

Energy Strategy for the Road Ahead



Scenario Thinking for Business Executives
and Corporate Boards

2007

GBN Global Business Network
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Executive Summary

What if ... terrorists destroy three Gulf Coast oil refinery operations?

... a new, more global and powerful OPEC emerges to embargo U.S. companies?

... the U.S., spurred by major shifts in public opinion about climate change, enacts aggressive mandatory targets to cut greenhouse gas emissions?

As alarming or unlikely as these possibilities may sound, **proactive U.S. corporations are systematically looking at the risks that energy impacts may present for their businesses in new ways.** They are doing this to successfully manage energy-related risks despite deep uncertainty about the future. These companies are valuing energy very differently today than they did 20 years ago. Why the change? Senior executives realize that, given the dynamics of today’s world, energy has emerged as a greater risk to the health of their business than in the past. **The very astute also see greater opportunities arising from these uncertainties.**

Recently, a group of senior corporate executives from a variety of manufacturing and commercial companies* worked with Global Business Network (GBN) and the U.S. Environmental Protection Agency’s ENERGY STAR® Program to evaluate how the world energy scene might impact their businesses through 2020. **The group framed and created four plausible “roads” ahead, each posing a specific challenge to corporate leaders.**

- “The Same Road”** where the world continues much in the same direction it appears to be going now in regard to energy and environmental concerns around climate change
- “The Long Road”** where the world undergoes a significant shift in economic, geopolitical and energy centers of gravity
- “The Broken Road”** where the world continues much in the direction of today, but is then hit by a severe event that overturns established systems and rules
- “The Fast Road”** where reasoned decisions and investments about energy and climate risk are made early enough to make a difference

How would your company, as it operates today, survive — or even succeed on — a journey down any of these roads?

* Participating Companies		
California Portland Cement	HSBC	PepsiCo / Frito-Lay
Cascade Engineering	Jones Lang LaSalle	PPG
CEMEX	Merck & Co.	Procter & Gamble
Dow Chemical	Mercury Marine	Shell NA
Eastman Chemical	Mittal Steel	Toyota NA
Genentech	National Starch & Chemical	UPS
General Motors	Owens Corning	

Before taking any trip, seasoned travelers prepare. Similarly, **travel on any of these roads requires advance preparation in the form of corporate energy strategies.** Our group of business executives looked to the scenarios and considered the strategies that would enable a company to successfully travel along whichever future actually emerges. **The widespread conclusion is that there are several steps that all businesses can take now to ensure energy success regardless of the future.**

First, Master the Fundamentals of energy efficiency. Build an energy efficiency culture through executive leadership—appointing an empowered corporate energy director and team, setting aggressive goals, measuring and tracking energy performance for all operations, and establishing accountability and review and recognition systems across the business.

Second, Take Both a Longer and a Broader View of investments and strategic decisions about energy. Make major company strategic decisions (e.g., acquisitions, technology choices, and facility location) with energy cost, use, and supply in mind. Balance more assured returns of energy project investments against lower initial returns across a longer time horizon. See the entire Energy Value Chain, including upstream inputs from suppliers (into internal operations) and downstream outputs to customers (from internal operations).

Third, Search Out Business Transformation Opportunities in the way the company manages, procures, and uses energy. Frame energy as a lever for positive growth and change within the business, not simply a cost. Make the most of the strategic value of energy by thinking in terms of “Embedded Energy” and “Energy Productivity.” Be innovative and aggressive in pursuing and publicizing new product and service offerings based on new energy technologies and supplies.

Fourth, Prepare Contingent Strategies for emergent future scenarios. Rehearse specific aspects of the future, including substantial and sustained swings in energy price and supply, severe weather events, and penalties or incentives around energy use and greenhouse gas emissions. Actively manage exposure to risks, and ready plans to take full advantage of what the future brings. Monitor for signs of which “road ahead” is emerging.

Finally, Take Personal Action. Corporate leaders can take a number of “to-do” actions today for tomorrow. All can be taken individually, in companies, on boards, and across industries. For specifics, see the back cover of this report.

What if ... a business could increase energy efficiency by 5 percent in one year, and then do better in each of the next five years?

... a corporation could use investments in energy as strategic stabilizers to ride out uncertain times?

... a company could identify major new opportunities for its skills and products in a world that is reinventing its relationship to energy?

Energy-intensive companies are not the only ones concerned about managing an increasingly volatile future. Everyone needs an energy and climate strategy. Now.

Introduction

“My interest is in the future because I am going to spend the rest of my life there.”

— Charles Franklin Kettering, founder, A.C. Delco, and Vice President, General Motors Research (1876 – 1958)

In the last year, energy and climate change issues have moved from the sidelines to center stage. Once a topic “owned” by environmentalists, it is increasingly one that is ranked as urgent by senior executives from just about every industry. There has been a wholesale shift in business attitudes in the U.S. around climate change and energy in the last year, coinciding with the course of this project. Companies are beginning to see the true costs of carbon-centric energy consumption patterns exemplified by recent natural disasters like Hurricane Katrina, combined with volatility in energy markets, geopolitical turmoil, changes in the regulatory climate, surging energy demand from emerging economies, and changes in the attitudes of customers. This congruence of concerns around cost, supply reliability, and environmental impacts of the energy needed to sustain our economies and very way of life are increasingly influencing business decisions at the highest level. **In short, our relationship to the energy that drives our economies and societies is in the throes of a fundamental transformation.**

As a result of this rapid change of perceptions, corporate America has reached a tipping point, with companies across a host of industries now making the cost, availability, and environmental impact of their end-to-end energy consumption a strategic priority. Increasingly, the wider impact of climate change on their markets and operations is being factored in. They are now frequently viewing energy management as a form of risk management. **What had once been managed purely as a cost is increasingly being managed as a strategic risk—and even, intriguingly, as a source of new value and opportunities.**

However, the future of energy is still very uncertain territory. Factors such as growing world energy demand, threats to supply from terrorism, emerging regulations and market changes to address climate change, and developments in efficiency and alternative energy are just some of the issues pushing that uncertainty still higher, leaving the timing and nature of the transitions and shifts ahead over the next several decades impossible to predict. Nevertheless, decisions must be made by companies, not only to secure energy but to use it productively over the long term. Despite major uncertainties about tomorrow, critical decisions must be made by executives today. Making such decisions requires corporations to deepen their individual and collective understanding of the dynamics of—and possible strategies for—the U.S.’s energy future.

This report is the result of just such an effort. Starting in November 2006, the U.S. Environmental Protection Agency's ENERGY STAR® Program sponsored two groundbreaking workshops. The first brought together a group of influential corporate leaders from a broad spectrum of industries to participate in a scenario planning exercise on the future of the U.S. energy environment through the year 2020. **This group developed four scenarios about how U.S. energy issues might play out over the next 15 years, with active facilitation, contribution, and analysis by Global Business Network, a member of the Monitor Group.**

In February 2007, a second group of senior executives came together to consider the business implications of these scenarios. They assessed how these different futures could influence the way corporations approach and manage energy. **They also evaluated possible strategies that might enable their companies to sustain—or potentially re-invent—their core business within and across these various futures, in spite of the high levels of uncertainty over how the energy future might play out.**

This report is designed to be useful both for the business leaders who attended these workshops and those who did not. It is divided into three sections. The first explains how scenarios work and why they offer uniquely valuable insight into the underlying uncertainties of the emerging and evolving energy environment we are facing. The second outlines four scenarios for the future of U.S. energy, and begins to explore how we might know if these scenarios are playing out. The third communicates key strategic steps that any executive, corporate leader, or manager can—and even must—take to successfully navigate future uncertainty around energy, given these possible roads into the future.

PROJECT SUMMARY

Goal: Understand the factors that are likely to influence the U.S. energy environment in the future, and create strategies for its management

Approach: Conduct a scenario-based analysis of the future of the U.S. energy environment through the year 2020, and consider implications of those changes in terms of how they could influence the way corporations manage energy

Support: Two groups of managers and executives from a variety of industries, facilitated by Global Business Network and its Chairman, Peter Schwartz, business strategist and futurist

“Both Hurricane Katrina and the Russian natural gas embargo on the Ukraine are mere hints of the growing vulnerability of our energy systems.”

— Peter Schwartz, scenarist, strategist and GBN Chairman

Rehearsing the Future through Scenario Thinking

“You can never plan the future by the past.”

