

# Corporate Strategies for Addressing Climate Change

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## **Executive Summary**

Climate change is now a bright, blinking issue on the radar screens of companies worldwide. Companies have started addressing climate change for a myriad of reasons – reasons as diverse as their respective business models. The academic and business literature has done a fairly good job of exploring why companies are addressing climate change. This study examines how they are addressing climate change. It explores the risks, rewards, opportunities and barriers surrounding corporate action on climate change and provides insight into the strategies employed by companies that have led the way in taking early action. The lessons learned by early actors can inform the efforts of those who follow.

Climate change presents companies with significant risks, uncertainties, and an increasing number of market opportunities. Companies now confront a patchwork of regional regulation. In addition, most companies in our survey expect federal regulations to limit GHG emissions within the next decade. The unknowns of potential regulation create uncertainty, and therefore risk, for businesses making strategic decisions. Volatile energy prices wreak havoc on cost structures, severely impairing the ability to accurately forecast profitability. Large storm events have caused companies to think differently about the physical risks of climate change. Accumulating scientific evidence, coupled with these large storms, has boosted public awareness, leading to changing consumer preferences. Companies are looking at these changing preferences and

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identifying market opportunities, broadening the traditional risk-mitigation-centered approach to climate change.

The focus of this study is “climate-related strategies,” defined as the set of goals and implementation plans within a corporation that either aim to reduce GHG emissions, or that significantly reduce GHG emissions as a co-benefit. This includes strategies and measures for achieving near-term emission reductions from a company’s own operations; research, development, and investment in low-carbon production and process-related technologies; alternative products that have a more attractive carbon profile; energy-efficiency initiatives; reductions obtained through offsets and emissions trading; and activities to reduce “upstream” or “downstream” GHG emissions along their value chain.

*Methodology*

There are two primary research methods used in this study. The first method is a one-hundred question survey of twenty-seven members of the Business Environment Leadership Council (BELC) of the Pew Center on Global Climate Change<sup>1</sup> and four non-BELC members.<sup>2</sup> The second method is a set of six in-depth case studies of companies taking action (five member companies of the BELC<sup>3</sup> and one non-BELC member).<sup>4</sup> Each of these companies has a stated commitment to address climate change. The demographics represent a sample weighted toward large, publicly-held, North American-based, multi-national corporations.

*Findings*

This study examines four elements of climate-related corporate strategies – strategy development, organizational integration, external outreach and policy. This study focuses on the common aspects and recurring themes across strategies, but will also highlight unique and innovative practices.

*Strategy Development*

To develop an effective strategy, companies must understand their motivation for addressing climate change, identify options for GHG reductions, determine which options align with corporate goals and values, and find ways to fund the initiative.

We found three primary drivers of climate-related strategies: cost savings, mitigation of risk and values-based reasons. These drivers are not mutually exclusive or comprehensive. Because profits are the ultimate measure of corporate success, many seek to make a link between GHG emission reductions and bottom-line results. Despite these efforts, the financial case for justifying such efforts remains vague. Therefore, companies have relied upon cost-saving energy efficiency to achieve GHG reductions, discussing the potential future value of managing risk and enhancing institutional knowledge in the present, and linking climate-related strategies to corporate culture and values.

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Cost savings are most closely tied to energy and operational efficiencies that deliver bottom-line results in the short-term. Energy efficiency is often easier to connect to traditional business strategy than GHG reductions. As an element of operating costs, energy use flows directly to the bottom-line and is therefore easier to communicate to employees. Furthermore, companies have been addressing energy as a cost issue for years, and in many industries it is a guarded strategic element.

In contrast, risk mitigation seeks long-term payoff by managing the political, legal, price and physical risks associated with climate change. The most consistently-cited risk identified by companies is the uncertain political environment. However, an effort to reduce GHG emissions is a much newer – and trickier – concept than energy efficiency. There is no direct link to operating results, and the benefits are uncertain, often described as distant and speculative. While an effort to reduce GHG emissions is viewed as strategic at the corporate level, building a connection to the business unit and employee level has proven more challenging.

Values-based reasons center on “doing the right thing” and addressing climate change because it is consistent with the corporate culture and values. Often, the targets of these values-based reasons are employees – both to allay the concerns about straying from the business plan described above and to improve employee morale.

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Methods of addressing climate change traditionally come in the form of either energy efficiency or GHG reduction initiatives. More recently, however, some companies have identified market opportunities within the climate change issue. Some are changing their product mix, while others are also pushing customers and suppliers to seek GHG reductions.

While calculating the financial benefits is difficult, the process for measuring and tracking GHG emissions is more clearly defined. The GHG Protocol and other GHG accounting standards have established well-accepted principles and guidelines for corporate reporting of GHG emissions. However, without strict regulations in place, companies face two major issues: what method to use in accounting for emissions, and how to measure those emissions. These calculations require data that is not always available, sometimes prompting the development of new information systems.

Another critical element of a climate-related strategy is funding. Some companies in this report simply utilize special pools of capital allocated to climate-related projects. Some lower their internal hurdle rate for relevant projects or implement a shadow price for carbon when evaluating capital investments. Each of these methods increases the likelihood that climate-related projects will be undertaken.



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Trading GHG emissions credits serves to offset the cost of certain projects. Companies can sometimes sell the emissions reductions achieved to generate a revenue stream that will improve the financial return. Some companies have experimented with internal trading to funnel capital to least-cost solutions. However, most have abandoned such efforts due to ineffectiveness and the development of external carbon markets.

*Organizational Integration*

Effective implementation of climate-related strategies requires alignment with the structure and overall strategy of the business. While these strategies are often initiated by the Environment, Health and Safety group, success depends upon inputs from the entire company, support from management, and buy-in from employees. When companies encounter resistance, they apply several consistent methods to overcome it. Effective communication remains the underlying theme for effective integration of strategies.

How a company addresses climate change is often dictated by the organizational structure and the company's strategy and culture. Some companies, especially those that are decentralized, need to allow for flexibility across business lines. It is also important, given policy differences, to allow for differences across geographic boundaries.

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Initial champions of climate-related strategies tend to be the Environment, Health and Safety group or senior management. Most companies utilize cross-functional teams both in the development of and implementation of their strategies. The accounting, finance and marketing departments tend to be the least involved, though certain companies have developed creative ways to involve them.

Gaining buy-in from employees who can influence the success of strategy implementation is essential. The best means of doing so is consistent communication of the company's position and direction. Four common methods are used to overcome resistance to climate-related strategies: communicating a clear link between the climate-related strategy and the values of the company; leveraging strong support from senior management; developing a robust business case with compelling bottom line benefits; and increasing internal education.

*External Outreach*

Companies find that external communication of climate-related goals and efforts to meet those goals is important in earning recognition and in helping produce a return for the company's investment. Equally important is an effective internal strategy that achieves results, ensuring credibility of the company's messages.

The most commonly realized benefit of implementing a climate-related strategy is enhanced reputation. With a better reputation companies have experienced

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increased market share, improved employee morale and improved relationships with regulatory agencies.

All companies in this study are publicly reporting climate-related goals and progress toward meeting those goals. Goals and progress are reported to boost transparency and stakeholder engagement. Companies post their goals and results in their corporate sustainability reports, annual reports, and sometimes in special reports dedicated to climate change. Other important communication tools are press releases and climate reporting venues such as the Department of Energy (DOE) 1605(b) voluntary reporting program or the Carbon Disclosure Project. . Although energy efficiency is a key component of most climate-related strategies, energy specific goals and achievements are not as widely reported, reflecting their importance as guarded strategic information.

Targets of external communication strategies include a wide array of stakeholders, including NGOs, regulatory agencies, shareholders and employees. Employees were the most common target, suggesting that these reports are as important for internal communication as they are for external communication. Although the investment community was not named as an important driver of climate strategies, they are a target of external outreach. Three quarters of the companies surveyed note that climate change is not a material item requiring Sarbanes-Oxley disclosure, but one-quarter does believe

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it to be material to their business. This suggests that the issue may be relevant to mainstream investors very soon.

Another key element of external outreach is partnerships. Many companies partner with NGOs, government agencies and other companies to address climate change. Such partnerships provide added capacity and expertise to companies that are trying to understand the implications for their business. Furthermore, partnering with independent organizations adds legitimacy and credibility to corporate climate-related strategies.

Although companies find value in working with external stakeholders, they also find external resistance from government and trade groups that restrict corporate efforts to address climate change. Most notable is the U.S. government's lack of a clear climate policy, which causes uncertainty and hinders investments that could create climate benefits. Trade associations are sometimes resistant to climate change efforts, and companies tend not to stray too far in forming their policy positions and strategies.

*Policy*

All of the companies surveyed in this study believe that government involvement is required to effectively address climate change, and almost all of them note the strategic importance of participating in the policy development process. While

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some view participation in policy development as a responsibility of business, others simply recognize a business opportunity.

It is not surprising, given the selection bias of this study, that all of the companies believe major climate policy is imminent in the United States. Many are actively lobbying at the state and federal level to shape such policy. While there is general agreement on certain policy mechanisms, others are more controversial.

Most companies agree that flexibility and price signals are key components of an effective policy that minimizes economic disruption. Most agree that GHG trading is the preferred method for achieving this outcome. Other areas of agreement include a provision for sequestration credits, and among these first-movers on climate change, there is a large push to receive credit for early action. Beyond these points, policy interests quickly diverge. Some companies, especially utilities, favor an economy-wide policy. Others, especially the cement industry, prefer a sector-specific policy that recognizes different price-elasticity across industries. Companies in high-growth industries favor intensity based measures, while other companies prefer regulation of absolute GHG emissions. Another area of contention is the treatment of indirect emissions, specifically from product use.

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*Conclusion*

This study presents several overarching themes for companies addressing climate change. The first theme is that greenhouse gas regulations are coming – companies themselves are convinced of it. In fact, companies say the problem of global warming cannot be fixed without regulations.

With those regulations in mind, companies are trying to figure out how to prosper under a potentially tough regulatory regime. Most surveyed companies believe they will face regulatory risks in the next decade. Some are concerned about risks to their physical plants. Many are also looking for the business opportunities of developing new products that will perform well in a carbon-constrained world. In addressing those risk and opportunities, companies are leveraging the immediate cost savings they can achieve through energy efficiency programs to transition to longer-term greenhouse gas reduction programs.

Another theme is that gaining buy-in – both internal and external – is the key to implementation. Companies find that normal internal resistance to climate change initiatives can be overcome by strong CEO commitment to the issue, combined with a clear demonstration of how climate change work is consistent with the company's values. Similarly, companies find that connecting with outside stakeholders, especially NGOs, can help build brand image and credibility in the policy arena.

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Finally, climate change will alter the rules of the game. Climate change is rapidly gaining steam as an issue, and will create new markets and create shifts in existing markets. In the longer run, some traditional industries may become irrelevant. There will be winners and losers; those with an interest in resisting and trying to delay such a market transformation and those who will try to capitalize on it. The difference between these two groups lies in a careful cost/benefit analysis of doing something versus doing nothing. Not all companies will benefit from GHG reductions and voluntary reduction programs must be based on sound business logic.<sup>5</sup>

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## **I. Introduction**

Climate change has garnered much attention recently. The increasingly certain science, media attention, rising energy prices, and impacts of recent storm seasons have created a greater level of awareness among the American public and business community alike. With these developments it is clear that corporations must confront climate change head on. However, the impacts of such an issue are still extremely complex and long term, complicated by such issues as the lack of comprehensive domestic legislation. Developments are occurring rapidly, changing the way many businesses operate, and in the process creating both risks and opportunities.

The United States has consistently lagged behind much of the rest of the industrialized world in developing policies designed to address climate change issues. In 2001, the U.S. refused to ratify the Kyoto treaty, and the current administration has opted for voluntary emission reduction strategies instead of mandatory cap and trade schemes.

However, recent developments indicate that domestic climate policy is on the way. The scientific community continues to develop research and data around issues of warming rates, glacial melts, sea level rise and acidification, and associated impacts on ocean currents.<sup>6</sup> In the absence of a comprehensive federal policy, cities and states have begun to address the issue on their own. California has enacted legislation that would require companies to reduce their

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emissions to 1990 levels by 2020 – a 25 percent reduction from business as usual. Given this growing patchwork of regulation and increasingly clear scientific evidence, companies themselves are beginning to call for legislative action. Recently, a group of companies including GE, Shell, Wal-Mart, Exelon and Duke Energy spoke out in favor of mandatory carbon caps. It seems as if the policy makers are listening.

Energy prices continue to rise, affecting all areas of the economy. Fluctuating energy prices increase business risk and make the business case for efficiency improvements all too clear. Interestingly, the three-decade worst-case energy price inputs considered in a 2003 scenario planning exercise published by the Pew Center on Global Climate Change were all surpassed as of the writing of this report.<sup>7</sup>

These rising energy prices and the physical impacts of storm events such as Hurricane Katrina have made the average citizen aware of climate change as well. This awareness is leading to a change in consumer preferences, and consumers are searching for new products to lower their costs, such as hybrid vehicles and energy efficient appliances. In addition, reputation issues become more important as consumers base their purchasing decisions, at least in part, on the company's action, or lack thereof on climate issues. The Carbon Trust forecasts that "climate change could become a mainstream consumer issue by 2010," placing corporate brands at risk.<sup>8</sup>

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In the meantime, the scientific community continues to develop research and data around issues of warming rates, glacial melts, sea level rise and acidification, and associated impacts on ocean currents.<sup>9</sup>

Mainstream investors are beginning to pay attention to the issue as well, creating implications for future access to capital and investment. For instance, Goldman Sachs recently joined the socially responsible investing (SRI) community by announcing a new policy for promoting activities that guard against climate change.<sup>10</sup> The Carbon Disclosure Project, an international organization that gathers information regarding companies' climate change strategies for institutional investors, now represents \$31 trillion worth of investment. The Sarbanes-Oxley Act of 2002 creates issues concerning climate change's relation to materiality and fiduciary duty.<sup>11</sup>

Climate change issues have become, and will continue to be, a mainstream business issue. The question about whether to act has largely been resolved, and has been the topic of a large number of reports in the academic and business community. However, an individual company's response to the issue is highly contextual and dependent on a number of factors, including initial drivers, product mix and market opportunities.

