waste. Cellulosic biofuel is about 80% more efficient than corn ethanol. Switchgrass is a fast-growing crop that holds some promise. It can grow on land that's unsuitable for growing other crops, requires low inputs for growing and a surplus can be used as animal feed. Plus it would produce more fuel per acre than corn. Still, to replace U.S. oil consumption with biofuel made from switchgrass, we'd need 420,000 square miles of cropland, which is roughly 67% of total U.S. cropland. Therefore, any attempt to switch from conventional fuels to cellulosic biofuel would have to be manufactured from plant waste materials and from crops that could grow on infertile land.

Harvesting switchgrass
(Photo Courtesy of DOE/NREL)

A far better solution would use a new clean technology called biomass gasification that produces biofuel from anything with carbon in it, thereby making it endlessly useful for converting our ever-growing garbage streams into useful fuel. Researchers are studying the digestion capabilities of termites, trying to understand and replicate the enzymes that allow them to digest wood in hopes of applying this concept to biodigesters that would convert wood waste to biofuel.

Biofuels have much to offer in alleviating our transportation energy needs. Thomas Foust from the National Bioenergy Center estimates that if auto efficiencies increase to that of a hybrid (45-50 mpg) and we used a switchgrass crop mix for biofuel, we could supply two-thirds of the demand for auto fuel in the U.S.

Conservation:
Last but not least, conservation must play a large role in our energy future. In fact, it should be considered as the first and foremost priority. Focusing on increasing the energy efficiency of systems we already use is the most immediate and cost effective way to reduce our consumption. In the 70s, when the U.S. felt the first oil crisis pinch, conservation was emphasized and people got behind the movement. When oil prices dropped back down to previous levels, conservation unfortunately went out of fashion and in large part has remained that way in mainstream America.

Energy Star logo
(Photo Courtesy of DOE/NREL)

Funding for energy programs typically goes to long-term alternatives, but if we were to invest in a diverse range of energy efficiency programs, the pay-offs would be more immediate. According to efficiency experts, the amount of oil, electricity and other energy that could be saved from energy efficiency efforts in the U.S. alone is larger than our current physical reserves of oil and gas.

Below are some compelling statistics on energy efficiency:

- By upgrading power plants and transmission systems, we could cut home electricity usage by 40% and cut CO_2 emissions in half.
- Household furnaces, one of the biggest home energy users, could be replaced with energy efficient ones and within 15 years would reduce natural gas demand in the U.S. by 25%.
- Inefficient power plants waste more energy in the form of heat than the energy needed to run the entire country of Japan.

- Only 15% of the energy in a gallon of gas reaches the wheels of a car.
- The most energy efficient refrigerators, probably the second highest energy users in the household, use only one-eighth as much electricity as those of a decade ago.

Transportation may account for most of our energy use, but our household energy needs come in a close second. Even though the average home in the U.S. is much more efficient than 20 years ago, most houses are much larger now with no corresponding increase in family size so the energy savings has been negated. U.S. houses use twice as much energy as those in Europe and Japan.

In the developing world, energy efficiency would have a huge payoff. These countries need energy to fuel their development and progress. They don't have money to fund a new infrastructure based on new forms of energy, so simple things like efficient cooking stoves and heating systems can make a noticeable difference in a family's ability to meet its needs.

Strategy

Our current energy system is not sustainable. Because of predicted growth of global energy demand, because we are reaching or have already reached peak oil, and because of the imminent dangers of global warming, there is an urgent need to transform our energy system to a sustainable and renewable one. It may take two or three decades before an integrated suite of clean technologies is ready for widespread use, along with the policies needed to support their economic viability. If we begin now to take integrated steps in shaping our next energy economy, the shift will be more peaceful, less chaotic, and we will have the freedom to experiment with and develop lasting solutions.

