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+ Getting Ahead of the Curve:

Corporate Strategies

That Address Climate Change

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by

Andrew J. Hoffman

THE UNIVERSITY OF MICHIGAN



PEW CENTER

ON

Global CLIMATE CHANGE

Getting Ahead of the Curve:

Corporate Strategies

That Address Climate Change

Prepared for the Pew Center on Global Climate Change

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Foreword *Eileen Claussen, President, Pew Center on Global Climate Change*

There is a growing consensus among corporate leaders that taking action on climate change is a responsible business decision. From market shifts to regulatory constraints, climate change poses real risks and opportunities that companies must begin planning for today, or risk losing ground to their more forward-thinking competitors. Prudent steps taken now to address climate change can improve a company's competitive position relative to its peers and earn it a seat at the table to influence climate policy. With more and more action at the state level and increasing scientific clarity, it is time for businesses to craft corporate strategies that address climate change.

In this Pew Center report, author Andrew Hoffman of the University of Michigan has developed a “how to” manual for companies interested in developing effective climate strategies. One of the clearest conclusions is that businesses need to engage actively with government in the development of climate policy. After years of inaction, momentum is growing at the federal level to pass mandatory climate legislation. Nearly all the companies surveyed in this report believe that federal legislation is imminent, and 84 percent of those believe federal standards will take effect before 2015. With a number of new climate bills forthcoming, it is clear that Congress has entered the design phase for legislation. Now is the ideal time for the corporate sector to engage constructively with lawmakers to ensure that sensible policy is developed to reduce greenhouse gas emissions at the lowest possible cost.

And constructive engagement is tightly linked with another compelling theme of this report: the shift of companies' focus to creating climate-related market opportunities. Companies with a strong history of reducing emissions are shifting their focus from risk management to exploring new business platforms. They understand better than their peers that new markets will be created and existing ones will change. There will be winners and losers. The shape of climate legislation will be the strongest factor in determining how the market rewards innovators of climate-friendly products and services, as well as how it punishes laggards. More than ever, integrating climate issues into corporate strategy is a necessary aspect of managing risk and seizing competitive advantage.

The Pew Center would like to thank Mike Lenox, Forest Reinhardt, and Paul Tebo for their comments on an earlier draft of the report; Alcoa, Cinergy (now Duke Energy), DuPont, the Shell Group, Swiss Re, and Whirlpool for agreeing to be profiled for the case studies in the report; all the companies that completed the Corporate Strategies Survey; and the many member companies of our Business Environmental Leadership Council that provided comments and guidance throughout the research process.



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All greenhouse gas emissions generated from air and road travel associated with the development of this report have been offset through renewable energy certificates purchased from 3 Phases Energy Services, LLC. In total, 14 metric tons of carbon offsets were created through 18.9 MWh of landfill-gas electricity generated at the Granger Electric Generating Station in Grand Blanc Michigan.

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Executive Summary

This report compiles the experience and best practices of large corporations that have developed and implemented strategies to address climate change. Based on a 31-company survey, six in-depth case studies, a review of the literature, and experience gained by the Pew Center in working with companies in its Business Environmental Leadership Council (BELC), the report describes the development and implementation of climate-related strategies. It is primarily a “how to” manual for other companies interested in developing similar strategies. But the report will also be of value to investors and analysts in evaluating the effectiveness of company strategies for managing climate risk and capturing climate-related competitive advantage. Finally, it will offer policymakers insight into corporate views on greenhouse gas (GHG) regulation, government assistance for technology advancement, and other policy issues. Although the report focuses primarily on U.S.-based multinationals, it considers the global context of climate change and related market transformation.

The report describes eight specific steps clustered into three stages that describe the various components of a climate-related strategy. Table ES1 summarizes these steps, which include assessing emissions and exposure to climate-related risks, gauging risks and opportunities, evaluating action options, setting goals and targets, developing financial mechanisms, engaging the organization, formulating policy strategy, and managing external relationships. The report is organized along the framework presented in the table, though it must be emphasized that individual companies do not necessarily follow the steps shown in a linear fashion.

Lessons learned at each step of the strategy development process are presented throughout the report. Taken together, four overarching themes emerge from the survey results and case studies. The first is the importance of **strategic timing**. Some companies acknowledge the dangers of starting too early on climate action, while others highlight the risks of starting too late. Despite continuing uncertainty, there is general consensus among the companies in this report that recent changes in the level of external awareness about climate risks, state government action, momentum toward stronger federal policy, and consumer demand for cleaner and more efficient products make it imperative to act now. Well-timed strategies can prepare companies for eventual regulation and create flexibility for longer-range strategic options.

A second theme is the importance of **establishing an appropriate level of commitment**. While the companies in this report are leaders in their industries, some caution against getting too far ahead of the competition. For many companies, uncertain demands from government, the marketplace, and the financial community—coupled with limited hard data and models to guide aggressive action—make it challenging to support extensive expenditures on GHG reductions. Therefore, many companies justify early action on other grounds: the managerial imperative to undertake low-risk initiatives that produce immediate or near-term cost benefits; their fiduciary obligation

Table ES1

Stages of Climate-Related Strategy Development

Stage I Develop a Climate Strategy			Stage II Focus Inward		Stage III Focus Outward		
Assess Emissions Profile	Gauge Risks and Opportunities	Evaluate Action Options	Set Goals and Targets	Develop Financial Mechanisms	Engage the Organization	Formulate Policy Strategy	Manage External Relations
What kinds of direct and indirect GHG emissions are being created, from what sources, and in what quantities? What metrics can be used to track emissions, and what technologies or techniques are required to measure them?	What risks are posed by emissions from operations and GHG-intensity of products and services? Where can we excel and get ahead of peers in climate-friendly or risk-reducing business lines? How may demand for products and services change? What products and services may flourish given carbon constraints?	What options are available for reducing emissions? Are there any "low-hanging" emission-reduction opportunities? Where can we innovate? What long-run steps can be taken? How can climate-related strategies enhance top-line and bottom-line objectives?	Why set GHG reduction targets? What kinds of efficiency or reduction targets should be set, and over what time period? How do efficiency improvements relate to GHG reductions? How can targets be connected to business strategy? What kind of goals are achievable regarding new business opportunities? What kind of adaptation strategies should be considered?	What financial instruments are available to support GHG reductions? What are the pros and cons of emissions trading (internal and external), carbon shadow pricing, lower hurdle rates, and special capital reserves?	How can buy-in from the workforce be achieved? How important is senior leadership? Where are the sources of support and resistance? How can resistance be overcome? How can climate-related activities move from the periphery to the core?	How might possible policies help or hurt business and/or on-going climate-related activities? What policy options are on the table? What is a desirable policy outcome? What are the best ways to influence climate policy at the state, national, or international level?	What external constituents are important to the success of climate-related strategies? How should they be engaged?
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8

Feedback and monitoring to refine business case, strategy elements, and tactics

to address risks from climate change and from related regulations, particularly to the extent these could affect future asset values and market positioning; and socially and ethically responsible business values—that is “doing the right thing.”

A third theme for many companies is the need to **influence policy development**. Any policy that regulates GHG emissions will certainly constitute a major market shift, setting new “rules of the game” and changing the competitive landscape. Companies in this report feel they cannot leave the ultimate form of such regulations to chance. All policies are not equal; they will, by their nature, favor certain actions, companies, and industries. Early action is seen as a way for companies to gain credibility and leverage participation in the process of policy development, and thereby have a measure of control over their future business environment.

A fourth and final theme is the importance of **creating business opportunities**. Companies with a history of climate-related activity are trying to shift their strategies from a focus on risk management and bottom-line protection to instead emphasize business opportunities and top-line enhancements. Firms that incorporate climate change into their core business strategies will be in the best position to take advantage of emerging opportunities and gain competitive advantage in a changing market environment. Sustainable climate strategies cannot be an add-on to business as usual; they must be integrated with a company's core business activities.

In the end, it is the consensus of the companies in this report that climate change is driving a major transition—one that will both alter existing markets and create new ones. As in any such transition, there are risks and opportunities, and there will be winners and losers. In this context, a growing number of companies believe that inaction is no longer a viable option. All companies will be affected to varying degrees, and all have a managerial and fiduciary obligation at least to assess their business exposure to decide whether action is prudent.



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+ Getting Ahead of the Curve: **Corporate Strategies** That Address Climate Change

Synthesis Report

Introduction

This report compiles the collected wisdom and experience of companies with a history of addressing climate change. It provides a model for corporate action, from making the business case for a proactive approach, to developing appropriate goals and targets, to implementing innovative strategies. Exploring the risks, rewards, opportunities, and barriers companies have encountered and documenting their successes and failures yields insights for those considering similar action and suggests best practices for assessing future efforts. As Yolanda Pagano, Director of Climate Strategy and Programs at Exelon, explains, “Many others—companies, governments and NGOs—have plowed this road before. Seek to leverage their learnings.”

One prime motivation for early action on climate change is the looming threat of greenhouse gas (GHG) controls. Nearly all companies in this report (90 percent) believe that government regulation is imminent, and 67 percent believe it will take effect between 2010 and 2015 (see Figure 1). All face

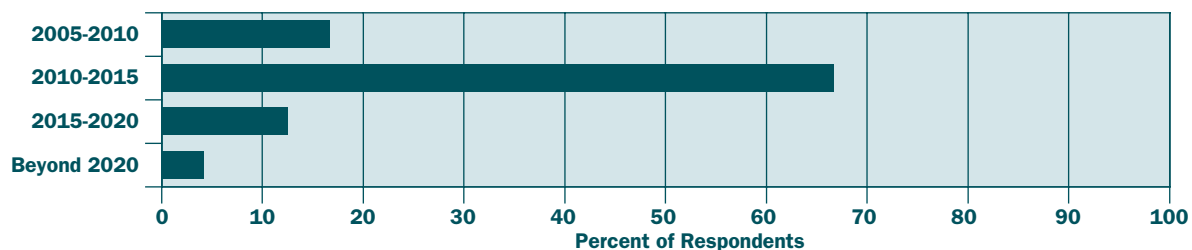
Nearly all companies in this report (90 percent) believe that government regulation is imminent, and 67 percent believe it will come between 2010 and 2015.

systemic risks from changing policies and higher energy and feedstock prices as a result of GHG controls. But they also have individual reasons for addressing the issue. Some companies are deeply engaged in the scientific debate over climate change. For others, that debate is secondary to the potential business impacts of regulation. Still others look to market changes and opportunities caused by shifting consumer and investor demands. All companies see a business reason for undertaking climate-related strategies, and each of their strategies reflects a different sense of the changing business and policy environment.

Figure 1

Anticipated Date of Federal Standards on Climate Change

[If you believe that federal standards on climate change are imminent] when do you believe these standards will take effect?



Total Respondents: 24

A. The Business Case for Climate Action Grows

Is a carbon-constrained world inevitable? Should companies engage the policy debate? Is there a business opportunity in this changing landscape? An increasing number of companies realize that the answer is yes.¹

Climate change and related policies create systemic risks across the entire economy, affecting energy prices, national income, health, and agriculture and creating regulatory, physical, and reputational risks at the sector, industry, and company-specific levels.² In short, climate change is altering the competitive environment, and certain companies, industries, and sectors will be more at risk than others. Some see the electric utility, steel, and aluminum industries as particularly vulnerable.³ Others warn of impacts to oil and gas companies⁴ or automakers.⁵ Some see American companies overall as less prepared than their European and Asian counterparts.⁶ Few sectors are immune from these effects.

In the public arena, there are signs that a national climate policy is very near. Much like the process that led to the formation of the U.S. Environmental Protection Agency (EPA) in 1970,⁷ states are increasingly enacting climate-related legislation. As of July 2006, 266 mayors representing over 47 million Americans had signed the U.S. Mayor's Climate Protection Agreement, committing each city to achieve significant emissions reductions and which urges "the U.S. Congress to pass the bipartisan greenhouse gas reduction legislation, which would establish stronger national emissions trading system." A growing "patchwork quilt" of state and regional regulation is motivating a growing number of corporations to support stronger national policy. Activity in Congress has also increased. In 2003, 43 senators voted for the McCain-Lieberman GHG cap-and-trade bill and in 2005, 54 supported a nonbinding resolution sponsored by Senator Bingaman (D-NM) calling for a "national, mandatory, market-based program to slow, stop, and reverse growth of [GHG] emissions." The first hearing on designing such a program was held by the Senate Energy Committee in 2006 and several major corporations testified. A number of senators have since joined McCain, Lieberman, and Bingaman in proposing their own solutions to the climate problem.

Movement can also be observed in other arenas. On the financial front, mainstream investors are beginning to take notice⁸ with companies like Goldman Sachs, Bank of America, JPMorgan Chase, and Citigroup adopting guidelines for lending and asset management aimed at promoting clean-energy technologies.⁹ The intersection of fiduciary responsibility and climate risk is coming into focus, particularly around the "materiality" of GHG emissions under the Sarbanes-Oxley Act of 2002,¹⁰ which some believe creates new climate-related legal risks for companies (and their directors). This possibility is not just hypothetical: eight states and New York City have filed a lawsuit against five of the nation's largest power companies demanding that they cut carbon dioxide (CO₂) emissions.¹¹ Some major insurers have since expressed concern about exposure to Directors' and Officers' (D&O) liabilities if climate risk is not properly disclosed and/or addressed, even as the number of shareholder resolutions requesting financial-risk disclosure and plans to reduce GHG emissions grew from 20 in 2004 to 30 in 2005.¹² Rising energy prices have also affected all areas of the economy and have strengthened the business case for reducing energy consumption and moving toward alternative energy sources while creating new demand for hybrid and flexible-fuel vehicles and efficient appliances.¹³ The Carbon Trust forecasts that "climate change could become a mainstream consumer issue by 2010," placing corporate brands at risk.¹⁴

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On the technology Research and Development (R&D) front, President Bush laid out new priorities for energy research in his 2006 State of the Union address. As coal is expected to figure prominently in future energy supplies, not only in the United States but worldwide, attention has focused on new, high-efficiency coal combustion options such as integrated gasification combined-cycle (IGCC) technology with carbon capture and sequestration, as well as on the next generation of nuclear technology.¹⁵ Clean-energy markets are also growing dramatically: global investment in wind and solar power reached \$11.8 billion and \$11.2 billion in 2005, up 47 percent and 55 percent respectively from the year before.¹⁶ Announcing a set-aside of \$100 million for investments in cleaner energy, transportation, air, and water technologies, venture capitalist John Doerr of Kleiner Perkins Caulfield & Byers has said, “This field of greentech could be the largest economic opportunity of the 21st century. There’s never been a better time than now to start or accelerate a greentech venture.”¹⁷

Americans have become more attuned to the potential consequences of climate change in the wake of recent natural disasters, as has the insurance industry, which faced \$78 billion in losses from such catastrophes in 2005,¹⁸ the largest amount to date.¹⁹ Future warming could disproportionately affect vulnerable sectors such as agriculture, fisheries, forestry, health care, insurance, real estate, and tourism—as well as offshore energy infrastructure (such as oil rigs and pipelines)²⁰—prompting many in those sectors to begin exploring adaptation strategies.²¹ Meanwhile, the scientific community continues to develop research and data on a variety of possible impacts, including glacial melt, sea-level rise, ocean acidification, and associated impacts on global water currents.²² Indeed, in the mainstream scientific community, the issue is no longer whether climate change is happening, but what can be done to slow its progress and mitigate its effects.²³

All of these developments create an increasingly compelling case for corporate action on climate change. Indeed, according to Ceres, the number of American companies addressing the issue has risen notably just since 2003.²⁴ In this changing business environment, action by one company can affect many others. Wal-Mart, for example, recently announced that it will begin giving preference to suppliers who set goals for aggressively reducing GHG emissions (see “Wal-Mart Mini Case Study” on page 43),²⁵ while Toyota has been able to take market share from other automakers in part by aggressively pursuing hybrid vehicles.²⁶ Putting it all together, the Conference Board warns, “Businesses that ignore the debate over climate change do so at their peril.”²⁷

B. Scope

This report focuses on “climate-related strategies”—defined as the set of goals and implementation plans within a corporation that are intended to reduce GHG emissions, produce significant GHG-reduction co-benefits, or that otherwise respond to climate-related changes in markets, public policy, or the physical world. Corporate activities encompassed by this rubric include measures for achieving direct and indirect emission reductions from a company’s own operations (such as energy efficiency initiatives); research, development, and investment in low-carbon production and process-related technologies as well as climate-related financial and business services; reductions obtained through emissions offsets and trading; activities to reduce “upstream” or “downstream” emissions along the value chain; and adaptation strategies.

C. Methodology

The research team for this report utilized two data-gathering methods. The first was a 100-question survey of 27 members of the Business Environmental Leadership Council (BELC) of the Pew Center on Global Climate Change²⁸ and four non-BELC members.²⁹ The survey sample was weighted toward large, publicly-held, multi-national corporations based in North America (see Table 1).

Table 1

Category	Results
Sector Representation	Electric Utility: 28 percent High Tech: 9 percent Metals and Mining: 9 percent Oil and Gas: 9 percent Other*: 46 percent
Ownership Status	Public: 87 percent Private: 13 percent
Headquarter Location	North America: 90 percent
Multinational Operations	Yes: 72 percent No: 28 percent
Market Segment**	Business-to-Business: 47 percent Business-to-Customer: 60 percent
Annual Revenue	< \$1B: 10 percent \$1-10B: 45 percent \$10-100B: 45 percent

* Other includes the following: Chemicals, Consumer Goods, Pharmaceuticals, Paper and Forest Products, and Cement.

**This figure exceeds 100 percent because some companies offer both services.

The second data collection method involved six in-depth case studies of five BELC member companies³⁰ and one non-BELC member,³¹ each of which had a stated commitment to reduce GHG emissions. To develop the case studies, the research team conducted face-to-face and telephone interviews with key executives and managers, typically including vice presidents for environment, health and safety (EHS); sustainability managers; operations managers; research and development personnel; and senior managers in governmental affairs and communications. Interviewers raised a consistent set of questions and topics to assure comparability between case studies and augmented the data gathered, where relevant, with information from secondary literature. The Pew Center has gathered feedback from BELC companies throughout the process.

D. Overview

This report has two parts. **Part One** synthesizes the main findings. It is organized into eight sections, each of which covers a major step in the development of climate-related strategies. Table 2 summarizes these steps, which include assessing emissions and exposure to climate-related risks, gauging risks and opportunities, evaluating action options, setting goals and targets, developing financial mechanisms, engaging the organization, formulating policy strategy, and managing external relationships. While presented in a linear fashion, it is important to note that the steps shown are not always followed sequentially since companies' actions must be tailored to their organizational culture, capabilities, and business plan. As with any well-managed initiative, constant monitoring and feedback are essential to effective implementation.

Part Two consists of six detailed case studies. Each seeks to identify what is unique about a company's approach, as well as what is transferable and potentially useful to other companies considering climate-related strategies.

Taken in its entirety, this report offers a comprehensive "how to" guide for implementing climate-related strategies and a compendium of best practices in the field. The results should be of interest to corporate decision-makers who are developing or considering climate-related strategies and to others seeking to understand

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Table 2

Stages of Climate-Related **Strategy Development**

Stage I Develop a Climate Strategy			Stage II Focus Inward		Stage III Focus Outward		
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Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8

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how companies gain competitive advantage by preparing for climate constraints, including financial analysts, institutional investors, state and federal officials, non-governmental organizations (NGOs), scholars, and participants in international efforts to address climate change.

E. Over-Arching Themes

Four over-arching themes emerged from the survey and case studies. These themes cut across all elements of climate-related strategies and involve timing, commitment, policy development, and business opportunity.

Ensure strategic timing: The question for companies in this report is not *whether* to take action on climate change, but *when*. Some have acknowledged the danger of pursuing initiatives too early; a few executives specifically highlighted false starts with the Clean Development Mechanism,³² which many believe is not realizing its full potential (see “Frustration with the Clean Development Mechanism” on page 97). In contrast, other companies wish they had started earlier. The key to a successful strategy lies in correctly timing its various components. According to Ron Meissen, Senior Director of Environment, Health and Safety Engineering at Baxter International, “Companies should take action now to define their global climate-related strategy, set GHG reduction goals and implement GHG reduction activities, not just for environmental reasons, but also for competitive advantage.”

“You should always remain one step ahead of the competition. But if you are two steps ahead, you lose the crowd. The ideal is for you to be the leader of the pack and everyone pulling in the same direction.”

For example, growing political interest has led DuPont to engage in more climate-related policy discussions with state and federal officials. Changing consumer preferences have prompted Whirlpool (which recently acquired Maytag) to focus more strongly on energy efficiency. According

to Casey Tubman, Brand Manager of Fabric Care Products at Whirlpool, “In the 1980s, energy efficiency was number ten, eleven or twelve in consumer priorities. In the last four or five years, it has come up to number three behind cost and performance, and we believe these concerns will continue to grow.” Mike Bertolucci, President of Interface Research Corporation, concurs: “Customers are now becoming more aware of the importance of the climate change issue.” For companies that sell consumer products, timing is all the more critical given the resources and lead time required to develop effective strategies. According to Jeff Williams, Manager of Corporate Environmental Initiatives at Entergy, “A significant amount of lead time was needed to select, fund, and complete quality projects before realizing CO₂ benefits.”

Establish appropriate levels of commitment: Closely related to the issue of timing is the question of how aggressively a company should pursue climate change strategies. Some companies warn that it is important not to get too far ahead of the rest of the business community. In the words of David Bresch, Head of the Atmospheric Perils Group at Swiss Re: “You should always remain one step ahead of the competition. But if you are two steps ahead, you lose the crowd. The ideal is for you to be the leader of the pack and everyone pulling in the same direction.” The policy and market impacts of climate change are still very uncertain, and it would be unwise for a single company to pursue initiatives that may not yield financial or strategic benefits. Many

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companies are concerned about implementing measures in a poorly defined political and market environment. For example, Cinergy (recently merged with Duke Energy) is making some GHG reductions, but CEO Jim Rogers does not believe the company can take aggressive action until there are clear regulatory and market signals. Absent such signals, companies may find it challenging to support GHG reductions and may need to justify action on the basis of short-term initiatives that produce immediate benefits, long-term projections of how climate change may affect their assets and market positioning, and socially and ethically based arguments for “doing the right thing.”