## **Scope**

The purpose of this report is to conduct a comprehensive analysis of the strategies employed by companies that are leading the way to address climate change. It reviews the development and implementation of their strategies, considers the benefits foreseen by them, discusses how they communicate with stakeholders regarding climate change, and offers what they have learned along the way. It explores the risks, rewards, opportunities and barriers surrounding corporate action on climate change and provides lessons learned from companies that have led the way in taking early action.

The focus of this report is “climate-related strategies;” defined as the set of goals and implementation plans within a corporation that are either intended to reduce GHG emissions, or that significantly reduce GHG emissions as a co-benefit. This includes strategies and measures for achieving near-term emission reductions from a company’s own operations; research, development, and investment in low-carbon production and process-related technologies; alternative products that have a more attractive carbon profile; energy efficiency initiatives; reductions obtained through offsets and emissions trading; and activities to reduce “upstream” or “downstream” GHG emissions along their value chain.

## **Methodology**

There are two primary research methods used in this study. The first is a one-hundred question survey of twenty-seven members of the Business Environment

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Leadership Council (BELC) of the Pew Center on Global Climate Change<sup>12</sup> and four non-BELC members.<sup>13</sup> The demographics represent a sample weighted toward large, publicly-held, North American-based, multi-national corporations.

<b>Category</b>	<b>Results</b>
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
Multi-National Operations	Yes: 72 percent No: 28 percent
Market Segment**	Business-to-Business: 47 percent Business-to-Customer: 60 percent
Annual Revenue	\$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% because some companies offer both services.

The second method is a set of in-depth case studies of six companies (five member companies of the BELC<sup>14</sup> and one non-BELC member).<sup>15</sup> Each of these companies has a stated commitment to address climate change. The authors conducted face-to-face and telephone interviews with the key executives and managers involved in the development of climate change or energy efficiency programs, the implementation of those programs and communication of those initiatives with external stakeholders. Typical interviewees included the vice presidents for environment, health and safety (EH&S); sustainability managers;

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operations managers; research and development personnel; and senior managers in governmental affairs and communications. Interview questions and topics were based on a set structure to assure comparability between case studies.

**Overview**

The report is presented as a synthesis report followed by in-depth case studies of the six companies. The synthesis report draws upon the results of the research to analyze corporate responses to climate change, and presents the research findings in five main sections:

- **Strategy Development.** This section explores the details of how companies are implementing their climate-related strategies. It includes issues such as goal setting, external drivers, program elements, measurement protocols, metrics of success, financial mechanisms for supporting programs, and benchmarking.
- **Organizational Integration.** A key aspect of developing an effective and sustainable climate-related strategy is gaining buy-in and participation from the internal workforce. This section assesses the level of senior management commitment, identifies the initial champions of climate change strategies, as well as those responsible for developing and adopting those strategies, the general progression from idea to adoption, sources of internal resistance, and methods for overcoming that resistance.

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- **External Outreach.** Recognition for internal action requires companies to participate in some form of external outreach, seeking to communicate their strategies and objectives to key external stakeholders. This section deals with tools for communicating goals and progress, the reasons for making those efforts public, identification of critical stakeholders, sources of external resistance and methods for overcoming that resistance.
- **Policy.** Future policy decisions have real world implications for companies, ranging from impact on investment decisions to fundamentally altering the characteristics of a market. Because of this, a critical component of external outreach involves interaction with governments on policy related to climate change. Most companies see a strategic benefit to being engaged in the policy development process. This can include possible controls on GHG emissions but also policies that provide tax relief or subsidies for research, development and commercialization of energy and GHG reducing technologies. In this section we assess respondent perspectives on whether government policy is necessary, the likelihood and time-frame of it occurring and the form it should best take.
- **Conclusions.** The report closes with a summary of the future challenges faced by respondent companies: gaps that exist in their knowledge for addressing climate change and possible changes in the business world that might alter the way that companies implement their strategy.

## **II. Strategy Development**

This section provides an assessment of the actual implementation of climate-related strategies, including issues such as the drivers, financial justifications, measurement protocols, metrics of success, and carbon trading. The case studies at the back of this report describe specific technical strategies that six companies have used to address climate change.

### **A. Drivers and Outcomes**

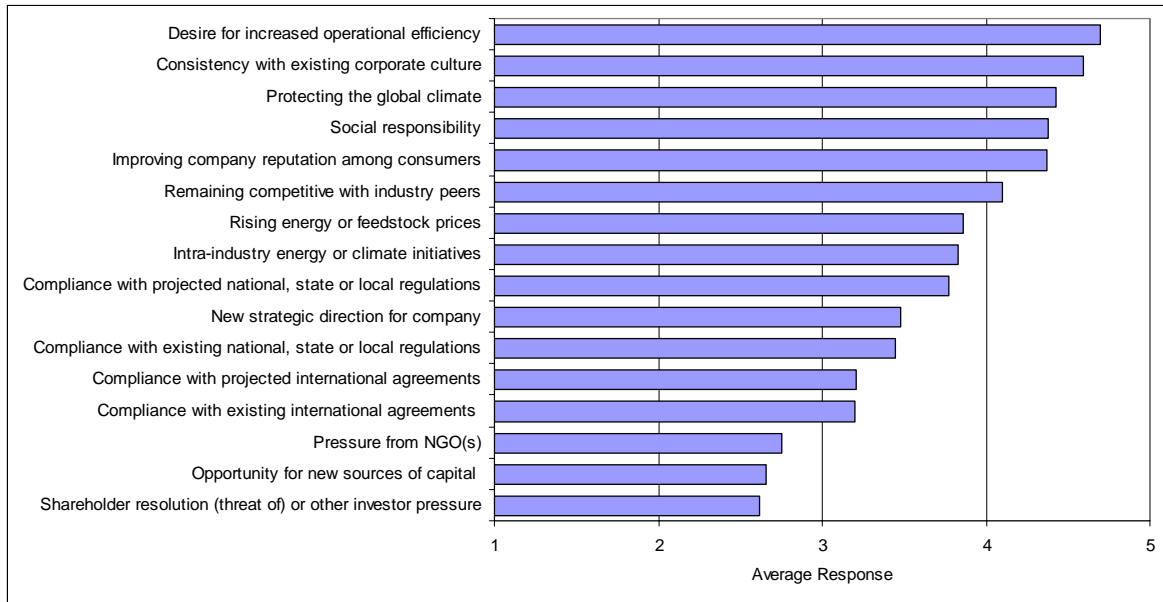
According to the survey and interview results, there are three primary drivers for developing corporate climate-related strategies: cost savings, the desire to “do the right thing,” and reducing exposure to the broad risks presented by climate change. Shareholders and NGOs were relatively unimportant drivers, although they clearly play a role. As climate-related strategies evolve, they begin to look beyond risk management toward market opportunity.

To reduce costs, company representatives emphasize that the near-term benefits of climate-related strategies are derived from improving energy and operational efficiency (see Figure 2). Survey respondents rank efficiency improvements as both the most prominent measure of success for their strategies (see Figure 3) and the action that most often provides bottom-line benefits (see Figure 4).



**Figure 1  
Drivers of Climate-Related Strategies**

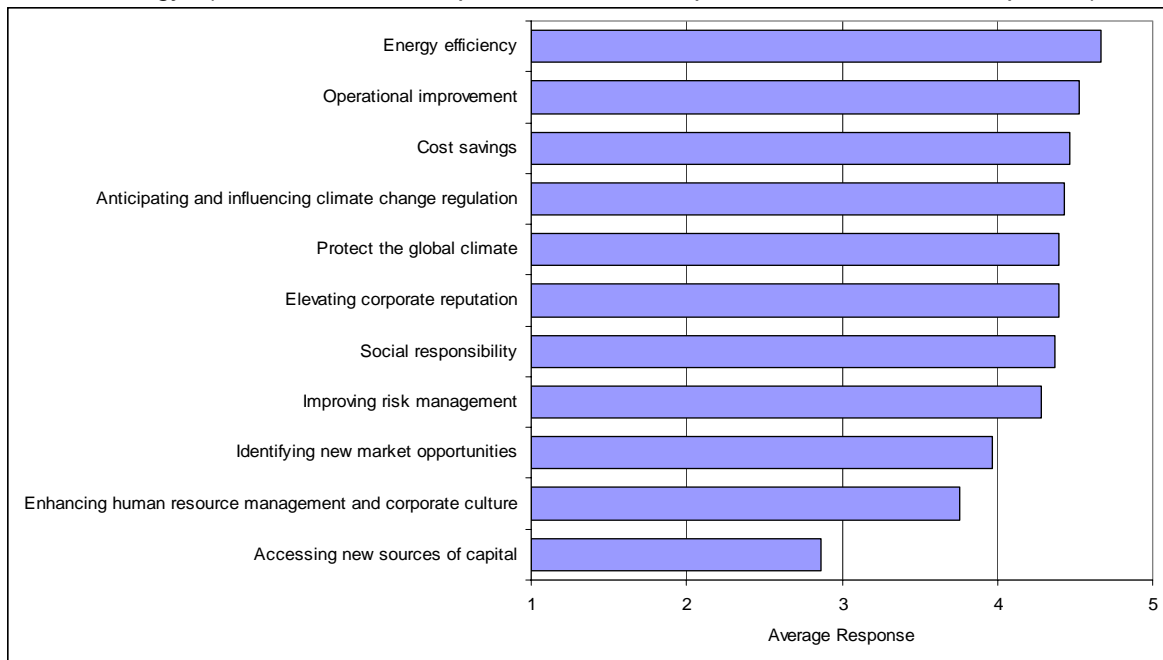
*How important were the following external drivers in leading your company to pursue its climate-related strategy? (Rate their level of importance: 1 = not important; 3 = neutral; 5 = important).*



Total Respondents: 30

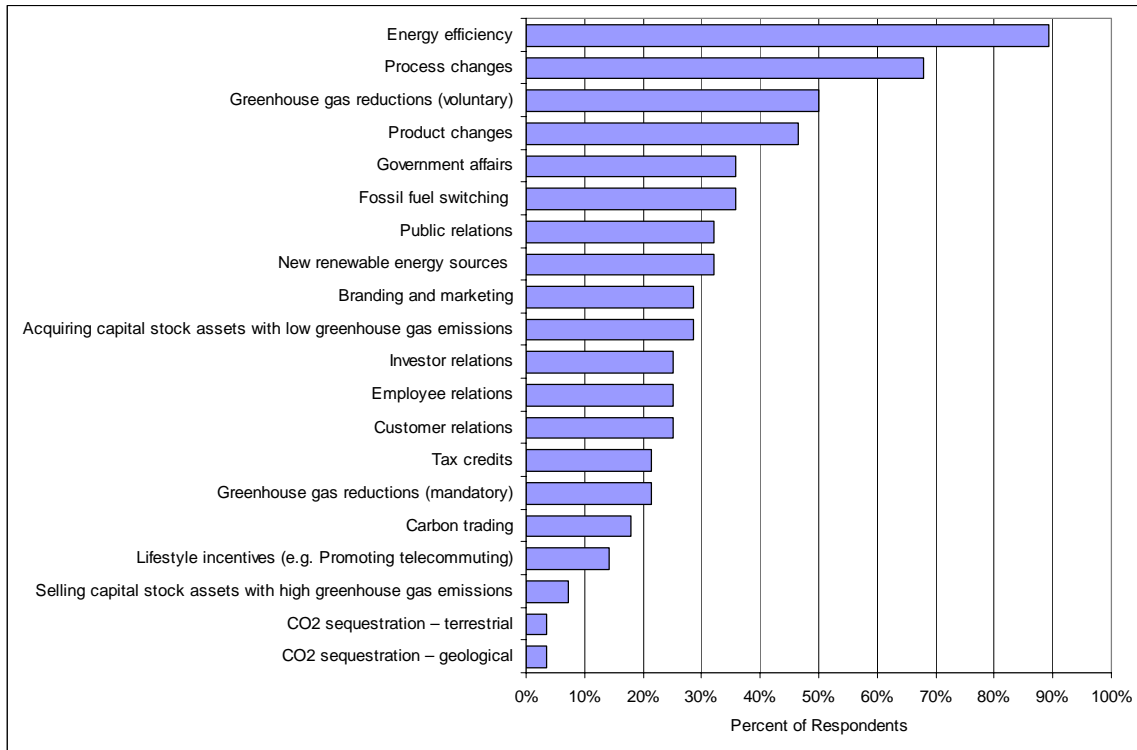
**Figure 2  
Measures of Success of Climate-Related Strategies**

*Once begun, how important are the following measures of success in undertaking your climate-related strategy? (Rate their level of importance: 1 = not important; 3 = neutral; 5 = important).*



Total Respondents: 30

**Figure 3**  
**Climate-Related Programs Which Contribute Financial Benefits**  
*Please indicate which are providing positive returns to the bottom line.*



Total Respondents: 28

Although making the effort to be socially responsible (termed by many as the desire “do the right thing”) ranks low in terms of generating bottom-line benefits (see Figure 4), companies consider it a driver and measure of success because they believe GHG action is consistent with their corporate values (see Figure 3). For example, after careful consideration of climate change science, DuPont designed and implemented a climate-related strategy to remain consistent with its culture of science, safety and environmental responsibility. Cinergy links a culture that values responsibility, transparency and stakeholder engagement with the adoption of its climate-related strategy.

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Companies are also motivated by the desire to reduce their exposure to the broad risks of climate change. These risks could include a damaged brand image from failing to act, policy and regulatory risk, legal risk, exposure to volatile energy prices and physical risk. What differentiates risk reduction from other drivers is timing. Unlike the near-term benefits realized from energy efficiency, operational efficiency, and enhanced reputation, benefits from risk reduction are longer-term, less certain, and more difficult to measure.

