

Climate Changes Everything: The Coming Revolution in the Energy Industry

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The Oscar for best performance in 2007 might as well have gone to climate change. Rarely has a single issue so dominated the political debate and the public imagination. Al Gore not only took home an Academy Award for *An Inconvenient Truth*; he also won the Nobel Peace Prize (together with the Intergovernmental Panel on Climate Change, or IPCC). Climate change topped the agenda of nearly every political summit, from the G8 to the European Council, culminating in the Bali Conference that set the stage for the next Kyoto.

The IPCC's report on climate change dealt a one-two-three punch to unbelievers, establishing, once and for all, incontrovertible evidence that carbon emissions pose an imminent threat. The Bush administration overcame its disbelief, while OPEC featured environmental issues at a rare summit in November 2007. And then in December 2007, in Bali, nearly 200 countries overcame initial skepticism to agree on ambitious landmark targets for a new global climate accord.

The convergence of concerns about climate change and energy security during the past two years has allowed us to move past the tipping point of awareness to the transformative stage of action. Informed individuals around the world now feel that it is up to them to help save the world from environmental catastrophe. They are busily screwing in fluorescent light bulbs, buying hybrid cars, taking shorter showers, and "greening" their homes by double-glazing windows, putting seals on doors, and sealing gaps in floorboards to cut down on energy use.

At the supermarket, they are beginning to scan "carbon labels" that have begun to appear on products like Pepsi and Walker's potato chips, which detail the amount of carbon dioxide generated in making the product—from growing the raw ingredients to disposal of the packaging. Many consumers are even tracking their personal carbon emissions on websites like mycarbonfootprint.eu, and buying carbon offsets through programs like the Conservation Fund's GoZero initiative. In the Netherlands, the "Friends of the Earth" is running a campaign called "Not with My Money" in which people are urged not to use financial institutions that invest in oil or coal energy.

Ordinary people, in short, have understood that for the first time in history, every individual can be an agent of change in addressing the world's greatest challenge. Big Oil was the protagonist of the 20th century; individuals are the stars of the 21st. Consumers understand that reduced demand is potentially the largest source of supply. It is their drive toward efficiency—enabled by end-use technologies that sip rather than chug energy—that must be at the heart of the new energy era.

