Plus low-carbon leaders that "get it"

On Our Way to a Low-Carbon World

In a world that is so profoundly based on affordable access to energy, where financial markets, energy markets, and communications are so closely linked, each action and movement in the global energy economy comes with an equal and opposite reaction and cost. This is especially true in the extraction of valuable fossil resources, a brutish process that stands in sharp contrast to the fragility of our environment.

The subject of how we power our lives continues to be a subject at the dinner table, and the environment is at the center of the discussion. "The climate agenda is certainly shaping the form in which energy will come to consumers, and that's because consumers are demanding it," says Bob Edwards, vice president of strategy at BP Alternative Energy (BP AE), in London. "It's not just that government is pushing the agenda…consumers are beginning to accept that there has to be a change."

Course Correction

The need for lower-carbon energy means reorienting our skills of innovation toward creating new processes and technologies. The energy sector now includes incumbent players, like BP, investing in wind, solar, biofuels, energy efficiency, and more. It is no longer about if there will be a change; it's about how fast the change is happening and where it will take us.

Examples abound as cities, states, and countries begin to move toward friendlier policies that fertilize growth in lower-carbon technologies. In San Jose, Calif., hybrid drivers park for free at parking meters. In Germany, government incentives are spurring growth in residential solar installations. Spain has become a giant in renewable energy. "Barcelona is a perfect example of a world-class city that is committed to sustainability," says Enrique Alejo, trade commissioner of the Trade Commission of Spain in Chicago. "The city's commitment to using renewable energies has reduced its CO_2 emissions by an average of 1,973 tons a year since 1999."

Pushing the Limit

Changing course in the race to a low-carbon future is a bit like changing sails in a storm. Today's energy sector is defined by the duality of supply difficulties and increased demand. "It's become clear that consumers increasingly seek energy that's cleaner and produced in an environmentally responsible manner, and they will expect us to deliver it at a reasonable cost," says BP's Edwards.

In the electricity sector, estimates are that the U.S. will need 50% more power in 2025 than today. With power demand accounting for 66% of energy consumption and 40% of CO_2 emissions, the U.S. faces significant challenges for producing electric power cleanly.

The growth in the green building sector is a telltale sign that markets are responding to increased energy and

environmental awareness. "The residential construction industry is of primary importance to the U.S. economy," says Harvey Bernstein, vice president, industry analytics, alliances, and strategic initiatives, for McGraw-Hill Construction, "and our research shows an increase in the number of home builders embracing green methods of construction and how consumers are demanding and buying more green homes."

When it comes to transportation, there has been an explosion of vehicle use around the globe. The numbers suggest that global vehicle stock is set to go from 800 million in 2002 to over 2 billion by 2030, when the number of vehicles in China is predicted to rise twentyfold and touch 390 million.

A Panopoly of Power Options

Society is once again turning to the natural, plentiful ambient resources that surround us. Many see renewable energy—be it solar power, wind, ocean, or other—as not the next big thing, but the current big thing. And it's about to get a whole lot bigger.

"It's become clear that consumers increasingly seek energy that's cleaner and produced in an environmentally responsible manner, and they will expect us to deliver it at a reasonable cost."

— Bob Edwards, vice president of strategy BP Alternative Energy

Large corporations, universities, venture capital, and scrappy entrepreneurs are all working to get a piece of the energy supply pie. Some predict that the solar equipment industry is on a path to grow from $20 billion in 2006 to $90 billion by 2010. The roller-coaster ride of ethanol stocks represents the tremendous interest in the search for the next non-fossil liquid fuel. Growth in the wind, ocean, geothermal, and hydrogen sectors is unprecedented, with companies around the globe researching, financing, and marketing products that convert things as simple as a midday breeze into electrons.

BP is one example of a corporation that sees opportunity in the change from traditional to alternative energy. "We are mobilizing to supply what the end user requires today, and will be requiring tomorrow," says Vivienne Cox, chief executive of BP AE. "We are heavily investing in the new technologies and in the energy value chain that will be providing a low-carbon future. And we view the suite of new products as quite complimentary to the current petroleum value chain."

Discovery Communications Inc. This Silver Spring (Md.) global nonfiction content provider, parent of The Discovery Channel and scores more TV and digital media properties, has launched Discovery PlanetGreen, a global, cross-platform initiative planning the first-ever 24-hour television network dedicated solely to green lifestyle programming. The initiative also includes treehugger.com, a multimillion dollar investment in new original content and a robust multi-platform offering with interactive tools and comprehensive "how-to" resources.

EnerNOC Inc. Boston-based EnerNOC is a leading developer of clean and intelligent power solutions. The company provides demand response and energy management services nationwide. EnerNOC's technology helps the energy industry cope with the challenges posed by rising energy demand, including escalating costs and an increased risk of rolling blackouts and brownouts.