Companies identify the unsettled regulatory environment as a key risk. A 2002 World Resources Institute report warns that climate change policies pose significant risks to shareholder value of oil and gas companies,<sup>16</sup> and a recent report by Environmental Defense suggests similar vulnerabilities for automakers.<sup>17</sup> According to the survey results, even though regulation was only rated as a moderate driver (see Figure 2), companies consider the ability to anticipate future regulations a critical measure of success (see Figure 3). Although policy will be discussed in more detail in section V, companies are clearly involving themselves in the legislative process to help legislators understand the impacts of climate change policy on their fundamental business models. It is this concern about the form of future regulation that explains why companies rank Government Affairs as an important contributor to the bottom line (see Figure 4). Surprisingly, shareholders and non-governmental organizations (NGOs) are not considered a major force in driving program

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development (see Figure 2). As will be discussed in Section IV, however, these groups are seen as important in benchmarking and public outreach.

Executives note that interest among shareholders and the financial sector increased around the middle of 2005. Goldman Sachs, for example, identifies business opportunities in three areas related to climate change: reputation, competitive position and new product development.<sup>18</sup> Similarly, some companies are moving beyond risk management by finding ways to integrate the issue into their core business strategy. Shell is seeking to establish a presence in the hydrogen markets, and is analyzing how its reserves of tar sands, gas and oil impact the company's GHG strategy. DuPont is investing significantly in its bio-based materials initiatives and working closely with customers to identify opportunities to lessen both its own footprint and that of its clients.

**B. Differentiating Energy Efficiency and GHG Reductions**

Companies are doing a better job of meeting internal energy efficiency targets than long-term GHG reduction goals. A similar number of companies in the survey have established energy efficiency goals as climate-change goals (72 and 77 percent, respectively). Of those with energy efficiency targets, 100 percent have reached them, and two-thirds have established new, farther-reaching ones. In contrast, only 60 percent of companies setting GHG reduction goals have met those goals.

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A close look at the goals themselves offers insights explaining this difference. First, energy efficiency goals have a longer history. Energy efficiency was first discussed by some surveyed companies as early as 1970. On average, efficiency goals were set in 1998 and most are ongoing annual targets. By comparison, GHG reductions goals entered the discussion much later. GHG reductions were first discussed by some surveyed companies in 1990, and on average, GHG reduction targets were set in 2000. Some corporate GHG goals, with initial deadlines of 2006 or beyond, have not yet run their course.

The specificity of GHG and energy efficiency goals is also different. The goals of energy efficiency strategies are generally directed at discrete, energy intensive processes, forcing units with operational responsibility to make the decisions about how to improve efficiency. Given the rising price of energy, these efficiency projects offer a growing incentive as measured by the return on investment. Greenhouse gas reduction goals, on the other hand, usually take the form of a set number (for example, an *X percent reduction by date Y*) without well-articulated ways to filter this number down to the business units. One outcome of this difference is that, for many companies, energy efficiency is seen more as a strategic issue of importance at the business level; a more proprietary effort that has direct impacts on the bottom line. Greenhouse gas reductions, on the other hand, are viewed more as a corporate EHS initiative, often carrying a cost rather than a competitive advantage.

### **C. Calculating the Bottom Line**

A prominent challenge facing companies attempting to generate internal support for their GHG reduction strategies is quantifying the bottom-line financial risks and rewards. As David Steiner, Vice President of Government Affairs at Maytag plainly notes, the “company must make money first.” Just over half of companies surveyed have not developed precise financial data to identify the bottom-line benefits of their GHG reduction strategies. Executives express frustration at this lack of quantification, saying it hampers efforts to maintain momentum and lock in employee support.

However, nearly all respondents have identified benefits from taking early action. In interviews and discussions, executives believe that their strategies are profitable. “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,” says Kevin Leahy, General Manager of Environmental Economics and Finance at Cinergy. Although the particular form of benefits – such as financial savings, emissions reductions, or an improved brand image – differ by company, there appears to be consensus among these companies that strategic financial planning is essential for moving forward on climate change.

So if companies aren’t able to accurately measure financial benefits of their GHG-strategies, how are they justifying them? First, they rely on cost savings from energy efficiency programs, which are more concrete and easier to fold into

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current business strategies. Nearly 50 percent of companies cite financial benefits from energy and operational efficiency. For example, Calpine saved \$25.8 million over a ten-month period last year by implementing its Plant Optimization Program, which targets thermal efficiency improvements in the company's power plant operations. DuPont has achieved an estimated \$2 billion in savings since launching its energy efficiency program in 1990. Examples like this reflect the ability to estimate energy savings, and given the recent escalation of natural gas prices, these efficiency gains have come at a serendipitous time and will continue to grow. According to Pat Atkins, Alcoa's Director of Energy Innovation, taking action is just smart business. "Why wait for climate change to make strategic and operational changes if the business case is already there?"

Beyond energy efficiency, companies tend to rely on two less-quantifiable methods to justify their climate-related strategies: a general belief among senior leadership that these strategies will add value in the future (see Figure 2) and values-based "it's the right thing to do" arguments. "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 prepares the company to successfully adapt to future regulation. While these softer, less measurable arguments are certainly important when making climate-

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related strategic decisions, the case for action is more compelling when combined with more tangible drivers. Tim Higgs, Environmental Engineer for Intel, actually avoids “focusing *solely* on ‘right thing to do’ environmental arguments.”

In looking to the future financial implications of climate-change, the vast majority of companies (93 percent) evaluate the financial risk related to climate change when making general investment decisions. In addition, 60 percent consider the related physical risks to assets such as plants and infrastructure. For some companies, such as those in insurance and reinsurance industries, these physical risks pose significant bottom-line exposure.

**D. Calculating GHG Emissions**

While companies struggle to quantify financial returns resulting from non-efficiency climate-related initiatives, they are effective at measuring their GHG emission reductions, which are more precise and therefore often presented as a measure of success of climate-related strategies. Greenhouse gas emission inventories have been performed by 97 percent of surveyed companies. Companies vary in how they measure these emissions. Some measure actual emissions, while others estimate emissions using fuel-based calculations. The difference depends, in part, on the complexity of the task. Companies with many emission sources or extremely hostile stack environments prefer to avoid in-site measurement equipment.



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Sixty-two percent have developed new information systems or monitoring equipment to measure and manage their company's GHG performance. The functionality of these measurement systems varies considerably by company; some use highly sophisticated, web-based database tools, while others are still developing reliable systems. Ruksana Mirza, Vice President of Environmental Affairs at Holcim states that the company's business platform (SAP) is linked to a carbon dioxide (CO<sub>2</sub>) calculation module that allows emissions to be calculated automatically every month from operating information entered into the system (production volume, energy consumption, fuel type, etc). While most companies that have instituted new monitoring systems are satisfied with their performance, other companies point to a lack of such tools as a great need moving forward. For example, Whirlpool has had difficulty finding an appropriate emissions tracking system at an affordable price, noting a recent quote of approximately \$250,000 for one particular system.

There is variation in what companies measure and include in their GHG emission inventories. While 75 percent of respondents measure indirect emissions, there are competing definitions of what they include. Many companies measure the emissions from purchased energy and 35 percent measure emissions from product use. Shell measures the emissions from consumer use of its fossil fuels and Whirlpool measures the emissions created by the use of its appliances in the home. A small number of companies, particularly those in the financial sector

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such as Swiss Re, go so far as to measure emissions from material transport, business travel and commuting.

Companies are evenly split on whether they use absolute or indexed measures for GHG emissions (48 and 52 percent respectively<sup>19</sup>). Twelve percent of companies use a mix, tailoring measurements as appropriate for the reporting unit. Shell, for example, uses absolute targets for the whole company and indexed targets for individual units to allow for small-unit flexibility. The most common measurement methods include: Total tons of carbon dioxide equivalent (CO<sub>2</sub>e) (73 percent); Tons of CO<sub>2</sub>e per unit of product (50 percent); BTU (energy consumed) per unit of product (39 percent); and Total BTUs (35 percent). Notably absent from this list is the indexed measure recommended by the National Commission on Energy Policy (NCEP) of tons of CO<sub>2</sub>e per dollar of revenue.<sup>20</sup>

**E. Funding and Investment.**

Most companies use a combination of investment strategies to fund their climate-related strategies. The most popular methods include reserving a special pool of capital for investment in those strategies (47 percent); lowering internal hurdle rates (32 percent); and using shadow prices for carbon (33 percent). Incidentally, several executives indicated that internal shadow prices are becoming unnecessary because of market prices established by external trading programs.

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In concept, carbon trading is a market mechanism designed to direct capital toward the least-cost GHG emissions reductions. Most companies in this study are in favor of such mechanisms as will be discussed in Section V. In practice however, companies are taking a cautious approach to trading, primarily because the market is not well developed in the United States. While 40 percent of survey respondents use external carbon trading, these companies note that it is more useful in educating the workforce on carbon controls than in reducing costs. Furthermore, companies that trade carbon externally usually engage in other methods of funding projects, such as a reduced hurdle rate. Nevertheless, many companies consider trading something they should be prepared to implement in the future.

Of the four companies that have experimented with internal trading, none still have programs in place. All concluded that their program did not achieve its intended objective of driving reductions to the least-cost options. Shell, for example, discovered that the Shell Tradable Emissions Permit System suffered from various problems, including a lack of participants, a lack of liquidity, tax issues, and problems with permit apportionment. In the end, internal trading, like shadow pricing, is becoming irrelevant as external trading markets continue to develop.

### **III. Organizational Integration**

Effective climate-related strategies must be aligned with a company's existing business strategy, corporate culture, and core competencies. Success ultimately depends upon the level of buy-in among employees. According to Vince Van Son, Manager of Environmental Finance and Business Development at Alcoa, "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." This section will consider the importance of various functional roles and management levels in the initial development and on-going implementation of climate-related strategies.

#### **A. Senior Leadership**

According to survey respondents, senior-level support and engagement are the most critical components of any successful climate-related strategy. While some respondents referred generally to senior level management, others explicitly singled out the CEO and Board of Directors as the most important targets for internal buy-in. CEO leadership was identified as a key driver in all stages of program development and implementation (see Figures 5 and 6). In the words of Alcoa's Atkins, "On a scale of one to ten, senior level support is an eleven." Melissa Lavinson, Director of Federal Government Relations at PG&E, goes further by specifically highlighting the importance of board-level engagement on the importance of these issues. In one example, when business units within

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DuPont were reluctant to push hard to reach the first round of energy efficiency goals set in 1994, CEO Chad Holliday stepped in personally to make it clear that failure to reach the targets was unacceptable. His commitment to the program was cited by “DuPonters” as critical to its early success. Despite the high importance of senior-level leadership, CEOs from over 33 percent of the companies in the survey have yet to make a public statement on climate change or energy efficiency.

CEOs that take the strongest leadership position on climate-related strategies tend to have a long-term perspective on their company’s strategy, thinking well beyond their own tenure, and measuring time-lines in decades or even centuries. “When your time horizon is short, you’re thinking stonewall it and it won’t happen on your watch,” explains Jim Rogers, CEO at Cinergy. “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.”

Beyond this unusually long time frame, climate change differs from other corporate environmental issues because of the complex and dynamic nature of the problem. It requires a more concerted level of engagement on the part of senior management to understand the issues, determine the importance to the organization, and convey the implications and necessary action throughout the organization. According to Intel’s Higgs, “Climate change is a more difficult

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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.” Given this complexity, many companies feel that challenging stretch goals are necessary to get people’s attention and make significant progress on the issue.

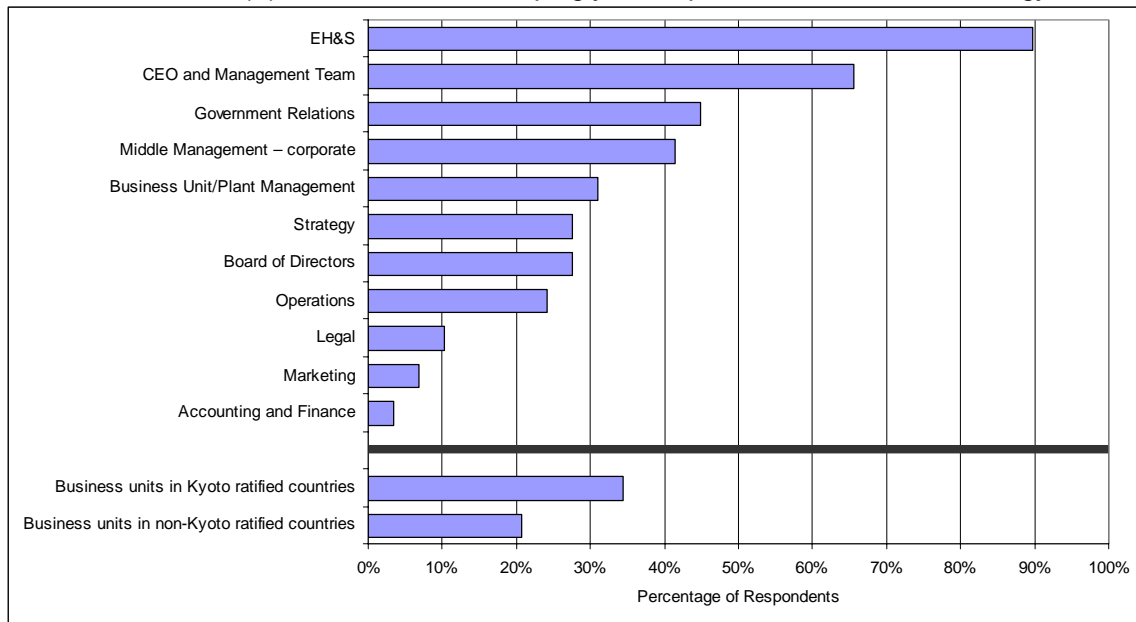
**B. From Idea to Adoption**

Ninety percent of respondents identified the Environment, Health and Safety department (EH&S) as the initial champion of their climate-related strategy (see Figure 5). This is not surprising given the technical expertise typically found in these departments. Sixty-six percent identified the CEO and the management team as an initial champion, which is consistent with the discussion in Section IIIA on the importance of top-down leadership on this issue. Not surprisingly, initial champions are more likely to emerge from units in countries where the Kyoto treaty was ratified.