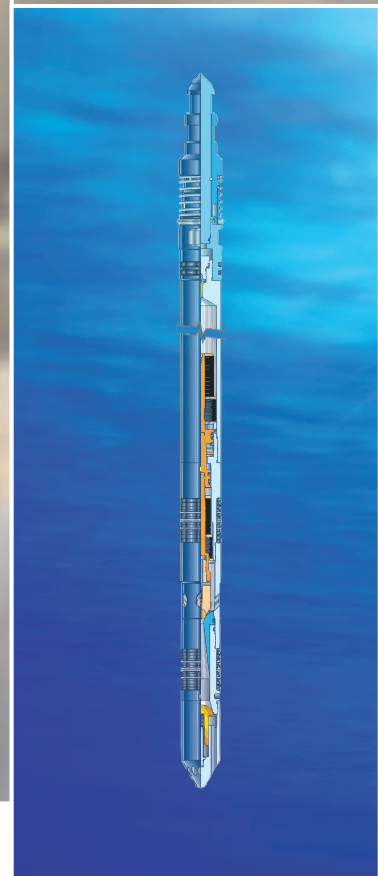
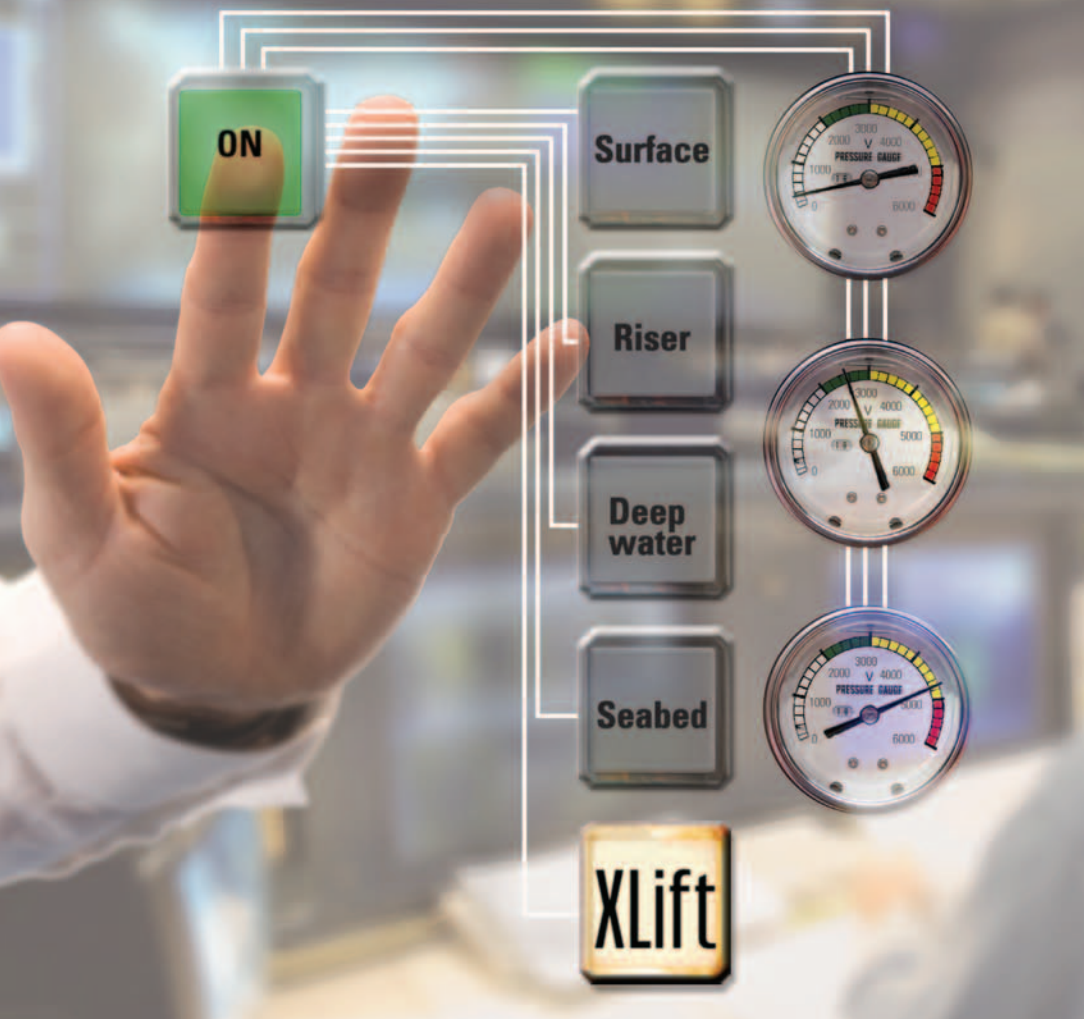
Business also gets it. Companies are creating new products whose production and use reduce carbon emissions and fossil fuel consumption. The critical challenge for them will be to do this while at the same time producing better products. They will have to deploy hope and aspiration as marketing tools, rather than fear and deprivation. The smartest companies will understand that this is the only way they can be sustainable. The more stubborn ones, ultimately, will go out of business. Dinosaurs, after all, can't dance. This process of creative destruction will lead to winners and losers, which is only natural in a free market.

With pressure from consumers and civil society mounting, corporations will increasingly be guided by an ethic of corporate sustainability, wherein carbon

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strategies help them reduce their carbon footprints. Truly sustainable corporations will go even further down the green path, reducing their environmental impact across the board—reinventing their production processes, their packaging, and trying to make production as local as possible. Corporations, of course, are driven mostly by the bottom line. The private sector, however, can be harnessed for the common good. If we capture all the costs to the commons of producing and using energy, we can afford to allow the profit motive to work out the best answers.

This is where the third change agent, government, must come in to establish the rules of the game and create a level playing field that draws in all the necessary players. There is a dual challenge for government.

First, it must enforce full and accurate pricing of energy. No longer can we blithely ignore the environmental, health, and other costs of fossil fuels—these must be incorporated into the price we pay at the pump and at the cash register, through taxes or other means. Full and accurate prices also demand an end to market-distorting subsidies like those that go to ethanol producers. If government creates a level playing field that transparently accounts for costs, then businesses will be able to make sustainable decisions to create sustainable products and services. Consumers, thus, will be able to adjust their consumption patterns in ways that make the world a better place.

Second, government must establish the rules of the game by which energy producers will compete over the next generation. This is essential since there is no silver bullet that will solve our environmental crisis. The European Union Energy Commissioner put it well in November 2007: “There is a pressing need for strong frameworks in which the massive energy investments needed worldwide can be undertaken with confidence in the coming years.” If we have full and accurate pricing, companies and individuals can make correct decisions—and therefore profits will be full and true as well. And make no mistake: most companies are keen to see such a framework in place, because today they are facing an opportunity

of a lifetime. We are about to witness the largest investment ever made in the energy and energy-using sectors.

Finally, government must work together with the private sector and civil society to ensure that climate change literacy becomes a top educational priority in our schools and in the public discourse. Only by instilling a new green ethic in rising generations can we be assured of creating a sustainable world.

Climate Change and Energy Security

As oil flirts with triple digits, and with climate change fever rising, the energy industry is eager to innovate on every front. And if their enthusiasm fades, policymakers will be right there to compel change by making their “license to operate” contingent on moving to clean and renewable fuels. Industries will be forced to reduce carbon emissions both in the process of production and in the use of fossil fuels.