General Motors This Detroit-based auto giant is committed to creating a cleaner, greener tomorrow, and the proof is already on the road. GM offers 24 different cars and SUVs getting 30 mpg or higher on the highway, FlexFuel vehicles that run on E85 ethanol, advanced hybrids, fuel cell propulsion technologies like the Chevrolet Equinox Fuel Cell, and the innovative electric vehicle – the Concept Chevy Volt.

Google Inc. From solar panels on its Mountain View (Calif.) headquarters to a nonprofit investment arm committing $10 million to companies and entrepreneurs focused on sustainable transportation, Google is a company that "gets it." The company even holds an environmental fair to help introduce employees to various sustainable practices, low-impact living, and natural products, plus offers a cash incentive to employees purchasing a fuel-efficient vehicle.

Port of Los Angeles Comprising 7,500 acres, 43 miles of waterfront, and 27 cargo terminals, the Port of Los Angeles is increasingly moving cargo with the environment in mind. The Port has created programs for cleaner operating ships and boats, terminal equipment, trains, and trucks. The Port's landmark Clean Air Action Plan is aimed at the long-term development of facilities that maximize cargo transport efficiency and minimize the impact of goods movement on air, water, and land resources.

UPS Known for its global delivery reach, Atlanta-based UPS is gaining a reputation for its environmental efforts as well. The company operates the largest private alternative fuel fleet in its industry, with deployments that include compressed natural gas, liquefied natural gas, hydrogen fuel cell, electric, hydraulic hybrid, hybrid electric, and propane-powered vehicles. Since just 2000, the UPS Green Fleet has traveled more than 126 million miles.

Xcel Energy Inc. This Minneapolis-based public utility, which provides a comprehensive portfolio of energy-related products and services to 3.3 million electricity customers and 1.8 million natural gas customers in eight states, is becoming increasingly well known for its vision of minimizing the environmental impact of generating power. Xcel Energy actively promotes conservation and is pursuing renewable energy sources such as wind, solar, and biomass. In 2007, the company was listed on the Dow Jones Sustainability Index for the second consecutive year.

The companies above were selected by independent consultants and the Energy Series 2007 Board of Advisors. The selection process did not involve BusinessWeek editors or staff.

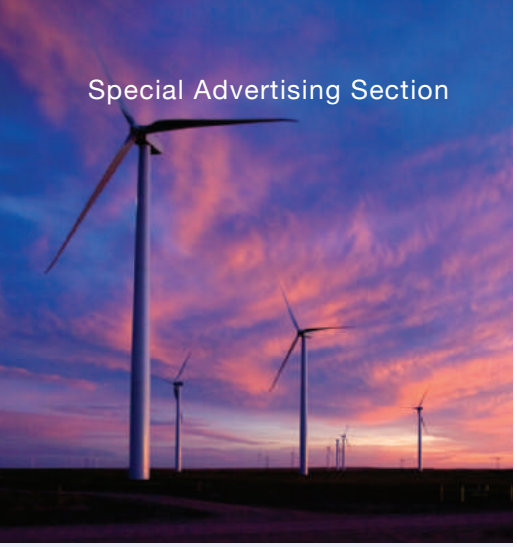
BP
Responsible Leadership for a Sustainable Energy Future

Energy has entered a new, uncharted era. Consumer demand remains strong, unchecked by high prices. Yet the path to a sustainable future clearly requires change. The energy industry must ensure that fuel production becomes cleaner and more environmentally responsible.

To meet this need, BP is both investing in and delivering a range of low-carbon and biofuels-based energy products. "BP is committed to action," says Vivienne Cox, chief executive of BP Alternative Energy (BP AE), in London. "We are mobilizing to meet the growing energy needs of consumers with environmentally sensitive products. We are heavily investing in new technologies as well as in the new energy value chain, which will provide a low-carbon energy future to us all."

To meet these goals, BP is supporting ongoing investment and research in five key areas:

- Solar, where BP will lead the industry with more than 300 megawatts of installed manufacturing capacity by the end of 2008.
- Wind, in which BP will have completed or have in construction more than 450 MW by year-end. This is in addition to managing a portfolio of nearly 100 wind projects with a potential generating capacity of 15,000 MW.
- Hydrogen, where BP has partnered with Rio Tinto and General Electric to jointly develop and build as many as 15 hydrogen power plants,



The Cedar Creek Wind Farm in Colorado is a 300 MW joint development venture between Babcock & Brown and BP Alternative Energy.

two of which are expected to be running as early as 2013.

- Biofuels, where BP is collaborating with DuPont on advanced biofuels, marked by a $400 million partnership with Associated British Foods and DuPont to build a major biofuels facility. Additionally, BP has made a $500 million commitment to establish the Energy Biosciences Institute with the University of California, Berkeley, the University of Illinois, and the Lawrence Berkeley National Laboratory to perform groundbreaking research aimed at providing new and cleaner fuels, including advanced biofuels.
- Energy reuse, with a new research initiative to convert coal, petroleum, coke, and other low-value feedstocks into power and motor fuels.