**Figure 4**

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

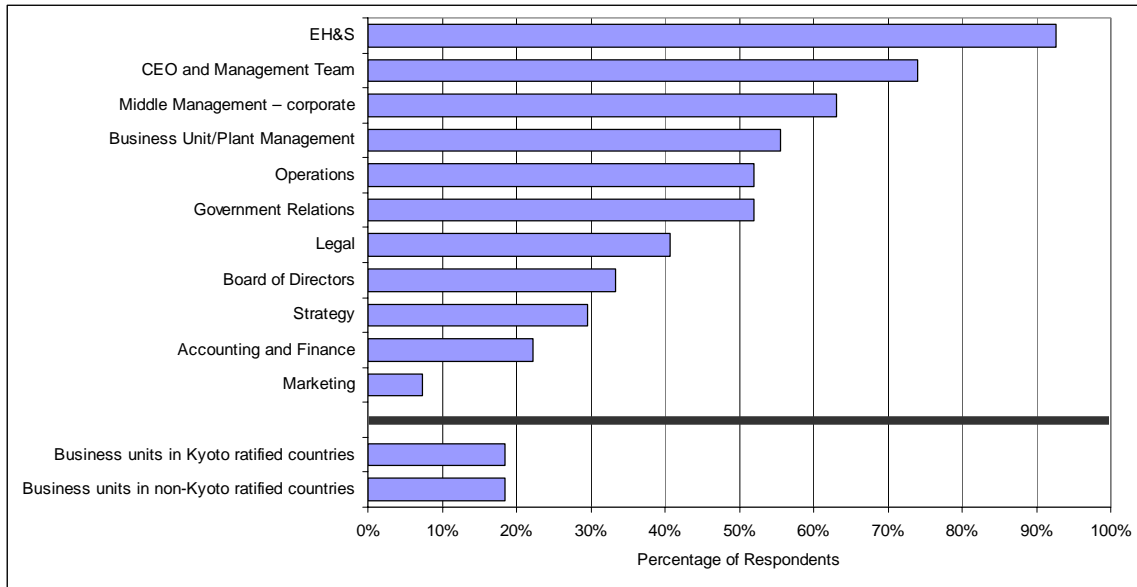
*Which positions, facets and/or department(s) within your company would you consider to be the INITIAL CHAMPION(S) for the idea of developing your corporate climate-related strategy?*



Total Respondents: 29

Companies with greater expertise in implementing climate-related strategies are finding that responsibilities of implementation are diffused throughout the organization. While EH&S and senior leadership are identified as leaders in the development and adoption phases, (93 and 74 percent respectively, see Figure 6) a more diverse set of players eventually assumes responsibility. The importance of all categories increases while certain departments, such as operations, rise above others. Surprisingly, units in countries party to Kyoto are no more likely to be involved in program development and adoption than units in non-ratified countries.

**Figure 5**  
**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

The involvement of a particular department varies by industry and across companies. For example, marketing is extremely important for product companies like GE and DuPont, but less so for service companies like Cinergy; operations is critical for process-intensive companies like Cinergy, but less so for reinsurance firms such as Swiss Re.

### **C. Overcoming Resistance**

During the initial development and adoption phases of climate-related strategies, companies rank the accounting, finance and marketing departments among the least involved, and strategy is considered only moderately involved (see Figure 6). Similarly, these departments are perceived to be the most resistant to implementation (see Figure 7). For some companies, however, marketing and finance are assuming an increasingly critical implementation role. For example,

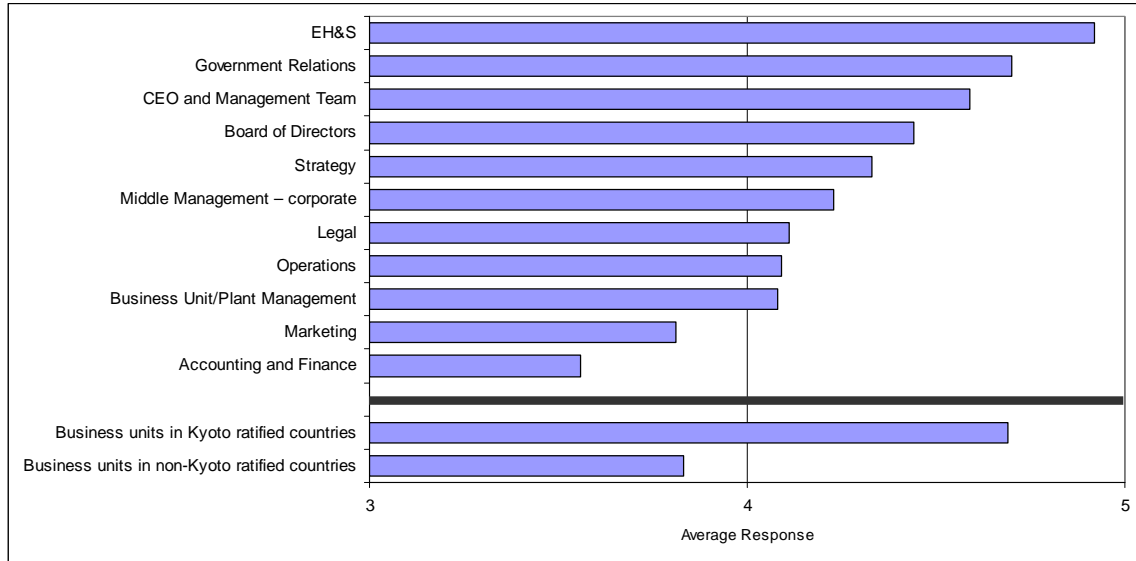


GE is spending an estimated \$90 million to market its “Eco-magination” initiative.<sup>21</sup>

**Figure 6**

**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, Leave blank if uninvolved.)*



Total Respondents: 26

Survey respondents identify four main strategies to overcome internal resistance. Three of these are recurring themes throughout this report: establish a clear link between the climate-related strategy and the values of the company; demonstrate clear CEO commitment; and create a robust, quantifiable business case to demonstrate climate-related initiatives can improve the bottom-line.

A fourth method for overcoming resistance – increasing internal education – introduces another dimension to climate-related strategies. In the experience of some companies, resistance can derive from a lack of understanding about climate-related issues. To increase internal awareness, companies have

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launched a variety of creative initiatives. For example, Alcoa gives its employees tree saplings and asks them to plant and tend to them. The company is also asking its employees to reduce their personal carbon footprint through the one-ton challenge.<sup>22</sup> Swiss Re hosts a wide variety of internal marketing events, including onsite hybrid car demonstrations during which employees are allowed to test-drive the vehicles. DuPont ties environmental performance metrics to the bonuses of key employees, and has created an employee award program that recognizes exceptional environmental achievements throughout the company.

Companies that have struggled to overcome the challenges of generating internal support for climate change – both with executive-level management and general level employees – emphasize the importance of an effective communication strategy. Given the relative complexity of the issue, the ability to identify and communicate the most salient points in an easily understandable manner is particularly useful. “When you talk about trading, impact on energy and economics, you need something besides words. Its hard stuff,” says Cinergy’s Leahy.

Many companies use cross-functional teams to gather input and diffuse responsibilities for implementation. Shell and DuPont, for example, utilize cross-functional teams in both technical implementation of GHG projects and managerial implementation. Alcoa’s *Corporate Climate Change Strategy Team* includes professional representation from operations, government affairs,

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technology, communications and finance and geographic representation from the United States, Canada, Australia, Europe, and Brazil.

Executives point out that efforts to build internal awareness must be tempered by an acknowledgement that companies often operate in diverse markets or have decentralized operational structures. This can create areas of resistance based on geography or division when some business units can achieve their goals more easily than others. Consequently, Mike Bertolucci, President of Interface Research Corporation, advises against “requiring standardized implementation programs in a diverse, decentralized culture.” The use of various absolute and indexed GHG measures discussed in Section II is one example of how companies grant individual business units the authority to identify the most effective implementation strategies. Some believe that embracing such internal diversity is not only an effective tool for mitigating internal resistance, but an important strategic consideration for companies with multinational operations. According to Daniel Gagnier, Senior Vice-President of Corporate and External Affairs at Alcan. "Although there is a global focus on the issue, there are regional differences in approaching the issue that require a company to have both a global and regional focus.”

Companies cite a need to know their audience when communicating their climate-related strategy internally. “You need to ease people into the discussion. Link it to what they already know is possible,” says Cinergy’s Leahy. “For us, it

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was our experience with cap-and-trade in our acid-rain program.” Whirlpool tries to refrain from using the term “climate-change” in internal discussions, preferring instead to use more familiar terminology. “We’ve got a train moving on efficiency,” explains Mark Dahmer, Director of Laundry Technology at Whirlpool. “We’d just start confusing things if we tried to start a new train.”

**IV. External Outreach**

External engagement and internal action are complementary. Almost all case study interviewees note that recognition for internal action requires companies to reach out to external stakeholders. Similarly, leadership and credibility in external arenas depends heavily on the extent to which the company has taken internal action on the issue.

**A. Reputation Benefits**

Reputation improvement is the most commonly experienced benefit of external outreach. More specifically, companies cite increased market share, improved recruiting and employee retention, and enhanced relations with regulators among the direct benefits. At Interface, Bertolucci believes the company’s strategy has helped it become “Internationally recognized as a sustainability leader.” For IBM, offering telecommuting options as a part of its climate strategy “has had a positive impact on recruitment and retention,” according to Dione Edan, Director of Corporate Environmental Affairs. As discussed in Section II, reputation and

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social responsibility are highly-rated drivers and measures of success for companies engaging in climate-related strategies.

Other companies are seeing business benefits from reputation improvement. Executives at Alcoa were approached by Toyota for possible business ventures after the two companies (along with BP) were singled out by Innovest as the world's top three most sustainable companies. Both Alcoa and DuPont were recently cited in *Business Week*<sup>23</sup> for their climate change accomplishments, a clear indication that external stakeholders are paying attention to the issue and recognizing companies that assume a leadership role.

### **B. Public Reporting**

All companies with a climate change strategy not only publicly report their goals, but also their progress toward meeting those goals. In several instances, companies are reporting their GHG profile even without a formalized strategy for reducing their footprint. Conversely, companies sometimes treat information about energy efficiency as part of their competitive advantage, and that information is not always made public. Seventeen percent of companies that have energy efficiency strategies do not publicize information about their performance results.

The most common objectives of public disclosure are transparency and stakeholder engagement. Mirza states that Holcim reports information publicly “to

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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.”

Public reporting of climate-related strategies typically occurs through pre-existing formats, such as the corporate sustainability report, annual reports and press releases. Less common are carbon-specific reporting efforts, such as the Department of Energy (DOE) 1605(b) voluntary reporting program and the Carbon Disclosure Project.

Swiss Re has undertaken some more unorthodox approaches to external outreach. In 2003, the company sponsored the development of a documentary called *The Great Warming*. Narrated by singer/songwriter Alanis Morissette and actor Keanu Reeves, the show was broadcast in 2005 on the Public Broadcasting System (PBS) in the United States. The company has also partnered with the United Nations Development Program and the Harvard Medical School to host a conference and produce a report called *Climate Change Futures: Health, Ecological and Economic Dimensions*.

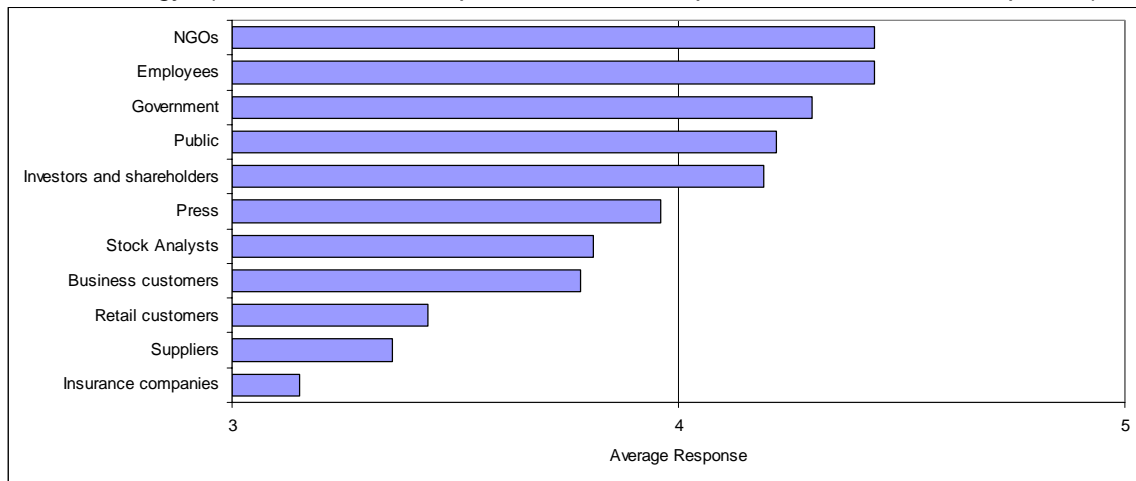
**C. Targeted Audience**

External outreach efforts are aimed at a wide array of stakeholders (see Figure 8), with employees and NGOs cited as the most important. This is consistent with the identification of corporate culture and social responsibility as primary drivers

of climate-related strategies in Section II. Close behind are the government, the general public, institutional investors, and shareholders, supporting the finding (also in Section II) that regulation is a long-term issue for external outreach rather than a near-term driver for initial program implementation.

**Figure 7**  
**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).*



Total Respondents: 27

While in Section II mainstream investors are not considered a primary driver of climate-related strategies, they are a target of external outreach. Survey respondents and interviewees note that interest has thus far been limited to the socially responsible investing community, but anticipate 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.

With the advent of the Sarbanes-Oxley Act of 2002, more companies are discussing climate change and the associated risks in their annual reports. An

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open question is whether the issue is “material” under SEC rules. Seventy-four percent of companies state that climate change factors do not have a “material impact” on the company under the act. In the face of regulatory uncertainty, “Quantification would be mostly speculative,” states Cinergy’s Leahy. Others are quick to point out that the question of materiality varies greatly by industry and depends upon whether GHG controls are legislated. One study suggests that “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.”<sup>24</sup> Toward that end, Bob Page, Vice President of Sustainable Development at Trans-Alta, believes that, “Shareholders must understand actions taken to manage GHG and climate risks.”