“To validly have a seat at the table, you have to bring experience. You cannot just take a seat because you are interested.”

Influence policy development: Any policy that regulates GHG emissions will set the “rules of the game.” Companies are aware that regulation can change the competitive landscape³³ and that future climate policies are likely to favor certain actions, companies, and industries. Relevant factors include the types of emissions regulated, tracking and measurement methods, target setting, and many others. To maintain a measure of control over their future business environment, companies are actively seeking ways to influence policy, and they recognize that credible action can give them greater leverage in that process. As David Hone, Group Climate Change Advisor at Shell, cautions, “To validly have a seat at the table, you have to bring experience. You cannot just take a seat because you are interested.”

Create business opportunity: Companies with a history of working on climate change are now trying to shift their focus from risk management and bottom-line protection to business opportunity and top-line enhancements. Goldman Sachs has identified three ways that climate strategies can add value: protecting reputation, enhancing competitive position, and developing new products.³⁴ Later sections of this report detail some of the specific climate-related business opportunities that companies have identified and are seeking to leverage through early action.

The strategic integration of climate goals with other objectives should be of particular interest to the financial community as analysts seek to develop tools and benchmarks for identifying competitive advantage based on best practices. While this report can help determine whether a company has taken appropriate steps to prepare for carbon controls and new business opportunities, the impact of climate change on company financial valuations needs further study.

Ultimately, sustainable climate-related strategies cannot be an add-on to existing business models, independent of the company’s overall competitive strategy. As Linda Fisher, Vice President and Chief Sustainability Officer at DuPont, explains, “We need to understand, measure, and assess market opportunities. How do you know and communicate which products will be successful in a GHG constrained world? How should we target our research? Can we find creative ways to use renewables? Can we change societal behavior through products and technologies? The company that answers these questions successfully will be the winner.”



Stage I: Develop a Climate Strategy

This stage involves determining how climate change creates risks and opportunities for a company and outlines steps for developing a strategy to address them.

Step 1: Conduct an Emissions Profile Assessment

The first step in developing a climate strategy is to analyze a company's GHG emissions profile throughout the value chain. This is a fundamental starting point for identifying and prioritizing emissions reduction options, the means to reduce emissions, products and services that may be affected by carbon constraints, and potential strategies that are complementary to the core business. To identify sources, types, and magnitude of emissions, as well as the vulnerability of business lines, companies need a basic awareness of the tools and protocols available to gather such information.

A. Lessons Learned

- Nearly all companies measure direct emissions and most measure indirect emissions. Yet, there is great variability in what emissions are considered. Companies should be aware of the range of possible emissions categories and the extent to which their business activities contribute to each one.
- Companies are evenly split in their use of absolute or indexed measures for tracking and reporting emissions. Absolute measures are necessary for assessing a company's full exposure to carbon constraints, but indexed measures may be useful for setting targets among various divisions or for benchmarking against other companies.
- Companies can measure actual emissions or develop estimates using fuel- or material-based calculations. The former approach may be more expensive and labor-intensive but the latter is complicated by the variety of methodologies that exist for calculating emissions.
- Companies have developed or are working to develop new systems for measuring and tracking emission reductions. These systems can be labor intensive (requiring, for example, energy reporting and verification of third party invoices) and may require further work to be integrated with other information systems (such as SAP³⁵ and Environmental Management System (EMS) under ISO14000).

B. Emission Types

Nearly all (97 percent) of the companies surveyed for this report have inventoried their emissions of six GHGs: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydroflouorocarbons (HFCs), perflouorocarbons

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(PFCs), and sulfur hexafluoride (SF₆). Many companies have converted all emissions to a carbon-dioxide equivalent (CO₂e) measure using 100-year global warming potential values established by the Intergovernmental Panel on Climate Change (IPCC).³⁶ Direct and indirect³⁷ emissions may be included, although there are a variety of ways in which these categories are currently defined.

Direct emissions come from sources owned by the reporting company and generally include emissions from on-site production processes, from the direct combustion of fossil fuels in boilers and furnaces, and from on-site power generation. One area of ambiguity involves emissions from joint ventures and from partial or wholly-owned subsidiaries. Cinergy, for example, only measures direct emissions from facilities in which it has an ownership position and operational responsibility. If a facility meets these criteria, the company assumes responsibility for all GHG emissions and does not prorate on percentage of ownership.

Another question revolves around emissions from divested operations. In 2004, DuPont divested itself of its nylon business, Invista®, which generated significant N₂O emissions. The company's decision to subtract these emissions from past performance and baseline measures diminished its overall footprint reduction from 72 percent to 60 percent.

The 77 percent of survey respondents that measure indirect emissions—that is, emissions that do not directly occur at the reporting company's facility—use a variety of approaches. The most commonly reported sources of indirect emissions are electricity, heating or cooling, and steam purchased from a third-party provider. Cinergy, on the other hand, does not track power purchases from third party vendors, as such variation raises questions of double counting if the seller is also counting these as direct emissions.

Other companies measure emissions generated by the use of their products (defined as Scope 3 emissions by the WRI/WBCSD reporting and accounting protocol; see “Developing an Emissions Inventory” on this page). For Whirlpool, the use of its home-appliance products constitutes 93 percent of the company's GHG profile and is the primary focus of reduction efforts. Alcoa, on the other hand, does not consider its product use in its emissions profile.

A small number of companies (such as IBM, Interface, and several financial-services firms) account for emissions from material transport, business travel, and/or commuting. Swiss Re, for example, generates 43 percent of its emissions profile from business travel (direct emissions and indirect office electricity use account for the

Developing an Emissions Inventory

An emissions inventory is an essential early step in developing a corporate GHG strategy. The World Resources Institute/World Business Council on Sustainable Development (WRI/WBCSD) Greenhouse Gas Protocol Corporate Accounting and Reporting Standard provides a step-by-step guide for quantifying GHG emissions and is used as the starting point for most reporting efforts around the world. Companies can do a Scope 1, Scope 2, or Scope 3 inventory. Scope 1 includes direct emissions; Scope 2 includes indirect emissions from the consumption of purchased electricity, heat, or steam; and Scope 3 includes other indirect emissions from upstream and downstream sources, as well as emissions associated with outsourced or contract manufacturing, leases, or franchises not included in Scope 1 or Scope 2. The WRI/WBCSD Protocol includes guidance for identifying relevant source categories and calculation tools for emissions from particular source categories.³⁸



remaining 13 and 44 percent, respectively). Cinergy, on the other hand, does not count upstream emissions from the mining and transport of coal.

One final issue concerns emission credits from biological carbon sequestration, something that Cinergy includes in its inventory. The company identifies test plots and measures tree volumes, underbrush, and soils for carbon content. The measurements are repeated at regular intervals and resulting data are extrapolated to the entire acreage of plantings. The company states that this process yields a 95 percent statistical level of confidence.

C. Emission Metrics

GHG emissions can be reported in a variety of forms. To gain a clear sense of a company’s exposure to possible climate-change policy, absolute measures are necessary. But to track performance relative to other economic

“There are regional differences in approaching the issue that require a company to have both a global and regional focus.”

or production goals, or to competitor benchmarks, emissions can be normalized with another measure such as dollars of revenue or units of production.

Survey respondents are evenly split between absolute or indexed measures for tracking and reporting progress on GHG emission reductions (48 and 52 percent respectively).³⁹ The most common metrics include: total tons CO₂e; tons CO₂e per unit of product; energy consumption per unit of product; and total energy consumption.⁴⁰ (See Table 3)

A minority (12 percent) of survey respondents use a combination of absolute and indexed metrics, tailoring emissions measurements as appropriate for particular goals or reporting units and regions. Daniel Gagnier, Senior Vice-President of Corporate and External Affairs at Alcan, explains that despite the general trend to evaluate reductions from a global perspective, “there are regional differences in approaching the issue that require a company

to have both a global and regional focus.” Shell decided that setting a universal standard would be impractical because of its size and multinational focus. Even though the company reports an absolute target externally, it gives individual business units the flexibility to use indexed measures for internal reporting. This approach is particularly popular with units that have significant growth opportunities.

D. Emission Measurement Tools and Techniques

Some companies measure actual emissions, while others estimate emissions using fuel-based calculations (based on methodologies such as those created by WRI/WBCSD, the European Union Emission Trading Scheme (E.U. ETS), the U.S. Department of Energy (DOE) and others). The difference depends, in part, on the complexity of the task. Companies with many emission sources or extremely hostile stack environments prefer to avoid

Table 3

Most Common Metrics for Measuring GHG Emissions*

1. Total tons of CO ₂ e	73 percent
2. Tons of CO ₂ e per unit of product	50 percent
3. BTU (energy consumed) per unit of product	39 percent
4. Total BTUs	35 percent

*Many companies use more than one metric.

on-site measurement due to the cost of purchasing, installing, maintaining, and replacing monitors. Cinergy measures CO₂ directly at generating units equipped with continuous emissions monitors (CEMs).⁴¹ For units not equipped with CEMs, estimates are calculated using the energy (BTU) value of the fuel consumed multiplied by its carbon intensity (pounds of CO₂ emitted per million BTU) as provided through the DOE's Energy Information Administration (EIA) 1605(b) reporting program.

The majority (62 percent) of survey respondents have developed new information systems or monitoring equipment to track GHG emissions. The functionality of these measurement systems varies considerably by company: some use highly sophisticated, web-based database tools, while others are still in the development process.

All companies recognize the importance of emissions measurement and tracking. Alcoa, for example, considers the development of its internal web-based GHG information system a major step toward achieving its climate goals. Its centralized system currently includes detailed process and energy consumption information for 41 facilities worldwide, including four power generation facilities, nine alumina refineries, and 26 smelters. Alcoa's system uses the methodology of the E.U. ETS to calculate emissions and sweeps databases every evening to download process and production data. Designated individuals at each plant are responsible for manually entering energy consumption data on a monthly basis and reminders are issued automatically to ensure that data for all facilities are available as soon as possible after the end of each month.

Some companies have been able to incorporate GHG tracking into integrated performance measurement systems like SAP, allowing them to link emissions reductions to financial measures. Ruksana Mirza, Vice President of Environmental Affairs at Holcim (U.S.) Inc., states that the company's SAP enterprise resource planning platform is linked to a CO₂ module that automatically calculates monthly emissions using relevant operating information (e.g., production volume, energy consumption, fuel type, etc.).

At DuPont, progress on GHG reductions is tracked at the business-unit level through the Corporate Environmental Plan, a database that captures annual performance information on waste, GHG and other emissions, and energy use at company facilities worldwide. Energy-related emissions are calculated based on fuel consumption according to the WRI/WBCSD GHG reporting protocol. The current system requires data inputs from direct metering of gas consumption, invoices for other fuel purchases, reconciliation to inventories, and emissions factors for a variety of fuels. Process emissions are reported separately and indirect emissions are calculated based on localized information. All of this information is collected once per year in the corporate database.

As these examples illustrate, tracking GHG emissions can be complicated and, at times, labor intensive. While some companies are generally satisfied with the performance of their respective systems, many see room for improvement. For example, despite having tracked emissions since 1991, John DeRuyter, Principal Consultant, Energy Engineering at DuPont, still believes the "biggest headache is in capturing and reporting data, particularly energy reporting and verification of third party invoices." There is no link with the company's SAP system, which would be desirable but is currently prohibitively expensive.

Other companies point to a need for better measurement tools in the future. According to Steve Willis, Director of Global Environment, Health and Safety at Whirlpool, a data management system and international GHG conversion factors are the most significant requirements for implementing a climate strategy.

Step 2: Gauge Risks and Opportunities

Emissions alone do not reveal a company's exposure to carbon constraints. Companies must also consider potential impacts on product and service lines.

The next step in climate-strategy development is consideration for how operations and sales may be affected—both for the positive and the negative—by climate change-related factors and, as a result, how such factors may alter competitive positioning. As part of this analysis, companies should consider their emissions profile relative to industry peers, the industry's position relative to other sectors, potentially relevant future regulatory developments, trends in input costs, and potential changes in customer preferences. Identifying risks and opportunities must flow from an understanding of the company's current and future GHG footprint in the context of a current and future carbon-constrained society and economy.

A. Lessons Learned

- Benchmarking is geared towards gaining information on best practices, as well as gaining the strategic benefits that come from being identified as a leader on climate change.
- In assessing product and service line vulnerabilities, companies begin with a focus on risk management and bottom-line protection.
- With time and experience, companies then shift their strategies for addressing climate change to emphasize business opportunities and top-line enhancements.

B. Benchmarking

Seventy-three percent of survey respondents report that they benchmark against other companies on their climate-related performance. In general, these companies report that they benchmark against the other companies in their own industries, but many also report that they identify singularly-visible companies that have gained exposure for their climate activities.

The goals of benchmarking activities are to identify best practices for addressing climate change, as well as managing reputation and industry status on the issue. Benchmarking can help protect the company against being identified as a laggard, but more importantly, can help the company gain the benefits of standing out as a leader. The experience of the Pew Center is that an increasing number of companies turn to benchmarking of industry peers in target setting, especially in certain industries and for second-round goals (see discussion of benchmarking in Step 4 on page 23). In the former case, a company that is labeled as a low performer may be susceptible to costly criticism in the press or from NGOs. In the latter case, however, securing a first-mover advantage in addressing

climate change can create opportunities and garner recognition (such as through rankings by *Business Week*, *The Financial Times*, Ceres, and others). Securing this recognition requires efforts at external outreach, which are discussed in Step 8. Finally, benchmarking can inform the need for collective industry action, especially if an industry wishes to achieve sufficient reductions on a voluntary basis to reduce pressure for onerous regulation.

C. Risks from Operations, Products, and Service Lines

In terms of assessing product and process line vulnerabilities to carbon constraints, companies generally begin with a focus on risk management and bottom-line protection. Cinergy, for example, is concerned about the impact of climate-change regulation on the value of its existing and future energy producing assets. When the company first completed its GHG profile for the year 2000, it was clear that the majority of emissions came from legacy electric-generating units. Because

Ultimately, the most effective climate-related strategies connect GHG reductions with a company's core business strategy.

new generating capacity has an expected lifespan of 40 to 50 years or more, Cinergy is particularly sensitive to uncertainty surrounding future climate policy as it relates to strategic investments. Therefore, the company is working to develop new technologies for reducing emissions from its coal-fired assets and sees increased value in the nuclear capacity acquired through its recent merger with Duke Energy.

For Alcoa, one core business concern centers on aluminum production costs. As an energy-intensive basic materials company, securing reliable, low-cost, long-term energy sources is among its most pressing strategic priorities. Climate policies threaten to alter the economics of critical energy inputs. Thus, against the backdrop of global climate policy trends, the emissions profile of existing and new energy sources has been a focus of its strategy.

D. Product and Service-Line Opportunities

While risk management can be a starting point for addressing climate-related vulnerabilities, with time and experience companies shift their climate-related strategies to emphasize business opportunities and top-line enhancements. In fact, the mere presence of risk from GHG intensive operations, products, and services signals the potential for business opportunities based on GHG efficiency. Companies need to assess whether and how demand for their current and future product and service lines may be enhanced by climate-related developments.

Ultimately, the most effective climate-related strategies connect GHG reductions with a company's core business strategy. This can be done in a variety of ways. One way is through operational improvements. For example, instead of flaring methane gas in its exploration and refining operations, Shell now captures the gas and either pumps it back underground to enhance well production or feeds it to nearby facilities for power production. When the economics are right, the methane can be converted into liquefied natural gas (LNG), a major potential growth area.

Another approach is to find new uses for existing product lines and to develop new products to satisfy emerging market needs. For example, DuPont developed a special grade of Tyvek® house wrap for European

customers; this wrap reduced energy use and CO₂ emissions and lowered heating bills. DuPont engineers also work directly with the company's business customers to help them reduce energy consumption. This strategy not only delivers higher value, it enhances DuPont's relationships with its customers and may be rewarded by larger or longer-term contracts.

Swiss Re is also looking for ways in which to augment its existing activities to create opportunities from climate change. For example, the company channels investments in its sustainability portfolio into a number of sectors, including alternative energy, water, and waste management/recycling. More specifically, the company seeks opportunities representing medium to high risk-return profiles in: infrastructure investments such as wind farm, biomass, and solar projects; investments in publicly quoted, small- to medium-capitalized growth companies, and; cleantech venture capital investments, representing the highest risk-return profile. As tightening policy frameworks increase demand for such projects, the company's investment strategy is beginning to pay off. The portfolio's market value rose substantially in 2005 thanks to strong share performance, as well as new investments.

Yet another way to create synergies between climate and business strategy is through acquiring assets that balance a company's portfolio. For example, Cinergy's emissions profiling and assessment of likely future regulatory scenarios pointed to increased value in nuclear capacity, which it gained through its recent merger with Duke Energy. Any form of GHG regulation will favor electricity from no-carbon and low-carbon sources over time, signaling potential advantages for operators of nuclear plants. Moreover, this potential opportunity may grow for utilities like Duke, Exelon, Entergy, and others that have particular expertise in permitting, building, and operating nuclear capacity.

Alcoa found that future climate policies may create market opportunities by expanding aluminum recycling. Considering that aluminum produced from recycled materials requires only five percent of the energy needed to make primary aluminum and that energy prices will likely continue to rise, the company has pledged that 50 percent of its products, other than raw ingot sold to others, would come from recycled aluminum by 2020. Increasing recycling rates is among the more significant long-term strategic opportunities for the company. Another is the expected boost in demand for aluminum as a material in lighter-weight vehicles, and the company is continuing to make progress into this area. For example, Alcoa developed "Dura Bright" commercial truck wheels that are lower mass than conventional wheels and, as an added marketing advantage, don't require polish or scrubbing. According to the company, a 10 percent reduction in vehicle weight typically yields a 7 percent reduction in GHG emissions.

Similarly, Whirlpool's business opportunity lies with consumer choices. As most lifecycle GHG emissions from home appliances come from their use rather than production, the company's primary focus is on appliance efficiency. Whirlpool expects mounting awareness of climate issues and rising energy costs to drive consumer demand toward less energy-intensive products and therefore is leveraging its core competencies to continue bringing the most energy-efficient appliances to market.

But, going even further, some companies have focused their energy and efforts into fundamental technology shifts. DuPont, for example, has identified the most promising growth markets in the use of biomass feedstocks that can be used to create new bio-based materials such as polymers, fuels and chemicals, new applied Biosurfaces, and new Biomedical materials. One promising development is Sorona® polymer. In a joint venture between DuPont and Tate & Lyle PLC set to go on-line in the third quarter of 2006, the company will begin producing 1,3-propanediol, the key building block for the new polymer, using a proprietary fermentation and purification process based on corn sugar. This bio-based method uses less energy, reduces emissions, and employs renewable resources instead of traditional petrochemical processes. Another promising development for DuPont is the 2006 creation of a partnership with BP to develop, produce, and market a next generation of biofuels. The two companies have been working together since 2003 to develop products that will overcome the limitations of existing biofuels. The first product to market will be biobutanol, which is targeted for introduction in 2007 in the U.K. as a gasoline bio-component. This biofuel offers better fuel economy than gasoline-ethanol blends and has a higher tolerance to water contamination than ethanol.⁴² Both of these developments represent the new direction in which the company is headed—one that significantly reduces the company's environmental footprint. According to Uma Chowdhry, VP of Central Research and Development, this is not a subtle shift, but rather a significant change in product lines and research focus for DuPont. She is hoping that DuPont will soon be known for leading the industrial biotechnology revolution and predicts that over 60 percent of DuPont's business will stem from the use of biology to reduce fossil fuel use in the next few decades.

New Products Reduce Carbon Dioxide Emissions

Jeff Hawk, Director, 787 Government and Certification, The Boeing Company

In 2008, The Boeing Company will begin delivery of a new airplane—the 787 Dreamliner—that reduces CO₂ emissions by approximately 20 percent compared to today's similarly sized airplanes. In addition to new, more efficient engines, Boeing also redesigned the airframe to be more efficient by streamlining its aerodynamic shape and significantly increasing use of lightweight composites. Airline interest in the airplane has already generated a record number of firm orders—more than 375 since the plane was launched about two years ago. Airplane design decisions are based on market requirements including passenger loads and route structure; research to reduce CO₂ emissions from the 787 began in the mid-1990's. After studying the market with customers, Boeing decided to design a mid-sized airplane (200 to 300 passengers) that could travel as far as today's bigger jets while reducing CO₂ emissions through lower fuel use. By designing an airplane that can travel efficiently on long-range routes with fewer passengers, the 787 can help to eliminate stops at “hub” airports, creating more direct flights and reducing extra flight miles, saving fuel, CO₂ emissions, and passengers' time. While aviation represents less than 3 percent of worldwide CO₂ emissions (according to the IPCC), it is a growing sector of the economy. Boeing believes it is important to continue environmental improvements, especially CO₂ and noise reductions, to meet future expectations.

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Step 3: Evaluate Options for Technological Solutions

After developing an emissions profile, the next task is to evaluate options for reducing emissions. This step is often conducted in an iterative fashion with goal setting. Some companies set goals and then search for ways to achieve them. Others consider their options for reducing emissions and then set goals accordingly. The precise ordering is a matter of individual management style.

A. Lessons Learned

- Many companies were able to identify a variety of low-cost options for reducing their GHG emissions. These “low-hanging fruit” opportunities often include behavioral or technological changes that improve efficiency and reduce energy consumption.
- A few companies developed breakthrough technology solutions that facilitated a dramatic reduction in their GHG footprint. Such “silver bullet” opportunities are often the focus of new technology development but have also been realized in existing operations.
- Over the long term, companies can develop and fine tune programs to implement more challenging solutions. This can involve technical efforts aimed at plant optimization as well as organizational efforts related to information sharing and internal consulting.
- Companies typically distinguish on-system options for reducing emissions from off-system opportunities. On-system reductions involve projects within a company’s operations. Off-system reductions can include forest sequestration projects, purchased offsets, sourcing offsite renewable energy, and others. Public and private benefits and costs for these reductions vary.
- Ultimately, the goal is to find ways to reduce GHGs in a manner that supports other business objectives. This can involve linking emission reductions to improved operations, finding new markets for existing products, or creating new products to serve emerging markets.