Policies & Regulations:

In the U.S., gas currently averages about $3/gallon. But this reflects only the cost of pumping, refining and delivery. If hidden costs such as tax subsidies to the oil industry, military costs of protecting oil supplies, not to mention healthcare and climate change costs were included in the price, we'd pay about $12/gallon at the pump. What if we removed or reduced the subsidies for finding and delivering oil and shifted them to clean energy technologies?

Hybrid vehicles
(Photo Courtesy of DOE/NREL)

Maybe the most important step the U.S. could take to immediately reduce our oil consumption would be to raise fuel efficiency requirements for cars and light trucks. The National Commission on Energy Policy has called for major tax subsidies to help U.S. automakers engineer and deliver cars that would meet these requirements. In China, Europe and Japan, there are regulations already in place requiring modest fuel efficiency in vehicles.

Amory Lovins (RMI) has suggested that automakers institute what he calls a "feebate scheme," whereby a new car buyer would receive a rebate for choosing and purchasing a fuel efficient vehicle. This rebate would be paid for by fees imposed on people who purchase inefficient vehicles – another possible way to incent U.S. drivers to choose fuel efficient vehicles.

Some states are becoming frustrated with the lack of a strong and coherent federal energy policy and have begun acting independently, enacting their own state emission requirements. Some states are even considering phasing in carbon taxes.

In a recent *TIME* survey (2006), 52% of Americans favored government mandates to curb global warming and 87% supported tax breaks to develop wind, water and solar power. However, 68% opposed a higher gas tax. This indicates that people support government policies that will encourage efficiency and stimulate innovations for a clean energy future, but oppose just raising the cost of fuel to discourage driving. This may fuel the perception that the oil companies are simply pocketing more money when the price at the pump becomes glaringly high.

Oil Corporations

Lots of funding for renewable energy will come from small, private investors, but investment capital could also come from large, traditional companies already in the energy business. Shrinking oil reserves are pushing the major oil corporations into non-traditional markets. Although some believe all oil corporations are recklessly exploiting the earth's non-renewable resources for short-term profit, at least two large oil companies are thinking and investing in longer-term solutions for powering the future.

Royal Dutch/Shell

Scenarios:

Scenario planning was pioneered at Shell to explore and

consider a range of alternative possible futures. This planning process proved to be extremely useful at Shell, since they base their business decisions on long-term outlooks. Shell has been producing these scenarios for over 30 years and has actually inspired other companies who benefit from long-range planning to adopt this idea. The scenarios are not so much forecasts or predictions – Shell says they are used as "possible narratives about the future."

In the scenarios, Shell identifies key drivers such as the societal goals of security, community and efficiency. Their latest Global Scenarios report identifies three potential futures in looking ahead to 2025:

1) "Low Trust Globalisation" where the world's economy continues to become globalized but there is increasing public distrust of companies and markets, along with moderate economic growth.
2) "Open Doors" where there is increasing international cooperation, increasing economic integration and the economy is growing strongly.
3) "Flags" where the global economy is more fragmented, economic growth is slower and there is strong national and community solidarity.

Shell sees the possibility of a direct path to renewables, with some reliance on gas during the shift, or an indirect path where new developments in fuel cells and other technologies lead to a hydrogen-based global economy. Generally, all the scenarios predict renewables as becoming increasingly important, perhaps as high as 50% of market share by 2060. They see energy from biomass, wind, solar, geothermal and hydrogen growing, perhaps strongly, but probably at about 10% per year. Hydrogen, in particular, they say could remain only a niche market, but in the meantime they are still pursuing and developing business opportunities in the hydrogen and fuel cells market.

Future Strategy:
Shell's corporate strategy includes a new business model based in part on renewable energy, while fully recognizing and emphasizing its existing fossil energy business. As CEO Jeroen van der Veer says, "The era of cheap oil is over, however demand for our products will remain huge." With energy demand growing globally at such a rapid pace, the world will need much more energy to meet demand, and Shell believes that most will come from fossil fuels, at least until advances in renewable energy technologies are

Shell's London office

integrated into the existing system. In the drive for sustainable energy, meeting these changing patterns will require huge investments in delivery chains and downstream infrastructures.