**D. External Resistance**

Forty-three percent of companies encounter external resistance that limits their ability to implement or advance their climate-related strategy. Eighty-two percent of those cite regulators as a barrier, with some pointing to the lack of clear climate policy as an obstacle. All of the companies encountering such barriers seek to overcome them by lobbying at the national level and 88 percent lobby at the state level. In a recent report by Deloitte, some executives in the Power and Utility Sector say “the lack of specific policy guidance makes voluntary remedies a guessing game.”<sup>25</sup> (Lobbying will be discussed in greater depth in Section V.)



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Trade associations – used by 62 percent of companies in their lobbying efforts – and standard setting bodies are also an obstacle. More than one-third of respondents are members of trade associations or other organizations that oppose climate change regulation. However, not all such companies see this as a contradiction. Instead of discontinuing their membership, these companies prefer to work within these organizations, citing an opportunity to inform and influence others as well as understand other positions on this issue. One exception is Whirlpool, which decided 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.

**E. Partnerships**

The majority of companies do not develop their climate-related strategies in isolation. Rather, they partner with NGOs or government agencies and work within industry groups to inform and shape their actions. These partner organizations are viewed as a source of information – a place to learn about best practices, perform benchmarking, exchange ideas and develop possible solutions. Shell, for example, has worked with a panel of NGO and Native American tribal representatives as part of its Canadian Athabaskan oil sands unit in Canada. DuPont is leading the Integrated Corn Bio Refinery consortium, which includes private, public, and academic participants. The initiative was awarded

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\$19 million in matching funds from the Department of Energy. Collaborating can elicit alternative viewpoints not easily seen from within a corporation.

While not seen as a major driver of climate-related strategies, NGOs are seen as an important outreach target for credibility, education and enhanced reputation (see Figure 8). In the words of Linda Fisher, Vice President and Chief Sustainability Officer at DuPont, “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.”

**V. Policy**

Nearly all companies acknowledge the strategic value of having a “seat at the table” during policy development. Cinergy’s Rogers feels that this position 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.” Shell, for example, played an advisory role in the development of the E.U. Trading Directive.

While some companies consider it a business opportunity to advocate their desired policy; others believe it is a responsibility for good policy. At times, it is

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hard to tell the difference. “It is important for industry to help government find cost effective solutions to the climate change issue. Government can’t do it alone,” says DuPont’s Fisher. “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.”

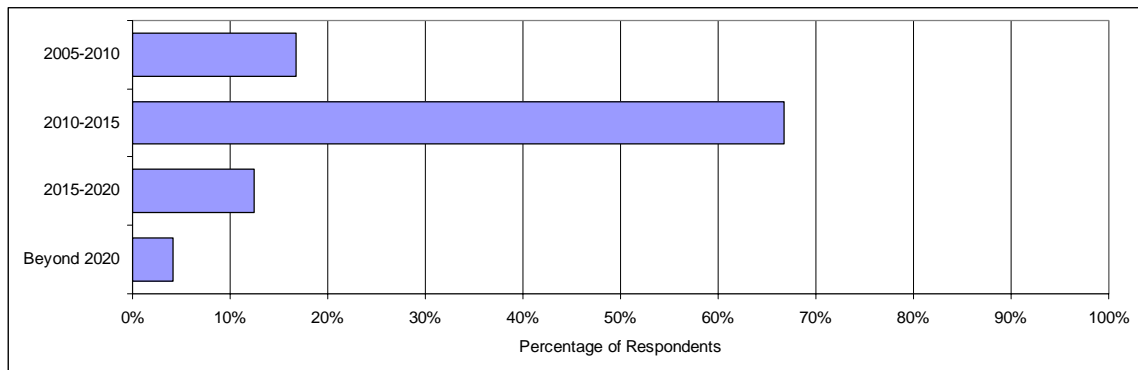
However, not all organizations are as sanguine. A handful of companies cite disenchantment with a lack of influence over the Kyoto process or state programs in the Western and Northeastern United States. These concerns extend to frustration over the lack of acceptance of certain technologies or mitigation techniques such as biological sequestration. As DTE’s Boyd remarks, “Politics and special interests – even those with the stated claim of reducing/offsetting emissions like major environmental NGOs – have hampered progress in policy development. It certainly appears that interests beyond simply addressing the climate change issue are playing into decision making.” However, acknowledging the importance of continuing to engage governments, he concludes, “This will be a long path. We need to convince policymakers to begin with small steps that clearly will not result in economic harm to get things started.”

**A. Policy Is On the Horizon**

Despite little progress toward national GHG regulations, 100 percent of respondents believe that government involvement is necessary to address the issue of climate change. According to Yolanda Pagano, Director of Corporate Strategy and Programs at Exelon, “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 CO<sub>2</sub> has a price signal...and that market signal will be created by regulation.”

For companies in this report, there is little doubt that government regulation and the associated market push are just over the horizon. In fact, the majority believe that regulations will arrive between 2010 and 2015 (see Figure 9), a date that is consistent with the 2010 proposed start date of a national tradable-permit system by the NCEP.<sup>26</sup>

**Figure 9**  
**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

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Companies are facing numerous pressures motivating them to support government regulation. For companies in highly capital-intensive industries, climate policy is a matter of business certainty. For example, when considering the investment in a power plant with a 50-plus year life-span, electric utilities need to know the type of climate regime under which it will be operating. For the insurance industry, the physical implications of climate change have a more direct consequence for the fundamental business model. “If we don’t have [a predictive model], we are just gambling,” says Chris Walker, Managing Director, Head of Sustainability Business Development at Swiss Re. As a result, the company has been an outspoken advocate for any policy, though Walker notes that he is not interested in engaging in conversations about “whether we need five percent or six percent reductions. We need 60 percent reductions!”

Similar to the findings of a 2004 report published by the Pew Center on Global Climate Change, many respondents observe connections between United States action, the actions of other nations and international carbon markets.<sup>27</sup> 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.” The resulting patchwork of regulation creates additional costs and undermines the price of carbon. “Complexity requires additional resources,” adds David Rurak, Director of Operations at DuPont. “Market liquidity of carbon credits is restrained without a global market, which drives down the price.”

## **B. Policy Mechanisms**

As with any new regulation, a core concern for some companies is additional cost and red tape. According to DTE's Boyd, "While the U.S. does not always have the most stringent environmental standards in words, it often has the most stringent in practice." Others believe that 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. Research recently conducted by Deloitte supports this perspective, stating, "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."<sup>28</sup>

Given the sheer scope of any climate policy, respondents believe that flexibility is essential to address such concerns. "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 and IGCC coal with carbon capture and storage," warns Jeff Williams, Manager of Corporate Environmental Initiatives at Entergy. "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

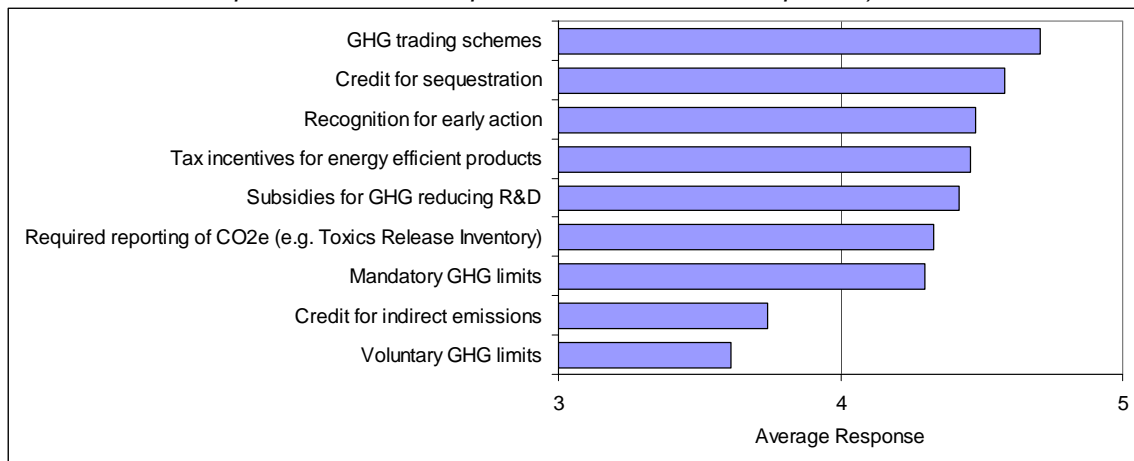
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Tom Catania, Director of Government Relations at Whirlpool, “This would be a huge misdirection of resources and much less can be achieved if we are subjected to a balkanized set of standards from fifty different sources.”

Notwithstanding the broad range of industry sectors represented in this survey, there are a number of areas where there is agreement regarding policy mechanisms (see Figure 10). At the top of the list is GHG credit trading, followed by credit for carbon sequestration. The high prominence of sequestration is notable because it was ranked lowest in terms of providing bottom-line benefits to companies (see Figure 4). Though this is not surprising given the current unavailability of most sequestration technologies, most companies in the survey view IGCC paired with carbon sequestration as critical to determining the role of coal in the energy future of the United States. Thus, it makes sense that subsidies for a technology with lower than average perceived returns would be supported by industry.

**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).*



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Total Respondents: 26

Many of the companies in this survey are early adopters of climate-related strategies and many have achieved meaningful GHG emission reductions. Among this group, credit for what has already been accomplished is considered an important element of policy. For some, such as DuPont and Alcoa, it is critical. According to Jake Siewert, Vice President, Environment, Health Safety, Global Communications and Public Strategy at Alcoa, “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.”

When questioned about their preferred baseline date for emissions reductions, companies answered with a median date of 1990 and an average date of 1994. This is consistent with both the 1990 baseline set by the Kyoto treaty and reflective of the early action taken by most companies in this survey. The primary concern for these companies, irrespective of what date is chosen, is that the reductions be certified credibly.

Moving beyond these basic elements of agreement, there are notable differences among company positions on policy. For example, companies such as Holcim prefer setting caps on a sector-level basis. These companies argue that differing price elasticities between sectors could create a situation where one sector bids carbon prices to a level high enough to adversely impact another sector. Some have suggested that a sector-specific approach to gathering industry input would prevent energy intensive industries, which are seen to have the most at stake,



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from capturing the regulatory process.<sup>29</sup> On the other hand, companies such as Cinergy favor economy-wide approaches where all industries are covered under one cap. Intel would like to see an intensity measure that allows for industry growth.

There is some disagreement among companies over whether to credit use-phase GHG reductions. A number of manufacturing companies want credits from use-phase emissions reductions. Maytag and Whirlpool consider use-phase reductions a central part of their respective strategies. According to Steve Willis, Director of Global Environment, Health and Safety at Whirlpool, “If the company is going to move forward on climate change, we need to get credits for indirect emissions.” Other manufacturing companies, such as Alcoa, see no such issues. According to the company, decreasing a vehicle’s weight by 10 percent typically yields a seven percent reduction in GHG emissions. So, instead of gaining credits for use-phase reductions, Alcoa is more excited about how GHG reduction goals will increase the market for its product. The company is satisfied with the increased sales from, for example, continued light-weighting of automobiles.

Despite the universal belief that policy is needed to adequately address climate change, Cinergy’s Leahy paints a sobering picture of how difficult it will be to justify climate change regulation to the average voter. “Advocates for a carbon control regime should be prepared for an aggressive media campaign by

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opponents – who was that couple we saw in the early-nineties during the health care debate? As soon as anything 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."

**VI. Conclusion**

Most companies agree that inaction is not a viable option with regard to climate change. In the estimation of these respondents, companies that do nothing to address climate change or energy issues are not only missing out on potential financial savings opportunities, but also setting themselves up for potential longer-term political and financial struggle. "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," says Baxter's Meissen. "Energy-saving projects result in both GHG reductions and energy savings, which can significantly reduce operating costs."

**A. Timing is Critical**

Timing is the most critical element of any climate-related strategy. On the one hand, some companies acknowledge the dangers of pursuing climate-change

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initiatives too early. For example, some executives specifically highlight false starts in certain initiatives, such as the Clean Development Mechanism (which many believe is not realizing its potential). In contrast, others wish they had started earlier. Embedded within this tension is a desire to be in front on the issue, but not 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.”

Based on the survey responses, it is clear that climate-related strategies take considerable time, resources and energy to develop. “A significant amount of lead time was needed to select, fund, and complete quality projects before realizing CO<sub>2</sub> benefits,” acknowledges Entergy’s Williams. Furthermore, if companies are serious about the climate change issue, their strategies should not be independent of the company’s overall business strategy. According to David Hone, Group Climate Change Advisor at Shell, “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 lingering concern for many companies is the poorly defined political and market environment. Cinergy, for example, is pushing for change and preparing for a carbon constrained future, but Rogers does not believe the company can take

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definitive action on climate change until there are clear regulatory and market signals to do so.

Despite the challenges of timing, there are numerous examples of companies who have met or exceeded their internal target before the stated deadline. Alcoa reached its 2010 emission reduction goals seven years early, and Entergy not only met its stated goal of stabilizing CO<sub>2</sub> emissions at 2000 levels, but also reduced them by an additional 21 percent through year-end 2004. Shell achieved its targeted reductions in 2002 and developed a new set of targets in 2005. And DuPont reestablished its climate change goals in 1999 after achieving the desired targets early.

The good news for relatively inexperienced companies wanting to push ahead on this issue is that there are abundant examples from which they can learn. “Many others – companies, governments and NGOs – have plowed this road before,” says Exelon’s Pagano. “Seek to leverage their learnings.” Sunoco’s Green has the following advice for companies with significant manufacturing operations: “GHG emissions from manufacturing operations with combustion units overwhelm all other company GHG emissions, so reduction of energy use is the most cost effective strategy.” Andreas Schlapfer, Head of Internal Environmental Management at Swiss Re, adds that novices in the area of building efficiency have an opportunity, “If you’ve never focused on energy efficiency before, achieving 30 percent reduction is simple.” Irrespective of company type, there is

a growing wealth of expertise about how to most effectively address climate change and energy issues in a cost-effective manner.