B. Low-Hanging Fruit

Companies in this report have found myriad low-cost or low-risk, easily identifiable solutions for lowering their emissions profiles. This is particularly true for companies that have not actively pursued reductions in the past. Such “low-hanging fruit” may include simple energy efficiency initiatives, behavioral changes, or process improvements. For example, the first step in Swiss Re’s three-tiered approach to reducing GHG emissions involved turning down heating and cooling in company offices and turning off lighting systems during non-working hours. As a second step, the company has focused on small investments, such as motion sensors and compact fluorescent light-bulbs, and on reducing emissions from business travel by curtailing short-distance trips for internal meetings and by providing employees with the latest telephone or video conferencing technology. The final tier of Swiss Re’s approach involves refurbishing company-owned property

and buildings by, for example, replacing cooling towers, generators, insulation, or windows.

Many electric-generating companies have undertaken efficiency improvements at individual power plants to produce more electricity per unit of fuel input. Boosting output at non-GHG emitting nuclear, hydro, and landfill-gas facilities can be an effective approach to reducing emissions as well. In sum, though the specific opportunities may differ, all companies should identify “low-hanging” options.

C. “Silver Bullets”

Some companies have achieved dramatic GHG reductions by implementing a single initiative that significantly altered their emissions profile. For example, Shell managed a sizable portion of its pre-2002 emissions by reducing the venting of associated gas (methane) from its exploration and production facilities. In many cases, “silver bullet” initiatives require innovation and investment in improved processes. Most of Alcoa’s GHG-reduction efforts have involved cutting perfluorocarbon (PFC) emissions by reducing the number of anode effects in the aluminum smelting process (see “Anode Effect: An Overview” on page 103). DuPont’s “silver bullet” involved reducing emissions of two potent GHGs—N₂O and HFC-23 (an unintended byproduct of producing HCFC-22, a common refrigerant)—through two discrete process technologies.

Even if such big-impact opportunities do not exist at present, companies are working to make them a reality in the future. Alcoa is developing a new smelting technology based on an inert anode which would eliminate consumable carbon anodes and related PFC and CO₂ emissions. For Cinergy, coal IGCC technology combined with carbon capture and sequestration (CCS) holds promise for reducing future emissions. The company has been involved in IGCC since the early 1990’s when it

Clean Energy for a Low-Carbon Future

Bill Gerwing, Director Health, Safety, and Environment, BP America

BP believes that power generation and a clean environment are not opposing goals. That belief is at the heart of BP’s plans for a Hydrogen Power Project in Carson, California—in what would be the company’s second industrial-scale hydrogen power project—designed to generate electricity and reduce greenhouse gas emissions by capturing carbon dioxide (CO₂) and storing it safely and permanently. The result would be California’s cleanest new power plant. The project would combine a number of existing industrial processes to provide a new option for generating electricity without significant CO₂ emissions. Petroleum coke produced at California refineries would first be converted to hydrogen and CO₂ gases with around 90 percent of the CO₂ captured and separated. The hydrogen gas would be used to fuel a power station capable of providing the California power grid with 500 MW of electricity, enough to power about 325,000 homes in Southern California. At the same time, about four million tons of CO₂ per year will be captured, transported and stored in deep underground oil reservoirs where it will enhance existing oil production. When completed, the Carson Hydrogen Power Project would be the largest hydrogen-fired power generation facility in the world and would have the lowest CO₂ emissions in the world for an integrated gasification combined cycle (IGCC) plant.



built one of the first demonstration plants in the United States; it is now working with GE Energy and Bechtel Corporation to study the feasibility of a commercial scale (600 MW) IGCC generating station with CCS.

D. Ongoing Reductions

To continue making GHG reductions, companies must sustain their efforts over the long term. For example, Alcoa and Shell are conducting ongoing efficiency assessments at operating plants to generate

Capital investments to reduce energy consumption often meet resistance because they are not viewed as “sexy” or compelling. If the pool of resources is dwindling, the certainty of returns in energy-efficiency projects can actually become a liability.

recommendations for operational, equipment, and behavioral changes. They have also facilitated information sharing about promising energy practices between plant locations. Both companies provide technical support and access to further resources as needed. Similarly, DuPont is focusing its ongoing GHG-reduction efforts on more capital-intensive measures that affect yield, capacity,

and utilization; process changes; combined heat and power; and modern heat management using insulation, steam traps, waste heat recovery, and modern motors.

One challenge to sustaining climate-related strategies is that they must compete with other initiatives for funding. According to John Carberry, Director of Environmental Technology at DuPont, capital investments to reduce energy consumption often meet resistance because they are not viewed as “sexy” or compelling. If the pool of resources is dwindling, the certainty of returns in energy-efficiency projects can actually become a liability. DuPont, for example, has ruled out lowered hurdle rates, internal carbon shadow pricing, or setting a budget for energy efficiency projects: “The problem is that when we pitch 20 percent return with 99 percent certainty on energy, we lose to a marketing group pitch of 40 percent return with 60 percent certainty,” says Carberry. The choice to create internal price supports for emissions-reduction efforts is a strategic decision for companies; absent such supports, climate-related projects must show positive returns relative to other initiatives if they are to offer value to the company.

E. On-System versus Off-System Reductions

Not all GHG reductions are made at the facility level or even within the company: Cinergy, for example, intends to achieve up to one-third of its emissions reductions off-system. Off-system reductions can include forestry projects, end-user efficiency programs, and research and development projects. By contrast, Cinergy’s on-system projects target direct emissions from smoke stacks and vehicle tailpipes, or methane emissions from the company’s natural gas distribution system.

Swiss Re plans to achieve 15 percent of its reduction target through actual facility reductions and the remaining 85 percent through off-system investments in the World Bank Community Development Carbon

Fund. However, sourcing emissions credits through external means is not always easy. DuPont has found that cost-competitive alternative energy projects are relatively scarce and difficult to identify. The company has been able to source about 5 percent of its energy from renewable sources but hopes to increase that amount. These two examples highlight a distinction between purchasing emissions offsets that are not directly related to a firm's activities (the Swiss Re/World Bank example) and sourcing renewable energy for a firm's own use (the DuPont example). Each has very different public and private benefits and costs.

Step 4: Set Goals and Targets

The companies in this report have made a wide range of commitments to reduce GHG emissions, the specifics of which differ in such aspects as timetable, objectives, baseline year, and types of emissions covered. For example, DuPont's goal of reducing GHG emissions 40 percent below 1990 levels by the year 2000 was set in 1994. That target was met in 1999, and the company established a new goal to reduce net GHG emissions 65 percent below 1990 levels by 2010. Whirlpool's target, set in 2003, calls for reducing total GHG emissions from global manufacturing, product use, and disposal by 3 percent from a 1998 baseline by 2008, while also increasing sales by 40 percent over the same period.

Goals and targets need not be limited to GHG reductions but can include strategic initiatives and adaptation strategies. As noted earlier, goals can be based on identified emissions-reduction opportunities or set as stretch goals. Most companies establish short- and long-term goals in an iterative fashion and in a way that is aligned with their strategic objectives. Ultimately, these goals must fit the company's capabilities, culture, and business model.



A. Lessons Learned

- Companies adopt targets for a variety of internal and external reasons. Some have identified climate change as a significant strategic issue for the future while others have been prodded by shareholders or other external constituencies.
- Companies cite three primary sources of motivation: cost savings, social responsibility, and reputation enhancement. The latter is linked to an expectation of enhanced ability to foresee and influence future regulation.
- Most companies develop goals by analyzing risks and opportunities in their many business units. Those that have achieved the most dramatic GHG reductions set stretch goals beyond what their original analysis indicated was possible. Many of these companies subsequently achieved their goals before the target date and set new, more ambitious ones.



- Many companies establish both energy-efficiency and GHG-reduction targets. While efficiency improvements often yield near-term financial benefits, the value of GHG reductions is more difficult to quantify and serves longer-term objectives. As a result, efficiency programs are more likely to be considered strategic and proprietary, while GHG reductions may be difficult to connect to a company's bottom line.
- In making the business case for climate-related strategies, companies typically focus on the quantifiable financial benefits of energy efficiency projects, the less quantifiable reputational and organizational benefits of "doing the right thing," and scenario planning that highlights the future likelihood of, and impact from, carbon constraints.
- Companies are also developing other goals. Examples include sourcing renewable energy, reducing solid waste, eliminating all waste, increasing use of hybrid biofuels and vehicles, and others.
- Finally, companies are developing adaptation strategies to be prepared for the physical risks associated with climate change.

B. Motivating Factors

+ A company's motivations for taking action can be influenced by corporate history and culture, core competencies, or the competitive environment. Many companies in this study first became involved through a narrowly focused internal initiative. Cinergy's efforts began in the early 1990's after the company commissioned a study on the feasibility of adopting an internal CO₂ cap. Shell had been watching the climate change issue since the early 1990's through its Issues Management Team within Corporate Affairs. In 1998, Jeroen van der Veer (then a group managing director and now Shell CEO) championed a more formal study of climate change and its potential impact on the company's businesses globally. DuPont's actions were foreshadowed by its experience with stratospheric ozone depletion in the 1970s and 1980s. When the IPCC issued its first assessment report in 1990, DuPont's (former) CEO Ed Woolard saw a familiar scenario playing out and directed the company to become an early adopter of GHG reductions.

+ Interest in climate-related strategies can also be motivated by outside parties. While Cinergy's CEO and management team were interested in climate action from the early 1990's, concurrent shareholder resolutions in 2002 and 2003 helped the company take the final step. Dialogue with shareholders resulted in a plan to disclose risks related to climate regulation, and Cinergy formally announced its internal GHG-reduction program in September 2003.

While the specific impetus for each company varies, three overarching drivers emerged from the survey: cost savings, social responsibility, and reputation. These drivers are linked by a common desire to ensure the long-term success of the organization and are discussed in more detail below. It should be noted, though, that as a company fulfills its goals in these areas and gains knowledge of the issue, the motivations then

shift toward leveraging climate-related market changes for competitive advantage. Companies just starting the strategy process for the first time should tap this motivation from the start.

Figure 2

Motivations for Undertaking Climate Action



Cost savings: As noted previously, near-term cost savings are generally realized through improvements in energy and operational efficiency (see Figure 3). Survey respondents rank efficiency improvements as the most prominent measure of success (see Figure 4) and the action that most often provides bottom-line benefits (see Figure 5).

Social responsibility. Although social responsibility (often characterized as the desire to “do the right thing”) ranks low in terms of generating short-term bottom-line benefits (see Figure 4), companies consider it a primary motivator and see early action on climate as consistent with their corporate values (see Figure 3). For example, DuPont cites its culture of science, safety, and environmental responsibility, while Cinergy points to its cultural values and a history of responsibility, transparency, and stakeholder engagement. For Alcoa, climate strategy is part of the company’s sustainability efforts, which in turn feed into overall corporate goals. Whirlpool draws a close connection to its Midwestern roots, which foster a strong belief in corporate citizenship. At Whirlpool, according to Mark Dahmer, Director of Laundry Technology, one of the company’s core principles is that there is “no right way to do a wrong thing.”

Reputation. Companies are also motivated by the desire to protect or enhance their reputation. Remaining inactive on climate change can expose the firm to criticism and negative press, particularly when industry peers are taking action. Conversely, meaningful action can create good will with investors, customers, regulators, and communities. For Swiss Re it is critical to have a voice in social and political debates over climate change. So, while recognizing that its emission reductions amount to merely a “rounding error” compared to other companies, Chris Walker, Managing Director and Head of Sustainability Business Development says, “We need to do this if we are going to be seen as credible.”

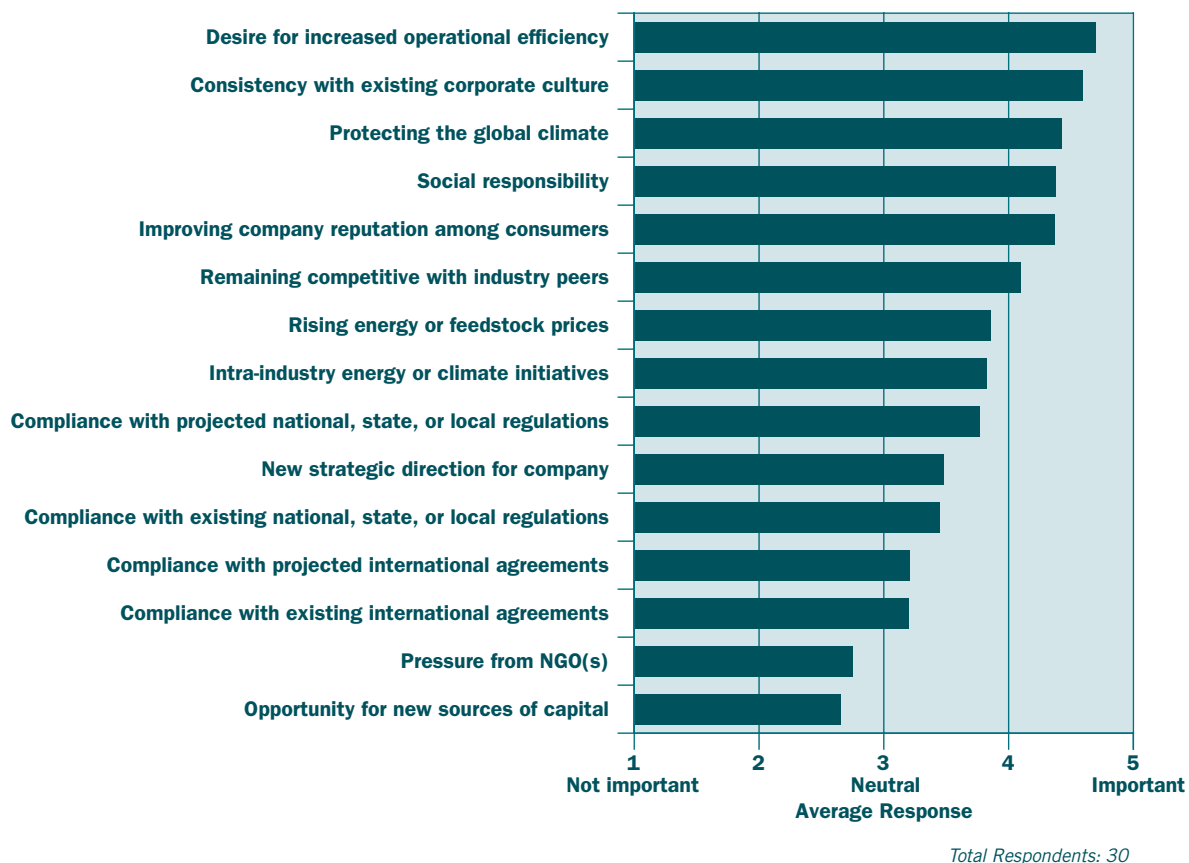
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Figure 3

Drivers of Climate-Related Strategies

How important were the following external drivers in leading your company to pursue its climate-related strategy?



Alcoa recognizes that a good environmental reputation enhances its ability to site and build new plants. Whirlpool wants its customers to see the company as a source of energy-efficient and environmentally friendly products. Shell has long been motivated by the belief that a leadership position would allow the company to foresee and possibly influence government policy. Similarly, other survey respondents consider the ability to anticipate future regulations to be a critical measure of success (see Figure 4).

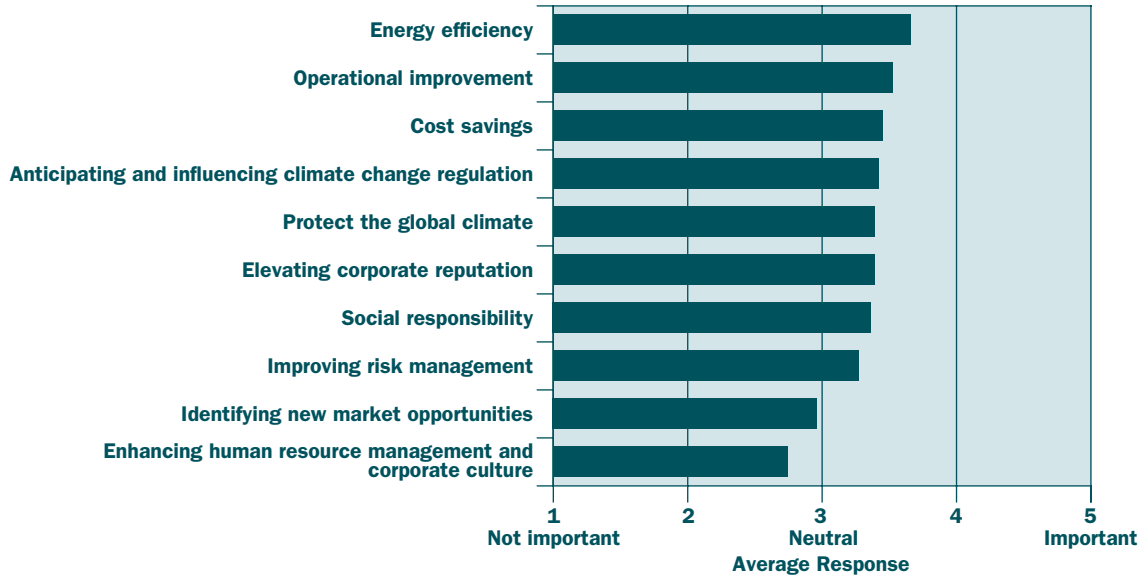
C. Developing Climate Goals and Targets

Understanding the context in which a company first takes note of climate change can help inform the development of meaningful goals. Companies in this report tend to be introspective, looking inward at capabilities and interests when establishing targets. Whirlpool, for example, began by soliciting input from each of its product

Figure 4

Measures of Success of Climate-Related Strategies

Once begun, how important are the following measures of success in undertaking your climate-related strategy?



Total Respondents: 30

groups and compiling data on projected sales volumes, consumer use, product turnover, and plans for introducing new, more efficient models. Total energy consumption was then calculated over the average life of each product and converted to GHG emissions using country-specific factors. (See Step 2 on page 12 to learn more about the use of benchmarking for target setting).



Several companies solicited opinions from individual business units but then pushed further, creating a stretch goal to make significant progress. Craig Heinrich, leader of the global energy team for DuPont's Titanium Technologies division explains, "You need the tension of a very challenging goal. Inspirational goals call an organization to act beyond conventional boundaries...an easy goal fails to challenge the creative potential of the organization."

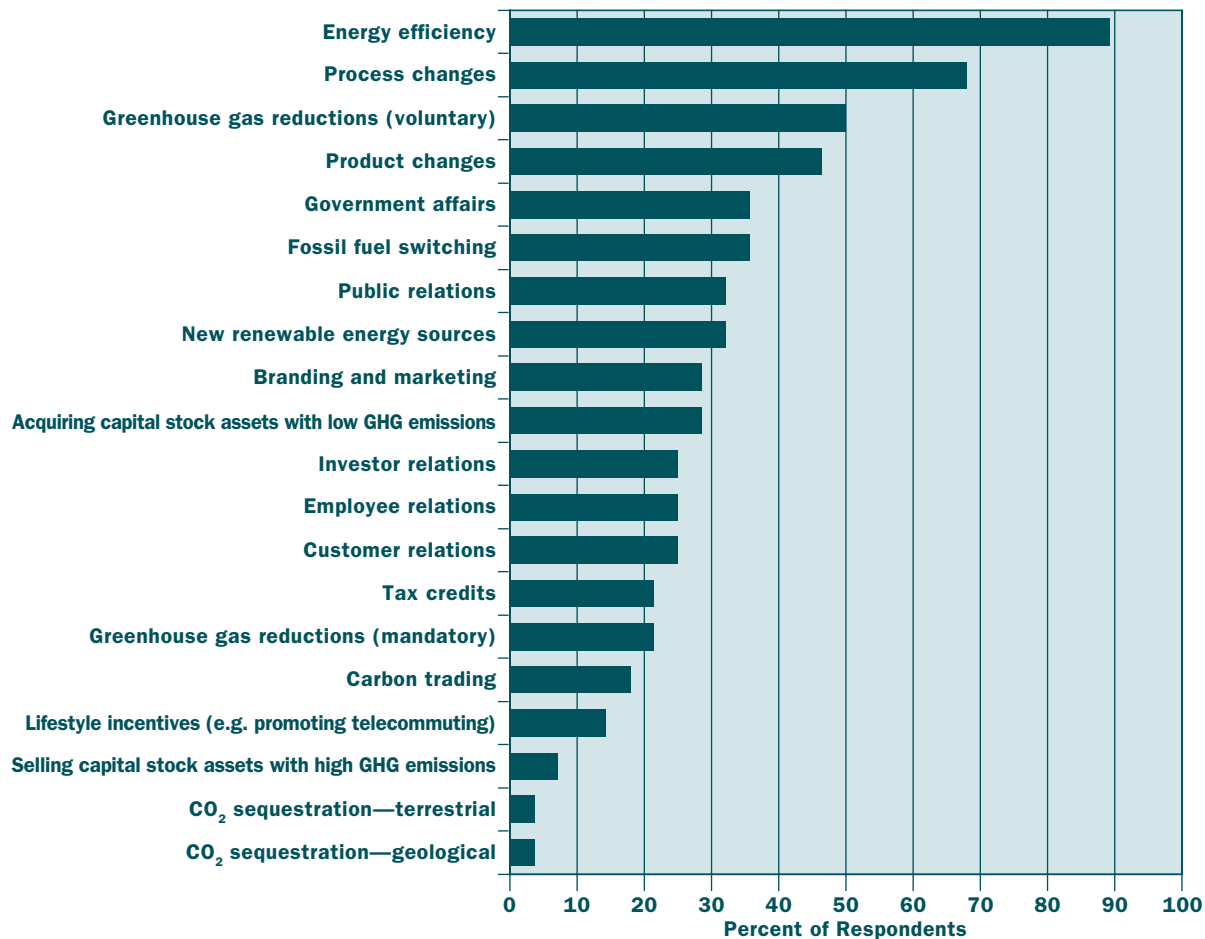
Several companies have met or exceeded internal targets before the stated deadline. Alcoa reached its 2010 emission-reduction goals seven years early, and Entergy not only met its goal of stabilizing CO₂ emissions at 2000 levels, but reduced emissions by an additional 21 percent as of the end of 2004.⁴³ Andreas Schlaepfer, Head of Internal Environmental Management at Swiss Re, believes that for non-manufacturing companies like Swiss Re, substantial reductions from building-related conservation efforts are quite easy: "If you've never focused on energy efficiency before, achieving a 30 percent reduction is simple."