Shell's primary strategy remains to find and develop oil and gas resources and to refine and deliver these products to its customers in a profitable and sustainable way. Since oil and natural gas supply more than 50% of the world's energy, this strategy, Shell says, helps meet the world's immediate energy needs. But at the same time, Shell is pursuing a range of potential opportunities to develop alternative energies.

Alternative Energies:
In 1997, Shell created its fifth core business, Shell Renewables, with an initial investment of $500 million. Comparing this investment as a percent of total, Shell's investment in renewables may seem paltry. However, it is significant when compared to the size of the entire renewables industry, and is helping to drive forward innovations and funding the facilities needed to support the industry. Wind and solar are Shell's predominant focus because they are viewed as the most cost competitive in the short term. Shell is among the top 5 investors in solar and the top 10 producers of wind energy, with plans underway for building the world's biggest wind farm in the Thames Estuary area. Meanwhile, the Renewables Division is also exploring biofuel, geothermal, hydrogen, wave and tidal energy.

Shell hydrogen station
(Photo Courtesy of DOE/NREL)

The switch to alternative forms of energy will not be entirely smooth and seamless. Significant investment will be required, and there will be significant economic, environmental and technological challenges to overcome. Shell is nonetheless committed to investing both capital and resources in renewable energy, seeing it as perhaps the only sustainable one. Shell has invested over $1 billion since 2000 for developing these new energy technologies and alternative fuel resources.

No Waste Pilot Projects:
In 2003, Shell met with leaders from the Rocky Mountain Institute to generate ideas about the global energy future and Shell's role in it - specifically looking at refineries and how existing practices could be challenged. Together they envisioned a future refinery that created no waste, where all by-products of the refining process could be used as an

input to another product or process of value. This "stackless refinery" is only conceptual, but the idea serves to illustrate what a forward-thinking energy company can do.

In another project, Shell has explored water re-use after filtration through reed beds. After this treatment, the water is still saline but can be used for irrigating crops that are salt-tolerant. Some of these crops could then be used in fiber production, creating new businesses and employment for local communities.

Climate Change:
When an energy source requires the burning of hydrocarbons, this means addressing the problem of the CO_2 that is emitted as a result. Finding ways of capturing this carbon before it's released into the atmosphere is a continuing industry challenge. Shell has actually created a senior position that they call "Mr. CO_2" whose role it is to seek and develop solutions to the CO_2 problem, whether by exploring underground sequestration, carbon fixing via mineralization, or other means. To encourage small businesses to tackle global warming, a new program called Shell Springboard was created in 2005 that pays companies up to £40,000 (or $81,000) if they can provide innovative ideas to reduce greenhouse gas emissions in economically viable ways. Recognition that innovative concepts can come from creative individuals, small businesses or global corporations is key to working collaboratively to find solutions.

Shell Chemicals has found some use for its excess CO_2 by selling it to a nearby soft drink maker. At one of its plants, more than 60% of the CO_2 emitted is being used to carbonate sodas, while the soft drink maker supplies all steam and electricity needs to the Shell complex – an exchange that's a win-win. At another plant, 40,000 tons per year of the emitted gas is supplied to a paper company for the production of calcium carbonate, a compound needed in their paper-whitening process.

Corporate Social Responsibility:
Corporate Social Responsibility (CSR) means companies should address the legal, ethical, commercial and other expectations society has for business, and make decisions that reflect these expectations. In responding to concerns about their role in energy security, Shell sees a number of priorities. At least two involve a sustainable energy future with low environmental impact. Conserving energy is

Shell sculpture – London office

identified as something they must pursue to both significantly reduce their impacts and provide a more secure energy future for their business. And bringing new energy sources to market must be pursued with vigor to drive down costs and increase production from renewable sources.

According to CEO van der Veer, the energy company of the future must secure the trust of the communities in which it operates. It must ensure that it is a force for good, and act responsibly in environmentally sensitive areas. He acknowledges that people may be skeptical about Shell's efforts to apply sustainable concepts to their operations, but insists that the international oil company of the future must consider all of this to survive.