## **B. Challenges Ahead**

The examples described in this report offer a glimpse into the state of the art of climate-related strategy implementation. But this is a rapidly changing field and the nature of these strategies will change accordingly. In fact, over the last one to two years, most companies have noted a shift in the climate change arena. The general consensus is that recent changes in the level of external awareness, government interest, and consumer demand make it more imperative to address this issue now. According to Interface’s Bertolucci, “customers are now becoming more aware of the importance of the climate change issue.” Shifts such as these appear tied to the challenge facing many companies at this point in time; shifting their climate-related strategy from one that is focused on risk management and bottom-line protection to business opportunity and top-line enhancements.

Looking forward, companies identify three key variables that may significantly influence the form of future climate-related strategies. The first is the potential impact of rising energy prices, which can have both positive and negative implications and varies by industry and business. In the estimation of 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

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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." Price increases might help companies such as Whirlpool promote more energy efficient products in the marketplace or Intel pursue new technologies that are more cost effective than they have been in the past. In contrast, rising prices clearly pose a threat to energy intensive industries such as aluminum and cement. Regardless of the specific impact on a particular company or industry, there is consensus that energy prices will play a significant role in the developing climate change debate.

Second, while regulation did not rank highly as a near-term driver of climate change strategies, a number of companies note it as a long-term concern. For certain companies, the key challenge will be balancing regulation and carbon constraints with the company's growth strategy.

Third, companies acknowledge growing awareness in the investment community as a recent change in the business environment that might impact strategy implementation. Baxter's Meissen believes that "there is an increased volume of requests from investors for companies to disclose GHG data, define climate strategies and report progress in reducing emissions"

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Adding these uncertainties to the list of risks that opened this report yields a picture that climate change is altering the business environment in ways that are not yet fully clear. But the companies surveyed have determined that this alteration requires preparation for new rules of the game. Climate change represents a market transition and, as in any market transition, there are great opportunities and grave implications. There will be winners and losers; those with an interest in resisting and trying to delay such a market transformation and those who will try to capitalize on it. The difference between these two groups lies in a careful cost/benefit analysis of doing something versus doing nothing. Not all companies will benefit from GHG reductions and voluntary reduction programs must be based on sound business logic.<sup>30</sup> This report explores the strategy considerations of companies that have decided to take action and what kinds of actions they have taken.

## **Case Studies**



## **Managing “Stroke of the Pen” Risk Cinergy\***

Cinergy’s heavy reliance upon coal combustion for electricity generation makes it particularly vulnerable to carbon regulation. Yet, according to Chairman and CEO Jim Rogers, addressing greenhouse gas (GHG) emissions is not only the ethically right thing to do; it is also a smart business decision. Rogers believes that U.S. industry will soon face domestic carbon constraints, a prediction that presents Cinergy with a serious strategic challenge. While climate change is a long-term problem, many industries need short-term regulatory and market clarity in order to properly value potential investments. For companies like Cinergy within the power sector, the future of climate policy and carbon regulation will affect strategic decision-making about investments in new generating capacity that have an expected life of 40 or 50 years.

<b>Cinergy’s Footprint (2005)</b>	
Headquarters:	Cincinnati, OH
Revenues:	\$4.6 billion
Employees:	7,842
Percentage of Emissions	
In Kyoto Ratified Countries:	0 percent
Direct CO <sub>2</sub> e Emissions	
Legacy Generating Units:	58.2 MMtons*
Cinergy Solutions Projects:	2.6 MMtons
Other Direct CO <sub>2</sub> e Emissions:	0.3 MMtons
Aggregate CO <sub>2</sub> e Emissions**:	
Target:	61.1 MMtons
Target:	5 percent reduction in GHG below 2000 levels by 2010-2012
Year Target Set:	2003

\* Million metric tons.  
\*\* Cinergy does not track indirect emissions resulting from power purchases nor does it calculate emissions from product use.

“The greatest risk we face is ‘*stroke of the pen*’ risk, the risk that a regulator or congressman signing a law can change the value of our assets overnight,” says

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\* We would like to thank Eric Kuhn, Kevin Leahy, David Maltz, Darlene Radcliffe, Jim Rogers, Catherine Stempien, and John Stowell for their contributions to this case study.

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Rogers. “If there is a high probability that there will be regulation, you try to position yourself to influence the outcome.” Cinergy is actively managing this regulatory risk through its voluntary GHG emission reduction program and its aggressive leadership role within the utility industry. These actions make the company a legitimate participant in the national policy debate, creating the opportunity to work with government, trade associations, environmental organizations and other stakeholder groups to help shape legislation on GHG emissions. But, while Rogers leads Cinergy with a long-term focus, he does not feel that the company can take definitive action on climate change until there are both clear regulatory and market signals to do so. As Kevin Leahy, General Manager of Environmental Economics and Finance, explains, “The technologies will emerge when CO<sub>2</sub> has a price signal. All we need is a market signal to act, and that market signal will be created by regulation.”

**Company Profile**

Cinergy is one of the leading diversified energy companies in the United States, with 2004 revenues exceeding \$4.6 billion and a workforce of 7,842 employees. The company was created in 1994 through the merger of Cincinnati Gas & Electric (CG&E) and PSI Energy, Inc., the largest electric utility in Indiana. Cinergy is currently organized into two core businesses: Regulated Operations and Commercial Businesses.

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The Regulated Operations unit consists of PSI's regulated generation, transmission and distribution operations, and CG&E's regulated electric and gas transmission and distribution systems. This unit plans, constructs, operates and maintains Cinergy's transmission and distribution systems, and delivers gas and electric energy to consumers. It owns over 7,000 megawatts (MW) of electric generating capacity serving 1.5 million electric customers, and operates 9,200 miles of gas mains and service lines that serve about 500,000 customers.<sup>31</sup>

The Commercial Businesses unit is comprised of the wholesale generation and energy marketing/trading operations. This includes CG&E's 6,300 MW of electric generating capacity in Ohio, which was deregulated in 2001. The wholesale generation division also includes the subsidiary company Cinergy Solutions ("Solutions"), which owns or operates 27 cogeneration projects with over 5,400 MW of electric generating capacity and performs energy risk management analyses, provides customized energy solutions and is responsible for all international operations.<sup>32</sup> Solutions' projects usually entail taking an ownership position in the energy production or distribution facilities of strategic partners and reworking the facility to improve energy efficiency and environmental performance. In addition to producing bottom-line revenues, these projects usually generate GHG reduction benefits as well.

In 2004 Cinergy generated 69 million megawatt hours of electricity, 98 percent of which were generated from the combustion of 28.2 million tons of coal,

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approximately 2.8 percent of the total 1.016 billion tons of coal consumed for electric power in the United States.<sup>33</sup> Cinergy's 2004 CO<sub>2</sub> equivalent ("CO<sub>2</sub>e") emissions totaled 68.6 million metric tons, representing almost one percent of total CO<sub>2</sub>e emissions in the U.S.<sup>34</sup> The majority of these emissions (94 percent) are from "legacy generating units," those electric generating plants that were part of the original CG&E and PSI utility systems, as well as those electric generating plants acquired by the unregulated merchant group that are not Solutions projects. These figures will soon change as Cinergy has agreed to be acquired by Duke Energy through a \$9 billion stock swap .

**Strategy Development**

Cinergy began its attention to climate change with a study in the early 1990s by ICF Consulting on the feasibility of adopting an internal CO<sub>2</sub> cap. Given the coincident activities surrounding the CG&E/PSI merger, the study only served to awaken concern within the company. GHG goal development was initiated as in 1993 with Cinergy's participation in the Edison Electric Institute/DOE Climate Challenge. In September 2003, Cinergy formally announced its voluntary GHG emissions reduction program, with the goal of reducing annual emissions to five percent below the 2000 baseline for the years 2010 through 2012. The company's decision to more aggressively embrace climate change was made possible by three forces converging: an internal management push, pull from external stakeholders and technological developments that would allow the company to move forward in a carbon-constrained world.

**Internal Management Push.** Chairman and CEO Jim Rogers leads Cinergy with a long-term view and an approach that is rooted in stewardship. Given the expected 40 to 50 year lifespan of investments in generating capacity and the regulated nature of the industry, long-term planning is common for utilities. However, the principles of stewardship employed by Rogers are rare. “When your time horizon is short, you’re thinking ‘stonewall it and it won’t happen on your watch,’” Says 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.”

Today, when Rogers looks out over the business horizon, he sees six “signposts” indicating that climate change is an issue to be dealt with head on<sup>35</sup>. Notably absent from this list is scientific research and analysis. According to Rogers, “Our decisions are purely business based. The science is interesting, but not truly relevant for our purposes.” Based upon these trends, he believes it is his responsibility to prepare the company for the likelihood of operating in a carbon-constrained world.

**Signpost #1:** States are taking action.

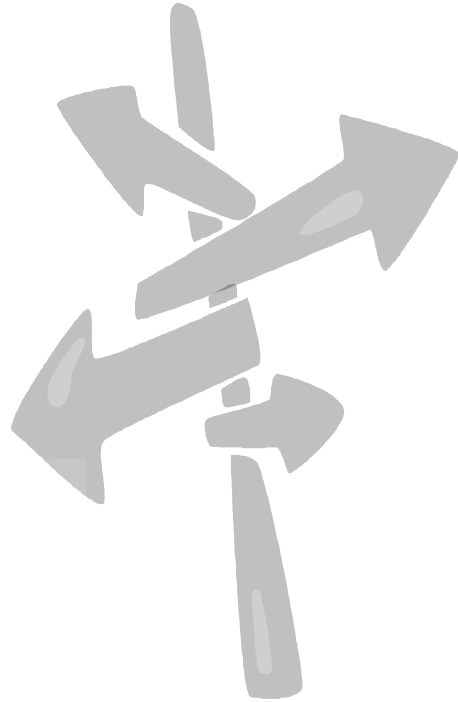
**Signpost #2:** An increasing number of U.S. Senators are expressing concern about global warming.

**Signpost #3:** The Kyoto Protocol was ratified and became law on February 16, 2005.

**Signpost #4:** A growing number of shareholder groups are asking companies to quantify the risks associated with GHG emissions.

**Signpost #5:** CO<sub>2</sub> and GHG emissions trading markets are developing in Europe and the United States.

**Signpost #6:** Global warming is becoming part of our everyday consciousness.



Cinergy deals with climate change as a long-term systematic effort primarily through capital investments and a focused public policy stance. This approach is well suited to the utility industry and aligned with the long-term nature of the climate change issue. Because climate change is caused by the concentration of long-lived GHGs in the atmosphere, there is cause to begin action but not immediate draconian reductions. The mantra is “slow, stop and reverse the growth of emissions.” Yet, according to Eric Kuhn, Principle Environmental Scientist, “There is a real commitment on Jim Rogers’s part to provide resources for this issue. CEO buy-in is critical, especially for a voluntary program.”

Rogers’ leadership style infuses the corporation with a strong focus on stakeholder engagement and transparency. His varied background and

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credentials lend legitimacy to his messages and engender trust from his audiences. Prior to joining PSI in 1988, he acted as an intervener on behalf of consumers in gas, electric and telephone rate cases in the Commonwealth of Kentucky, served as Deputy General Counsel for Litigation and Enforcement of the Federal Energy Regulatory Commission (FERC), and legally represented energy companies before the FERC, the Department of Energy, various Congressional committees and federal courts. Rogers has testified before Congressional Committees 13 times since 1989, on issues ranging from the environment to national energy strategy to industry restructuring.

The culture of stakeholder engagement dates back to when Rogers became head of Public Service Indiana (PSI) in 1988. At that time the company had a failed nuclear program, very poor relations with customers and was nearly bankrupt. Rogers introduced a strategy to improve relations through meaningful engagement with environmentalists, consumers and industrial groups in the state. Having a dialogue and listening with an open mind has developed trust from stakeholders, which has proven to be an asset for the company in efforts ranging from rate cases to locating infrastructure development. This credibility has extended into the policy arena, allowing Cinergy to base discussion on climate change on what it views as an economically rational foundation. Cinergy believes its collaborative approach is good for all of its stakeholders, including investors, customers, employees, policymakers, regulators, suppliers, partners and communities.

In fact, stakeholder engagement played a significant role in stimulating a more public position from the company on climate change. Early collaboration with the DOE on the Climate Challenge program and on-going interaction with policy makers on three air pollutant issues (sulfur dioxide, nitrous oxides and mercury) provided insight into the future of carbon regulation. Subsequent to these efforts, Cinergy made a commitment to participate in the current administration's Climate Leaders Program.

**Pull from external stakeholders.** In 2002, the Committee on Mission Responsibility through Investment (MRTI) of the Presbyterian Church (USA) submitted a shareholder resolution requesting that Cinergy provide information on GHG emissions and disclose the risks associated with climate change. Cinergy appealed to the Securities and Exchange Commission and was granted no-action relief. After MRTI tried again in early 2003, the company chose to reach out and engage in discussions that ultimately led to MRTI withdrawing the proposal. This dialogue also resulted in the development of a plan to disclose Cinergy's risks related to climate regulation.

In September, 2003, the company formally announced its internal GHG reduction program, a response to both the Climate Leaders Program commitment and the intervention by MRTI. In February 2004, the company announced it would partner with MRTI to develop the *Air Issues Report to Stakeholders (AIRS)*. The



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December 2004 issuance of *AIRS* was a watershed moment for Cinergy. The report provided a broader analysis of the company's risks related to climate change and other emissions, with a thorough discussion of the linkage between energy, economics and the environment. The effort also represented a more public positioning on climate change and a culmination of analysis that had begun years earlier.

**Technological developments.** Heavy reliance on coal exposes Cinergy to regulatory risk in any form of carbon regime. Despite this fact, coal's abundance and low cost in the United States leads the company to believe that coal will continue to be central to the country's longer term fuel mix. Cinergy's work with environmentalists gave it an early indication of a potential to break the carbon-environmental impasse; some environmentalists were warming to the idea of coal being part of the solution.