— Edmund Burke, political philosopher (1729 – 1797)

There are a number of trends that, moving on their current course, could significantly change the U.S. energy environment over the next decade or two. New directions will come from technological innovation inside and outside of the energy sector, along with emerging national or state-driven regulatory change, and policies to address environmental concerns such as climate change. The U.S. energy environment also exists within a global market shaped by a wide range of geopolitical, environmental, economic, and social forces. To cope with this complexity, and to encourage new and open thinking about the longer-term future, the U.S. EPA, through ENERGY STAR® and consultation with GBN, chose scenario planning as the tool for initiating new thinking about more strategically managing energy in the face of inherent and increasing uncertainty.

Scenarios help us make sense of our emerging future. They are not predictions, nor are they strategies. They are stories, with a beginning, a middle, and an end. Scenarios outline, and then add color and dimension, to plausible futures in which we might find ourselves. They enable us to rehearse the future, to test current strategies, and to generate novel approaches and options when it comes to making decisions today to prepare and plan for tomorrow. Scenarios also help us discover robust strategies for a range of possible futures, and by so doing highlight the risks and opportunities inherent in each of these future worlds.

Scenario thinking simultaneously considers a number of different possibilities in order to make better-reasoned choices and to rehearse today's decisions against a variety of futures. Such rehearsing often leads to decisions that are more likely to stand the test of time, create distinct competitive advantage, and produce robust strategies. **By recognizing the signs anticipated in scenarios, decision-makers can also gain advantage through flexibility, avoid surprises, and act effectively and proactively.**

Creating the Scenarios

To be useful, scenarios must be focused. The set of scenarios created in the November 2006 workshop were anchored by the following focal question:

How Might the U.S. Energy Environment Evolve through 2020?

From this standpoint, the group identified the forces of change in the world that could have a significant impact on the issue in question. GBN engaged the group in a detailed process that systematically considered many factors that could influence the future U.S. energy environment. The discussion was also informed by a number of subject matter experts in the areas of oil commodity markets, energy technology, regulation, and policy. **Project participants focused on the most uncertain forces, ultimately arriving at consensus around a set of eight critical areas of uncertainty:**

1. **Advances in global energy supply and use technologies**
2. **Shifts in U.S. politics and regulations related to climate change (especially as the impact of carbon dioxide emissions)**
3. **Public and shareholder perceptions of climate change**
4. **Shifts in financial markets that impact energy markets**
5. **Changes in energy commodities supplies**
6. **International political and economic patterns around energy**
7. **Growth in energy efficiency**
8. **New business opportunities arising from energy and climate change**

Once identified, these uncertainties were narrowed down. **Two seemed simultaneously most uncertain and most critical to the issue at hand.** These chosen two were then overlaid on axes, where the endpoints represent extremes of how that uncertainty might play out:

How might shifts occur in U.S political and regulatory arrangements, especially as it relates to carbon dioxide emissions and climate change?

Shifts in U.S. Politics and Regulations

- | | |
|---|--|
| <ul style="list-style-type: none"> ▪ Less emphasis on controlling carbon emissions ▪ Economic growth more of a priority ▪ No new regulations or incentives | <ul style="list-style-type: none"> ▪ More emphasis on controlling carbon emissions ▪ Environmental health more of a priority ▪ New regulations and incentives |
|---|--|

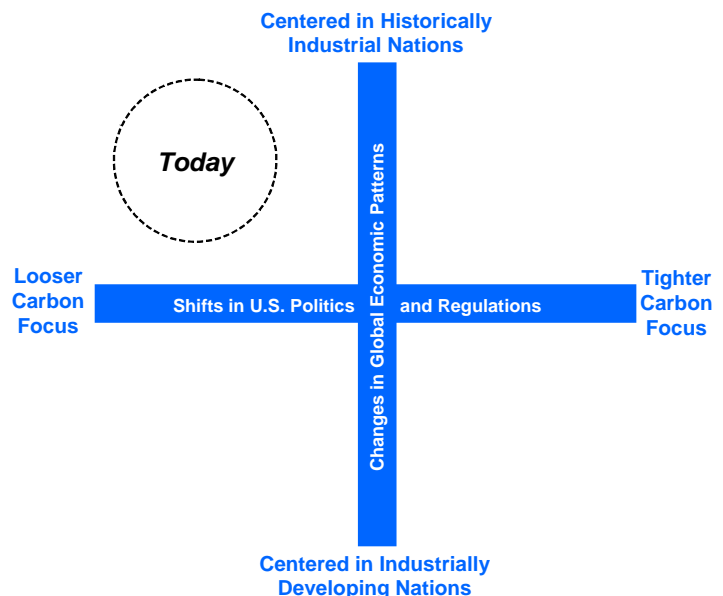
How might changes occur in global economic patterns, markets, and rules that drive general energy demand, supply, and prices?

Changes in Global Economic Patterns

- | | |
|--|---|
| <ul style="list-style-type: none"> ▪ Production and capital flows re-center toward the industrially developing nations ▪ More volatile energy price swings | <ul style="list-style-type: none"> ▪ Production and capital flows remain centered in historically industrial nations ▪ Less volatile energy price movements |
|--|---|

The Scenario Framework

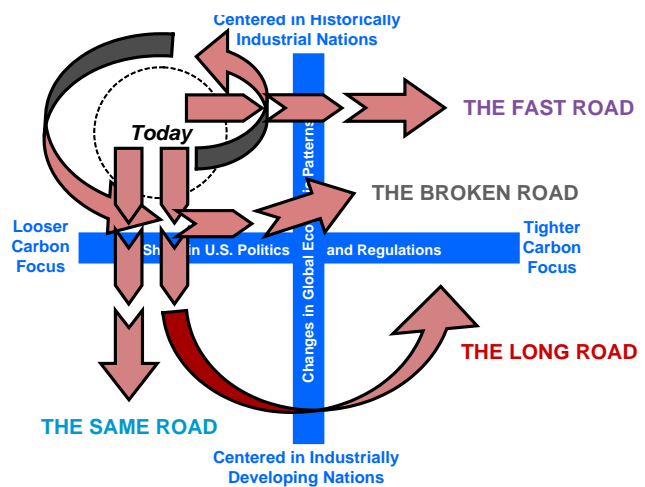
The two axes were then crossed to form a two-by-two matrix framework, consisting of four scenario quadrants. **Each quadrant represented a plausible and relevant story that, taken as a set provided different future trajectories.**



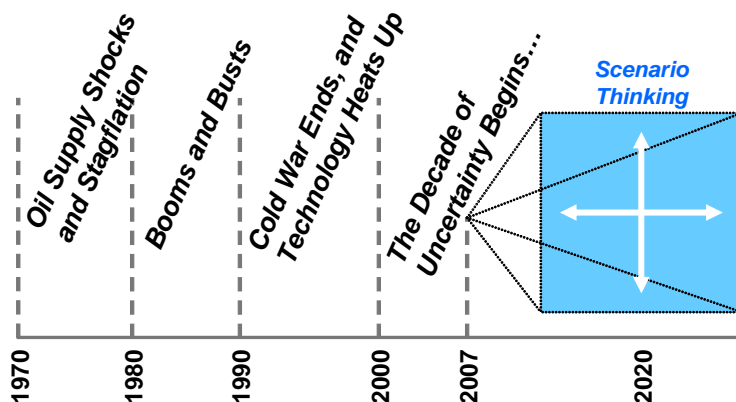
This framework not only allowed other important areas of uncertainty to be played through each quadrant, but also served as backdrop for movement across, between, and through each quadrant. Workshop participants all agreed that the upper-left quadrant is where we find ourselves in 2007, but they did not see that quadrant as a steady state. How would we move from where we are today, to where we will find ourselves tomorrow? What would be the paths into the future?

Project participants agreed that four possible different “roads” lie ahead for the future of energy. “The Same Road” moves slowly to the lower left. “The Long Road” moves quickly through the lower left to the lower right, and then heads for the upper right. “The Broken Road” circles in the upper left before heading to the upper right. And “The Fast Road” moves directly from the upper left to the upper right.

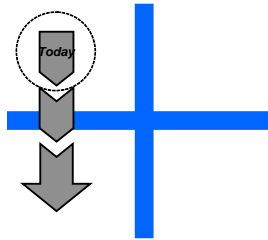
The scenarios that follow are not meant to be exhaustive. They are designed to be provocative yet plausible, and wide-ranging yet bounded. **Once these futures were created, the next step was to try to imagine what it would be like for an organization or society to live in each of these futures.** The exercise may sound simple, but the results were surprising and profound. In the process of adding detail and color to each future, new issues and strategic concerns rose to the surface, while old issues were reframed (See Appendix, Summary of Key Elements).



The story associated with each “road” provides a different answer to the focal question, and as such serves as a “wind tunnel” of the future, in which company executives can test and create their own energy management strategies. Each scenario carries with it a set of implications for energy strategy and management at a general level. Each will prompt particular options that will be industry-specific, and even more precise for individual companies.