And finally, in an effort to be as transparent as possible, Shell created a discussion forum on its website called "Shell Dialogues," which allows public message postings - including visible, sometimes scathing criticisms of its operations. It allows Shell to explain what they do and how they do it, and provides an opportunity for the public to air their views about our mutual energy future. What roles we each can play in this future and whether we choose to work in opposition to each other or not remains to be seen, but it would likely be more fruitful and productive if we work together in partnership.

BP

BP used to stand for "British Petroleum." In 1997, former CEO Lord John Browne hired an advertising firm to help create a new image for the company, saying, "I want this company to be a force for good in this world. Build that image and I will hold the company accountable to it." Thus, BP as "Beyond Petroleum" was born. The renaming is somewhat of a paradox. The public often resents and distrusts oil and gas companies, but we are also consumers of energy. By renaming themselves Beyond Petroleum, it may help bridge that divide, perhaps encouraging partnership in envisioning what a "beyond petroleum" energy future might look like.

Alternative Energy at BP:

The BP Alternative Energy division was launched in 2005 in order to aggressively develop, market and trade low carbon power sources. BP predicts renewable energy will account for 50% of world production by 2050, so they believe investing in alternative energy is a good business strategy. Renewable energy technologies are becoming increasingly

competitive so there's an opportunity for good returns. They already have capabilities in each technology.

BP's initial investment in alternative energy was $800 million/year. Considering the company invests some $15 billion/year overall, their financial commitment to renewable energy may seem small on the surface. Since the alternative energy industry is currently such a small part of the world energy market, BP's investment of $800 million/year is a significant percentage of that total, as is the case with Shell. In 2005, BP announced that it would double its investment in renewable energy sources with plans to spend $8 billion over the next ten years, growing this business segment five to ten times what it is today.

BP focuses on four areas within the alternative energy sector: wind, solar, hydrogen and gas-fired power generation. Some people have been critical of their inclusion of gas-fired power in their alternative energy division, but BP believes that's legitimate because modern gas turbine plants are twice as clean as traditional coal-fired power plants. They are also growing their natural gas business, as they see it as an important bridge fuel. Natural gas produces half the CO_2 that coal does, so it's a cleaner interim fuel until we can truly live in a low- or no-carbon energy world.

BP also believes that advanced biofuels hold much promise for a carbon-constrained future. Biofuels can be developed based on materials that don't require intensive farming, like straw or waste materials. When biofuels are blended with gasoline, greenhouse gas emissions can be reduced by 25% in standard vehicles and up to 50% if used in very fuel-efficient vehicles. In 2006, BP set up a business partnership with DuPont to explore, develop and market new generations of biofuels. And BP will invest $500 million over 10 years to create an Energy BioSciences Institute which will explore how bioscience may lead to production of new and cleaner energy.

BP has aggressively pursued solar energy for over a decade, and its solar division is one of the world's leading solar companies. In the U.S., it teamed up with Home Depot to give homeowners easy access to solar kits and information on home-based solar power. Despite BP Solar's leadership and presence in the solar industry, it only became profitable for the first time in 2004. These renewable technologies are still developing and only now becoming truly cost competitive with other more traditional and less clean technologies.

BP billboard sign in London

Portrait of a Sustainability Champion: Vivienne Cox, BP

Vivienne Cox joined BP in 1981 with a chemistry degree from Oxford University – and later got her MBA from Insead. She had always wanted to do something regarding the environment that would make a difference, but didn't know what to do to get positively engaged. In 2004, she got a new job at BP with responsibilities for gas, power and renewables. Suddenly she had a portfolio with a legitimate right to get involved - in a company that was taking environmental issues seriously.