Figure 5

Climate-Related Programs Which Contribute **Financial Benefits**

Please indicate which are providing positive returns to the bottom line.*



Total Respondents: 28

*Not all of these program elements are relevant to all survey companies, so the responses may be skewed. For example, geologic sequestration only applies to oil and gas companies, chemicals, and a few others at this stage of development of the technology.

Interviewees warn, however, that companies should avoid creating one universal reduction target. They suggest it is best to develop a set of diverse targets across different business units that all contribute toward the overall corporate goal. Interface's Bertolucci advises against "requiring standardized implementation programs in a diverse, decentralized culture." DuPont, for example, expects the output of its Titanium Technologies division to double from 1990 levels by 2010. Because energy comprises a significant percentage of the selling price of titanium dioxide (TiO₂), this creates a significant challenge for meeting the company's energy-efficiency and climate-change goals. The division has been tasked with the goal of increasing energy use by only 40 percent. As a result, other divisions will be expected to make deeper cuts. Alcoa also

allows diversity in its divisional targets, but this variation primarily reflects geographic differences. Local management is permitted to determine the company's official position on climate policy within each country based on local circumstances.

D. Differentiating GHG-Reduction and Energy-Efficiency Targets

While energy-efficiency and GHG-reduction targets eventually need to merge into an integrated approach, companies tend to treat them as separate goals in the short run. Among survey respondents, 72 percent have established energy-efficiency goals, whereas 77 percent have established GHG-reduction goals. Of the former group, 100 percent have reached their energy-efficiency targets and 66 percent have established new, more ambitious ones. In contrast, only 60 percent of companies that have adopted GHG-reduction goals have met them. A close look at three aspects of these goals helps to explain the difference.

“You need the tension of a very challenging goal. Inspirational goals call an organization to act beyond conventional boundaries... an easy goal fails to challenge the creative potential of the organization.”

First, energy-efficiency goals have a longer **history**. Energy efficiency was first discussed by some surveyed companies as early as 1970, and the average date for setting efficiency targets was 1998. One company states that energy efficiency “was always an objective.” By comparison, GHG-reduction goals entered the discussion much later. At the earliest, survey respondents did not discuss them until 1990, and the average date for setting these types of targets was 2000. In several cases, these initiatives have not yet run their course because many companies set initial deadlines of 2006 or beyond.

Second, energy-efficiency and GHG-reduction goals tend to have a different **focus**. Energy-efficiency strategies are generally directed at discrete, energy-intensive processes, requiring units with operational responsibility to make local decisions regarding improvements. Moreover, they often offer a return on investment. GHG-reduction goals, on the other hand, are usually articulated at the corporate level as an “X percent reduction by date Y” without well-defined ways to filter this goal down to individual business units.

Third, energy-efficiency and GHG-reduction goals differ in their direct, near-term impacts on a firm's **bottom line**. For many companies, energy efficiency is seen as an important strategic business issue. GHG reductions, on the other hand, are typically viewed as an initiative of the EHS department, sometimes carrying an (actual or perceived) upfront cost rather than, in the absence of regulation, providing a competitive advantage. All companies publicly report progress toward meeting GHG-reduction goals. But 17 percent of companies that have energy-efficiency targets do not publicize information about their performance results because this information is considered proprietary.

Quantifying bottom-line risks and rewards is important in generating internal support for GHG-reduction strategies. As David Steiner, Vice President of Government Affairs at Maytag, plainly states, the “company must



Making the Business Case for Climate Action⁴⁴

With a relatively straightforward body of measurements and analyses, almost any company can develop a financial rationale for some set of corporate actions related to energy use based on historic and current energy prices. Going the next step to assess what makes sense based on expected future prices increases the challenge of “making the business case.” This is particularly true in considering decisions that lock in long-term cost drivers, such as investments in plant and equipment, which must take account of projected market forces and regulatory developments many years in the future. The decision to develop new climate-related products and services, particularly those requiring large-scale, long-term R&D, is even tougher to achieve with quantitative certainty. Assessing the case for any intangible aspects of strategy, such as engagement in policy or protecting reputation, is still more art than science.

Those responsible for building or refining the “business case” can draw several lessons from corporate experience to date—including experience in assessing the rationale for other aspects of corporate strategy under conditions of high uncertainty.

- Begin with a clear understanding of the range of uncertainty in analyzing various strategy elements. Consider creative ways to find numbers to construct the case, but beware of false precision and avoid setting an expectation that the case for most strategy elements will have a clear net present value. It may be helpful from the outset to communicate

explicitly to all those involved about what to expect in terms of quantitative and qualitative analysis.

- Frame the initial effort at building a business case as the first step in an iterative process, with the aim of identifying no- and low-regrets strategic options. For example, the initial case can focus on energy-efficiency and clean-energy supply measures that meet the company’s investment hurdle rate given existing prices and supply reliability factors. For companies with high exposure to regulatory risk, increased leverage in policy debates may be another obvious point. Certainty about some drivers will increase over time and will allow iterative improvements in the business case, especially if the company makes initial strategic commitments that build internal capacity to understand and respond to climate-related developments.
- It is best to combine “top down” and “bottom up” approaches when building the business case. The top-down approach may be based, at the simplest level, on logic and common sense related to whether the company has a significant financial exposure to the climate issue, whether regulation and other market factors may be coming into play already or soon, whether these conditions call for proactive instead of reactive responses, and which broadly proactive stance fits best with company strategy and culture. The bottom-up approach applies assumptions about market

make money first.” More than half of companies surveyed have not been able to quantify bottom-line benefits for their GHG-reduction strategies. Executives warn that this hampers efforts to lock in employee support and create momentum for change. Tim Higgs, Environmental Engineer at Intel, advises against “focusing solely on ‘right thing to do’ environmental arguments. While this is certainly a key factor in environmental decisions, the case for action is more compelling when combined with more tangible drivers.”

E. Making the Business Case for Climate Strategies

How do companies justify GHG strategies if they aren’t able to quantify financial benefits? Nearly 50 percent of surveyed companies cite **cost savings from energy-efficiency programs** as evidence of near-term benefits. For example, Calpine estimates it saved \$25.8 million over a ten-month period in 2005 by implementing its Plant Optimization Program, which targets thermal efficiency improvements in the company’s power-plant operations. Alcoa confirms nearly \$80 million in annual savings potential from energy-efficiency improvements and has thus

preferences, competitive positioning, regulatory constraints, government incentives, and other drivers to decisions about operations, supply chain management, product development, marketing, and other functional aspects of the company.

- Consider using tools of decision science that help build uncertain and qualitative information into quantitative models. For example, tools for Monte Carlo analysis incorporate uncertainty into financial models in a systematic way. Crystal Ball™ can be used with financial modeling applications to build in ranges of probability that regulation will create a carbon price in any given future year and at any given level.
- Although large companies may have quantitative analyses of brand value, few can accurately predict how consumers, customers, communities, and shareholders will value climate-related factors in the future. Just as climate change and its impacts are not linear, neither is change in public sentiment. Here again, the business case should build in historical examples such as the rapid shift in public attitudes toward clean air in the 1970s and corresponding impacts on company reputations.
- In assessing the business case for policy engagement, look to history for qualitative lessons and even some anecdotal quantitative data. Good examples covered or referenced in this report are DuPont's engagement in domestic and international policy on ozone depletion,

Whirlpool's involvement in appliance standards, and Intel's collaboration in advancing the Energy Star™ programs. The financial returns to these efforts are not clear, but it is reasonable to consider these companies' long-term performance and positioning relative to competitors on environmental issues.

- Seek a range of external sources for information and opinions on non-quantitative questions such the shape and timing of climate policies in any given state or country. Industries, particularly industry associations, may face problems of insularity and protracted "group-think" that prevent timely, adaptive thinking about developments in science, business, government, and society. Some good information sources include leading Wall Street firms such as Goldman Sachs and Citigroup and leading consulting firms such as PricewaterhouseCoopers, Mercer, and Deloitte.
- A key tactical tool, which over time can also help build a rigorous business case, is an enterprise-wide energy and environment management system (EMS) that automates operational performance measurement and links this to financial data. Usually safety and health are included as well. The best systems allow managers to look at performance from the plant level all the way up to the entire corporation, and at business unit or geographical "slices" of the company. Best systems can alert managers to poor and excellent performance and allow them to correct problems while also recognizing and disseminating best practices.



far captured annual savings exceeding \$20 million. DuPont states that it has achieved an estimated \$2 billion in savings since launching its energy-efficiency program in 1990.⁴⁵ Given the recent escalation of natural gas prices, similar examples are likely to become more common.

Companies also rely on **less quantifiable methods** to justify their climate-related strategies. One is a general belief among senior leadership that these strategies will add value in the future. "Management believes they add value," says Skiles Boyd, Director of Environment at DTE Energy. "We just haven't been able to quantify it." Some companies believe that getting ahead on this issue offers strategic benefits, such as superior competitive positioning and the ability to identify new market opportunities. For others, getting further out on the learning curve enables them to make the most appropriate investments and prepare to successfully adapt to future regulation. Cinergy treats money spent to reduce GHG emissions, in part, as "tuition to learn." Through such justifications, the business case can be made without precise dollar amounts. As Kevin Leahy, Managing



Director, Climate Policy, explains, “I can’t tell you the exact number when it comes to the business case for climate change, but I can tell you the range and an order of magnitude.”

Finally, **scenario planning** has helped some companies make the business case for action on climate change. DuPont, for example, has conducted informal scenario exercises that project future business plans and strategies and assess the risk or opportunity implications for families of products. Shell, which has the most experience in this arena, uses scenario planning as a strategic framework for thinking through challenges, identifying risks and opportunities, making investment decisions, developing a common strategic language for leadership teams, and engaging key public policy matters. The most recent (2005) edition of Shell’s *Global Scenarios to 2025*, articulates a vision of how worldwide forces might shape markets over the next two decades and reaches the conclusion that the world (and companies) will eventually face a price for carbon. For Shell, this conclusion justifies efforts to increase natural gas production (especially LNG) and investments in wind, solar, biofuels, coal gasification, and experimental hydrogen delivery systems (while still working to make its core business—fossil fuels—succeed in a carbon-constrained world).

F. Other Related Climate Goals and Targets

Some companies have adopted additional climate-related goals and targets. Swiss Re, for example, has committed to increase the renewable share of its energy purchases from 14 percent in 2005 to 37 percent in 2006 and 50 percent in 2007.



DuPont has set three additional climate-related goals as part of its sustainable growth initiative, including a commitment to hold energy consumption to 1990 levels, source 10 percent of that consumption from renewable sources at cost-competitive rates, and receive 25 percent of the company’s revenue from non-depletable resources by 2010. So far, energy use has declined by 7 percent compared to 1990 levels, despite a 30 percent increase in production but, as noted previously, the company has only been able to source about 5 percent of its energy from renewable sources, mostly using landfill gas. DuPont is currently two-thirds of the way toward achieving its non-depletable resource goal. This goal represents DuPont’s effort toward creating new markets that harmonize with climate constraints. For example, BP and Dupont have targeted 2007 for introduction of biobutanol in the UK as a gasoline bio-component. Once new business opportunities are identified and selected, planning will include goals and targets. As for any business venture, these may include R&D schedules and milestones, product launch dates, revenue targets, market share goals, etc.



In October 2005, Wal-Mart announced the extremely ambitious goal of eventually using 100 percent renewable energy and producing zero waste. These goals tie in with the company’s commitment to cut its GHG emissions 20 percent over the next seven years, double the fuel efficiency of its truck fleet within 10 years, and reduce solid waste from U.S. stores by 25 percent in the next three years.⁴⁶



G. Adaptation Strategies

A final, important area of climate-related strategy involves adaptation. According to Ivo Menzinger, Head of Sustainability and Emerging Risk Management for Swiss Re, “No matter what we do now in terms of mitigation, changes in climate are inevitable.”⁴⁷ Indeed, 60 percent of survey respondents consider physical, climate-related risks to assets in their investment decisions.

The insurance industry is perhaps most directly affected by these types of risks, because it underwrites natural catastrophes and property losses. Swiss Re estimates that total insured property and business interruption losses from natural catastrophes reached \$83 billion in 2005. Because climate change directly affects its core business, with or without regulation, the company is integrating related concerns into its underwriting practices, particularly in areas such as Directors & Officers (D&O) and Business Interruption (BI) insurance.

“No matter what we do now in terms of mitigation, changes in climate are inevitable.” Indeed, 60 percent of survey respondents consider physical, climate-related risks to assets in their investment decisions.

Companies operating in regions that are especially affected by climate change are also at risk. For example, Diavik Diamond Mines Inc. relies on “ice bridges” to move equipment and materials to the northern regions of Canada. However, the 2006 winter was so warm that roads closed early and the ice never got thick enough to allow transport of the heaviest trucks. The company had to absorb the additional costs of shipping materials by helicopter. In Alaska, the allowable period for traveling on the tundra has shrunk from 220 days in 1970 to about 100 days today.⁴⁸ Other impacts of thawing tundra include shifting foundations for pipelines, buildings, and drilling platforms. Further south, warming temperatures can lead to altered growing conditions for agricultural concerns and damage from more extreme hurricanes, such as Katrina and Rita, which impacted oil drilling and refining operations in the Gulf.

In seeking to protect their assets, companies are considering weather concerns as part of their short- and long-term planning and are conducting more extensive resource planning for future plant and market needs. Exelon, for example, expects rising temperatures to alter operational and market forecasts for electricity demand and supply, especially peak consumer demand. This risk is exacerbated by the potential for increased storm severity to damage critical generation, distribution, and transmission systems and produce higher maintenance and capital costs. To prepare, the company is analyzing its ComEd and PECO systems using “worst-case” forecasts of summer peak load based on continually updated information on the likelihood of extreme weather. Exelon has also established emergency preparedness procedures in the event of weather-related disruptions and is planning for increased costs and lead-time to obtain certain supplies. Costs for some supplies could be \$30 to \$40 million higher in 2006 compared to 2005 due to the after-effects of hurricanes Rita and Katrina.⁴⁹



Physical Assets at Risk from Climate Change

Robert Page, Vice President of Sustainable Development, TransAlta

Climate change is forcing companies to change many financial and asset management practices in order to ensure the viability of existing and future assets. TransAlta, an electricity generator with facilities that stretch from Mexico to Alberta, is now faced with serious issues relating to the sustainability of water resources. Over the past few years water flows for hydro-generation have been unreliable. Some of TransAlta's hydro reservoirs have experienced one year in a century low-water conditions, several years in a row. In the Canadian Rocky Mountains, for example, basic water flows have been affected by receding glaciers and erratic snow packs, reducing the generating capacity of hydroelectric facilities. In the U.S. Southwest there are different water issues: TransAlta chose not to proceed with a thermal power project because the company determined that the available water rights for cooling were not sustainable given climate change and other factors. TransAlta needs 40-year certainty to launch any project. Water sustainability is now a key factor in corporate planning within the company and, as the physical aspects of climate change continue to become more acute, related risks to TransAlta's physical assets and future investments will become more severe.

Gary Serio, Vice President Safety and Environment, Entergy

Climate change poses potential long-term physical risks to the economic vitality of coastal areas. Entergy's franchise territory and assets are particularly susceptible to flooding and hurricanes due to the geographic profile of the territory it serves in the Gulf Coast region. Over the next century, some scientists project average global temperatures will rise five to nine degrees Fahrenheit and sea levels will rise 4 to 35 inches due to projected increases in atmospheric GHG concentrations. Sea-level rise of this magnitude, combined with coastal subsidence, increased hurricane intensity, reduced protection from barrier islands and wetlands losses would exacerbate current vulnerabilities. Physical risks to Entergy include potential damage to power plants, transmission and distribution systems, customer base and other facilities. As an indicator, Entergy's restoration cost for hurricanes Katrina and Rita was \$1.5 billion. The social and economic well-being of employees and customers could also be impacted. Entergy has voluntarily reduced its CO₂ emissions 23 percent below 2000 levels over the past five years and is demonstrating economically efficient emission offset transactions. The company also supports mandatory legislation to limit GHG emissions. Sustainable planning for communities should be fostered to adapt to the potential impacts of climate change. Entergy is working with stakeholders for the energy-efficient re-building of New Orleans and the restoration of coastal wetlands. "Hurricanes Katrina and Rita have put a face on the potential risks and financial impacts climate change could mean to our service territory if meaningful action is not taken to reduce atmospheric concentrations of greenhouse gases," according to Jeff Williams, Manager, Corporate Environmental Initiatives at Entergy.

Stage II: Focus Inward

This stage involves integrating climate goals and targets inside the organization by developing supportive financial instruments and engaging employees.

Step 5: Develop Financial Mechanisms to Support Climate Programs.

What are the costs associated with meeting emission-reduction goals and what financial instruments are available for supporting them? This section discusses the pros and cons of internal and external trading, and describes other financial mechanisms used for implementing climate-related initiatives.

A. Lessons Learned

- Costs for climate-related strategies vary widely. Companies can measure these costs along three dimensions: absolute, normalized, and financial-return measures.
- Companies have found internal trading to be of limited value in reducing the cost of actual emission reductions but say it is tremendously useful for educating the workforce and developing expertise.
- Absent legal mandates, U.S. companies are currently using internal pricing mechanisms to support their GHG-reduction efforts, including special pools of capital, lowered internal hurdle rates, and internal shadow prices⁵⁰ for carbon. For many companies, the details of these mechanisms are considered proprietary, suggesting that climate strategies are increasingly viewed as a source of competitive advantage.
- Expertise and knowledge gained by developing these mechanisms can help companies understand when climate programs make sense only with an external carbon price and when they can be sustained without one.

B. Cost Estimates for GHG Reductions

On an **absolute-cost** basis, investment in climate strategies varies widely across companies. DuPont knew that the \$50 million it spent to develop end-of-pipe controls for N₂O emissions would have no direct payback but decided to pursue the technology anyway, both to preempt government regulation of N₂O emissions and to fulfill its GHG-reduction commitment. In Cinergy's case, the company budgeted \$3 million per year in 2004 and 2005 for GHG-reduction projects as part of \$21 million the company has set aside for climate programs through the end of the decade. Of the total spent in 2004 and 2005, \$4.4 million (73 percent) funded on-system projects and \$1.6 million (27 percent) was invested in off-system projects. Resulting annual emissions reductions totaled approximately 600,000 tons and 25,000 tons of CO₂e respectively.

Table 4

Measuring the **Cost of GHG Reduction** Strategies
Three Examples

Absolute Costs	Normalized Costs	Financial Return
DuPont spent \$50 million to develop end-of-pipe control technology to reduce N ₂ O emissions	Cinergy estimates that the average per-ton cost of CO ₂ e reductions was \$8.28 in 2004 and \$12.49 in 2005.	Alcoa has traditionally not pursued climate and energy projects unless they have a payback of one year or less.

Companies also incur costs to develop GHG measurement and tracking systems. Alcoa, for example, estimates that it cost as much as \$500,000 to develop its Energy Efficiency Network (after accounting for travel, human capital, and use of internal resources). Richard Notte, Vice President of Energy Services at Alcoa, is quick to add that, “our system is as complicated as anyone is going to get.” Whirlpool’s call for bids on a data management system to track emissions and conservation yielded cost estimates between \$75,000 and \$225,000, leading the company to decide to develop a system in-house.

A second way to look at GHG investment is on a **normalized basis**, such as cost per ton of emissions reduced. Again, these numbers can vary widely. Cinergy, for example, estimates that the average cost per ton of CO₂e reductions was \$8.28 in 2004 and \$12.49 in 2005. These numbers are lower than the \$20–\$30 range of

“The most important step is to get all opportunities systematically on the radar screen. Just as every piece of fruit ripens at a different time, not all projects should be pursued immediately. The process starts with quality information.”

allowance values seen in the E.U.’s mandatory ETS and higher than the average \$2.00–\$4.00 per ton values (depending on year) found on the voluntary Chicago Climate Exchange (CCX).⁵¹

A third way to consider costs is on a **financial-return basis**. Again, costs using this metric vary across companies. For example, Swiss Re’s three-tiered approach for reducing energy consumption is based in part on payback. The first tier is zero cost. The second tier focuses on small investments with paybacks of one year or less. The final tier, which includes refurbishing property, allows for a payback period as long as 10 years. At DuPont, measures implemented by the Titanium Technologies division have led to net year-over-year savings of \$3–\$5 million. Some projects may have a return of 300–400 percent while others are undertaken with no capital return and are justified on different grounds.

For Alcoa, the availability of capital and the threshold internal rate of return (IRR) required to support GHG initiatives depends on the business situation at individual locations. The company has traditionally not pursued climate and energy projects unless they have a payback of one year or less. As its efforts have matured, Alcoa is moving beyond “low-hanging fruit” investments and implementing projects with longer payback periods. Within its Primary Metals division, energy efficiency projects with an IRR as low as 20 percent are now considered even if the required funds might not be allocated in individual plants’ capital budgets. According to Vince Van Son,

Manager of Environmental Finance and Business Development at Alcoa, “The most important step is to get all opportunities systematically on the radar screen. Just as every piece of fruit ripens at a different time, not all projects should be pursued immediately. The process starts with quality information.”

C. Internal Carbon Trading

Internal emissions trading has been identified as a highly efficient and accurate way to aggregate information within a company,⁵² but of the four companies that have experimented with this tool, none still have programs in place. They all concluded that internal trading did not produce the least-cost, most efficient emissions reductions. Shell, for example, discovered that its STEPS program (Shell Tradable Emissions Permit System) suffered from problems including a lack of participants, a lack of liquidity, and difficulties with permit apportionment. The system was further weakened by the fact that it was voluntary and business units often requested, and received, more permits. Finally and most seriously, there were legal issues: internal emission permits with a monetary value could not be traded across international boundaries without significant tax consequences in host countries.