“The Same Road”



This is a world in which a combination of political inertia and global economic growth keeps the U.S. energy environment in familiar territory. Energy prices fluctuate in well established patterns, along an upward trend with a series of price spikes. Economic power steadily shifts toward developing nations, but not at a disruptive pace that threatens the historically industrialized nations. There is slow growth toward strategic energy management due to relatively low energy prices, few government incentives, and lack of policy initiatives to address climate change.

Beginning Years, 2007–2010

The U.S. retains its leading position in the world economy amidst a relatively peaceful process of globalization. In particular, relationships with China, India, and Russia remain positive and productive. Oil and natural gas supplies remain adequate and new finds are regularly announced. Oil and natural gas prices fluctuate along an upward trend, but even at high points, the world economy is able to adjust without significant recessions. Annual GDP growth in the U.S. remains in the 2–4 percent range. In this environment, energy management within companies remains more decentralized as most new capital investment goes overseas, particularly in manufacturing.

Middle Years, 2011–2015

Although the political debate continues to raise the dangers of greenhouse gases and climate change, only moderate policies are put in place, most based on using economic incentives and voluntary structures to address the problem. Several U.S. states successfully implement regulations that drive energy efficiency throughout their economies. Hybrid automobiles comprise 33 percent of new car sales and clean coal power plants make up 50 percent of new electricity generating capacity in the U.S. Global energy market structures continue to evolve, including a global liquid natural gas commodity market.

The most notable feature of the world economy during these years is the continuing rise of the developing economies. By 2015, China surpasses the U.S. in energy use and also in several key industrial markets. India and Southeast Asia now equal the European Union in overall GDP. The U.S. becomes just one key player among several, as China and India wield greater influence in both the United Nations and the World Trade Organization, and the EU continues a steady expansion and integration. The problems of the Middle East are still politically tender; however, some agreements have been reached that

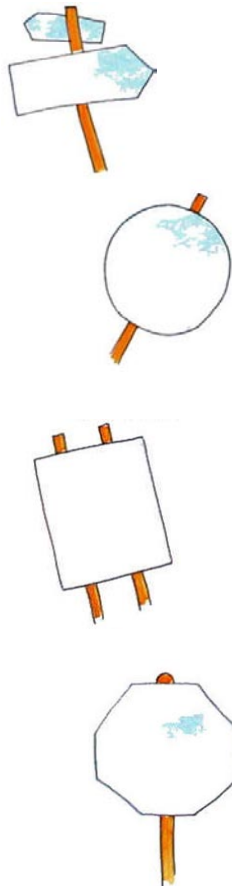
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support expanded trade and dialogue, both of which have brought a general ratcheting down of war and terrorism. Capital investments continue to follow these shifts, searching for greater returns outside of the U.S. American companies are increasingly squeezed by ever-climbing energy prices, and cost-cutting measures focus on reducing exposure to energy-related risk.

End Years, 2016–2020

World energy supplies strain to meet demand, resulting in overall energy use beginning to flatten, some new energy-efficient technologies coming online, and renewable fuel use, primarily ethanol and biodiesel, expanding. Oil now increasingly flows from places like Alaska's Arctic Natural Wildlife Refuge, Siberia, and Iraq. Significant innovation has also occurred in the use of liquid and clean versions of coal. Concern about global climate change remains an issue, but serious impacts have not been realized. Companies approach energy as they would any other global risk—with thorough assessment and management systems.

“Road Signs”—Indicators of this Future



“Not Much Market for Worry Beads in the Executive Suites”

A recent study published by the accountancy, PriceWaterhouseCoopers, indicates that U.S. executives rank below their international counterparts in considering the environment in strategic decision-making. The study also points to a general neglect of longer-term issues that do not immediately impact profit forecasts and market sentiment.

(*The New York Times*, January 27, 2007)

“Energy Research on a Shoestring”

In spite of the recent public clamor for initiatives to combat climate change, public opinion has historically proven to be an unstable base from which to launch environmental policy. As public interest wanes, federal funding dries up—funding is already split between a myriad different programs and clean technologies. At the same time, general consumer habits favoring larger homes and cars, and greater levels of consumption often counteract the gains from incremental efficiency gains.

(*The New York Times*, January 25, 2007)

“Gasoline Reaches All-Time Price High”

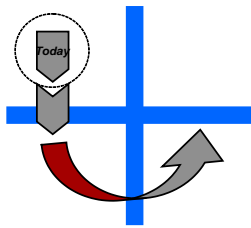
Gasoline jumped to \$3.22 a gallon, matching the March 1981 inflation-adjusted all-time U.S. high price for gasoline. (*ABC News*, May 21, 2007)

“Surprise: Average Gas Price Dips Below \$3”

On the other hand, some motorists, despite their complaints, could be inured to \$3-plus prices. “I have not seen people significantly cut back on their driving—or cut back at all,” says the President of midwest oil company.

(*USA Today*, June 22, 2007)

“The Long Road”



This is a world in which a combination of rapidly shifting political conditions, along with booms and busts in global economic growth, push the U.S. through a long, hard transition similar to the 1970s. Energy prices fluctuate, with large and sudden spikes, and traditional energy supplies are subject to disruption and insufficient investment. Economic power shifts significantly toward developing nations in a way that is very disruptive to the historically industrial nations and ultimately unsustainable for the newly emergent. Movement toward strategic energy management is overly cautious and almost too late, only happening after energy prices rise, the locus of economic power shifts, consensus around climate change passes a tipping point, and companies have had to face long and difficult adaptive challenges.

Beginning Years, 2007–2010

These turn out to be the last years in which the U.S. is able to maintain a political and economic position above almost all other countries or economic blocs. The world’s major economies enter a period of aggressive competition and uncoordinated economic expansion at all costs, leading to a massive overinvestment in productive capacity. Accelerated boom-and-bust cycles play out in 2009 and 2010, as worldwide production and consumption of durable goods and commodities swing first one way, then the other. Corporate energy management decentralizes, with energy procurement emphasized due to strong competition between multinationals for energy supplies.

Coal remains the fuel of choice for domestic power production in the U.S. and China, and these two compete for access to energy supplies, even threatening politically-driven energy embargos. Environmental concerns are especially notable in China, particularly after the 2008 Olympics bring extensive news coverage of severe air and water pollution there. Partial solutions to greenhouse gas emissions are attempted, such as a cap-and-trade market for carbon dioxide, but these meet with only moderate success because they are only available to specific industries and so create poor incentives for energy efficiency. China and India experience bouts of hyperinflation, as prices rise in the face of booming demand; inflation in the U.S. rises in lockstep.

Middle Years, 2011–2015

The long-feared Chinese banking crisis hits in 2012. The weaknesses of central planning, uncertain legal structures, and corruption hit China hard, sending repercussions throughout the global economy. Stagflation emerges when prices driven by inflexible costs meet declines in demand, bringing a global

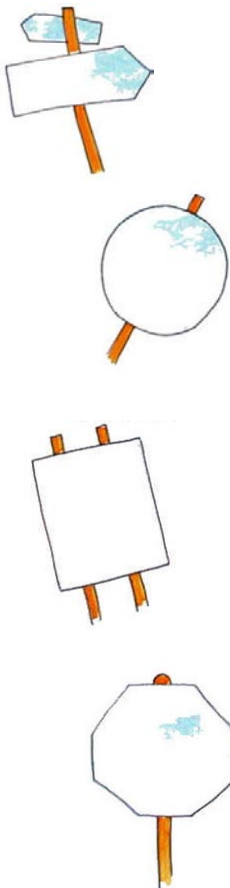
In 2012, the long-feared Chinese banking crisis hits. The weaknesses of central planning, uncertain legal structures, and corruption hit China hard, sending repercussions throughout the global economy. Stagflation emerges when prices driven by inflexible costs meet declines in demand, bringing a global recession in early 2013. Meanwhile, destructive droughts and storms are increasing in more places around the world.

recession in early 2013. Meanwhile, destructive droughts and storms are increasing in more places around the world, causing more uncertainty and difficulty in both commodity and insurance markets. All U.S. companies tighten their belts, with many consolidating and a growing number entering bankruptcy.

End Years, 2016–2020

Irrefutable evidence of climate change mounts and finally passes a tipping point that sparks a political reassessment of the role of carbon in the U.S. economy. Chinese, Indian, and even a few African companies charge ahead. The U.S. decides to reinvent its economy using clean, energy-efficient technologies in the strategic areas of communications, sensors, and data management. Nuclear power plants are fast-tracked and carbon dioxide taxes are enacted throughout the economy. European Union companies gain market share as a result of earlier adoption of climate friendly policies in the EU. Finding themselves late in the game, U.S. companies begin years of adjustment and aggressive energy management to increase efficiency and control costs, as old products are replaced with versions that require less energy to produce. American consumers accept tradeoffs, and by 2018, a new economic cycle begins to emerge that will sow the seeds for a fundamentally restructured economy in the next generation.