"It's the responsibility of the energy industry–with some transitional support from governments–to provide consumers with the energy they demand, and to do so in a clean and environmentally sound way," says Bob Edwards, BP AE's vice president of strategy. "There is no time to wait. BP is taking decisive action to move our industry toward broader use of environmentally responsible low-carbon and biofuels-based products."

Place Your Bets

The number of installed solar power installations around the world is growing exponentially, and researchers are exploring new ways to promote and improve solar power. In Europe, Spanish companies and research centers are taking the lead in the recent revival of concentrated solar power, as expanses of mirrors are being assembled around the country for concentrated solar plants. In the U.S.,

Photo: © Zachary Lyman

The PowerCube, a portable solar power generator, exemplifies new products entering the renewable energy space.

California is throwing a solar power party, fueled by government incentives. The solar industry is expected to triple in the next three years, to about $40 billion in revenue.

As for wind, installed wind generation is growing around the world. Once again, Spain is making its mark, as the second-largest wind-energy producer in the world. Some examples are Gamesa Eólica, the world's second-largest turbine manufacturer; Iberdrola, the world's largest wind-farm owner and operator; and Acciona Energía, the world's largest wind-farm builder and developer. In the U.S., wind-power-generating capacity increased by 27% in 2006 and is expected to increase an additional 26% in 2007, according to the American Wind Energy Association.

Interest and excitement in biofuels have grown significantly over the last few years. Whether you're looking at ethanol, biodiesel, biobutanol, or renewable diesel, the growth in the biofuels sector over the last few years has been stunning. The American biofuels sector is growing at a rate of 40% per annum.

The growth is coming from a combination of factors: renewable fuels standards; sustained high gas; diesel and oil prices; state biodiesel and ethanol programs; the growth in E85; federal emphasis on expanding the U.S. fuel supply; and of course, the environmental awareness now coursing through the public dialogue.

Innovative to many in the energy field is BP's move toward biobutanol, a biogasoline the company believes will get us to the level of scale we need. The fuel's main advantage is that it packs more power. Conventional corn-based ethanol is only about 70% as efficient as gasoline. This means consumers have to use more of it to drive the same number of miles.

The so-called hydrogen economy is capturing imaginations in both industry and government. A number of players are betting that 25 to 30 years from now, we will have a new energy infrastructure that is based on making, storing, and distributing hydrogen for use in generating electricity or in fuel cells for both our vehicles and our buildings.

The advantages of a hydrogen economy are many. If we make hydrogen using solar, wind, or other similar power sources, it's 100% clean. Hydrogen can be made from a variety of domestic feedstocks like water, biomass, coal, and natural gas, and it is nontoxic and will not contribute to groundwater pollution. Fans point to the fact that hydrogen does not create "fumes" or other harmful emissions, and that, in fact, using hydrogen in fuel cells produces only electricity and pure water. The promise of a hydrogen economy has created a boom in hydrogen investment in the last few years, spurred in large part by President Bush's 2003 announcement that the federal government would invest $1.2 billion in hydrogen this decade.

BP is on track to have two commercial hydrogen-based plants in advanced stages of engineering by 2010, with plans for them to be up and running by 2013 or 2014. The cost of research and infrastructure raises the stakes for any individual player. Long-term bets on a technology type are risky, and while many see the need for a change to lower-carbon energy, there is no one company that can do this alone, says BP's Edwards. "This is about partnerships. We have to have collaboration, and we should all expect partnerships—between oil companies and utilities, between governments and energy companies, at the state level and at the federal level."

Given increasing emissions and the nonlinear climatic occurrences we have experienced, industry, government, and consumers need to begin to reduce emissions growth now. Time is a luxury we do not have.

ENERGY SERIES 2007

Web Directory

BP
www.bp.com/us

McGraw-Hill Construction
www.greensource.construction.com
www.greensource.construction.com/resources/smartmarket.asp

Renewable Energy Access
www.renewableenergyaccess.com

Trade Commission of Spain
www.us.spainbusiness.com

Produced by Carey Publishing Group, www.careypublishing.com
Written by Henry Gentenaar, Reluminati LLC, www.reluminati.com
Designed by Segal Savad, www.segalsavad.com
Visit: www.businessweek.com/adsections

Fernando Gutiérrez de Vera, Civil Engineer
and President of the SEOPAN Concessions Committee.

field research

Spain enjoys high standards of well-being and quality of life. It is the reflection of a first-rate level of socio-economic development. Spanish businesses are very aware of environmental and sustainability issues and are also outstanding in their achievements in technological research and development.

Spain is currently a leader in infrastructure management. It is the second largest country in the European Union and has the highest average altitude. Spanish companies survey areas in order to design the best routes, incorporate latest-generation technology and design efficient management systems.

Six of the world's top ten transport infrastructure concessions companies are from Spain.*

*** Ranking of "Public Works Financing," (Top Transportation Developers 2005, N° of Concession/P3 Projects)**

españa, technology for life.

www.spainbusiness.com