Despite these difficulties, the STEPS program provided several benefits. It was successful in building awareness among Shell employees, it created a structured mechanism for factoring GHG considerations into the operations of individual business units, it gave the company an opportunity to develop in-house expertise on carbon trading, and it helped the company build credibility in policy circles (Shell’s views were considered in the development of the European ETS).

BP claims similar benefits from internal trading. According to Jeff Morgheim, then Climate Change Manager, BP learned “to keep things simple, to get started, to capture the learning and to continuously improve the system. Practical experience is the key to developing a robust system.”⁵³ For Shell and BP, internal trading served as a stepping stone to eventual external trading.



D. External Carbon Trading

External trading programs (like the voluntary CCX or the mandatory U.K. and E.U. ETS systems) offer similar benefits and reduce the need for internal trading systems. According to Interface’s Bertolucci, “Interface’s participation in external trading programs has helped us to improve our database quality and it has enhanced our ability to track our GHG emissions.”

As a founding member of CCX, Baxter International has extensive experience in external trading. According to the company, “Having a goal and reporting on our progress publicly each year has required that Baxter have information systems and verification processes in place to ensure that we are indeed capturing our true performance.... Our emissions in CCX have been entered into a registry and audited for accuracy. This is another learning process for us and because of it we have changed certain things on how we collect and verify global energy usage and calculate associated GHG emissions. This has made our company-wide GHG database more robust.... One of the things we have learned in the auditing process is the need for accurate and easily retrievable



energy usage information. This has motivated Baxter to expand the use of external utility payment services, which scrutinize each invoice for accuracy, enter key data into a computer database and scan the actual invoice into the system for possible future reference.”⁵⁴

Similarly, Ed Mongan, Global Manager for Energy and Environment at DuPont, says that participation in CCX provided an opportunity to influence the development of trading programs and to demonstrate that market-based approaches are a cost-effective way to achieve GHG reductions. CCX has also helped verify company baseline and annual emissions, which could prove useful for potential revenue generation as DuPont currently has excess emissions- reduction credits. Interface’s Bertolucci concurs, “The CCX membership provides valuable third-party validation for what we are doing in regards to climate change.”

The precise numbers and formulas companies use for shadow pricing or internal hurdle rates are generally considered proprietary for strategic reasons.

Ultimately, Baxter believes its involvement in CCX will help the company withstand the scrutiny of future emissions verification and trading programs. In the meantime, Meissen sees other benefits: Baxter’s involvement in CCX has been widely

publicized around the world and has become a source of pride for employees who have been asked to present at various conferences and workshops and have been approached by other companies looking to benchmark emissions or become involved with CCX.

Among surveyed companies, 40 percent participate in voluntary trading programs like CCX, though most note that this participation has not generated revenues. Until mandatory policies create an external market for carbon reductions, companies must develop other means of financially supporting climate projects.

E. Other Financial Instruments

Table 5

Most Common Methods for Funding Climate-Related Investments*

1. A special pool of investment capital	47 percent
2. Shadow prices for carbon	33 percent
3. Lowered internal hurdle rates	32 percent

*Many companies use more than one method.

Most companies use a combination of approaches to fund their climate-related strategies and evaluate prospective investments. Among those surveyed, the most common methods include reserving a special pool of investment capital; using shadow prices for carbon; and lowering internal hurdle rates (see Table 5).

The precise numbers and formulas companies use for shadow pricing or internal hurdle rates are generally considered proprietary for strategic reasons. For example, Shell uses three different internal shadow prices for carbon: one for the E.U., a second for other developed countries, and a third for the developing world. With these shadow prices, Shell requires that energy efficiency and GHG-reduction projects meet the same internal hurdle rate as other investments. Such internal mechanisms become redundant as mandatory carbon regimes create a real external market price

in some locations. By way of illustration, Shell's Hone explains how the value of carbon can be a significant driver in energy-efficiency decisions: One barrel of oil produces about 0.36 tons of CO₂. An E.U. ETS CO₂ price of 25 Euros is like adding a further \$11 per barrel to the price of oil, which makes an energy-saving project even more compelling. The company uses long-term premise values for both oil and carbon when valuing internal efficiency projects (the actual numbers used by Shell are confidential and change with the market).

“Our people link our systems and our success. The best technology only gets you so far. Employees will devise innovative ways to achieve clearly stated goals when they understand the linkage with the company’s vision and values.”

Step 6: Engage the Organization

Employee buy-in is crucial to the success of any climate-related strategy.

As Alcoa's Van Son explains, “Our people link our systems and our success. The best technology only gets you so far. Employees will devise innovative ways to achieve clearly stated goals when they understand the linkage with the company's vision and values.” Edan Dionne, Director of Corporate Environmental Affairs at IBM believes that the company's climate strategy “has had a positive impact on recruitment and retention.” This section describes techniques for promoting workforce buy-in, identifies common sources of resistance, and describes ways to move climate goals from the periphery of the organization to its core.

A. Lessons Learned

- Given the long-term and complex nature of the climate issue, gaining buy-in from the workforce takes time and effort. Companies find that communication strategies work best if climate initiatives are linked to more familiar issues.
- Many companies link climate-change goals to rewards, bonuses, and public awards. Others employ novel techniques such as promoting tree planting, participation in personal GHG reduction programs, or the purchase and use of low-emission vehicles and bicycles by employees.
- Senior leadership—in the form of speeches, policy statements, Congressional testimony, financial resources, and personal support—is critical.
- Within an organization, it is important to identify the departments or functions that will act as change initiators, implementers, and resisters. Survey respondents identify accounting, finance, and marketing as often less supportive of program implementation than other departments.
- The ultimate goal is to move climate change as an issue from the periphery of the organization to its core. Companies often deploy teams to facilitate this process. To sustain long-term efforts, companies need to maintain a department dedicated to addressing climate issues.



Ways to Gain Buy-In for Climate-Related Strategies

- ▶ Gain support from senior leadership.
- ▶ Identify change initiators, implementers, and resisters.
- ▶ Develop both cross-functional and specialized teams.
- ▶ Create a clear connection between climate change and business strategy.
- ▶ Implement specialized internal programs:
 - ▶ Tie performance to rewards and bonuses.
 - ▶ Create public recognition through award programs.
 - ▶ Encourage employees to plant trees to offset emissions.
 - ▶ Create internal marketing and educational programs.
 - ▶ Encourage participation in programs like Smart Trips and the One-Ton Challenge.
 - ▶ Offer financial support for purchasing low-emission vehicles and/or bicycles.
 - ▶ Purchase emission offsets.
 - ▶ Encourage telecommuting or teleconferencing.



on energy and economics, you need something besides words. It's hard stuff," says Cinergy's Leahy. Knowing the audience is critical. "You need to ease people into the discussion. Link it to what they already know is possible," says Leahy. "For us, it was our experience with cap-and-trade in our acid-rain program." Whirlpool ties climate change to long-standing company priorities and even refrains from using the term in internal discussions, preferring instead to employ the more familiar terminology of energy efficiency. "We've got a train moving on efficiency," explains Whirlpool's Dahmer. "We'd just start confusing things if we tried to start a new train."



Companies have used traditional and innovative programs to build internal awareness. (see "Ways to Gain Buy-In for Climate-Related Strategies" on this page) DuPont, for example, ties related performance metrics to employee bonuses and has created an award program that recognizes exceptional environmental achievements throughout the company. Rewards and public recognition are common methods of creating buy-in for corporate initiatives.⁵⁵

Alcoa purchases trees from local suppliers and distributes them to employees who are then encouraged to plant them in their communities or on Alcoa property. As of 2005, 1.5 million trees have been planted toward the company's goal of planting 10 million trees by 2020. The company is also encouraging employees to participate in local and regional programs like Smart Trips⁵⁶ to increase the use of public transportation and reduce their personal carbon footprint.⁵⁷ Swiss Re hosts a wide variety of internal marketing events, including

B. Gaining Buy-In

Organizations must have an appreciation for the time it takes to educate the general workforce and management. For example, despite Alcoa's progress, Atkins admits the company would be even further ahead if it had worked on this in "year two, instead of year ten. It takes time to educate 130,000 people."

Educating management can be equally challenging. According to Intel's Higgs, "Climate change is a more difficult subject to convey to management due to the complexity and scope of the issue and the relatively tiny impact of an individual corporation. Other environmental issues are often more acute and therefore easier to drive understanding on why the company should take action."

Companies that have struggled to generate internal support for GHG reductions emphasize the importance of an effective, easily understandable communication strategy. (see "An Energy Efficiency Champion on the Ground" on page 95) "When you talk about trading, impact

on-site demonstrations that allow employees to test-drive hybrid vehicles. Other companies provide incentives for purchasing hybrid cars.⁵⁸ Google offers its full-time U.S.-based employees a \$5,000 subsidy toward the purchase of a vehicle with an EPA fuel economy rating of 45 mpg or higher; Integrated Archive Systems offers a \$10,000 subsidy.

Interface associates in North America are offered the option of having trees planted to celebrate their years of service with the company, in lieu of traditional service awards. For example, its “Legacy Award” option sponsors the planting of 80 to 400 trees through an organization called American Forests. Since 2002, more than 3,400 trees have been planted through this program. InterfaceFLOR Commercial Canada provides interest-free bicycle loans to its employees to encourage alternative transportation and emission reductions. And, Interface’s Cool Co₂mmute™ program provides associates with an affordable way to “improve their move” by offsetting emissions from commuting and personal travel. Such programs make the climate issue more tangible to people and connect it to their daily lives, while offering examples of how they can make a difference.

C. Senior Leadership

According to companies in this report, senior-level support and engagement are the most critical components of any successful climate strategy. Among survey respondents, CEO leadership was identified as a key driver at all stages of program development and implementation (see Figures 6 and 7). In the words of Alcoa’s Atkins, “On a

Figure 6

Functions that were **Initial Champions** of Climate-Related Strategies

Which positions, facets and/or department(s) within your company would you consider to be the initial champion(s) for the idea of developing your corporate climate-related strategy?

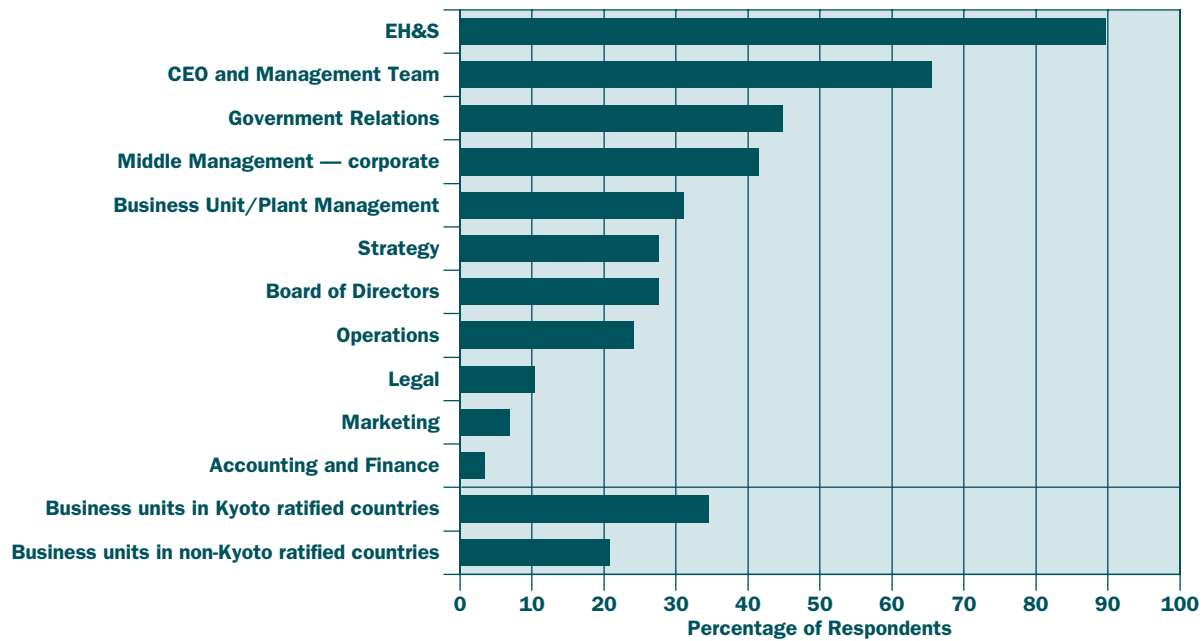
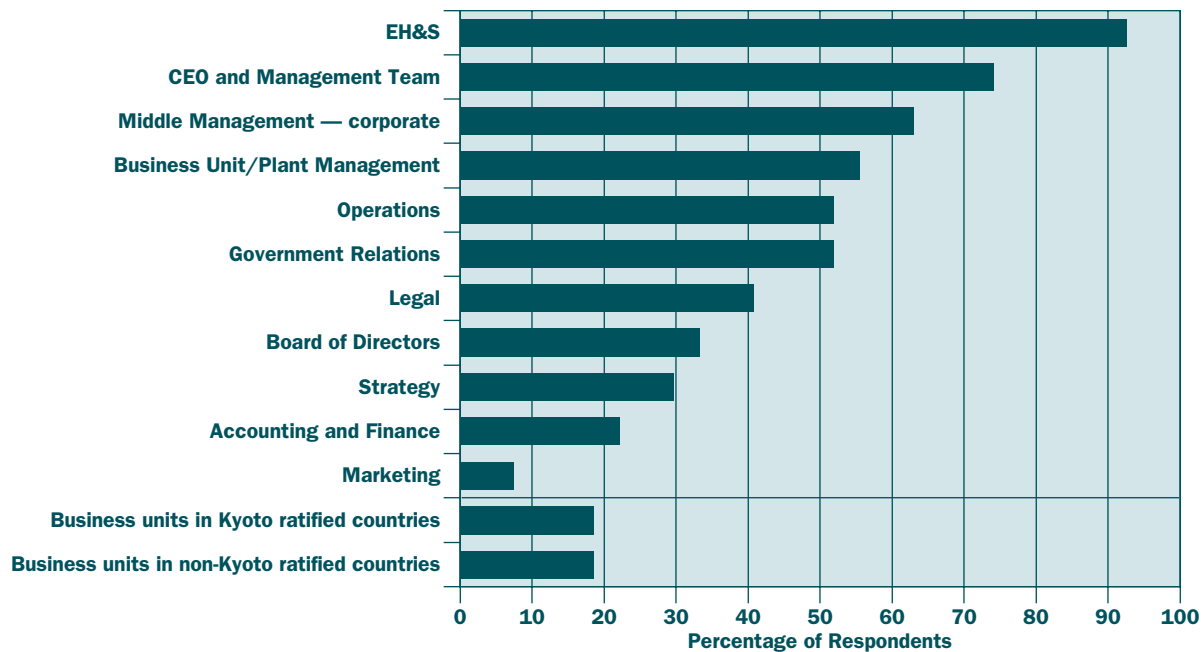


Figure 7

Functions Responsible for **Developing & Adopting** Climate-Related Strategies

Which positions, facets and/or department(s) within your company were significantly involved in developing and adopting your corporate climate-related strategy?



Total Respondents: 27



scale of one to ten, senior-level support is an eleven.” When asked about most important lessons learned, Melissa Lavinson, Director of Federal Government Relations at PG&E, notes that, “It is critical to have buy-in at the highest levels and to have the commitment of senior management. It is also important that the Board of Directors understand the business impacts, and opportunities, associated with addressing climate change.” Despite the importance of senior-level leadership, CEOs from over 33 percent of surveyed companies have yet to make a public statement on climate change or energy efficiency.



Senior leadership can demonstrate a commitment to addressing climate change in other ways, of course. For example, when business units in DuPont were reluctant to push hard to reach the company’s first round of GHG-reduction goals, CEO Chad Holliday stepped in personally to emphasize that failure was unacceptable. His commitment was cited by employees as critical to DuPont’s early success. Similarly, Alcoa credits former CEO Paul O’Neill with asking the right questions and challenging engineers to improve the smelting process. Other CEOs, such as Cinergy’s Rogers, have been visible spokesmen at Congressional hearings and in the press. More recently, Wal-Mart CEO Lee Scott has received considerable attention for the new, more environmentally sustainable path his company is taking.

CEOs that take a strong leadership position on climate are not afraid to challenge their companies to achieve stretch goals and tend to have a long-term strategic perspective that extends decades beyond their own tenure.



Companies in capital-intensive industries, such as DuPont and Alcoa, even talk in terms of centuries. Says Cinergy's Rogers: "If you are a steward, you make decisions on a longer time horizon, looking beyond your own tenure. When you think of it that way, your view changes. We look 20, 30, 50 years down the road."

In contrast to other companies studied, the criticality of CEO support was not as pronounced with Whirlpool's efforts at emissions reductions. JB Hoyt, Director of Regulatory and State Government Relations, admits that top-down leadership would have been important if the company were starting from scratch, but feels there was no need to push a new mindset given Whirlpool's historic focus on energy efficiency.

D. From Idea to Adoption

When initiating change within a company, climate-related or otherwise, the first questions are: Who will be for it? Who will do it? And who will be against?⁵⁹

Change initiators. The great majority (90 percent) of survey respondents identified their EHS department as an initial champion of climate action (see Figure 6). Sixty-six percent also identified the CEO and the management team. Often EHS supplies the necessary technical expertise while senior management provides the necessary leadership. Initiators are more likely to emerge in business units that are affected by mandatory GHG limits.

Change implementers. In the implementation phase, a wider range of departments and expertise becomes involved, although EHS and senior leadership continue to play critical roles (see Figure 7). As responsibilities spread through the organization, all departments and functions become important, with some departments, such as operations, playing an especially important role in implementing reductions. Here, business units subject to mandatory emissions limits (such as units in countries that are implementing the Kyoto Protocol) are no more likely to be engaged than units elsewhere, suggesting that once a company adopts a corporate climate goal, all parts of the organization get involved.

Change resisters. Survey respondents rank the accounting, finance, and marketing departments as among the least involved in developing and adopting climate programs, while departments responsible for corporate strategy are considered only moderately involved (see Figure 7). These departments are also perceived to be less supportive of implementation than other departments (see Figure 8). Ultimately, breaking down internal resistance is critical to success. Survey respondents identify four main strategies for doing this: establish a clear link between the climate-related strategy and company values, demonstrate clear CEO commitment, create a robust business case for climate-related initiatives, and educate the workforce.

"If you are a steward, you make decisions on a longer time horizon, looking beyond your own tenure. When you think of it that way, your view changes. We look 20, 30, 50 years down the road."



E. Moving Climate Change from the Periphery to the Core

Many case study companies describe how climate change began as an endeavor within EHS but diffused from the periphery to the core and, in the process, became an issue of strategic importance to the company.⁶⁰ For this to happen, initiators and implementers must create a clear connection between climate and corporate business strategy that requires all core departments to become involved.⁶¹ Every company approaches this challenge differently. For example, consumer-products companies like Proctor & Gamble are motivated when climate is connected to consumer demand and engages product development, while technology companies like Intel are more likely to address the issue when it is connected to the manufacturing process and engages engineering.⁶² At GE, the marketing and finance departments have become heavily involved as a result of the company's \$90 million "ecomagination" marketing initiative.⁶³ Some companies have developed new teams to identify and implement climate-related strategies; such teams may be cross-functional or may have particular expertise and be devoted to a narrow goal.

Figure 8

Organizational Resistance and Buy-In for Climate-Related Strategies

What positions and/or departments within your company are significantly involved in the implementation of your strategy, and what is their level of buy-in or resistance toward your corporate climate-related strategy? (Rank their level of buy-in: 1 = Resist; 3 = Neutral; 5 = Embrace.)



40

Market Opportunities from Climate Change

Andrew Casale, Director, Global Marketing and Strategic Planning, Air Products and Chemicals, Inc.

Climate change is driving demand for technologies and solutions that produce cleaner fuels and power. Air Products and its Greenhouse Gases Strategy Team, a cross-functional team led by marketing, is leading efforts to examine the trends, needs, and uncertainties in the regulatory and business environment to create integrated corporate strategies, ensure more sustainable and advantaged businesses, and identify future commercial opportunities. “As a company whose products improve the quality of life for people around the world, every day, as well as help solve the environmental problems of our customers and society at large, we are committed to continuing the journey,” says Air Product’s CEO, John P. Jones. In an effort to help mitigate emissions from the largest GHG emitters, the transportation and energy sectors, Air Products is actively promoting practical low-carbon technologies for cleaner fuels and power. Work in certain fields, such as the hydrogen economy, carbon capture, and energy efficiency, is an integral part of existing in a carbon-constrained world. Air Products is working with funding and resources from university alliances, venture investments, and the U.S. DOE to develop infrastructure for hydrogen fuels and has already installed over 40 hydrogen fueling stations. Air Products has also demonstrated key technologies in carbon capture programs through in-house R&D, government, and industry partnerships worldwide. Oxyfuel, one example, is a viable option under development for reducing CO₂ emissions, and Air Products has already played a major role in several oxyfuel studies for new-build clean-coal facilities and for retrofitting existing refineries and coal power plants. These and other solutions provide many opportunities for Air Products to continue to provide technology, equipment and services, and products for a sustainable world.

Cross-functional teams: Climate change generally enters the corporate radar screen through existing teams or departments that watch for issues critical to the company’s future. Whirlpool, for example, first began attending to climate change in the same way it addresses other environmental issues: through the company’s Environmental Council, a group comprised of representatives from its six geographically dispersed business units. Similarly, Interface’s Global Sustainability Council is a cross-functional team that looks at climate change and other pertinent issues from a wide variety of perspectives including product development, life cycle assessments, business development, public relations, sustainable operations and reporting, and EHS.

Teams with Focused Expertise: Once on the agenda, companies often develop new teams to focus on climate strategies. For example, Alcoa launched a Corporate Climate Change Strategy Team directed by top executives and comprised of 11 members representing operations, government affairs, technology, communications, and finance and with geographic representation from the United States, Canada, Australia, Europe, and Brazil. According to Randy Overbey, President of Primary Metals Development and the current director, the secret to the team’s success is its multi-functional membership: “The members may not always agree with each other, but having such diverse representation increases the robustness of our results.”