“Road Signs”—Indicators of this Future



“Barrels of Confusion”

Over the past year, corporations, investors, and policy-makers have focused less on absolute oil price levels and more on their stability. Watching oil prices move up and down maniacally, trying to predict and avoid being caught out, long-term corporate strategy is sacrificed to cope with the vagaries of “volatility” and “market reaction.”
(*Business Week*, January 29, 2007)

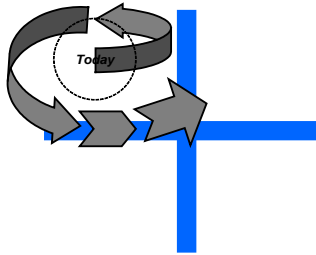
“Worldwide Carbon Dioxide Emissions Soar”

Warnings about global warming may not be dire enough, according to a climate study that describes a runaway-train acceleration of industrial carbon dioxide emissions. Fueled by rapid growth in coal-reliant China, rates of carbon dioxide emission from industrial sources increased from 2000 to 2004 “at a rate that is over three times the rate during the 1990s,” says a National Academy of Sciences report.
(*USA Today*, January 19, 2007)

“Clean Air or TV?”

Indicative of drawbacks to Prahalad’s “Bottom of the Pyramid” innovations, there is a proliferation of low-cost, high-pollution diesel generators in developing countries where people’s demand to connect to the world exceeds their ability to connect to the grid.
(*The New York Times*, January 9, 2007)

“The Broken Road”



This is a world in which a combination of political indecision and uneven global economics set the stage for a sudden break with the past. Energy prices fluctuate in well-established patterns for several years, until severe weather and geopolitical tensions create a supply shock that kicks up prices and long-term concerns. Through the resulting gyrations in global trade, currency, and energy markets, American political and business will crystallize quickly to jump-start and accelerate national programs to move the U.S. to global leadership. Though late, this movement toward strategic energy management finally takes place at a torrid—and successful—pace.

Beginning Years, 2007–2010

During these years, the U.S. enjoys the last of the good old days of relative stability, with moderate energy prices and climate patterns just about within historical norms. Traditional energy sources continue to expand, although at somewhat higher prices. Leaders feel no real pressure to make long-term investments in infrastructure, to trim budget deficits, or to pay particular attention to energy efficiency and climate change because there are more immediate issues to worry about, mainly the Iraq war and domestic terrorist attacks. Energy management is status quo, i.e., little is invested. Unfortunately, a confluence of events unfolds that turns this lack of decisiveness into a costly mistake.

The very short-term crippling of parts of the U.S. energy infrastructure that occurred in 2005 with Hurricane Katrina are described by Larry King as “merely the warm up for Katrina’s big sister, Helena,” the largest, most sustained and most westerly of the new “super ‘canes.” Helena scares a partially rebuilt New Orleans, and then works along the coast to slam Houston, leveling wells, refineries, pipelines, and corporate campuses. Meanwhile in the Middle East, astoundingly rich from decades of high oil revenues and frustrated by perceived lack of progress on local issues, key players form an alliance to cut deliveries of oil and natural gas to the U.S., even though it means lower profits.

Middle Years, 2011–2015

Businesses dependent upon energy (which is to say most) experience huge spikes and swings in prices. Even more difficult are the periods, up to several months at a time, when supply is not only severely constrained, it simply does not exist and cannot be had or hedged against. Industries across the board are deeply affected, with transportation hit especially hard. The U.S. enters a sharp recession that lingers, mirroring the decade of stagnation in Japan during the 1990s. The global economy slows too, seeing a 1 percent drop in growth, caused by radical declines in China, India, and Europe. Assets are simply abandoned in some countries. Abnormal storms, droughts, and heat waves begin to routinely kill hundreds of thousands every year. Agricultural production is dislocated in many parts of the world, including the U.S., further exacerbating the situation.

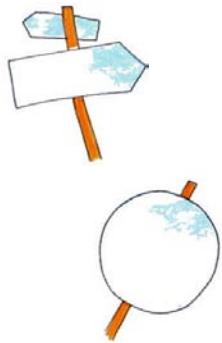
To handle short-term needs, the U.S. switches to coal: liquefying it, gasifying it, and investing in technology to clean it up. A national political consensus gains momentum for dramatically tighter and more effective regulations to control carbon dioxide emissions. EU corporations become major investors in the U.S. as the market demands for energy-efficient and alternative energy technologies increase dramatically. Experimentation with carbon trading and investment in new alternative energy supplies begins in earnest, while energy management becomes a major corporate focus. For a number of companies though, this is too little too late, and many face real layoffs—or worse.

End Years, 2016–2020

The U.S. elections sweep in a political consensus that says reducing energy imports is equally important to the war on terrorism. Another “super ‘cane” floods New York City in 2017, stunning the nation, and both rich and poor are made refugees in scenes reminiscent of New Orleans more than a decade earlier. This event is the nail in the coffin for any further delay in moving the U.S. toward a lower carbon economy. Insurance companies face bankruptcy and the federal government declares a National State of Energy and Climate Emergency.

The President launches an aptly named “Manhattan Project II” to aggressively develop new fuels, urban design approaches, and carbon reduction technologies, many of which are imported from other countries and governments, further strengthening the influence of the EU in the U.S. economy. Carbon emission monitoring and enforcement are backed up with stiff fines that rapidly shut down some old operations. Climate penalties even threaten jail time for executives, with the public asking, “How could they have ignored this issue for so long?” Energy efficiency, alternative energy sources, and carbon reduction have suddenly become a very, very serious matter.

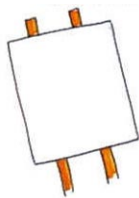
In 2017, the federal government declares a National State of Energy and Climate Emergency. The President launches an aptly named “Manhattan Project II” to aggressively develop new fuels, urban design approaches, and carbon reduction technologies. Carbon emission monitoring and enforcement are backed up with stiff fines that rapidly shut down some old operations. Climate penalties even threaten jail time for executives, with the public asking, “How could they have ignored this issue for so long?”



“Road Signs”—Indicators of this Future

“Venezuela Seizes Last Private Oil Fields”

President Hugo Chavez's government took over Venezuela's last privately run oil fields Tuesday, intensifying a power struggle with international energy companies. “The nationalization of Venezuela's oil is now for real,” said Chavez, who declared that for Venezuela to be a socialist state it must have control over its resources. (*USA Today*, May 1, 2007)

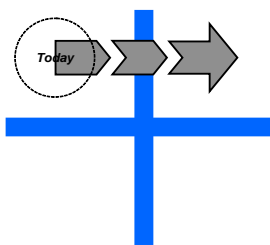


“N.Y. City Urged to Prepare for Major Hurricane”

Homeland Security Secretary Michael Chertoff warned Monday that a city on continuous alert for terror attacks also must brace itself for a natural disaster—a hurricane powerful enough to cause serious flooding in lower Manhattan. (*MSNBC*, June 12, 2007)



“The Fast Road”



This is a world in which, as a result of a combination of early political leadership and effective global economic and environmental decisions, the U.S. energy environment moves into a new territory of innovation. Energy prices rise steadily and are high enough to allow investments in alternative energy, efficiency, and urban redesign to pay off. A political consensus emerges early in the U.S. for tight but incentive-heavy regulations to control carbon dioxide emissions. A moderate shift in economic power toward developing nations does not threaten or disrupt the already industrialized nations, and the U.S. in particular benefits from the global expansion into the industrially developing world as it sells more high technology products and services.

Beginning Years, 2007–2010

These are the years when the U.S. economy shifts toward a more efficient, lower carbon, high technology driven industrial base. The boom of the late 1990s recovers from its bust in the early 2000s and a similar kind of techno-optimism returns with a younger generation of political and business leadership. Following the 2008 election in the U.S., in which voter turnout, especially amongst younger Americans, surges to a new high, federal leaders act in a coordinated fashion on issues of climate change, energy imports, and foreign policy. With the writing clearly on the wall, most companies establish strong, centralized strategic energy management programs. This is triggered as much by managing downside risk as pursuing new opportunities arising from a refined market reality.

Oil prices continue to fluctuate, but with limited impacts due to changed market expectations of the U.S.'s long-term energy security and productivity. The debate about carbon dioxide's role in global warming is, by and large, settled in the U.S. A business climate favoring reinvention for competitive advantage takes hold as federal, state, and city governments provide support through tax policy, incentives, technology development, and institutional restructuring.