Hydrocarbons, of course, will remain in focus for decades to come. The US Geological Survey estimates that there are two trillion recoverable barrels of conventional oil in the ground. New techniques—such as multilateral drilling, 4D seismic analysis, and electromagnetic direct detection of hydrocarbons—will allow us to improve the recovery rate from existing wells (with current technology, conventional wells yield only one-third of the oil they hold). In addition, other innovative technologies will gradually reduce the release of carbon into the atmosphere by traditional fossil fuels and also will tap an estimated two trillion barrels of nontraditional fossil fuels—in the form, for instance, of CO₂-intensive oil sands in Canada and heavy oil in Venezuela’s Orinoco Belt.

Here’s where the convergence of climate change and energy security really comes into focus. For these oil sands to be a long-term secure source of supply, we will have to reduce their carbon footprint—an issue being heavily researched today, with the Alberta and Canadian governments putting in place intensity-based carbon emission limits and associated trading programs. The industry is developing strategies to

respond, including considering alternative sources to provide the energy needed to extract the oil. The bottom line: the recovery rate of such nontraditional fossil fuels could increase from around six percent today to more than 40%.

Securing the continued flow of fossil fuels is essential, since it will take at least a generation to begin to shift our infrastructure to take advantage of energy efficiency, advanced end-use technology, and alternative sources (think of the hundreds of thousands of gas stations or of the oil-based boilers in millions of buildings). Innovation in tapping previously inaccessible hydrocarbons will be one way to ensure this. Manufactured fuels such as ethanol, autogas, and biodiesel are another; cellulosic ethanol, made from agricultural waste, could meet 10 percent of America’s automotive needs.

A significant part of this flow of fossil fuels is liquefied natural gas, which, together with compressed natural gas, has attracted more than USD 100 billion in investments. The cumulative effect of this innovation is that our definition of oil is changing. Manufactured fuels aim to make end-user emissions cleaner than they otherwise would be. Another approach—carbon capture and carbon sequestration—brings coal into the clean energy equation. (Coal has been declared dead many times in the past 50 years, but we use it now more than ever.) By removing CO₂ before power production, utilities can store the carbon in liquid or gas form in deep underground formations. The location of the power plant becomes critical. If this approach is truly developed, and storage is found, then we can create hydrogen-produced electricity that would then fuel plug-in hybrid cars. Assuming a legislative framework is put in place to encourage sequestration, it is even conceivable that we could have emissions-free fossil fuels within a decade. Nonetheless, as with other technologies, carbon sequestration is not a silver bullet, since limitations on storing captured carbon mean that the method cannot be applied everywhere. CO₂ cannot be sequestered everywhere a coal plant is built—and with China building one or

two new coal plants every week, this is a significant hurdle (though technology again might come to the rescue eventually; cutting-edge techniques to solidify CO₂ could be a silver bullet for clean coal plants).

With all these new technologies, it is critical that we vigilantly assess their cradle-to-grave impact. The recent furor over biofuels and their impact on food prices (not to mention the vast quantities of water needed to produce them) is the most obvious example of the need to understand the trade-offs we are making. Likewise, with the breakneck pursuit of the oil sands, we have to realize that there is a staggering cost of extracting such difficult fossil fuels—with each barrel of oil from oil sands requiring half a barrel to produce and abundant water, as well. And while carbon capture and carbon sequestration are important technologies, they are not for everyone. Pushing them too hard at the wrong time and in the wrong place could create collateral damage greater than the damage we were trying to avoid.

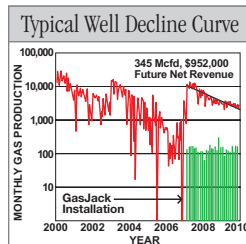
We are at the beginning of a long, experimental period, with different countries taking different approaches to reducing carbon emissions and creating a sustainable world. It is critical that we accurately monitor the various approaches being implemented and, based on a rigorous assessment, promote the best practices from among them. We might be surprised by what we learn. Experimenting with new approaches also has the virtue of keeping public attention focused on climate change. As individuals, companies and countries strive to become greener, they will keep a competitive eye on each other; the media will be keen to cover green innovation; and the progress of companies and governments will be ever more closely monitored by watchdogs in civil society. All this attention will keep us from becoming complacent. Meanwhile, the Bali agreement—by stretching our horizons further and setting common goals higher—should keep the momentum growing during 2008.

These are still the early days of a monumental, multigenerational global challenge. Yet, for the first time in histo-

ry, nearly every country on Earth—led by the grassroots activism of millions of individuals—is working toward the same goal. And even more heartening,

they seem inclined to use the market as the principal means of achieving this goal. Act One, it must be said, is off to a promising start. **JPT**

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