Cinergy developed a GHG Management Committee to oversee the allocation of its \$21 million GHG fund. The committee includes ten senior representatives from business areas that would be affected by GHG policy and one ex-officio NGO member, Environmental Defense. Similarly, Shell has created a new unit, led by senior executive

“GHG is becoming more and more internalized. While we are still learning, it is clear that climate change has to be imbedded in the real business strategy early on and not just remain a Health, Safety, and Environment issue.”

Graeme Sweeney, who is also head of Hydrogen and Renewables, to kick-start and foster GHG-reduction technologies until they are sufficiently integrated in the company’s business units to stand on their own.

Many companies also have groups that explicitly look for energy-efficiency opportunities: an example is Alcoa’s Energy Efficiency Network (EEN). DuPont has a similarly purposed Energy Competence Center,

while Shell has the Energise group within its Global Solutions internal consulting arm. Each team is slightly different in structure, but all include technical experts drawn from both corporate and local-business-unit levels. Alcoa’s EEN augments internal personnel with external experts. In each case, these groups deploy teams at the request of unit managers and perform audits to recommend operational, equipment and behavioral changes (the decision to implement is typically left to site managers). They also identify, document, and disseminate information about successful energy practices observed at plant locations.

The Ongoing Need for Specialized Expertise: Even after climate is integrated in core functions, the need remains for a smaller but dedicated department to identify future business opportunities. At Shell for example, company-wide internal trading began with the Health, Safety & Environment (HSE) group within Corporate Affairs. It was then moved to Shell Trading with the creation of a CO₂ trading desk to allow the company to participate in the Danish and U.K. ETS’s. “GHG is becoming more and more internalized,” states Shell’s Hone, adding, “While we are still learning, it is clear that climate change has to be imbedded in the real business strategy early on and not just remain an HSE issue.”

A similar process occurred at Swiss Re, which created a Greenhouse Gas Risk Solutions (GHGRS) department. The group was dissolved in the summer of 2005 and its mature offerings, including carbon trading, insurance products, and weather derivatives, were redistributed to mainline product groups. A centralized logistics department was created to oversee office-space management and carbon neutrality; and Walker, the head of GHGRS, was reassigned as a manager of Sustainability Business Development, which focuses on bringing products related to climate and sustainability to market. By successfully integrating its climate activities with its various mainline businesses, such as Capital Markets and Advisory (trading products), Risk Awareness (D&O insurance) and Carbon/Clean Energy Asset Management, Swiss Re can more effectively engage climate change as a strategic bottom-line issue going forward.

Wal-Mart Mini Case Study⁶⁴

In October of 2005, Wal-Mart CEO Lee Scott announced a series of sustainability goals, of which climate-related goals were central, of remarkable scale and ambition. Wal-Mart, Scott said, was going to buy 100 percent of its power from renewable sources; produce zero waste; double the fuel efficiency of its trucks; avoid greenhouse gas emissions by 20 percent; and challenge thousands of its suppliers to follow its lead. “People expect a lot of us, and they have a right to,” Scott said.⁶⁵ “Due to our size and scope, we are uniquely positioned to have great success and impact in the world, perhaps like no company before us.”

Size and Scope

The words “size” and “scope” are key to understanding Wal-Mart’s environmental impact and its sustainability strategy. Wal-Mart itself is huge, but its scope is almost incomprehensibly vast, with a supply chain estimated to be made up of between 30,000 and 60,000 companies. Wal-Mart organized its sustainability strategy under three main goals, two of which—increasing renewable energy purchases and cutting down on waste—the company characterizes as direct goals. The third goal, developing sustainable products, is an indirect goal, which Wal-Mart will work with its suppliers to achieve. According to Andy Ruben, Wal-Mart’s vice president for corporate strategy and sustainability, the indirect goal was recognized early in the process by company management as the real prize of the sustainability strategy. “We knew that 90% of our ability to create change was through our supply chain,” he said. For example, Wal-Mart recently calculated that its direct greenhouse gas emissions stand at a little over 20 million metric tons (MMT) of CO₂ equivalents. But it estimates that emissions from all of its suppliers could top 200 MMT. This does not include emissions from the use of the company’s products—appliances, electronics, light bulbs, etc.—which very rough estimates place in the hundreds of millions of tons of CO₂ equivalents, Ruben said. The real success of Wal-Mart’s sustainability strategy, therefore, will be measured by the extent to which the company is able to influence and support the behavior of its suppliers and customer base. “20 million metric tons is a scratch compared to what we can really change,” Ruben said. “But in order to get there, we need to walk the walk.” In other words, Wal-Mart’s direct goals,

while significant in their own right, are also designed to send a message that the company is serious about its sustainability initiative, and give it the credibility to demand change from its suppliers.

From Defense to Offense

But while the goals are ambitious and aggressive, Wal-Mart executives freely admit that the motivation behind the company’s sustainability strategy was initially “defensive.” “We started thinking, if we could go back 10 years, what are some of the things we would have done to avoid some of the issues we’re facing now,” said Ruben. Then the company looked 10 years ahead and tried to imagine some of the things it might be criticized for in the future. “And the environment was one of those things,” Ruben said.

What began as a defensive strategy, however, soon turned into something much more proactive as company executives and rank-and-file associates embraced the initiative wholeheartedly. “No one here imagined we’d be where we are a year and a half ago,” Ruben said. The key to the transition, according to Ruben, was having support from the highest levels of the company. “There’s nothing that can compensate for not having top-level support.” Ruben describes CEO Lee Scott as being “100 percent engaged” in the strategy. But Scott’s approach has not been to issue top-down mandates. Instead he has focused on persuading staff of the merits of the strategy and convincing them to pursue it based on its business benefits. “He’s actually changing the culture of the company,” Ruben said.

Crafting the Strategy

The development of the strategy began in June of 2004 when Scott first met with and engaged Jib Ellison from Blu Skye consulting. One of the first things Ellison and two other consultants from Blu Skye did after holding their initial meeting with Scott was develop a rough “back of the envelope” estimate of Wal-Mart’s environmental footprint. That analysis made it clear that the company’s main environmental impact resided in its supply chain. Following completion of the analysis, from June through September Ellison and his team conducted a series of hour-long interviews with top-level executives from Wal-Mart to get their thoughts on the nascent sustainability initiative.



The next major step came in September, when Ellison organized what he calls a “choice meeting.” The meeting was specifically designed to put the sustainability initiative “to a choice,” and give Wal-Mart officials the opportunity to opt out if they wanted, Ellison said. The invite list for the meeting was carefully crafted. CEO Scott was there, along with about 25 other top Wal-Mart executives. In addition, around 30 of the company’s rising stars were invited. “We wanted the future rock stars of the company,” Ellison said. With the exception of the head of Wal-Mart’s environmental, health and safety (EHS) department, Ellison purposefully chose not to invite any of the company’s Associates (employees in Wal-Mart are called Associates) who had existing environmental responsibilities. The decision to exclude Wal-Mart’s environmental personnel was designed to advance the principle that sustainability should be fully built into the business and not viewed as an add-on or extra component. Ellison believes that many consultants and nongovernmental organizations that advise on climate and sustainability mistakenly focus their efforts on lobbying EHS officials, which helps foster the misperception that sustainability initiatives should be pursued separately and distinctly from the company’s general business strategy. “My insight was no, this is a business strategy...the whole key is to switch this from a burden and a duty to an opportunity and something I want to do,” he said. By getting Wal-Mart’s rising business leaders involved in the process early, Ellison was better able to convey the idea that climate action and sustainability is a serious business growth opportunity and not an additional burden.

The September meeting spanned two days, with the first devoted mainly to educating the attendees on environmental sustainability in general, why it is a business issue, how it is affecting Wal-Mart, and how it can be used to create shareholder value. The consultants also described the company’s environmental footprint. Then presentations were made by a couple of Wal-Mart suppliers who have already embraced sustainability and made serious commitments in that area. Presentations were also made by representatives from Conservation International. On day two, after Ellison felt the meeting participants were well enough educated on the company’s footprint, sustainability in general, and the business risks and opportunities involved, he presented them with a choice: “Now what do you want to do?” The consultants left the room to let the employees discuss the issue privately

among themselves. When the consultants came back, the Wal-Mart employees told them that they were unanimously in support of pursuing a strategy. The rest of the second day was devoted to thinking about how to organize the development of the strategy.

It was also in September that the initiative was first discussed with Wal-Mart’s board of directors. According to Ruben, the board responded very positively to Wal-Mart’s emerging sustainability strategy and has continued to be supportive. “They’ve been urging us for years to take a more external view...to think about what the world looks like outside of Bentonville, Arkansas,” he said. Still, the board has not taken a hands on role in the development of the strategy.

In December 2004, Wal-Mart held a follow-up meeting with most of the same attendees from the September meeting. The winter meeting focused on how to engage with NGOs, particularly those critical of Wal-Mart. Ellison wanted Wal-Mart to learn how to deal constructively with its critics, because, “this is a company that’s been extremely isolated, in a lot of respects.” The December meeting became the model for the tri-annual meetings that are now known as “Milestone Meetings.”

The Milestone Meetings have three basic components: education; progress reporting; and forward planning. The education component is important so that Wal-Mart employees continue to learn new things as they move forward with the initiative. The progress reporting element is designed so that everyone can stay up-to-date with actions taken on the sustainability strategy. Ellison also considers the progress reporting element to be a crucial accountability mechanism. Employees know that at these meetings they may get called up in front of Lee Scott or board chairman Rob Walton to say, “I got it done, or I didn’t get it done.” They keep that in the front of their minds leading up to the meetings, which pushes them to make real progress on their climate and sustainability responsibilities. The “forward planning” component is essentially a way for the company to talk about and organize future actions. Additionally, Wal-Mart is bringing in more outside parties to the meetings for educational purposes, and as a way to build relationships.

Organization and Implementation

Wal-Mart organizes the elaboration and implementation of its sustainability strategy through 14 “sustainable value networks,” which grew out of four initial “clusters” that company officials

organized themselves into at the December meeting. Those clusters dealt with business communication (internal and external); products and supply chain; energy efficiency; and waste. Those clusters grew into the 14 networks that now cover the following topics: global greenhouse gas strategy; alternative fuels; energy design construction and maintenance; global logistics; operations and internal procurement; packaging; textiles; electronics; food and agriculture; forest and paper; chemical intensive products; jewelry; seafood; and the China sustainable network. Each network is led by a Wal-Mart employee and will often include five or six suppliers—including both direct and indirect suppliers—as well as outside experts invited from nongovernmental organizations, academia, and the government.

Organizing the climate and other sustainability strategy workstreams through 14 relatively decentralized networks has worked well for Wal-Mart, though it may not work for all companies, Ruben said. There are certain tradeoffs involved, and one of the disadvantages is that not all employees are equally motivated, and some networks move faster and more aggressively than others. Conceding a level of frustration that not everyone is moving at the same pace, Ruben said the company's promotion process is one way of motivating employees. "One thing that happens is that the people who are being promoted faster tend to be the ones who are involved in this sort of thing.... That gets the message across faster than any memo you can send."

Ruben also believes that employees will be more motivated if they perceive a clear business case behind the sustainability strategy. It has helped that the company organizes its initiatives into three buckets: "quick wins," which include things that are relatively easy to accomplish and provide almost immediate returns, like cutting waste and improving energy efficiency; "innovation projects," which are longer-term initiatives with less immediate payback, like the company's plans to sell some emissions credits from its supply chain reductions into carbon markets, and then reinvest the proceeds into GHG-reducing projects; and "game changers," which have the potential to fundamentally alter the way goods are bought, sold, and used. "What's been important is to take all the quick wins to fuel your growth," while continuing to go after the innovation projects and game changers at the same time, said Ruben.

Only five people work full-time on the sustainability strategy in a company that employs about 1.8 million people overall. And all of the heads of the "sustainable value networks" are doing that work in addition to their previous primary responsibilities, which has led to some concerns that the initiative is under-staffed. But Ruben believes Wal-Mart has the staffing levels set up in a way that is consistent with Ellison's philosophy that the sustainability strategy must be incorporated deep into the core of the business and integrated throughout the company. "It forces you to think about how this can live in the business." And the staffing levels are also consistent with Wal-Mart's general approach, he said: "Look for constraints that make you better."



Stage III: Focus Outward

This stage of climate-strategy development involves engaging important external constituencies that directly impact strategic success. To have external legitimacy, companies first need to establish a track record of credible internal action.

Step 7: Formulate a Policy Strategy

Companies must consider how different external GHG policies can affect their business objectives. At the most basic level, this means monitoring and anticipating pending government actions. Beyond that, companies must be aware of the policy options being considered and decide which would most benefit their own business strategy. At the highest level, companies will want to gain (and maintain) a seat at the table when future regulations are designed.

A. Lessons Learned

- All companies acknowledge the tight link between government policy and business strategy and see a strong need to participate in policy development. This participation can be geared toward advancing individual-company interests, but it is also seen as way of providing valuable input toward the goal of sound and effective policy.
- Nearly all companies (90 percent) in this report believe that government regulation is imminent, and 67 percent believe it will take effect between 2010 and 2015, a timeframe that is consistent with the 2010 start date of emission trading systems proposed by the NCEP⁶⁶ and the McCain-Lieberman Climate Stewardship Act.
- There is broad agreement among companies about several key aspects of prospective policy: market-based trading, sequestration credit, the need for federal regulation to supersede a growing “patchwork quilt” of state regulations, and credit for early action. Companies differ, however, in their views on other issues, such as the baseline date for reductions, credit for (and definition of) indirect emissions, and preference for sector-based versus economy-wide policy.

B. The Link between Policy and Strategy

All case study companies acknowledge the strategic value of having a seat at the table to influence policy development. In fact, most have a long history of working with government on environmental policy. Cinergy's Rogers feels that involvement with government is necessary to avoid “stroke of the pen risk, the risk that a

regulator or Congressman signing a law can change the value of our assets overnight.” Rogers continues, “If there is a high probability that there will be regulation, you try to position yourself to influence the outcome.” About the development of cap-and-trade programs, Shell’s Hone says plainly, “If you’re doing a deal with somebody and they’re setting the rules, then you want to have a say.”

While companies consider it a business opportunity to advocate their desired policy, some also believe their participation is necessary for good policy. According to DuPont’s Fisher, “It is important for industry to help government find cost-effective solutions to the climate change issue. Government can’t do it alone. They don’t have the capacity to understand all the implications of the different policy options.” Carolyn Green, Vice President of Health, Environment and Safety at Sunoco, goes further, citing “how little environmental regulators and advocates know about the energy intensity of their requirements.”

Involvement with government is necessary to avoid “stroke of the pen risk, the risk that a regulator or Congressman signing a law can change the value of our assets overnight.”

Other reasons for engaging in the policy-development process include: lobbying for subsidies or other support for strategic initiatives (such as IGCC), pre-empting regulation by demonstrating that action is already underway, deflecting policy toward other firms or industries, or convincing regulators that a policy will not be costly and should therefore be imposed on the entire industry.⁶⁷

C. Policy is on the Horizon

Despite little progress toward national GHG regulations, all survey respondents believe that government involvement is necessary to address climate change. According to Exelon’s Pagano, “We believe that leading companies will do what they can do in advance of mandatory programs, but we believe that to go beyond the base level of effort that is occurring in the voluntary period and to make significant progress in addressing this global issue, government mandates will be required.” Cinergy’s Leahy adds, “The technologies will emerge when CO₂ has a price signal, and that market signal will be created by regulation.”

Companies have also begun encouraging action in the global arena. Similar to the findings of a 2004 Pew Center report (*International Climate Efforts Beyond 2012: A Survey of Approaches*), many case study companies draw connections between U.S. action, actions by other nations, and the economics of international carbon markets.⁶⁸ According to Michael Parr, Senior Manager of Government Affairs at DuPont, “We won’t see China and India on board while the U.S. is on the sidelines.” As a result, “Market liquidity of carbon credits is restrained without a global market,” explains David Rurak, Director of Operations at DuPont.

“The technologies will emerge when CO₂ has a price signal, and that market signal will be created by regulation.”



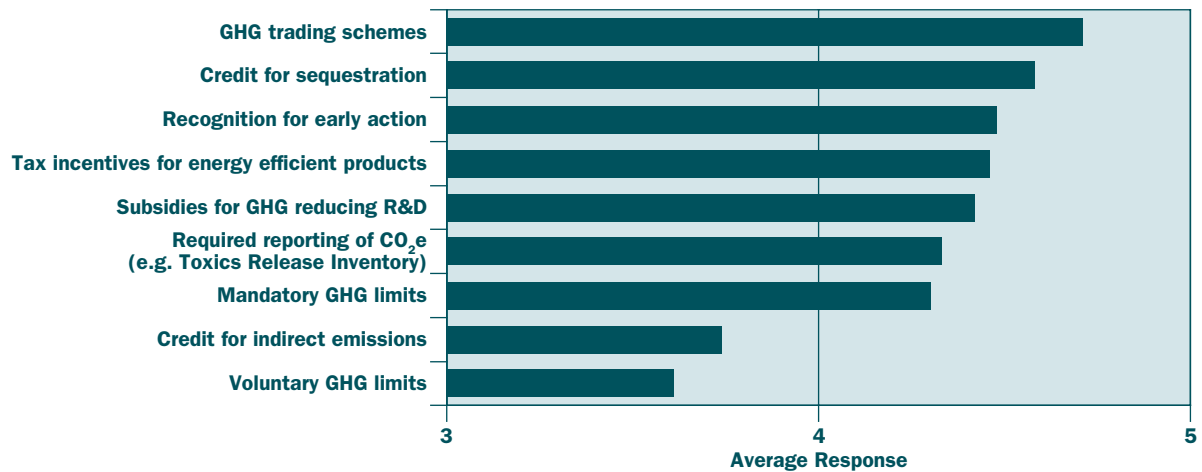
D. Options for Policy Mechanisms

Notwithstanding the wide range of industry sectors represented, the survey revealed broad agreement in a number of key policy areas (see Figure 9). At the top of the list is GHG trading. Research recently conducted by Deloitte supports the importance of this issue: “Trading in emission permits will enable power and utility companies to stay within the rules even though they may have difficulty cutting their emissions rapidly due to technology gaps and cost issues.”⁶⁹ Baxter’s Meissen envisions a future “not only with active regional and national GHG trading markets but also with interconnected markets among established financial centers of the world.” With trading, Cinergy believes that climate policy can be instituted in a manner that avoids significant costs to the economy. “What is important is that lawmakers know that even some coal-fired utilities think it is possible to deal with the climate problem without harming the economy,” says Cinergy’s Leahy.

Figure 9

Anticipated Features of Future Climate Change Standards

What kinds of actions will be most important [in federal standards on climate change]? (Please rate their level of importance: 1 = not important; 3 = neutral; 5 = important).



Total Respondents: 26

A second priority for many companies is ensuring that future policy allows credit for biological and geological carbon sequestration. The prominence of the latter is notable because it was ranked lowest in terms of providing bottom-line benefits to companies absent a carbon price signal (see Figure 5). Given how critical sequestration may be to the future of coal, support for carbon capture and geological sequestration (through subsidies or research and development support) is of paramount importance, especially to electric utilities.

A third priority—especially for early adopters who have already exploited “low-hanging fruit” opportunities—is receiving credit for previous emissions reductions. For some companies, such as DuPont and Alcoa, it is *the* critical issue. According to Jake Siewert, Alcoa’s Vice President of Environment, Health Safety, Global Communications

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Carbon Capture and Storage is a Critical Need

Marcelle Shoop, Director Environmental Policy and Partnerships, Rio Tinto

Rio Tinto recognizes that the long-term future use of fossil fuels, including coal, depends on widespread deployment of low emissions technologies such as carbon capture and storage (CCS). “The challenge for this century is to reduce CO₂ emissions from fossil fuels such as coal. We must use clean coal technologies, but the key to unlocking an environmentally friendly future for fossil fuels is secure carbon storage,” says Preston Chiaro, Energy Group Executive for Rio Tinto. However, the widespread application, public acceptance, rapid commercialization, and ultimate success of CCS will depend on:

- Identifying geologic sequestration potential, including potential in less explored areas;
- Improving the understanding of the permanence of CO₂ storage by developing appropriate techniques for monitoring, measuring, mitigating, and verifying the effectiveness of long-term CO₂ storage;
- Reducing CCS cost through significant public and private investment in research, development, demonstration, and deployment of various forms of capture and storage technology, but particularly at a large scale;
- Addressing key legal and policy considerations associated with the deployment of CCS technology, including issues of ownership and liability; regulatory policies for measuring, monitoring, and verification; and siting.

Rio Tinto is actively working with industry associations and international government-industry partnerships such as the Carbon Sequestration Leadership Forum and the Global Energy Technology Strategy Program to support key R&D activities including CCS technology and exploring CCS regulatory frameworks. In the United States, Rio Tinto is a founding member of the FutureGen Industrial Alliance, which is developing clean coal technology, including CCS. In Australia, Rio Tinto is a founding contributor to the recently announced Coal21 Fund, a voluntary coal-industry levy which aims to fund CCS projects. Through strong leadership and careful investment in research and demonstration, Rio Tinto and others will play an important role in developing and deploying emissions-reducing technologies like CCS.⁷⁰

and Public Strategy, “Although I can’t imagine anything coming out of Washington that would be too strict for us, the worst-case scenario is not getting credit for what we’ve already done and having to start today.”

To be positioned to gain credit for early action, companies have been careful to register their reductions through a variety of mechanisms. Cinergy, for example, reports its emissions reductions through the DOE’s EIA 1605(b) reporting system and to EPA as part of the Climate Leaders program. Swiss Re plans to register its emissions reductions with the World Economic Forum’s GHG registry. Whichever mechanism is used, this is a critical step for early adopters.

Companies’ preferred baseline date for purposes of future regulation usually corresponds with the date when they started reducing emissions. The median answer to this survey question was 1990 and the average date was

1994, consistent both with the 1990 baseline set by the Kyoto treaty and reflective of when most respondents began taking action. These companies' primary concern, irrespective of what date is chosen, is credibly certifying early reductions.