Middle Years, 2011–2015

In China, turmoil over investments based on a now discredited energy-intensive business model, poor financial management, and inadequate legal protection slows its growth. Perversely, this beneficially cools the world economy to a more sustainable pace and enables a more balanced dialogue around managing climate change. The U.S. continues to put policies in place that restructure its economy, including higher efficiency standards for cars, homes, and buildings, along with tax incentives to reduce greenhouse gas emissions, subsidies for renewable energy sources, and a shift to both domestic and imported biofuels. Full disclosure of climate risk exposure and actions to reduce environmental impacts becomes a required feature of company reports to the investment community.

U.S. trade flows and geopolitical alliances begin to focus more on South America and the European Union, and less on the Middle East. During this transition, economic growth flattens in

some years as mild recessions are experienced in a few industries and regions in transition. Still, U.S. companies start to feel the competitive benefits from this evolution, and begin to dominate markets in such areas as clean coal technology, solar energy, and clean manufacturing. The U.S. lead in information technology solidifies, strengthened by sensor networks, real-time data management, and predictive data mining—all technologies essential for effective energy management on a large scale. The U.S. overtakes the EU's lead in energy productivity, and becomes the place to be for this new energy innovation, drawing talent and capital from around the world.

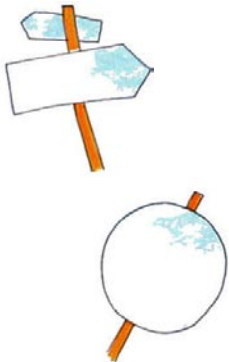
End Years, 2016–2020

The U.S. accomplishes an amazing feat of transition to a less energy-intensive industrial base. By 2018, there is still a lot to do. Old buildings and urban land-use policies need to be overhauled, and the automotive fleet requires a complete turnover. But there is no debate that the changes underway will succeed. Greenhouse gas monitoring and control is now widespread throughout the economy; people are as accustomed to it as they are to recycling. Embedded energy

After 2016, the U.S. accomplishes an amazing feat of transition to a less energy-intensive industrial base. There is still a lot to do. Old buildings and urban land-use policies still need to be overhauled, and the automotive fleet requires a complete turnover. But there is no debate that the changes underway will succeed. Greenhouse gas monitoring and control is now widespread throughout the economy; people are as accustomed to it as they are to recycling.

and lifecycle analysis become part of the typical approaches to managing energy.

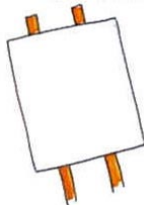
Meanwhile, China, India, and other developing nations are adopting many of the new approaches, directly leapfrogging from old methods, often with technologies imported from the U.S. Even countries in the Middle East now see the U.S. differently, not so much as a military aggressor, but as a creative industrial power willing to share its technology. Extreme climate change events still occur, but with new technology in place and emissions continually reduced, a global political consensus to stay the course is solidly in place.



“Road Signs”—Indicators of this Future

“Rising Energy Costs Spur Business to Action”

More than three-quarters of American business leaders believe energy prices are going to continue climbing, and as a result 60 percent of them say their companies have already or will soon implement energy efficiency in their offices and operations. (*GreenBiz.com*, May, 2007)



“Waking Up and Catching Up”

A confluence of defense considerations, weather events, environmental stewardship, and market factors is bringing together the left, the right, conservatives, and liberals under a single banner to combat climate change. As a result, the political climate has shifted in a decidedly green direction. (*The Economist*, January 25, 2007)



Implications for Energy Management

“A thing long expected takes the form of the unexpected when at last it comes.”

— Mark Twain, author (1835 – 1910)

As mentioned earlier, scenarios are a tool for rehearsing the future and testing how decisions made today may play out in a variety of potential settings. The set presented in the preceding pages poses the question, **What would be the impacts of these four “road” scenarios on energy strategy and management in U.S. businesses?** Each would matter in importantly different ways, and each would call for a variety of strategies. Since the future is uncertain, and it takes time for the future to become clear, prudent businesses prepare by developing adaptive and flexible strategies today that ensure successful navigation of any of these roads.

While each road varies significantly, one common theme emerges: energy-related risks and opportunities will have profound impacts on U.S. business and society during the next decade and a half. Corporate leadership should act now to reduce the risks—and maximize the opportunities—related to energy and climate change for their companies. As corporations develop a strategic energy plan, they should, at a minimum, address the following questions:

Energy and Climate Risk Assessment

- How vulnerable are our operations, including those of our suppliers, to energy supply disruptions?
- How vulnerable is our business to energy price volatility and/or increases?
- What energy risks do our products and services create for our customers?
- How will any climate change regulations effect our energy use in terms of cost, compliance, or incentives?
- How will our suppliers and customers be affected by climate change regulations?
- How vulnerable is our business to concerted pressure by stakeholders around climate change?
- How vulnerable are our facilities to extreme weather events caused by accelerating climate change?

Current Energy and Climate Management

- How much energy does the organization require to function effectively today?
- How do our current energy needs compare with those of our best global competitor?
- Who is accountable within our organization for procuring and managing energy use, at both executive and operations levels?
- Are energy-related leadership functions integrated and empowered to affect change across the organization, irrespective of the ultimate direction that change may take?
- What energy use or cost savings are possible?
- Are energy productivity and efficiency goals in place, with achievements measured and recognized?
- How comprehensive are our current energy strategies?
- Do our equipment and site selection strategies include energy efficiency and climate risk as critical decision factors?
- What are our greenhouse gas emissions, and where do they occur?
- Are our programs and processes for managing energy and climate risk sufficient?
- How do our programs compare with our best competitor?
- How do our programs compare with the best global corporate energy management practices?

Transformative Opportunities

- Are we better positioned than our competitors to adjust to new energy and climate risks?
- What factors will give us competitive and adaptive advantage in energy and carbon constrained markets?
- Do our policies make it easy to invest in energy efficiency or greenhouse gas emissions reductions?
- What investments can be made now that will have large payoffs in the future?
- Do we envision new business opportunities in the changing climate and energy context in all locations in which we operate?

Energy Strategy for the Road Ahead

“Before anything else, preparation is the key to success.”

— Alexander Graham Bell, inventor (1847 – 1922)

To survive and even thrive on whichever road ahead, all involved in this project agreed that corporations should, at a minimum, take the steps outlined below to prepare robustly for the future. Even before the first step, though, and as obvious as it sounds, addressing these issues sooner rather than later will ensure greater success across a range of future scenarios. The corporate leaders involved in this project also agreed that all senior executives should begin by investing personal time and attention to understand the energy and climate vulnerabilities and opportunities of their business.

ENERGY MANAGEMENT FUNDAMENTALS

Through the ENERGY STAR Program, the U.S. EPA has identified the fundamental elements of successful energy management:

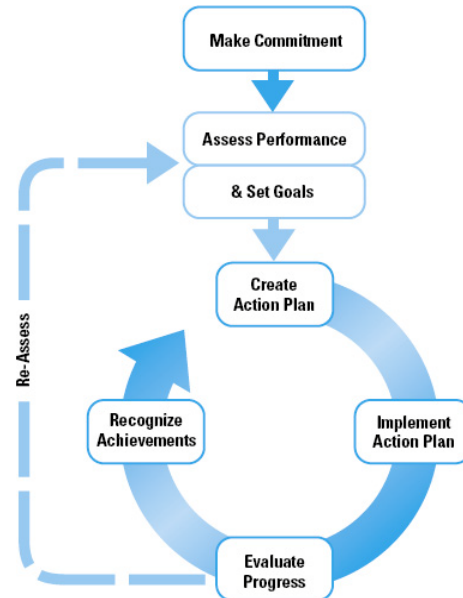
- **Executive commitment** to **continually improve** energy efficiency across the entire corporation, including clear processes and tracking systems to **identify opportunities**
- An empowered **corporate energy director** and **energy team** supported by sufficient human and financial resources
- **A corporate energy policy** that is accounted for at the top levels of the corporation
- Aggressive, numeric **energy goals** that stretch performance targets to draw out creative innovations for meeting them
- **Measurement and tracking of energy performance** for all energy use, corporation-wide, including **benchmarking facility performance** nationally and globally with similar companies, and a **review system** with accountability at all levels
- Communication on the value of energy, importance of improvement and executive commitment by consistently **recognizing accomplishments**

First, Master the Fundamentals

Every energy strategy is built upon increasing energy efficiency within all business operations. Such efforts typically focus on all parts of the business since each contributes to or impacts overall corporate energy productivity. A strong corporate energy management program empowered across the organization and supported by senior executives is the basic vehicle for successfully navigating the road ahead. **By participating in the ENERGY STAR® Program, many U.S. companies have developed strong energy management programs and achieved significant—even breakthrough—improvements in energy efficiency.** Despite the evidence of these successes, an alarming number of U.S. companies do not have formal nor effective energy management programs and practices in place. Mastering the fundamentals of energy management both drives efficiency improvements and ensures the smart procurement of energy.