The most promising means currently available for utilizing coal in a carbon-constrained world is through the implementation of Integrated Gasification Combined Cycle (IGCC) technology combined with Carbon Capture and Sequestration (CCS). The coal gasification process converts coal into a synthesis gas (syngas) and produces steam. The hot syngas is processed to remove sulfur compounds, mercury and particulate matter before it is used to fuel a combustion turbine generator. The heat in the exhaust gases from the combustion turbine is recovered to generate additional steam. This steam, along

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with that from the syngas process, then drives a steam turbine generator to produce electricity. The technology has the potential to capture CO<sub>2</sub> much more economically than other coal technologies because a concentrated stream of CO<sub>2</sub> can be more readily removed from the syngas of an IGCC plant. Captured CO<sub>2</sub> would then be injected deep underground for geologic sequestration. Industry analysts estimate that carbon capture could add as much as 72 percent to the cost of electricity from a conventional pulverized coal plant, 60 percent to the cost of a natural gas combined cycle plant, but only 25 percent to the cost of electricity from an IGCC plant.<sup>36</sup>

The company has been involved in IGCC since the early 1990s when it built one of the first demonstration plants in the United States in partnership with the DOE through the Clean Coal Technology Demonstration Program. The West Terre Haute, Indiana plant is still in operation today with Cinergy purchasing syngas from it for one of the units at its Wabash River Station. In 2004, Cinergy entered into an agreement with GE Energy and Bechtel Corporation to study the feasibility of a commercial scale (600 MW) IGCC generating station. Although various sites were evaluated as potential candidates, Cinergy's preferred IGCC site is the current location of a 160 MW pulverized coal plant near Edwardsport, Indiana built in the late 1940s. Given the importance of the climate change issue and the ability to continue to use coal, geologic sequestration potential was included as one of the site criteria for the first time as part of the company's internal evaluation. A Front End Engineering and Design (FEED) study is being

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undertaken and should provide enough detailed design and cost information for a decision to be made whether or not to move ahead with the plant by late 2006.

Ultimately, Cinergy believes that resolving the climate change issue will require a paradigm shift regarding the technologies employed to refine and use energy. The types of technologies being discussed today and deployed over the next 20 to 30 years will all continue to utilize fossil fuel as their source of energy; even hydrogen would likely come from fossil fuels. Although they are more energy efficient and have the capability to capture CO<sub>2</sub>, they are only stop gap or bridging technologies to be used until low or zero carbon technologies are developed and deployed in the second half of this century.

But, notes Kuhn, “We are not a technology developer or owner. We are a customer for new technologies to enable us to economically operate our plants and/or produce electricity. We will however work with partners to provide test sites and assistance. But we’ll likely not be the owner of resulting patents. We know intuitively that the cost of reductions could be huge so that the pennies that we are investing in research today could have tremendous returns in the future if only a small portion of the costs are reduced.”

**Climate Program.** Cinergy’s GHG Management Goal of five percent below 2000 levels for the period 2010 through 2012 was developed to position the company to take meaningful actions on GHG emissions and provide the company with

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credibility to lead the climate change policy debate. But developing the goal first involved a risk assessment process, performed by Cinergy's risk management and portfolio optimization teams, which examined a variety of options for action.

Once an optimal goal was selected, it was reviewed by various non-governmental organizations (NGOs) and with that input, revised goals were presented to Cinergy's senior management. Many were uneasy with the wisdom behind setting such a goal, but most were persuaded that the strategic positioning and organizational learning were worth the associated risks. The goals were presented to Cinergy's Board of Directors as a matter of course, although not for official adoption. Similar to DuPont's response to both CFCs and GHGs, Cinergy set a target that was a stretch, not knowing precisely how it would achieve it.

The first step in implementing the new goal was performing an assessment of the baseline year 2000 GHG emissions. This effort was completed in 2004 and reviewed by Environmental Defense, who acted as an independent third party to add validity to the process. Environmental Defense has reviewed Cinergy's definition of its corporate emissions footprint, approved how GHG reductions are identified and measured, evaluated the company's implementation of the GHG fund, and serves as an ex-officio member of the GHG Management Committee that is charged with implementation of Cinergy's GHG goal. Cinergy has not yet engaged a third party auditor to verify its calculations, but plans to do so in 2006.

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Baseline year 2000 emissions were calculated to be 73.8 million metric tons CO<sub>2</sub>e.<sup>37</sup>

<b>Baseline year 2000 CO<sub>2</sub> Equivalent Emissions</b>		
<b>Source of Emissions</b>	<b>Tons CO<sub>2</sub>e</b>	<b>Percent of Total</b>
Legacy Electricity Generating Units	69,768,000	94.48
Fugitive Natural Gas	409,000	0.55
Cinergy Solutions Projects	3,454,000	4.68
Fleet Vehicles	36,000	0.05
SF <sub>6</sub> Emissions	176,000	0.24
<b>Total</b>	<b>73,843,000</b>	<b>100.00</b>

Given historical trends in energy demand, Cinergy's GHG Management Goal of a five percent reduction translates to approximately 70 million metric tons per year or less.<sup>38</sup> The goal was reviewed by EPA Climate Leaders staff, who determined, based on their own projections for electricity demand in the region, that the proposed goal was substantial. During the three year period 2010 through 2012, approximately 30 million metric tons of CO<sub>2</sub>e emissions reductions would be achieved.<sup>39</sup>

Reductions will come from the company's regulated and non-regulated electricity generating units, combined heat and power (CHP) facilities, natural gas distribution system, vehicle fleet operations and other operations that emit significant amounts of GHGs. Cinergy takes credit for emission reductions from its Solutions business, but only if it has an ownership position and operates the facility. The emission credits are not prorated based on a percentage of ownership since Cinergy is taking responsibility for all of the GHG emissions from

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the facility. Cinergy operates, but does not own, a number of industrial power generation and CHP facilities. When Cinergy has no control over capital investments or operational changes at these units, their emissions are not included in the GHG baseline. Unless ownership passes to Cinergy, such emissions will not be included in future measures. Furthermore, Cinergy does not track the indirect emissions that result from power purchases, as it is virtually impossible to determine the origin of electricity purchased by traders. Finally, emissions from the mining and transport of coal are not included in the calculations.

Cinergy intends to achieve at least two-thirds of emission reductions “on-system” (or within its operations), and up to one-third “off-system”.<sup>40</sup> On-system emission reductions involve projects that impact Cinergy’s direct emissions. Examples include: CO<sub>2</sub> emissions from smoke stacks and vehicular tailpipe CO<sub>2</sub> emissions, methane emissions from the natural gas distribution system, or SF<sub>6</sub> emissions from the transmission and distribution system. Examples of off-system reductions include: forestry projects, electric end-user efficiency projects, and research and development projects. Implementing both on-system and off-system projects will generate experience and knowledge regarding in-house technical capabilities for reducing GHG emissions as well as real-time data regarding the cost-effectiveness of such efforts. By taking these actions now, Cinergy will be better prepared to contribute to the policy discussion and to operate in a carbon constrained future.

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As emissions reductions are achieved, they are reported to the DOE's Energy Information Administration (EIA) through the 1605(b) reporting system and to the Environmental Protection Agency (EPA) as part of Cinergy's commitment under the Climate Leaders program. Cinergy feels strongly that early actors must receive credit for their voluntary reductions when legislation is ultimately passed.

Carbon dioxide is directly measured at generating units equipped with continuous emissions monitors (CEMs). For stations not equipped with CEMs, estimates are calculated using the BTU value of the fuel consumed multiplied by the pounds of CO<sub>2</sub> emitted per million BTU as provided through the DOE's EIA 1605(b) reporting program.

Measurement and verification of biological CO<sub>2</sub> sequestered by tree plantings undertaken by Cinergy begins with the identification of measurement plots for testing. Within each sample measurement plot, tree volumes, underbrush and soils are measured for carbon content. The measurements are repeated at regular intervals, data is extrapolated between years when the measurement plots are surveyed and the measurement results are applied to the entire acreage of plantings. This process provides a statistical confidence level of 95 percent.

### **Organizational Integration**

In the years 2004 and 2005, Cinergy budgeted \$3 million (what Leahy calls “tuition to learn”) for projects to reduce GHG emissions, the first two installments of seven comprising the total \$21 million GHG fund through the end of the decade. This budget is managed by the GHG Management Committee (the Committee), which is comprised of ten senior representatives from business areas that would be affected by GHG restrictions (legislation) and one ex-officio member, Environmental Defense. Annually, GHG reducing and offsetting projects are solicited throughout the company and are open to any employee who would like to propose a project. Project proposals are limited to five pages in length and include a description of how the project will reduce GHG emissions, quantification of projected reductions, evaluation of the project’s permanence, and an analysis of cost estimates for the project. Another critical factor is whether or not the project would be implemented without GHG Funds. Projects are reviewed, evaluated and ranked by staff using criteria established by the Committee. The projects are then presented to the Committee for their consideration and funding.

In 2004 and 2005, the Committee received over 150 project proposals. The majority of on-system projects were small efficiency projects in the power plants. Other on-system projects included wind and solar demonstration projects, the purchase of four hybrid vehicles for the Cinergy transportation fleet, and customer end use electric efficiency projects. Customer electric efficiency



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projects are considered on-system because they reduce the CO<sub>2</sub> emissions from Cinergy's power plants. Examples of off-system projects included tree planting and the funding of research and development projects in the areas of carbon sequestration, biomass fuels, and renewable energy generation.

In evaluating potential projects, Cinergy does not use a shadow price for carbon, largely because internal sentiment is that regulation is too remote and uncertain to reliably quantify a price. Another reason to not use a particular cutoff price for carbon is the secondary benefits commonly associated with the efficiency projects, such as reduced fuel consumption and reduced SO<sub>2</sub> and NO<sub>x</sub> emissions. Preliminary data collected for the power plant efficiency projects implemented in 2004 indicate that the projects actually return value to the company in the form of fuel savings and generation of SO<sub>2</sub> and NO<sub>x</sub> allowances. These projects were considered "low hanging fruit" but as the company moves forward with its climate change program, reductions are expected to become more costly.

The criteria currently used to evaluate project proposals are more subjective than objective, including considerations such as the age of the facility and its availability rate. Ultimately, the Committee is interested in the cost per ton of CO<sub>2</sub>e emissions reduced, but it also considers issues such as project replicability, longevity of reductions achieved, and whether funding sources other than those related to GHG would be available. However, the cost data being

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gathered is part of the institutional learning desired by the program, generating hard data from historical actions on available reductions at various price levels. This has value internally as well as in policy debates.

According to Kuhn, many of the on-system reductions have been projects “that were on the cutting room floor because they did not meet internal rate of return criteria.” These projects had been previously forgone because the return on modest efficiency gains, in the form of fuel cost savings, was negligible given low coal prices. “However,” says Kuhn, “these projects become attractive when the value of GHG emission reductions is taken into account.”

Of the \$6 million allocated in 2004 and 2005, \$4.4 million (73 percent) was invested in on-system projects and \$1.6 million (27 percent) funded off-system projects, reducing annual CO<sub>2</sub>e emissions by approximately 600,000 and 25,000 metric tons respectively. While it is not fully accurate to calculate a cost per ton from these figures due to the research and development projects that are included, Cinergy estimates that the actual average cost per ton of CO<sub>2</sub>e emission reductions was \$8.28 in 2004 (On-system reductions averaged \$6.43 and off-system reductions averaged \$609.00) and \$12.49 in 2005. Cinergy has reviewed its reduction calculation methods with Environmental Defense and EPA Climate Leaders staff, and has pledged to hire a third party auditor to verify emissions reductions and provide assurance that figures and estimates are accurate for meeting its period 2010 to 2012 goal.

**Cinergy’s 2004 GHG Fund Projects**

<b>Project</b>	<b>Total Incremental Funds</b>	<b>Annual Tons of CO<sub>2</sub> Reduced</b>	<b>Average \$/ton CO<sub>2</sub> (2004-2009 projected)</b>
<b>On-System</b>			
Heat Rate Improvement Projects at Generation Stations	\$1,940,000	349,882	\$1.11
Markland Dam Software Upgrade	\$285,000	7,400	\$7.70
Hybrid Cars	\$20,000	26	\$153.85
Renewable Energy Demonstration Projects *	\$55,000	35	\$314.29
<b>Off-System</b>			
The Nature Conservancy Reforestation Project	\$180,000	1,000	\$36.00
Vestar - Oldenburg Academy Energy Conservation Project *	\$90,000	62	\$290.32
Cincinnati Zoo Education Center Solar Project *	\$150,000	33	\$909.09
EPRI Research Project	\$250,000	---	
<b>Total All Projects</b>	<b>\$2,970,000</b>	<b>358,438</b>	<b>\$1.66</b>
<b>On-System Projects and Reductions</b>	<b>\$2,300,000</b>	<b>77.4 percent</b>	
<b>Off-System Projects and Reductions</b>	<b>\$670,000</b>	<b>22.6 percent</b>	

\* Small demonstration projects are more expensive than the costs per ton that Cinergy would accept for full scale utility projects.

Looking more long-term, Cinergy is examining the potential of larger scale renewable energy sources in its service area, including wind, solar and biogas/biomass. But, according to Leahy, “Investment options depend in part on what one believes will happen on the technology front when regulation is set. For now, plant efficiency improvements will be first. These will be followed by loose methane from leaking pipelines and landfills, bio-mass co-fire in existing coal plants, and upgrades in renewables as possible. Tree planting will be part of the mix, but less than originally assumed as it is more costly than originally thought.

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There may be technologies like algae based ‘scrubbers’ to lower CO<sub>2</sub> from existing plants – though this is very early stage – that will be useful for existing plants.”

Some modest funding has been allocated to the development of renewable energy generating capacity, an energy conservation project, and carbon sequestration.<sup>41</sup> However, it is not believed that renewable energy sources will play a significant role in the voluntary GHG emissions reduction program, primarily due to their intermittent characteristics. When renewable energy sources are dispatched in regions where Cinergy operates, economics dictate that the most likely impact is displacement of a gas fueled unit, rather than a coal fired unit. However, should GHG legislation be passed, such technologies would become more competitive in a rising wholesale electricity market, and therefore could also become a more viable part of Cinergy’s generating portfolio.