Many companies agree with Entergy's Williams, who believes that "Policies need to allow price signals to be sent that will allow flexible investments in energy efficiency and clean, non-emitting generation technologies, such as renewables, nuclear, IGCC coal with carbon capture and storage. These investments will help keep the cost of a mandatory program low." A few companies also note the need for unified federal regulation to supersede a patchwork of state and local actions, which they believe place an unnecessary burden on manufacturers. In the words of Tom Catania, Vice President of Government Relations at Whirlpool, "This would be a huge misdirection of resources and much less would be achieved if we are subjected to a balkanized set of standards from 50 different sources."

In other key policy areas, company positions differ. For example, some companies, such as Holcim, prefer sector-level emissions caps because they are concerned that one sector (such as transportation) might otherwise bid carbon prices to a level high enough to adversely impact another sector (such as manufacturing). Some have suggested that a sector-specific approach would prevent energy-intensive industries, which are seen to have the most at stake, from capturing the regulatory process.⁷¹

"This would be a huge misdirection of resources and much less would be achieved if we are subjected to a balkanized set of standards from 50 different sources."

Other companies favor economy-wide approaches that cover all industries under one cap. In a recent white paper, Duke Energy stated: "Exclusions of sectors or GHGs from a program would be unfair and economically inefficient, and

would reduce program effectiveness." The white paper goes on to recommend that "the point of regulation should be upstream...Downstream and other approaches would likely result in more limited coverage, fragmented program approaches, economic inefficiencies and greater administrative complexity and costs."⁷²

Companies also differ on how they want policy to treat indirect emissions. For example, a number of manufacturing companies want credit for emissions reductions related to the use of their products. Maytag and Whirlpool consider use-phase reductions so important to their respective strategies that without it their involvement in carbon markets will be seriously limited. Other manufacturing companies, such as Alcoa, are less concerned about in-use emissions and are more interested in how GHG regulations will affect market demand for their products. Alcoa anticipates increased sales from, for example, continued light-weighting of automobiles.

In the end, all companies recognize that establishing climate policy will be a challenge, despite their universal belief that such policy is needed. Cinergy's Leahy believes it will be very difficult to justify GHG regulations to the average voter: "Advocates for a carbon control regime should be prepared for an aggressive media campaign by opponents—who was that couple we saw in the early 90's during the health care debate? As soon as anything

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looks like it may become law, we'll see them again, only this time they'll say, 'Honey, did you know we're going to get hit with an X percent tax on energy use?' 'Wow, that's going to force the price of everything UP!' 'Yes, and it says here X hundred thousand people will lose their jobs because of this!' It's tough to fit an accurate picture into nice sound bites, especially for such a complex issue." Just as much of the opposition to acid rain legislation was based on projected costs that were much higher than the ultimate reality,⁷³ similar cost concerns are likely to present a major hurdle to climate regulation.

Step 8: Manage External Relations

One final component of a successful climate strategy is engaging external constituents including competitors, trade associations, suppliers, customers, regulators, and NGOs. All case study interviewees note that these groups provide vital information and expertise, can help develop markets and support for climate-related initiatives, and are important adjudicators of credibility and reputation. As described in this section, firms must identify critical target audiences and understand their connection to company objectives.

A. Lessons Learned

- External outreach is critical to success. Outside groups can provide knowledge and key avenues for advancing business objectives.
- The external outreach efforts of survey respondents were aimed first at employees and NGOs, and then at government, the broader public, and the investment community.
- External groups sometimes oppose climate initiatives. Government and trade associations were named as the number one and two sources of resistance. In response, all companies engage in some form of federal- or state-level lobbying, and many work within trade groups to create change.
- Survey respondents also report reaching out to customers and other companies through research consortia, trade groups, and other avenues.
- In the end, all the steps in a firm's climate strategy have to fit with each other and with overall strategic objectives. External perception must not be different than internal reality.

B. Target Audience

All of the case study companies engage in external outreach as part of their climate strategy, most commonly to promote transparency and stakeholder dialogue. But at whom should these efforts be directed? Identifying the target audience is pivotal to successful outreach. Public reporting in one case may be strategic communications in another.

According to Mirza, Holcim reports information publicly "to establish to our employees, the communities in which we operate, customers, investors, and governments that we recognize this as a significant environmental



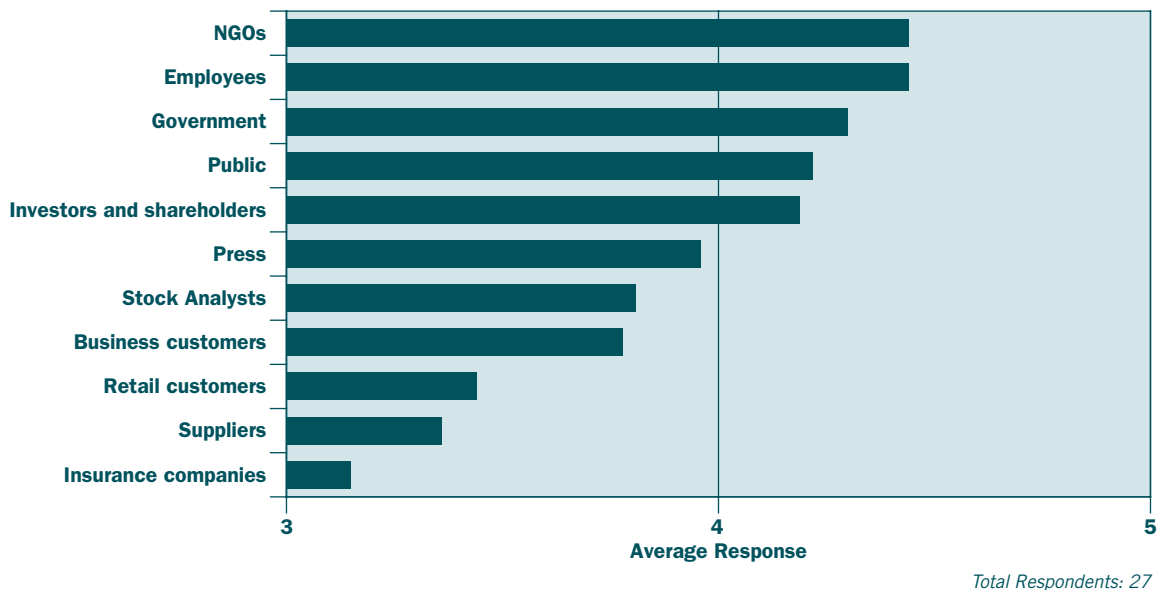
aspect of our operations, and that we are taking action to address it.” For Interface, Bertolucci believes the company’s public outreach strategy has helped it become “internationally recognized as a sustainability leader.” At Shell, the company’s annual *Sustainability Report* serves three purposes: to present the company’s public face and report its activities to the outside world, to give staff and different business units a guiding vision, and to allow those units to communicate concerns and ideas during the process of compiling the *Report*.

The survey results reflect a heavy emphasis on internal audiences. As noted previously, respondents state that external outreach efforts are aimed first at employees (a somewhat counter-intuitive finding) and NGOs, followed by government, the broader public, and investors (see Figure 10). Each represents a different audience and requires a different form of outreach.

Figure 10

Targets of **Public Reporting and Communications**

How important are the following groups to your company in communicating about its climate-related strategy? (Rate their level of importance: 1 = not important; 3 = neutral; 5 = important).



Outreach to **employees** is discussed in previous sections that cover the need for workforce buy-in and internal support (see Step 6: Engage the Organization on page 35).

All companies in this report have worked with **NGOs**, such as Environmental Defense, the World Resources Institute, and the Pew Center. Benefits from such engagement include access to scientific, technical, or policy information; access to specialized expertise; information sharing with other companies (through NGO-created consortiums like the Green Power Market Development Group and the BELC); the opportunity to test ideas before releasing them to the public; or verification of corporate emission reductions. NGOs can work with companies

through formal working groups, internal panels or boards, corporation-funded initiatives to promote technical research or public awareness, and as representatives of local community interests.

Many companies have found that NGOs can be tremendously helpful. According to DuPont's Fisher, "You can learn a lot from NGOs. They can open your eyes to market opportunities. Also, they add legitimacy to our environmental commitments. A big, branded corporation stating its efforts sounds like public relations, but an NGO recognizing them carries a lot of weight, both internally for employees who are passionate on the subject and externally." Alcoa's Siewert concurs: "We know we're not the expert on these issues; we need help. Our people broaden their view of sustainability by interacting with others who think more broadly, with the people who help manage the growth process more effectively. When we think too narrowly, we get in trouble because the rest of the world doesn't think that way."

Shell, for example, worked with a panel of NGO and Native American tribal representatives as part of its Canadian Athabaskan oil sands project. When Cinergy first developed a baseline emissions assessment, it partnered with Environmental Defense to help validate the process. Environmental Defense reviewed Cinergy's definition of its corporate emissions footprint, approved the methods used to identify and measure GHG reductions, evaluated the company's implementation of a GHG fund, and now serves as an ex-officio member of Cinergy's GHG Management Committee.

"You can learn a lot from NGOs. They can open your eyes to market opportunities. Also, they add legitimacy to our environmental commitments."

Alliances with NGOs also provide credibility for both parties. Shell's work with the Pew Center, for example, opens doors. "Once you go through Pew," Hone says, "it's like you've gone through a filtering process—you have additional credibility. Shell provides Pew with credibility. And likewise, Shell gets the same. There is less suspicion than if Shell went it alone." Whirlpool has used similar alliances to further mutual policy interests; for example, the company worked closely with the Sierra Club, Natural Resources Defense Council, and the Alliance to Save Energy to promote manufacturer tax credits for efficient appliances in recently adopted energy legislation.

Governments are targets of external outreach when companies seek to gain insights about—or have an influence over—the likely form of future regulations (see Step 7: Formulate a Policy Strategy on page 46).

The **public** is also an important audience for external outreach on climate issues. Swiss Re is the world's largest re-insurer and, more than any other company in the report, is concerned about general societal awareness. The company has therefore engaged in a broadly focused external outreach effort using some of the more unorthodox techniques documented in this report. For example, the company sponsored a documentary called *The Great Warming* that was broadcast in 2005 on the U.S. Public Broadcasting System (PBS). It also partnered with the United Nations Development Program and Harvard Medical School to host a conference and produce a report called *Climate Change Futures: Health, Ecological and Economic Dimensions*.



Enhanced Financial Disclosure of Climate Risk and Opportunity

Yolanda Pagano, Director Climate Strategy and Programs, Exelon Corporation

Despite having submitted GHG information through the U.S. DOE's 1605(b) program and to the U.S. EPA pursuant to Title IV of the 1990 Clean Air Act Amendments, and having published CO₂ emissions in its annual environmental report, Exelon sought to disclose more. Helen Howes, Vice President, Environment, Health & Safety, states that, "Our shareholders wanted to better understand the opportunities and risks that the climate change issue represented to their investment in Exelon, so we added a Global Climate Change section to our 2004 10-K."⁷⁴ This decision was influenced by Exelon's commitment to develop a voluntary greenhouse gas emission reduction goal through the U.S. EPA's Climate Leaders Partnership; heightened interest in climate change with the ratification of the Kyoto Protocol by Russia in 2004; and the rise in investor interest as evidenced by both the increasing number of shareholder resolutions at corporations and the direct requests from investor groups such as the Carbon Disclosure Project. Exelon feels secure in its competitive position given its large fleet of low-cost, non-carbon emitting nuclear generating assets and has disclosed its position in support of the science on climate change and the need to take action now to deal with climate risks.

All public companies pay close attention to the **investment community**. Some companies feel their climate strategies have kept investors from filing proxy resolutions or exerting other forms of pressure. Other companies actively engage investors on these issues. Alcoa for example, has convened meetings with its top investors to discuss sustainability concerns. Survey respondents and case-study interviewees note that interest until quite recently has been limited to socially-responsible investors. But they anticipate that mainstream investors may play a larger role in the future. "The mainstream investors are not as strong on this issue in the United States as they might be, but that could all change if legislation is enacted," says DuPont's Fisher.

In fact, by some broad measures, investor concern appears to be ahead of formal regulation. When the Carbon Disclosure Project began in 2002, 35 institutional investors endorsed a letter requesting disclosure of GHG emissions through a questionnaire that was distributed to *Fortune* 500 companies.⁷⁵ In 2003, 95 institutional investors with \$10 trillion in assets endorsed the letter. By 2006, that number reached 211 institutional investors with \$31 trillion in assets.⁷⁶

The Sarbanes-Oxley Act of 2002 is also prompting more companies to discuss climate change and associated risks in their annual reports. A critical question, about which there remains some uncertainty, is whether climate concerns are "material" under Security and Exchange Commission (SEC) rules. Some point out that the answer to this question is likely to vary by industry and depends on whether GHG controls are legislated. As one study suggests, "While climate

change risks and opportunities are unlikely to have material effects over the short-term...the certifications required by Sarbanes-Oxley will put ongoing pressure on management to account for and disclose, in financial statements

or otherwise, any aspect of climate change risk which could be fairly said to be quantifiable.”⁷⁷ In any case, while only 26 percent of survey respondents believe that GHG emissions are “material” under Sarbanes-Oxley, the vast majority (93 percent) nevertheless consider climate-related risks when making general investment decisions. As Bob Page, Vice President of Sustainable Development at TransAlta, puts it, “Shareholders must understand actions taken to manage GHG and climate risks.”

Shareholder understanding and concern about climate issues appears to be growing and the investment community is increasingly concerned about the uncertainty of federal climate policy in the United States. Coal-fired power plants, for example, have projected lifespans of 40 years or more and will almost certainly be affected by future climate regulation, particularly as it relates to feedstock and energy prices. In the current policy void, however, many investors feel they are unable to adequately analyze these potential risks and opportunities. Travis Engen, former CEO of Alcan says, “Some asset-intensive industries are making investments now that have a 30 to 50 year horizon. As CEO, I wanted to make damn sure my investments were good for the future, not just today.”⁷⁸

Financial experts are quick to differentiate uncertainty from risk. In general terms, “risk is a mathematical distribution of potential outcomes around known parameters, even if the actual parameters and shape of the distribution is in dispute. Uncertainty, on the other hand, involves a lack of information for determining the parameters with which to assess investment risk.”⁷⁹ As a result, “in Europe, climate regulatory risk can be analyzed because the parameters around policy are generally known. However, in the U.S. not only is the likely future structure of policy not known, but competitive responses by companies to these policies are difficult to estimate.”⁸⁰

Though climate risk has yet to play a significant role in valuation, it has begun to play a role in project finance. In the past few years, some of the world’s largest investors—including JP Morgan Chase, Goldman Sachs, Citibank and Bank of America—have announced plans to begin including GHG emissions when analyzing potential projects.

The Mainstream Financial Community is Taking Notice

*Mark Tercek, Managing Director,
Goldman Sachs*

Goldman Sachs takes seriously its responsibility for environmental stewardship and believes that, as a leading global financial institution, it can and should play a constructive role in helping to address the challenges facing the environment by doing what it does best—applying its people, capital and ideas to find effective market-based solutions to critical environmental issues. To guide its efforts, the firm introduced an environmental policy framework in November 2005.⁸¹ The policy framework includes a number of specific elements: using the firm’s expertise as a market maker to create more efficient markets for environmental products and services and acting as a liquidity provider by actively trading in those markets; applying research capabilities to examine the impact of environmental risk and the associated business opportunities; developing a deeper understanding of the impact of environmental issues on clients in order to more effectively advise and partner with them; and investing in renewable and alternative energy sources.



More recently, the finance community has begun to seek out potential opportunities created by climate regulation. JP Morgan has committed to creating financing solutions for investments in GHG reductions and low-carbon technologies and Citigroup has released a report on companies whose profits could grow under climate regulation. According to Citigroup, these companies are “the modern equivalent of the companies that sold products to California’s panners in the 1849 Gold Rush; the companies providing the means—picks and shovels—to achieve an end, reducing energy usage and cutting GHG emissions in the end.”⁸² The Citigroup report includes mainstream blue chips like General Electric (which produces components for IGCC systems, wind turbines, and efficient appliances) and more specialized companies such as Itron (which provides energy metering and management technologies) and Kinder Morgan (which develops carbon sequestration technology).

To systematically link climate-related risks and opportunities, Innovest has created the “carbon beta” which uses proprietary data to incorporate three broad factors in corporate finance decisions: (1) the cost of a company’s carbon exposure as a percentage of revenues (which can be up to 10 percent at \$20 per ton); (2) the company’s geographic risk exposure (that is, whether a company operates in a country that has ratified the Kyoto Protocol or in a country, like the United States, where it might be exposed to litigation); and (3) company-specific factors such as energy intensity and technological trajectory (for example, if the company has developed a “silver bullet” technology). As Innovest analyst Doug Morrow has remarked, “Upside and downside exposure to climate change is not yet priced into the fixed-income or equity markets, so there is out-performance potential in a product that uses specialized research to address these factors.”⁸³ In May 2006, Innovest partnered with UBS to offer a bond fund based on its carbon beta methodology.

C. External Resistance

Not all external stakeholders support corporate action on climate; indeed 43 percent of survey respondents encountered external resistance. Of this group, 82 percent cite regulators as a barrier, with some pointing to the lack of clear climate policy as the form of that obstacle. Similarly, according to the consulting firm Deloitte, some executives in the power and utility sector say “the lack of specific policy guidance makes voluntary remedies a guessing game.”⁸⁴ All survey respondents report efforts to overcome external resistance by lobbying at the national level and 88 percent also lobby at the state level.

Trade associations can be a tool in lobbying efforts (they are used by 62 percent of companies), but many also oppose action on climate change. More than one-third of survey respondents are members of trade associations or other organizations that oppose climate change regulation and 36 percent list trade associations as obstacles to climate action. Instead of discontinuing their membership, however, most companies prefer to work within their trade associations, citing opportunities to inform and influence others as well as to understand other positions on the issue. According to DuPont’s DeRuyter, “You should not become overly aggressive if you cannot get agreement. And with the [American Chemistry Council] it can be very

Improving Industry Specifications to Reduce GHG Emissions

Tom Chizmadia, Vice President, Communications and Public Affairs, Holcim (U.S.) Inc.

U.S. cement producers can reduce CO₂ emissions per ton of cement manufactured through the addition of mineral components such as fly ash or slag. However, reluctance to use these cements in construction material specifications and their use in project designs are significant barriers to achieving the reductions. The two organizations whose material specification standards have the most significant impact on the cement industry are the American Society of Testing and Materials (ASTM), and the American Association of State Highway Transportation Officials (AASHTO). Unfortunately, the specification standards that can yield CO₂ reductions in cement are infrequently applied by specification writers, and there has been a lack of consensus between the organizations about the addition of small amounts of limestone to portland cement. ASTM began allowing up to 5 percent limestone in 2004 while the AASHTO standard did not. However, a joint ASTM/AASHTO task group is working toward adopting one national standard for limestone additions.⁸⁵ There is little evidence to suggest that specification writers will use a blended or slag cement based solely on its potential to reduce CO₂ emissions. But Holcim (U.S.) Inc., one of the nation's largest manufacturers and suppliers of cement, has been working for over twenty years to demonstrate that a broader application of performance specifications can yield both excellent concrete and lower CO₂ emissions per ton of cement manufactured. Holcim has worked individually and through its trade associations to educate specification agencies, public officials, and customers about the technical merits of cements made with mineral components and to broaden their acceptance in the marketplace. The company has worked with several state departments of transportation about increasing the use of standards that allow composite and blended products, and has provided technical and empirical data to university engineering departments about the use of these materials. The company also is actively engaged in public policy discussions about CO₂ reduction strategies for the cement industry.

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hard to get agreement with companies on either end of the spectrum.” DuPont takes a cooperative approach, focusing its efforts within organizations that are actively engaging the climate issue, like the Pew Center, the International Climate Change Partnership (ICCP), and the Business Roundtable. Cinergy CEO Rogers has announced that he will adopt a less aggressive stance on climate when he becomes chairman of the Edison Electric Institute (EEI) and will advocate for voluntary rather than mandatory programs when he is speaking for EEI.⁸⁶

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Of the case study companies in this report, Whirlpool stands out as the only one that took a more confrontational approach by deciding to withdraw from the American Home Appliance Manufacturers (AHAM) over a difference of opinion on energy-efficiency standards. Whirlpool later rejoined AHAM after changes were made in the organization's bylaws.

Inviting Customers to Take Action on Climate Change

*Steven Kline, Vice President, Corporate Environmental and Federal Affairs,
PG&E Corporation*

PG&E provides electric and natural gas service to more than 15 million people throughout northern and central California and has some of the most environmentally conscious customers and policies in the nation. For example, California's commitment to energy efficiency has allowed per capita energy consumption in the state to remain flat for nearly 30 years, while the state's economy has grown dramatically. The state also has an aggressive renewable portfolio standard for investor-owned utilities (IOUs) and requires IOUs to apply a "greenhouse gas" adder when evaluating bids from power suppliers. As a result of these policies and other company actions, PG&E's carbon emission rate per kwh of generation is among the lowest of any IOU in the country, while its emission rate per kwh of delivered electricity is 60 percent below the national average. When PG&E looked to be responsive to its customers' desires to address climate change and to policymakers' calls for innovative approaches to do more, the company found it needed to look beyond traditional "green" tariff, energy efficiency, and other pricing programs.

In January 2006, PG&E voluntarily proposed a Climate Protection Program through which customers can choose to sign up and pay a small premium on their monthly utility bill to fund independent environmental projects aimed at removing CO₂ from the atmosphere. The first projects will focus on forest restoration and conservation, and the carbon sequestration and emission reductions from those projects will be verified by the California Climate Action Registry (CCAR). Once verified, the reductions will be permanently retired. PG&E expects to enroll approximately 4–5 percent of eligible customers into the program by the end of its third year, and achieve carbon reductions equivalent to taking 350,000 cars off the road for a year. As stated by Thomas Bottorf, PG&E's senior vice president of regulatory relations, "Through this first-of-its-kind demonstration project, we look forward to giving our customers the opportunity to help remove greenhouse gases from the atmosphere while also improving California forests and habitat."