Increasing energy efficiency within business operations is the first step toward reducing energy-related risks. Indeed, the best hedge against future energy price or availability risks is simply to not need as much in the first place! Companies that manage energy well understand clearly their current and future energy requirements and are in a good position to negotiate energy purchases. Further, companies that use energy efficiently are less exposed to volatility and price increases. On the supply side, companies need to integrate energy procurement programs and supply strategies within the overall energy strategy to manage volatility and to secure the best prices. New supply solutions—including heat recovery, renewable energy possibilities, and combined heat and power—should be fully evaluated and re-evaluated against likely changes in regulatory structures, energy prices, and potential climate-change penalties or incentives.

ENERGY STAR® GUIDELINES FOR ENERGY MANAGEMENT



See www.energystar.gov

Building an energy efficiency culture is exactly what the Chief Executive Officer and his Senior Vice President, Operations of California Portland Cement did. Recognizing the value a corporate-wide energy strategy could provide for the business, they empowered the company to move forward in instituting a comprehensive energy management system that encompasses all operations. “We did this by deliberately making energy management part of our core business, by creating a corporate function for energy, and by viewing energy as a profit center for our business,” explains CEO Jim Repman.

Merck & Co. has made energy efficiency a priority. Early in 2006, Merck CEO Richard T. Clark issued a call to action to all employees to do their part in making the company a leader in energy conservation in the pharmaceutical industry by reducing energy intensity by 25 percent by the end of 2008. Since then, the Merck Global Energy Team has been empowered to embark on aggressive initiatives to increase accountability for energy use, inform and engage employees, and upgrade facilities. These efforts have paid off, with a 9.4 percent decrease in energy intensity in 2006 alone, at the company's U.S. facilities. Says Larry Naldi, Senior Vice President, Science and Technology, "Merck views energy management as an opportunity to become leaner and more competitive. Leadership that emanates from the top, strong goals, empowered employees, and a long-term strategy all combine to help us determine our energy future."

Second, Take Both a Longer and a Broader View

While energy efficiency and a structured approach to procurement are key first steps, all companies—not just those in so-called energy-intensive businesses—must develop strategies that move beyond the basic, beginning foundation. Executives involved in this project suggested that company leadership should shift the way energy is viewed. Today it is often seen as a fixed cost for the business as a whole, rather than as a component of production or service. **Valuing energy in terms of corporate productivity, including tracking the company's energy productivity index (the amount of energy used to create a product or deliver a service), enables an organization to place energy on equal footing with labor, material, capital, and other operational expenses.** The strategic conversation then shifts from "How much energy can be saved?" to "How much energy is really needed?"

Energy productivity is an important measure of Toyota's energy future and is embodied in the company's leading principle: "Use only what you need, when you need it, in the amount needed." There is strong evidence that Toyota uses significantly less energy to produce a car relative to most of its global competitors, a significant aspect when put in the context of the tens of millions of vehicles it makes each year. "Transforming the discussion about energy from 'What can we save?' to 'What is actually required?' has enabled a majority of Toyota's manufacturing plants in the U.S. to be among the most energy-efficient in the nation, with many earning the coveted ENERGY STAR® for their energy performance," explains Josephine S. Cooper, Group Vice President, Government and Industry Affairs, Toyota Motor North America.

The Longer View

Most initial energy savings come from low-cost investments and no-cost operational improvements. **As these opportunities are exhausted, further energy savings require ongoing capital investment.** Corporations have typically perceived energy projects as non-strategic. As a result, they require energy projects to meet high hurdle rates or quick payback periods. In these circumstances, energy efficiency investments do not receive funding when competing for capital more obviously associated with the needs of the business and are not undertaken, or even discouraged.

Viewed over the longer term, however, energy projects carry some of the more attractive returns and lowest risk. New energy-efficient equipment, if installed and commissioned properly, will provide a sustained and predictable return on investment. Executives who balance the amount of risk involved in bringing new products to market with the nearly certain return delivered by an energy project can ensure a base rate of return across their portfolio of investments. Indeed, executives managing for the long-term will even create policies that look beyond projects with higher initial costs in exchange for assured returns over a longer period of time. **They recognize that capital investments that reduce energy consumption and greenhouse gas emissions have strategic long-term value and competitive advantage. And this advantage grows every time energy prices increase.**

Some examples of policies in use by proactive companies that have discovered the long-term value of energy projects include: lower hurdle rates for energy projects; use of lifecycle cost analysis; regular budget allocations for energy projects; risk adjusted rates of return; and incorporating real or hypothetical monetary values for potential carbon reductions. Some companies also allocate targeted pools of capital specifically aimed at energy efficiency and reliability projects.

Owens Corning pursues energy efficiency within company operations and also through product offerings to customers. Using a long-term investment horizon is key to both. “Over the past 14 years, our commitment to energy efficiency has resulted in a 40 percent reduction in the energy intensity of our operations. While we use less energy today, we are now focused on achieving additional energy-reduction targets by 2012. Further, our strategic commitment to energy efficiency within our operations is supported by attractive returns from these worthwhile investments.” says Mike Thaman, Chairman and Chief Financial Officer at Owens Corning. “Our products themselves are an ongoing commitment to energy efficiency. Because homes and buildings consume 40 percent of our nation's energy and account for 43 percent of the country's greenhouse gas emissions, adding more insulation to new and existing homes and buildings in the U.S. represents one of the single largest—and most cost effective—opportunities to seize this opportunity.”

Moving beyond reactive management to proactive engagement has been key for HSBC to begin tackling its own contributions to climate change. “We consider climate change to be the single biggest environmental challenge this century” says John Beckinghausen, Director of Sustainable Development & Operations, HSBC Bank USA. “Energy is a necessity for any business to operate. Our challenge, as it should be for all companies across the U.S. and around the globe, is to use it efficiently and sparingly. We currently have a six-sigma project underway to implement energy efficiency projects—all at aggressive payback rates—with the goal of reducing energy use by 7 percent in 2007. Replacing the use of brown power to operate our facilities with clean, renewable energy is another of our priorities, and currently stands at 35 percent of our total energy demand. Renewables make up one of the key components of our carbon neutral program, which we began operating in 2005.”

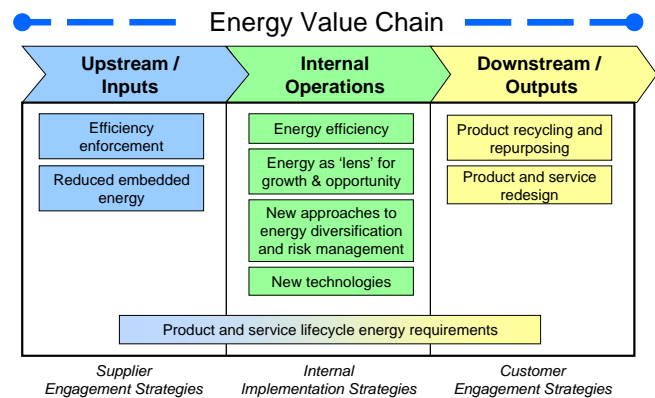
The Broader View

Expanding the energy management horizon to include all energy required to make and use the product or service by both suppliers and customers means seeing the entire Energy Value Chain. As products and services move along this chain—which includes extraction, manufacturing, conversion, transportation, operating, selling, and disposing of all goods and services—energy inputs are added. The sum of these energy inputs in the product or service at any given point in the value chain is the “Embedded Energy.”

Embedded Energy and the Energy Value Chain are concepts that can be used to explore and evaluate business decisions and opportunities more fully.

They provide a more holistic analysis of energy impacts on a business; they also require an understanding, awareness, and accounting of all energy impacts, including those upstream from (inputs), internal to (operations), and downstream from (outputs) the company.

Many companies are already examining their Energy Value Chain to identify opportunities to work with suppliers and customers to improve overall productivity. By doing so, these companies are better positioning themselves to succeed in the face of future uncertainties surrounding energy markets, as well as discovering new opportunities in the present. They also develop much greater business intimacy with suppliers and customers, in turn opening up new and unexpected opportunities for collaboration.



PepsiCo's corporate energy strategy encompasses the entire energy value chain. Looking “upstream” to reduce the embedded energy of inputs to its business, PepsiCo works with its suppliers to establish energy reduction goals, demonstrate energy management activities, and join the companies active in the U.S. EPA's ENERGY STAR® network of corporate partners. The company also has an active media campaign “downstream” to educate consumers about small steps they can take to live better such as purchasing green energy credits.