The Renewables business was seen as an investment, with solar having cost them $0.5 billion already. In early 2005, she brought 150 leaders together to create a shared context, a different sense of what the problem might be. Her "Strat Fest" brought all doubters as well as proponents together. They heard that the energy industry was at a crossroads, with discontinuities and dislocation in the model. There was lots of context sharing about the power industry and trading business, and many strands came together around "low carbon" power. Vivienne began to build a business case.

People started working on solar, wind, and hydrogen power projects with GE. However, the GE/BP collaboration required conviction and financing to get it done. Vivienne sent people out to create a buzz with questions such as: "Did you know you can get 12-14% risk free return on wind?"

Lord Browne (BP's CEO at the time) recognized the importance of their effort and saw that this could bring credibility to BP. He asked colleagues to sell the project: creating new business to invest $8 billion in 10 years. They created a separate company, not one sitting inside an oil company - one that would have a different culture, different way of behaving, a different look and feel. They called it Alternativenergy™ Powered by BP.

They launched the new company with the goal "to make low carbon power an accessible and affordable option for people and businesses everywhere" with the aim of "reducing carbon dioxide emissions by 24 million tons." In 2005, Vivienne said "BP Alternative Energy will be the world's first business dedicated to the development and wholesale marketing and trading of low carbon power."

Her "hydrogen power" group grew to 150 people in 2007, and they are thinking about bringing in a coal company as a collaborator. They now they have 500 megawatts under construction in the U.S. They have doubled solar capacity and are collaborating with GE on 2 hydrogen projects. Their business is beginning to shift the nature of the conversation about what is possible – both inside BP and out.

Vivienne has been on a personal leadership journey for the past few years. The path emerged from context sharing, relationships, and giving people space. She credits the power of emergence, allowing wisdom in the room to come through.

She is now facing a new dilemma. The opportunity set is now 3 times what they had seen before and is too big for BP to fund. Therefore, how can they sustain BP's position and their own sense of what is possible?

Stay tuned...

BP solar PV factory
(Photo Courtesy of DOE/NREL)

Although oil and gas production will remain BP's primary business for years to come, they will continue to develop cleaner, more efficient products toward the transition to a clean energy future. BP hopes that by leading the way, they'll encourage others to follow. For a successful transition, it's critical for BP's suppliers and partners to join them.

Corporate Social Responsibility:
Perhaps the most bold and impactful thing BP has done to help ensure a clean energy future is in the political arena. In April 2002, BP formally changed its corporate policy, prohibiting any corporate donations to political organizations worldwide. Recognizing that contributions from oil and gas companies can induce candidates or organizations to treat the fossil fuel industry favorably, and would actually harm the advancement of a renewable energy future, BP acted in a morally responsible way. This decision reflects the very essence of CSR.

BP has demonstrated their social responsibility in sensitive and remote areas of the world through other ventures. BP has developed programs that help remote communities by providing solar power to vital services and equipment such as lighting for schools, refrigeration for medicines and improved communication. This power has served as a lifeline to communities in countries such as Malaysia, Thailand, the Philippines, India, and Brazil. In 2006, BP developed a cookstove that can use LPG, biomass or both as the fuel source. This was developed for use in low-income communities in India and South Africa and provides a safer, cleaner and more affordable energy source for household cooking needs.

Climate Change
BP was the first major energy company to publicly acknowledge the need to take steps that would address climate change. Further, former CEO Lord Browne committed his company to reduce its own greenhouse gas emissions to 25% below 1990 levels by the year 2010. This goal was reached in 2002, eight years early. They've since raised the bar with more stringent reduction goals. BP also aims to be a leading trader in carbon credits.

BP states that a number of steps should be taken to reduce emissions globally. Some of these very aggressive goals are opposed by a number of U.S. industries, such as increasing fuel economy in cars to 60 mpg and increasing wind power by 50-fold and solar 700-fold.

Conclusion

There is no single solution for our energy needs. We will have to draw upon a multitude of clean energy technologies to both fuel our future and do it in a carbon-neutral way where the harm that has been done to our planet is reversed. Even an innovative combination of technologies alone is not enough without a corresponding shift in our perspective. Awareness of where our energy comes from and how much we use on a daily basis is a first step toward recognizing our individual roles in shaping our energy future. The levels of comfort and convenience we enjoy will likely need to change if subsequent generations are to enjoy similar comforts. We each have choices – and must weigh those choices.