D. Supply-Chain Partnerships

Targeting the supply chain—from customers to suppliers—provides the best opportunity for using outreach to connect climate concerns with a firm's business objectives. Exelon, for example, called on its suppliers to reduce emissions when it adopted a voluntary GHG reduction goal. All the suppliers who responded to Exelon's initial outreach reported that they were already engaged in some related activity, even if they had not originally characterized their efforts as part of a climate strategy. Examples included recycling or efficiency, renewable energy investments, transportation programs, and marketing programs.

Interface is working with the United Parcel Service to better understand GHG impacts associated with parcel freight transportation. Interface has also relied heavily on Invista, a large supplier of fiber for the

Industry-Wide Action to Reduce GHG Emissions

Tim Higgs, Environmental Engineer, Corporate Environmental Department, Intel

In the early 1990's, perfluorinated compounds (PFCs) in the semiconductor industry became an issue of concern due to their high global warming potential, which is thousands of times that of CO₂ (GWPs for PFCs range from 5,000 to 25,000). While there was no legal or regulatory requirement to reduce emissions, climate change was then beginning to emerge as a significant environmental concern and the industry recognized its obligation to demonstrate environmentally responsible management of these materials. So, Intel and the rest of the semiconductor industry developed a worldwide agreement to publicly commit to reducing PFC emissions 10 percent below 1995 levels by 2010. Intel took a leadership role on this initiative because its own environmental health and safety policy states that it will implement programs that go beyond regulatory requirements where appropriate. This was one of those times. Many were concerned that new regulations or even material bans were possible if the industry did not demonstrate leadership on the issue. In fact, several key PFC suppliers had publicly stated that they would require users to demonstrate proper management of PFCs before they would agree to sell to them. This strategy has proven successful. Bans or restrictions on high-GWP fluorocarbons have been proposed in recent years, primarily in the E.U. But these proposals have not focused on the semiconductor industry in large part because of this PFC agreement; the industry is viewed as taking its responsibilities on climate change seriously and acting to reduce emissions on its own. At this writing, Intel's own manufacturing has increased more than two and a half times since 1995 while its PFC emissions have remained roughly equal to 1995 levels, putting the company well on track to meeting its target by 2010.

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company's carpet business, to develop its climate-neutral Cool Carpet™ and Cool Fuel™ programs. In 2003 and 2004 Invista provided over 62,000 metric tons of certified CO₂e reduction credits from its Orange, Texas plant. Going further, Wal-Mart recently announced that it will begin to require emission reductions from its suppliers.

Companies often work closely with business partners on climate-related activities. For example, Whirlpool worked with retailers (like Lowes and Sears) and with consumers to address misconceptions about the efficacy of energy-efficient appliances and to educate people about their benefits, including their average five-year payback period. Whirlpool also worked with Proctor & Gamble to ensure that detergents suitable for their more efficient machines were available and to educate consumers on their use. Finally, the company was pivotal in convincing *Consumer Reports* magazine to include energy efficiency in its appliance rankings.

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Some firms participate in multi-company consortia to advance their climate objectives. For example, DuPont leads the Integrated Corn Bio Refinery consortium, which includes private, public, and academic participants and has been awarded \$19 million in matching funds from the U.S. DOE. Similarly, Alcoa works with the Curbside

Industry-Driven Innovation on Climate Change

*William Sisson, Director, Sustainability, WBCSD Buildings Program,
United Technologies Corporation*

Buildings account for 40 percent of global energy demand and nearly 37 percent of total CO₂ emissions. United Technologies Corp. and Lafarge are in the early stages of partnering with other companies through the World Business Council for Sustainable Development to lead a global industry project that will provide a response, framework, and timeline to advance effective and responsible building technologies for a carbon-constrained world. The goal is to influence a market transformation by 2050 across all business industry segments. “The biggest and shortest-term impact on greenhouse gas emissions, which many hold to be the greatest sustainability problem we face, is reducing energy consumption by marked improvements in installed product efficiencies,” says UTC’s Chief Executive Officer George David. “The best sustainability efforts, like everything else in human endeavor, are those coming from marketplaces and not mandates.” To spur industry-wide investment in climate change technologies, governments must commit significant financial incentives and R&D. Some of these technologies already are under development by UTC, including collaborative information tools that facilitate energy-efficient and economically viable buildings; technologies that increase heating/cooling system performance and efficiency; information infrastructures that better manage fire and security systems; elevator regenerable power drives; and renewable and fuel cell technologies for on-site power co-generation. With stronger federal support for such R&D activities, UTC believes the technologies needed for a self-sufficient, energy-efficient building are right around the corner.

Value Partnership (CVP) to educate the public and promote recycling through existing curbside collection channels. Finally, to demonstrate the value of terrestrial carbon sequestration, AEP, Cinergy, Entergy, Exelon, Wisconsin Energy, and other power companies are members of PowerTree Carbon Company, LLC, which plants trees in critical habitats in the Lower Mississippi River Valley.

Concerted efforts to address climate change allow companies to stand out as industry leaders. Alcoa and DuPont were cited in *Business Week*⁸⁷ for their climate-change accomplishments, and Ceres scored many BELC companies⁸⁸ highly in one of its recent reports.⁸⁹ Interface has a long received external recognition for its environmental work, including from the *Progressive Investor*, *Business Ethics*, *GlobeScan*, and *Global Finance*, among others. Recognition for climate leadership, in turn, can create further business opportunities. Alcoa executives, for example, were approached by Toyota for possible business ventures after the two companies (along with BP) were singled out by Innovent as the world’s top three most sustainable companies.

Conclusions

The prospect of GHG controls is already altering existing markets and creating new ones.⁹⁰ As in any market transition there are risks and opportunities and there will be winners and losers. All companies will be affected to varying degrees, and all have a managerial and fiduciary obligation to at least assess their business exposure to decide whether climate-related action is prudent.⁹¹ The companies in this report believe a proactive approach is necessary to prepare for the coming market transformation and that doing nothing means missing myriad near-term financial opportunities and setting themselves up for long-term political, operational, and financial challenges. Looking ahead, these companies identify three key drivers that will hasten the transformation to a carbon-constrained world.

The first driver is very clearly the **establishment of regulations**. When policy is set, the business landscape will change. Market signals will emerge that will drive technology and products toward a reduced carbon footprint. Companies hope to be fully prepared for that transformation and, ideally, to have a hand in shaping the policy.

The second driver is **rising energy prices** which will have different implications for different industries and companies. Rising energy prices help companies like Whirlpool or Intel promote more energy-efficient products in the marketplace. Conversely, they pose a threat to energy-intensive industries such as aluminum and cement. According to Cinergy's Leahy, "The sudden ramp up in energy prices may be changing the political landscape around this issue. On the one hand, it makes it easier to talk conservation but harder to talk about using a carbon price to pull new technologies along. People haven't made the connection between the fact that energy prices move up and down all the time—sometimes a lot—and the fact that an entry level carbon price shouldn't be that noticeable to consumers, yet it will change behavior at the margin."

"I worry that we are using 100 year-old technology. There will be a transformative technology. At what point will our generation and transmission lines become obsolete?"

The third driver companies are watching is growing **interest within the investment community**. Baxter's Meissen sees "an increased volume of requests from investors for companies to disclose GHG data, define climate strategies, and report progress in reducing emissions."

In sum, climate considerations are already altering the business environment in ways that are real and yet still fluid. The rules of the game are changing and companies ignore these changes at their peril. For example, Cinergy CEO Rogers says, "I worry that we are using 100 year-old technology. There will be a transformative technology. At what point will our generation and transmission lines become obsolete? There are a lot of things you might do, if you think there will be a new technology in 25 years. You need to hit your numbers with a short-term view, but you need to run your company with a long-term view." Shell's Hone has similar thoughts. "The key is both influencing the rules of the game and timing your transformation to a new carbon-constrained strategy. It's knowing what the next technology for energy production is, and transforming when the market is ready to reward it. We're not going to get out of the oil business in the near term." But, Hone says, you have to ask, "What is the iPod® for energy? Is it out there? You have to be on watch."



Glossary

1605(b): Under the Energy Policy Act (EPA) of 1992, Section 1605(b) program companies are encouraged by the Department of Energy to voluntarily report activities undertaken to reduce GHG emissions or to sequester carbon. Companies may want to report these activities to achieve recognition of achievements (from both regulators and stakeholders), inform the public debate on climate change, or to participate in educational exchanges.

Carbon Dioxide Equivalent (CO₂e): A metric used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as “million metric tons of carbon dioxide equivalents (MMTCDE).” They provide a universal standard of measurement against which the impacts of releasing (or avoiding the release of) different greenhouse gases can be evaluated. Every greenhouse gas has a Global Warming Potential (GWP), a measurement of the impact that particular gas has on “radiative forcing;” that is, the additional heat/energy which is retained in the Earth’s ecosystem through the addition of this gas to the atmosphere. The GWP of a given gas describes its effect on climate change relative to a similar amount of carbon dioxide and is divided into a three-part “time horizon” of twenty, one hundred, and five hundred years. As the base unit, carbon dioxide numeric is 1.0 across each time horizon. This allows the greenhouse gases regulated under the Kyoto Protocol to be converted to the common unit of CO₂e. Global Warming potentials for the greenhouse gases regulated under the Kyoto Protocol under a 100 year timeframe are as follows: Carbon dioxide (CO₂) has a GWP of 1; Methane (CH₄) has a GWP of 23; Nitrous oxide (N₂O) has a GWP of 296; Halocarbons (HFC) has a GWP range from 140 for HFC-152a to 11,700 for HFC-23; Perfluorocarbons have a GWP range from 6,500 to 9,200; Sulfur Hexafluoride (SF₆) has a GWP of 23,900.¹⁵³

Certified Emissions Reduction (CER): Reductions of greenhouse gases achieved by a Clean Development Mechanism (CDM) project. A CER can be sold or counted toward Annex I countries’ emissions commitments. Reductions must be additional to any that would otherwise occur.

Chlorofluorocarbons (CFCs): Compounds consisting of chlorine, fluorine, and carbon. CFCs are very stable in the troposphere, however are broken down by strong ultraviolet light in the stratosphere to release chlorine atoms that deplete the ozone layer. CFCs are commonly used as refrigerants, solvents and foam blowing agents. International phase-out programs of these chemicals are in place, most importantly the 1987 Montreal Protocol and its subsequent amendments. CFCs are also considered to be greenhouse gases and are targeted for reduction under the 1997 Kyoto Protocol.

Clean Development Mechanism (CDM): One of the three market mechanisms established by the Kyoto Protocol. The CDM is designed to promote sustainable development in developing countries and assist Annex I Parties in meeting their greenhouse gas emissions reduction commitments. It enables industrialized countries to invest in emission reduction projects in developing countries and to receive credits for reductions achieved.

Direct Emissions: Emissions from sources owned by the reporter.

Emissions Trading: A market mechanism that allows emitters (countries, companies or facilities) to buy emissions (“permits” or “credits”) from or sell emissions to other emitters. Emissions trading is expected to bring down the costs of meeting emission targets by allowing those who can achieve reductions less expensively to sell excess reductions (e.g. reductions in excess of those required under some regulation) to those for whom achieving reductions is more costly.

Geologic Sequestration: Injecting captured CO₂, under pressure into stable geologic formations where it is expected to remain indefinitely.

Global Warming Potential (GWP): See explanation under CO₂ equivalent (CO₂e).¹⁵⁴

Greenhouse Gases: There are six focal greenhouse gases. Greenhouse gases that are both naturally occurring and manmade include *carbon dioxide* (CO₂), *methane* (CH₄), and *nitrous oxide* (N₂O). Greenhouse gases that are not naturally occurring include *hydrofluorocarbons* (HFCs), *perfluorocarbons* (PFCs), and *sulfur hexafluoride* (SF₆).

Hydrochlorofluorocarbons (HCFCs): HCFCs are synthetic industrial gases made up of hydrogen, chlorine, fluorine and carbon. They are



being used as commercial substitutes for chlorofluorocarbons (CFCs) primarily for refrigeration but also as blowing agents for insulating plastic foams, fire extinguishants, and solvents. There are no natural sources of HCFCs. These compounds deplete stratospheric ozone, although much less than CFCs. Production and consumption of these gases are controlled under the Montreal Protocol.

Hydrofluorocarbons (HFCs): HFCs are used as a replacement for CFCs in a variety of industrial processes, including semiconductor manufacture (plasma etching and cleaning tool chambers), refrigeration and fire protection and have been used as a replacement for CFCs. The atmospheric lifetime of HFCs ranges from about 1.5 years for HFC-152a to over 250 years for HFC-23. HFCs are among the six greenhouse gases to be curbed under the Kyoto Protocol.

IGCC: Integrated Gasification Combined Cycle plants gasify coal, biomass, or petroleum waste products (typically from refining processes) without burning the feedstock. The gas is then combusted in a gas turbine, and waste heat is used to create steam to drive a steam turbine. Sulfur dioxide and other trace impurities are removed prior to combusting the gas. The process uses less water and produces approximately 50 percent less solid waste than conventional coal-fired plants (which combust pulverized coal to create steam) and produces a pure carbon dioxide stream that can be separated and captured with a lower energy penalty and at lower incremental costs than in the case of pulverized coal plants. Another benefit is the potential to remove mercury at lower costs than in conventional coal-fired plants.

Indirect Emissions: Indirect emissions are defined as emissions from sources other than that owned by the reporter, but caused by actions on the part of the reporter. The predominant source of indirect emissions is the purchase or sale of electricity. Another source of indirect emissions might include emissions caused by product use (i.e. the calculated emissions of the fleet of GM vehicles in operation in the United States or of the operation of Whirlpool washers and dryers in the United States). There are clear problems with these measures. For example, there is a real risk of double counting as both a utility and the entity that purchases the electricity each counts the emissions for the same kilowatt. The key question becomes, who “owns” the emissions arising from power generated on behalf of others.¹⁵⁵

Kyoto Protocol: An international agreement adopted in December 1997 in Kyoto, Japan. The Protocol sets binding emission targets for developed countries that would reduce their emissions on average 5.2 percent below 1990 levels.

Make-Rate: A term to describe the weight ratio of HFC-23 byproduct to HCFC production expressed as a percentage.

McCain-Lieberman Climate Stewardship Act: A bipartisan national plan for action to begin solving the problem of global warming. The Act gives power plants, oil companies and factories until 2010 to collectively reduce their greenhouse emissions to the levels they emitted in 2000. The Act calls for the creation of an emissions trading system to help companies meet these requirements. The Act also allows companies to meet a portion of their emissions goal by paying farmers to use conservation methods to increase the amount of carbon stored in their soil.

Nitrous Oxide (N₂O): N₂O is among the six greenhouse gases to be curbed under the Kyoto Protocol. N₂O is produced by natural processes, but there are also substantial emissions from human activities such as agriculture, industrial production of nitric acid and adipic acid and fossil fuel combustion. The atmospheric lifetime of N₂O is over 100 years, and its GWP is 310.

Off-System Reductions: GHG emission reductions that are achieved outside of the company's operations, such as reforestation projects (biological sequestration) or energy conservation projects undertaken with customers.

On-System Reductions: GHG emission reductions that are achieved within the company's operations, such as heat rate improvement projects at electricity generation stations, renewable energy demonstration projects or implementation of hybrid vehicles.

Safety Valve: A price cap within the cap-and-trade program whereby participants can purchase allowances from the government at the safety valve price if market prices exceed the safety valve. This would lower the risks of economic shocks created by unexpectedly high allowance prices, while lowering the risks of such a program being rolled back if high prices emerged (such as happened in the California RECLAIM market, where NO_x prices exceeded \$40,000/ton, causing the program to be shut down). Such a program is often referred to as a “hybrid,” combining elements of a cap-and-trade program with those of an emissions tax.

Sequestration: Opportunities to remove atmospheric CO₂, either through biological processes (e.g. plants and trees), or geological processes through storage of CO₂ in underground reservoirs.

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29. Non-BELC survey respondents are Advanced Micro Devices, Calpine, Fairchild Semiconductors, and Staples.
30. BELC case studies are Alcoa, Cinergy, DuPont, The Shell Group and Whirlpool.
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36. For more information on the IPCC, go to: <http://www.ipcc.ch/>, viewed 3/3/06.
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40. Absent from these top four is the indexed metric included in the President's Global Climate Change Initiative, which sets goals in terms of the GHG intensity of the economy (in tons of emissions per dollar of GDP). The National Commission on Energy Policy (NCEP) also recommended this measure. While the emissions-per-dollar-GDP metric was designed for national policy and not for individual companies, its absence is notable because companies often develop internal protocols to match external reporting and compliance structures. National Commission on Energy Policy. 2004. *Ending the Energy Stalemate: A Bipartisan Strategy to Meet America's Energy Challenges*. (Washington DC: National Commission on Energy Policy): 21.

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51. The Chicago Climate Exchange (CCX) is North America's only, and the world's first, greenhouse gas (GHG) emission registry, reduction and trading system for all six greenhouse gases (GHGs). CCX is a self-regulatory, rules based exchange designed and governed by CCX Members. Members make a voluntary but legally binding commitment to reduce GHG emissions. For more information, go to <http://www.chicagoclimatex.com>.

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95. Based upon Department of Energy (Energy Information Administration) 2004 data, combustion of coal accounted for approximately 85 percent of CO₂ emissions from the electric power sector in the United States in 2004. The electric power sector accounted for approximately 40 percent of CO₂ emissions in the United States. Total CO₂e emissions in the United States were approximately 7.6 billion tons in 2004.

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131. HCFCs are generally considered interim replacements for CFCs. Their phase-out schedule is delayed compared to CFCs under the Montreal Protocol.
132. Warren, S. 2006. "DuPont Warns High Energy Costs will Hurt Profit", *The Wall Street Journal*, January 12: A6.
133. Reasons for shedding the nylon business were that the technology was "socialized" and it was not seen as a growth area for the company; it generated 25 percent of revenue but represented 40 percent of assets and was heavily dependent on fossil fuel.
134. Ranieri, J. 2005. *DuPont BioSciences: A Climate Change Best Business Practice*, Speech delivered to the California Public Utilities Commission, February 23, San Francisco, CA.
135. Tyvek® is a synthetic material made of high-density polyethylene fibers; the name is a registered trademark of the DuPont Company. It is a spunbonded olefin product that offers maximum protection and durability at a very light weight. For example, 100 10" x 12" envelopes weigh the same as 57 envelopes of the same size in 28 pound Kraft. Tyvek® is unaffected by moisture and inert to most chemicals. It has a number of uses, including siding for houses, envelopes, floppy disk and microfiche carriers where protection from acid, lint, and abrasions is needed.
136. DuPont. 2006. *Press Release: DuPont and BP Announce Partnership to Develop Advanced Biofuels*. (Wilmington: DuPont).

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137. In some DuPont processes, steam is generated at a temperature above saturation (superheated). When process steps require saturated steam (which is cooler than superheated steam), water is sprayed into the superheated steam, cooling it down. This desuperheating water must be very high in quality so no deposits are formed when it vaporizes.

138. Speech delivered to the Clinton Global Initiative Panel on Climate Change, New York City, September 17, 2005.

139. Op. cite, Aston, A. and B. Helm. 2005.

140. Op. cite, Cogan, D. 2006.

141. For more on the Smart Trips program, see: <http://www.smarttrips.org/>, viewed 3/3/06.

142. For more on the One Ton Challenge, see: <http://www.climatechange.gc.ca/onetonne/english/index.asp?pid=179>, viewed 3/3/06.

143. Calculated for 2002.

144. Inskeep, S. 2005. "Gas Flaring Continues to Plague Nigeria." *National Public Radio*, Aug.25, <http://www.npr.org/templates/story/story.php?storyId=4797953>, viewed 10/18/05.

145. *National Public Radio* 2005. "Oil Firms Learn Trading Lessons." *National Public Radio*, May 9, <http://www.environmental-finance.com/2003/0302feb/bpshell.htm>, viewed 10/18/05.

146. Van der Veer, J. 2006. "A Vision for Meeting Energy Needs Beyond Oil." *Financial Times*, January 25: 21.

147. Reflects Whirlpool Corporation prior to the acquisition of Maytag Corporation in mid-2006

148. The company has been broadly recognized for this commitment, including being named in 2005 as one of the 20 best corporate citizens by *Business Ethics Magazine*. In fact, the company has been named to the list every year since the magazine began publishing it six years ago.

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149. *PRNewswire*. 2005. "Whirlpool Corp. to Cut Greenhouse Gas Emissions by 3 Percent From 1998 Levels." *PRNewswire*, <http://web.lexis-nexis.com/5>, viewed 9/7/06.

150. PA Consulting Group. 1992. *Ecolabelling Criteria for Washing Machines*. (London: PA Consulting Group).

151. *PR Newswire*. 2003. "Whirlpool Corporation Sues LG for Technology Patent Infringement." *PR Newswire*, <http://www.whirlpoolcorp.com/news/release.asp?rid=221>, viewed 10/28/05.

152. Horst, G. 2005. "Consumer 'White Goods' in Energy Management." <http://ciee.ucop.edu/dretd/Whirlpool.pdf>, viewed 10/28/05.

153. CO₂e.com. 2006. "What are Carbon Dioxide Equivalentents (CO₂e)?" <http://www.co2e.com/common/faq.asp?intPageElementID=30111&intCategoryID=93>, viewed 1/24/06.

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154. Greenhouse Gas Inventory Program. 2002. *Greenhouse Gases and Global Warming Potentials*. (Washington DC: U.S. Environmental Protection Agency): 9.

155. Energy Information Administration. 1997. *Mitigating Greenhouse Gas Emissions: Voluntary Reporting*. (Washington DC: U.S. Department of Energy).



This report provides guidance to companies on integrating climate-related concerns into their corporate strategies and is also intended to help investors, analysts, policymakers, and NGOs interpret corporate climate change risk, opportunity, and action. The Pew Center on Global Climate Change was established by the Pew Charitable Trusts to bring a new cooperative approach and critical scientific, economic, and technological expertise to the global climate change debate. We inform this debate through wide-ranging analyses that add new facts and perspectives in four areas: policy (domestic and international), economics, environment, and solutions.



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