Third, Search Out Business Transformation Opportunities

There are also companies in which energy management reaches deep into the core business and informs and shapes long-range business decisions. Energy is viewed and understood as a strategic issue, valued as a measure of productivity, and given a broader level of attention in the corporation. **Company leaders see energy as a lever for positive growth and change within the business, not simply as feedstock to a product, facilitator of a service, or cost to manage.** Such an approach looks beyond the obvious, immediate energy needed to make a product or to provide a service and considers all energy impacts on the business. In these companies, concepts such as “Embedded Energy” and “Energy Productivity” are used to explore and evaluate business opportunities and all strategic decisions.

This “next generation” energy management means taking a more strategic view of the total cost and opportunity of energy productivity. Fundamental energy management practices are in place and institutionalized. Executives at all levels are involved in energy management. Energy managers are empowered to execute initiatives with manpower funding and executive support and involvement. Operational and financial innovations are in use, such as risk hedging, to maximize future flexibility and “maneuvering room” for a company. Operations are redesigned to take advantage of more than cost savings. Cooperative, “open source” approaches to innovation, improvements, and information are shared across industries and geographies. How products and services are offered is evaluated and potentially redesigned. Energy awareness is marketed to customers and consumers alike. And business models are reinvented to be resilient across a variety of energy futures.

PPG believes the energy future is uncertain. This concern, along with a recognition that greenhouse gas concentrations are rising, has helped the company to solidify its strategic planning in regard to energy scarcity and climate change. Vicki Holt, Senior Vice President, Glass and Fiber Glass, explains: “In addition to controlling energy use and greenhouse gas emissions in our own operations, we see PPG’s position as a provider of energy solutions that help the broader community to do the same.” In accord with this position, and among other energy conserving solutions for a variety of industries, PPG developed a new, low-emissivity window glass, Solarban 70XL, which has the potential to significantly reduce the energy requirements for cooling buildings.

The Dow Chemical Company is thinking outside the box when it comes to propylene glycol production. Propylene glycol, a vegetable-oil-based raw material, is traditionally produced from petrochemical feedstock. The company will use breakthrough technology to manufacture it from glycerin generated during the manufacture of biodiesel. Dow refers to the new product as propylene glycol renewable, or PGR, because the glycerin raw material is created as a by-product when vegetable and seed oils such as soybean, sunflower, and canola are transesterified into the blend of methyl esters known as biodiesel. “Using PGR will enable customers to exercise their commitment to technologies that consume less fossil fuel and other finite resources,” says Mady Bricco, Dow’s global product director for propylene oxide and propylene glycol. ‘Dow Plans Propylene Glycol From Renewable Feedstock,’ Chemical & Engineering News, American Chemical Society, Vol. 85, No. 13: March 26, 2007.

*Responding to rising energy bills and heightened consumer awareness about the cost of heating wash water, **Procter & Gamble** invented Tide Cold Water—a laundry detergent that cleans as effectively in cold water as any warm-water detergent. “Innovation is at the heart of Procter & Gamble, and we are regarded as one of the most innovative companies in the world,” explains Dr. Len Sauers, Director, Environmental Science. “That innovation applies as much to our work in environmental sustainability as it does for Procter & Gamble brands and other business functions. For example, a tremendous amount of energy is used to heat water for the machine laundering of clothes. If all consumers lowered their wash temperatures to cold, the U.S. could save up to 3% of total household energy, which would eliminate 34 million tons of CO₂ per year—6 percent of the U.S. target under Kyoto.”*

Fourth, Prepare Contingent Strategies

With the robust approaches outlined above, U.S. companies will be better positioned to successfully and flexibly maneuver through any of the possible futures described earlier. **There are also, of course, contingent strategies that will work particularly well in specific scenarios.** Some examples of actions that a corporation might take as the conditions of a particular scenario emerge are listed in the following table. The degree to which a given corporation embraces these will be balanced by the company's desire to take full advantage of those conditions (See Appendix, Energy Value Chain).

	Scenario-Contingent Strategies
The Same Road	<ul style="list-style-type: none"> ▪ Evaluate the full lifecycle energy cost of products and services to find competitive savings and advantages. ▪ Aggressively pursue energy efficiency and creative procurement management in tandem with product and service quality. ▪ Become early adopters of proven renewable and heat recovery technologies and find ways to integrate them into operations.
The Long Road	<ul style="list-style-type: none"> ▪ Encourage and be an early adopter of climate management best practices in all markets where your company operates. ▪ Develop partnerships with key vendors and customers with a systemic approach to manage overall energy costs. ▪ Establish positions in new energy technologies that will become investment opportunities over the long term.
The Broken Road	<ul style="list-style-type: none"> ▪ Be in a long trading position, stockpile, or otherwise hedge key energy resources vital to continuing operations. ▪ Do early research on methods to drastically reduce the carbon footprint of all operations and dramatically increase energy efficiency. ▪ Consider marketing carbon reducing technologies learned in operations to others across the same or related industries. ▪ Anticipate market opportunities as market conditions become difficult.
The Fast Road	<ul style="list-style-type: none"> ▪ Prepare to create and participate in new methods and types of market transactions to limit the carbon footprint of all operations. ▪ Find ways to engage the suppliers and final consumers in energy usage throughout the lifecycle of your products and services. ▪ Connect brand identity with energy and climate management activities to establish competitive advantages in the market. ▪ Proactively seek global best-practice management approaches, technologies, and partnerships.

Finally, Take Personal Action

Thinking scenarically might seem too "big picture" and far away. Yet, that is precisely the point—to seriously explore the future, with its many uncertainties, so that we can make better decisions in the present. Then we must act accordingly.

Corporate leaders can take a number of actions today for tomorrow. All of these actions can be taken by individuals, all can have significant organizational impact, and all add up to becoming "energy aware" (just as successful business are already "cost aware"). **These actions, listed on the back cover of this report, are organized into four categories:** managing energy strategically within your business, bringing strategic energy management to corporate Boards (both yours and others'), influencing your industry to become more strategically energy aware, and connecting strategic energy management with company strategy, goals and programs.

Any of these actions will make energy management more strategic, and all of them will bring more company success across a range of futures.

“To create strategic maneuvering room with respect to energy, corporate leaders need to move today, not the day after tomorrow.”

— Peter Schwartz, scenarist, strategist and GBN Chairman

Appendix: Scenario Comparison Tables

Summary of Key Elements

	The Same Road	The Long Road	The Broken Road	The Fast Road
U.S. Energy Environment	<ul style="list-style-type: none"> A combination of political inertia and continued global economic growth keeps the U.S. energy environment in well recognized territory. 	<ul style="list-style-type: none"> A combination of rapidly shifting political conditions, along with booms and busts in global economic growth, push the U.S. through a long, hard transition similar to the 1970s. 	<ul style="list-style-type: none"> A combination of political indecision and uneven global economic growth delay any significant shifts until weather-related and geo-political events bring a break with the past. 	<ul style="list-style-type: none"> A combination of early political leadership, consensus, and effective global economic management shift the U.S. energy environment into a new territory of innovation.
Global Economic Developments	<ul style="list-style-type: none"> There is a steady shift in economic power toward developing nations at a slow enough pace that does not threaten historically industrialized nations. Traditionally industrialized nations benefit from global expansion into the developing world as they sell more products and services into expanding markets. 	<ul style="list-style-type: none"> There is a real shift in economic power toward developing nations, and it proves disruptive but ultimately unsustainable. Some historically industrialized nations are pulled into recessions as global expansion proves uneven, and many sectors must adjust to new market realities through downsizing and consolidation. 	<ul style="list-style-type: none"> Shifts in economic power to developing nations are fractured and uneven, with historically industrialized nations struggling through trade and market gyrations. Historically industrialized nations benefit from global expansion into the industrially developing world, but of course not without financial risks. 	<ul style="list-style-type: none"> A moderate shift in economic power toward developing nations does not threaten nor disrupt the historically industrialized nations. The U.S. in particular benefits from the global expansion into the industrially developing world as it sells more high technology products and services into expanding markets.
Energy Commodity Supplies	<ul style="list-style-type: none"> Traditional supplies of key energy fuels continue to flow at levels that maintain world economic growth without disruption. 	<ul style="list-style-type: none"> Traditional supplies of key energy fuels are subject to more disruption, political conflict and insufficient investment to improve. 	<ul style="list-style-type: none"> Traditional supplies of key energy fuels continue, but at very, very high prices. 	<ul style="list-style-type: none"> Traditional supplies of key energy fuels are maintained, and viable substitutes begin to come online.
Energy Prices	<ul style="list-style-type: none"> Energy prices fluctuate in well established patterns, along an upward trend with a series of price spikes. 	<ul style="list-style-type: none"> Energy prices fluctuate outside established patterns with large and sudden spikes. 	<ul style="list-style-type: none"> Energy prices fluctuate in well established patterns until a severe supply shock brings unprecedented prices and real long-term concerns. 	<ul style="list-style-type: none"> Energy prices rise steadily and to levels high enough that investment in alternatives pays off.