Beyond our own personal choices, why not work together in partnership with energy companies that can help build the infrastructure, improve the technologies and supply products for renewable energies? This includes both small independent renewable energy companies as well as forward-thinking major oil and gas companies. Isn't it more effective to encourage and reward those companies that are moving in a cleaner direction, and developing a dialogue with them, than to criticize and condemn at every step with suspicion of ulterior motives underlying all they do?

People are now broadly acknowledging global warming, and scientific consensus has increased. With growing global conflicts in and around oil-rich areas, we have a desire to be energy independent. The cost of filling our gas tanks is hitting us in the pocketbook like never before. All of this is compelling us to ACTION! We cannot throw up our arms in despair, declaring the situation hopeless. We must act. We must sense the urgency. We don't have to change everything overnight, but we must take some big steps now to secure a sustainable energy future based on clean and renewable sources that will sustain the many generations to come.

Science & Industry partnership
(Photo Courtesy of DOE/NREL)

Compact fluorescent light bulbs
(Photo Courtesy of DOE/NREL)

Action Steps

We can effect change on several different levels: as individuals, in our workplaces and companies, and as members of the community in which we live. Below are some suggested action steps each of us can take to support a renewable energy future at these various levels.

Individual:

- Consider fuel-efficiency and emissions in your choice of vehicle. Make sure it is the right size for your regular, everyday needs (not your extraordinary needs).
- Choose the smallest living space you can be comfortable in, thereby reducing your ecological footprint and the energy needed to run your home.
- Choose a home in a location as near your workplace and shopping needs as is feasible, thereby reducing your transportation needs.
- Use public transportation, walking or biking to places as a regular alternative to riding in your car.
- Audit your home for energy efficiency and replace or make improvements to one energy-inefficient device or feature per year.
- Gradually replace incandescent light bulbs with compact fluorescent light bulbs – they use 75% less energy.
- Use less paper – it takes 99% more energy to manufacture a sheet of paper than it does to print a page out on a printer.
- Consider installing a programmable thermostat for more efficient home heating and cooling.

Company:

- Champion energy efficiency at your workplace.
- Pressure companies who are not acting responsibly to consider energy use and emissions in all they do.
- Push your local energy supplier to provide increasingly more green power to its subscribers.
- Look for opportunities to become a leader. To make real and lasting change within an institution, a leader needs to take the reins, get people organized and then motivate and inspire them to carry change efforts forward.

Community:

- Write your elected officials about the need for federal standards for increased fuel efficiency in cars.
- Vote.
- Encourage your local transit authority to develop and promote the use of public transportation.
- Consider investing 10 additional hours per year of your time to volunteer organizations that promote energy efficiency and independence or to efforts that can influence government policy within your community.

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About the author

Carol Stoner's interest in sustainability stems from a childhood appreciation for nature and the outdoors. She is a strong advocate for environmental stewardship at work and at home. She tries to nurture this value in her kids so it will take root and grow, generation by generation.

Carol believes that business and industry have an enormous potential to positively impact the way we live on this earth. Two years ago she traded in her small SUV for a Toyota Prius. Although she gave up the large hatch space for her big dog and the capability to switch to 4WD to access remote areas in the Colorado mountains, she has found the trade-off to be well worthwhile. She advocates for friends, family, and even strangers who sometimes stop to inquire about her Prius that each consider a hybrid or another very fuel efficient car for their next vehicle purchase.

Carol obtained her B.S. in Forestry at the University of Nevada - Reno, and was certified as a ZERI Systems Design Professional in 2005. She is employed by Peakinsight LLC, a global consulting firm founded in 2000. Peakinsight LLC fosters catalytic connections between people, organizations, and the environment to impact how business will operate profitably and evolve sustainably in the future.