	The Same Road	The Long Road	The Broken Road	The Fast Road
International Politics	<ul style="list-style-type: none"> The war on terror and other global political challenges are contained through a blend of force, negotiation, and leadership. Scientific studies indicate that human-induced climate change is a minor factor compared to natural forces, and adaptation takes place through growth in overall wealth with some slowly improving technology. 	<ul style="list-style-type: none"> The war on terror and other global political challenges remain significant to Western leadership, as use of force continues. Scientific studies indicate that human-induced climate change is accentuating the natural forces, but reducing and improving energy use takes place slowly as the emergence of new technologies takes longer. 	<ul style="list-style-type: none"> The war on terror and other global political challenges continue to drain the U.S. and distract it from domestic issues. Scientific studies about human-induced climate change are steadily debated by politicians, thus slowing policy change and investment in new technology. 	<ul style="list-style-type: none"> The war on terror and other global political challenges are met through negotiation, leadership, and minimal force. Scientific studies indicate that human-induced climate change dangerously accelerates natural cycles, thus spurring faster policy changes that encourage investments in new technology innovation.
Perception of Climate Change, and Advances in Energy Technology	<ul style="list-style-type: none"> No political consensus emerges in the U.S. for tighter regulations to control carbon emissions. 	<ul style="list-style-type: none"> After seeing global competitors' impacts, political consensus finally emerges in the U.S. for more stringent regulations related to controlling carbon emissions. 	<ul style="list-style-type: none"> Following a serious supply shock due to a disaster linked to climate change, a national political consensus emerges very late for tighter and more effective control of carbon emissions. 	<ul style="list-style-type: none"> A political consensus emerges early in the U.S. for tight but incentive-laden regulations related to controlling carbon emissions.
U.S. Politics and Regulations about Carbon Dioxide	<ul style="list-style-type: none"> Energy management remains a middle-to-lower tier concern within the upper ranks of U.S. companies, although CEOs of the largest energy users pay it the most attention. 	<ul style="list-style-type: none"> Energy management gains importance for many U.S. companies, primarily in the context of international competition and uncertain geo-political conditions. 	<ul style="list-style-type: none"> Energy management remains a middle-to-lower tier concern for upper ranks of U.S. companies, until late policy shifts when companies must work to catch up with global competitors. 	<ul style="list-style-type: none"> Energy management takes a place of priority in the upper ranks of U.S. company management, both to keep up with fast changes and to find new growth opportunities.
Energy Management				
How is your business preparing?				

What is your company's energy strategy across these futures?

Implications for Energy Value Chain

	Upstream/Inputs	Internal Operations	Downstream/Outputs
<i>Robust across Scenarios</i>			
Action	<ul style="list-style-type: none"> Analyze all corporate inputs and the energy required to this point 	<ul style="list-style-type: none"> Analyze energy needs for all operations & facilities Anticipate future energy needs and sources 	<ul style="list-style-type: none"> Analyze energy requirements of products and services
Opportunity	<ul style="list-style-type: none"> Work with or require suppliers to reduce embedded energy in their outputs 	<ul style="list-style-type: none"> Develop and refine energy program to comprehensively manage efficiency, procurement, R & D, etc. 	<ul style="list-style-type: none"> Consider energy impacts of products & services Look for new business directions
Potential Outcomes	<ul style="list-style-type: none"> Reduce energy in products and services feeding into operations 	<ul style="list-style-type: none"> Reconsider how business is done Consider reengineering production and service processes Institute comprehensive energy management system 	<ul style="list-style-type: none"> Reengineer products to require less energy Develop new business lines to capitalize on changing energy environment
<i>Contingent upon Scenarios</i>			
The Same Road	<ul style="list-style-type: none"> Manage upstream energy use to buffer price volatility Build systemic relationships with suppliers Push international best practices on a global basis 	<ul style="list-style-type: none"> Think total cost of ownership Evaluate life-cycle cost of product portfolio Find ways to do energy efficiency without sacrificing product quality or costs 	<ul style="list-style-type: none"> Build systemic partnerships with vendors and customers Improve marketing strategy to communicate energy efficiency
The Long Road	<ul style="list-style-type: none"> Squeeze suppliers to meet tougher requirements 	<ul style="list-style-type: none"> Focus on cost-cutting and energy efficiency out of economic necessity Work to meet difficult organizational problems in technology change out 	<ul style="list-style-type: none"> Do only those changes which have clear cost-cutting benefits
The Broken Road	<ul style="list-style-type: none"> Implement integrated supply chain management Assess energy footprint of partners 	<ul style="list-style-type: none"> Manage peak power use Create actual dollar cost systems for monitoring Assess new investments for carbon impact Move to carbon neutral designs 	<ul style="list-style-type: none"> Reflect cost of disposal in price of products Label energy intensity of products Coordinate across industries to reduce energy use
The Fast Road	<ul style="list-style-type: none"> Evaluate energy supplies and hedging opportunities Review opportunities to shift commodity inputs to less energy intensive ones Figure out optimum mixes of inputs on energy basis Integrate supply chain into climate management system 	<ul style="list-style-type: none"> Set internal energy stretch goals Improve tracking and monitoring systems Integrate energy into enterprise risk management Benchmark energy intensity across industries Inventory and account greenhouse gas emissions Include climate and energy risk in investor reports 	<ul style="list-style-type: none"> Assess lifecycle costs Build for lifecycle recycling Reduce packaging Restrict dumping Raise tipping fees Assess brand value energy intensity

Acknowledgments

U.S. EPA ENERGY STAR®

Through its ENERGY STAR® Program (www.energystar.gov), U.S. EPA works with U.S. businesses to promote the efficient use of energy through corporate energy strategy development. As part of a comprehensive corporate energy strategy, energy efficiency is a powerful step forward for U.S. businesses as they prepare for the energy future. U.S. EPA is grateful to the companies who shared their time and thinking on this project.

Participating Companies

California Portland Cement	HSBC	PepsiCo / Frito-Lay
Cascade Engineering	Jones Lang LaSalle	PPG
CEMEX	Merck & Co.	Procter & Gamble
Dow Chemical	Mercury Marine	Shell NA
Eastman Chemical	Mittal Steel	Toyota NA
Genentech	National Starch & Chemical	UPS
General Motors	Owens Corning	

Content Experts

During the scenario creation phase, a number of content experts participated to cover the areas of energy technology, oil commodity markets, corporate strategy, and regulation and policy. Their perspectives ensured a rich basis for discussion. Elizabeth Dutrow and Walt Tunnessen of EPA's ENERGY STAR® Program provided particularly helpful introductions and guidance. Garforth International contributed their unique insights throughout this project.

Global Business Network

Founded in 1987 and a member of the Monitor Group since 2000, GBN (www.gbn.com) specializes in helping organizations adapt and compete more effectively and more responsibly in the face of mounting uncertainty—whether it's uncertainty about their future, the future of their industry, or the future of the world at large. A pioneer in the application and evolution of scenario thinking, GBN's consulting and training services focus on strategy, decision-making, innovation, visioning and alignment, and organizational and leadership development. The principal authors of this GBN report are Erik Smith, Gerald Harris, and Peter Schwartz. Contributors include Michael Ovadia and Bertram Chan.

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Energy To-Do List

Of one thing we can be sure: energy will be more challenging and more important in the future. Will you, and your business, be ready?

What Executives, Senior Managers, and Board Members Can Do:

- ▶ **Manage energy actively from your position.**
 - Empower energy staff to fulfill the fundamentals.
 - Push for strong energy efficiency from all parts of the business.
 - Enable energy investments by valuing them differently from other projects.
 - Educate customers on the value of energy performance in products.
 - Involve yourself.

- ▶ **Make strategic energy management a Board-level issue.**
 - Are you a member of the Board of another corporation?
 - Can you influence the corporation to examine its energy and climate strategy?
 - Is the corporation practicing strategic energy management?

- ▶ **Influence your industry.**
 - Do you participate in industry associations?
 - Can you initiate and lead discussions among your industry counterparts on why strategic energy management is important?

- ▶ **Use scenario thinking in your ongoing strategic discussions.**
 - Wind-tunnel your current energy and climate strategy in these scenarios.
 - Connect energy and climate strategy with broader company programs, goals, and strategies.

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