That said, not all projects are chosen for low cost emission reductions or long-term research value. Some are chosen for their symbolic or educational value. For example, the company’s purchase of hybrid vehicles for its fleet does not represent the most cost-effective GHG emissions reductions available, but they do succeed in making the program tangible to employees and stimulating conversation.

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Overall, the corporate culture of stewardship, the leadership of Jim Rogers, and the structure of the program have all been critical in garnering internal support for the climate change program. Naturally, having capital available to fund projects in a time of capital constraints makes the program much more real for staff working at the plant level. But the most critical component of Cinergy's program implementation, according to John Stowell, VP of Federal Legislative Affairs, Environmental Strategy & Sustainability, has been communication. "Internal and external communications are part of the culture at Cinergy," says Stowell. "Plant managers know about this program. We have meetings with them, and Jim Rogers discusses the issue often."

**External Outreach**

External communication is an on-going component of Cinergy's GHG reduction program as well. In fact, it is such an integral part of the company's on-going initiatives and strategy already discussed that treating it as a separate initiative is not completely correct. Cinergy actively engages stakeholders to keep them informed and involved throughout the policy discussion and also to gather important feedback. In reality, the company finds the nuts and bolts of the program are of most interest to other specialists, while the wider public is interested in Cinergy's policy position and endorsement of regulation.

One way Cinergy began to engage its many stakeholders on climate change was through a third party consultant who conducted interviews which were published

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in the 2004 Annual Report titled *Global Warming: Can We Find Common Ground?* Taken as a whole, they led to a number of conclusions that reflect the core of Cinergy's approach to climate change: global warming is a complex problem that must be dealt with holistically; time is of the essence; the customer is still the top priority; good corporate governance is based on stewardship, and; uncertainty will likely persist on this issue.<sup>42</sup>

But the challenge the company discovered in reaching out to stakeholders was finding a balance between the short-term interests of some groups of investors focused on quarterly earnings results, and the long-term interests of other groups such as employees, customers and communities. According to Rogers, "It's important to deliver for the investor, but when running your company from a stakeholder perspective, you include customers, communities, everyone. You need to raise rates slowly for the customer. You often need to make decisions that do not necessarily maximize the next quarter." The company has found that, because the financial risk associated with climate change is still uncertain, institutional investors are not as interested in this issue as they are about the prospects for near term financial results.

**Policy**

The uncertain regulatory environment flows through to uncertainty regarding the value of Cinergy's assets. It also makes it very challenging to evaluate large capital investments going forward. To help resolve this uncertainty, the company

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has laid out a number of broad criteria that it believes future regulation should encompass. GHG policy should focus on all sectors of the economy, embrace market-based cap-and-trade principles combined with a “safety valve,” and be neutral to fuel type. In addition, compliance flexibility, including off-system reductions, is critical to finding a least-cost solution. Finally, GHG policies should be international.

Ultimately, Cinergy believes the policy should take steps to slow, stop and then reduce emissions growth while promoting public-private partnerships for the development of technology solutions (such as IGCC with CCS). The cost for individual companies of complying with GHG regulation will depend upon the timetable for implementation, emissions reduction requirements, allowance allocations, the impact on fuel prices and ultimately the format of the regulation. It is believed that a cap-and-trade program would be less expensive than a command and control approach.<sup>43</sup>

Cinergy communicates this message to lawmakers through the normal channels of the regulatory and legislative processes, including meetings, discussions at conferences and public statements. The company is not alone in its policy stance; utilities such as Exelon, Entergy and PNM have taken similar positions. According to Leahy, “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. We’ve spent more time working on this problem and so

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have a better understanding of it than most. Our job now is to help other firms by being open with what we've found – facts are friendly.” Industry groups such as the Edison Electric Institute provide a forum for CEOs to share perspectives and hear from experts. When Rogers takes the rotating Chairman's position in June, 2006, he hopes to help the organization move toward a broad consensus regarding climate change; perhaps one that focuses on opportunities, not just risks.

**Challenges Ahead**

Cinergy's strategy is designed to position the company as an industry leader on climate change. That has paid off with recent recognition by Ceres as one of the electric power sector leaders (tied with AEP).<sup>44</sup> But when asked what the company could be doing better, Stowell responds that the company needs to go even further in presenting its policy position. “Being clearer on the details of desired policy would be helpful. We could probably benefit from communicating more with other utilities and coal companies about what we've learned regarding the risks and potential upsides. At the same time, we don't have all the answers or any precise legislative language to promote. But it's clear we're getting close to the point where all of us will have to come up with something more defined. That includes who's covered, what sort of allocation process to use, what's the base year for determining the level of the cap and so on. As is often the case, the devil will be in the details – but that's where we should be able to help.”



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And for all its strides, Cinergy people still feel the pressure to stay on top of technology developments so as to prepare for the market shift that climate change will create. According to Kuhn, “There are opportunities for reducing the cost of compliance by being active in the shaping of policy. There are also opportunities available by getting ahead of the curve to be in a position to be a first mover. If you’re looking for the technologies, you’ll be there to make the investments.”

Like David Hone at Shell, Rogers worries how climate change could alter the fundamentals of his industry. “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.” Having a seat at the policy table and influencing the final legislation will help ensure that it fits with Cinergy’s interests and future direction.

### **Cinergy's Merger with Duke Energy**

In May 2005, Cinergy and Duke Energy announced they would merge in an all stock transaction. The combined company will retain the Duke Energy name, and will be headquartered in Charlotte, NC, the current home of the much larger Duke Energy (2004 revenues of \$22.5 billion and generation capacity of 32,000 MW.)<sup>45</sup>

The merger is attractive on many dimensions, climate change being one of them. Rogers feels that the strong cultural fit between the two utilities assures that efforts on climate change will continue. Duke Energy CEO Paul Anderson (who will become Chairman of the combined company while Rogers takes over as President and CEO) "has already socialized the issue at Duke," says Rogers, "my assignment is to continue to lead on it."

Synergies between the two companies' fuel diversity may help that process along. For example, Duke Energy's 3,600 MW of gas fired capacity located in the Midwest has not been profitable for Duke in the past. But these assets could be utilized immediately by Cinergy to meet system capacity requirements. If gas prices were to drop significantly, they could also reduce carbon emissions by shifting generation away from older coal fired units, thus creating a partial hedge.

Another important aspect of this merger is nuclear power. Rogers explains, "If you think about a carbon-constrained world and our need for energy, nuclear may be an option for the future." However, both legacy companies that formed Cinergy (PSI and CG&E) had failed attempts at building nuclear capacity. Rogers continues, "Given our history, nuclear was not an option for us; coal and gas were it. Combining with Duke, one of the best nuclear operators in the country, gives us the assets and expertise to work in a future where nuclear is an option."

Despite these benefits, the risks associated with climate change were not part of the asset valuation process. Rogers explains, "They are regulated in rate base, as are we. Intrinsic value does not really change with carbon regulation because the cost would be passed through to rate payers. The [non-regulated] Ohio assets would change in value, but with their very low variable costs, they could remain competitive with a carbon charge." The larger picture shows that the portfolio of the combined company will be more diverse, lowering the regulatory risk profile.

The favored policy outcome of the combined company remains to be seen. Cinergy has maintained that a cap-and-trade policy would be best, while Duke has promoted a carbon tax. "We've been thinking about this for a long time," says Rogers, "We see how successful cap-and-trade is with SO<sub>2</sub>. Further, we don't think a tax is politically viable. In any case, the least expensive long term policy will employ a price signal of some sort." Rogers acknowledges the need to develop a position that best suits the combined entity. Yet one thing is clear, the size of the combined entity will provide much greater weight in shaping the policy debate moving forward.

## ***Staying One Step Ahead on Climate Change, Not Two Swiss Re\****

Where other companies in this report are motivated by the potential risk of future climate change regulation, Swiss Re stands out as being more at risk from the physical impacts of climate change itself.

The insurance industry may experience dramatically increased costs due to a growth in climate-related effects; including growth in natural disasters, disease vectors and mortality rates over the next ten years.<sup>46</sup> But in keeping with the nature of reinsurance, the company has been working hard to integrate this risk into its business model. According to former Chief Executive Officer John

<b>Swiss Re's Footprint (2005)</b>	
Headquarters:	Zurich, Switzerland
Premiums earned:	CHF 27.8 billion (\$22.4 billion)
Employees:	8,882
Percentage of Emissions in Kyoto Ratified Countries: 90 percent	
Direct CO <sub>2</sub> Emissions:	6,829 MTons*
Indirect CO <sub>2</sub> Emissions**:	42,863 MTons
Aggregate CO <sub>2</sub> Emissions:	49,693 MTons
Target:	GHG Neutral by 2013
Year Target Set:	2003
* Metric tons.	
** Measured as electricity use and business travel.	

Coomber (retired at the end of 2005), "While companies in most industries aim to avoid risks, reinsurers create value by analyzing risks and providing coverage for those they judge to be insurable."<sup>47</sup> "Climate change is a phenomenon that is starting to have a major impact on Swiss Re, its partners and clients. The question is no longer whether global warming is happening, but how it will affect our business, as well as our personal lives."<sup>48</sup>

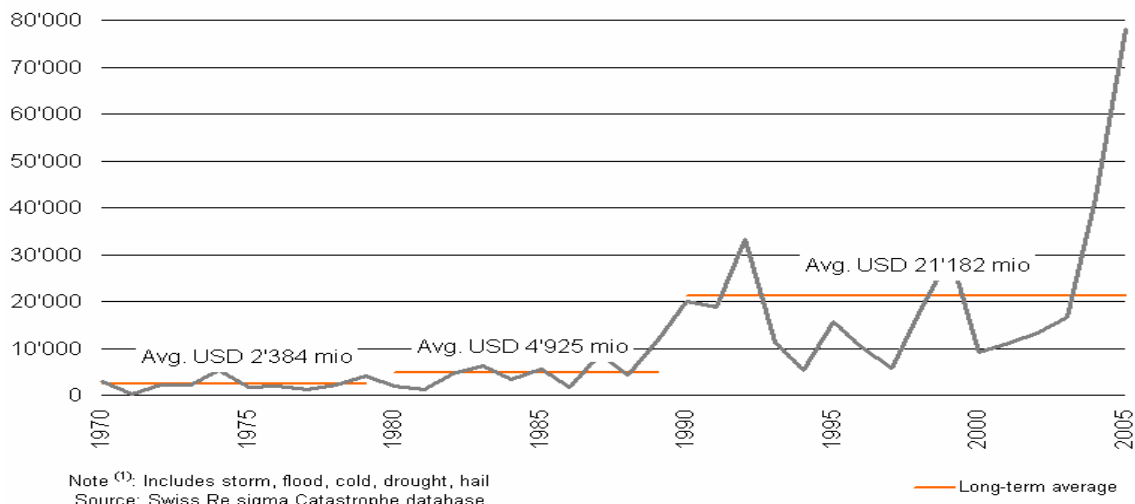
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\* We would like to thank Nigel Baker, David Bresch, Pascal Dudle, Ivo Menzinger, Andreas Schlaepfer, Cosette Simon, Brian Thomas, Chris Walker and Mark Way for their contributions to this case study.

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According to Chris Walker, Head of Sustainability Business Development, climate change is a central concern to the company because, “It could change the predictive model. If we don’t have that model right, we could face problems in pricing some business going forward.” In short, climate change undermines the fundamental model upon which reinsurance is based: that the earth’s systems, though somewhat unpredictable in the short-term, are stable in the long-term. “What Swiss Re wants most is statistical regularity,” says Brian Thomas, Manager of Content and in-house editor. But that statistical regularity is disappearing. According to Swiss Re, the insurance industry recorded \$38 billion weather related natural catastrophe losses in 2004, the largest amount to date (see table). In 2005, the company estimates that total insured natural catastrophe property, and business interruption losses for the industry reached \$78 billion. This figure does not include uninsured natural catastrophe-related economic losses, which the company values at \$174 billion for windstorms.

**Weather related <sup>(1)</sup> Nat Cat insured losses 1970 - 2005**  
(property and business interruption)  
USD mio, at 2005 prices



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Considering the company's substantial climate-related risk, Swiss Re has worked hard to promote understanding and action on climate change for more than a decade. Though the company received public notoriety for its early actions to address the issue, efforts at creating business opportunity through climate change mitigation related products and services have fallen short of financial expectations. Walker feels that, "Considering how the political climate subsequently developed we were in the game too early; as a consequence, we lost momentum." Where Swiss Re was once the most visible financial services company on this issue,<sup>49</sup> that may no longer be the case. A 2005 *Business Week* article ranked the company eighth among its peers, behind climate newcomers such as HSBC and JP Morgan Chase.<sup>50</sup> Walker believes this is a result of a recent increase in attention to new entrants rather than a judgment of Swiss Re's 10 years of activity and commitment on the issue.

But the company is careful in its attempts to rectify this situation, wishing to be sure that there is no discrepancy between the company's external perception and internal reality. According to Mark Way, Head of Sustainability Issue Management and Reporting, "This is not about PR. We believe that the materiality of our commitment is comparable with the best of our peers. However, there is a danger to being perceived as a leader." David Bresch, Head of the Atmospheric Perils Group, agrees. "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."

## **Company Overview**

Headquartered in Zurich, Switzerland, Swiss Re is the world's largest life and health reinsurer, and second largest reinsurer overall.<sup>51</sup> With operations in 70 offices spanning 30 countries, the company has three divisions: Products, Client Markets and Financial Services (which includes Asset Management). Forty-nine percent of Swiss Re's premiums come from North America, 38 percent from Europe and 13 percent from other parts of the world, mainly Asia. "We're a Swiss company with an American accent," quips Cosette Simon, Senior Vice President for Government Relations and Public Policy.

Swiss Re has historically operated as a quiet company in a low public profile industry. That said, there is a strong sense of pride within Swiss Re about its roles as a "knowledge company" and an "enabler" with a very long-term perspective. The company, for example, tries to avoid advocating a particular policy or regulation. Rather, it wants to be called upon for objective expertise on informing the development of that policy. "We want to be the first or second call someone makes if they want advice on the financial side of climate change," says Walker. As an "enabler," the company makes business deals and development projects possible by providing the necessary instruments to offset and diversify risk.

Because Swiss Re is a reinsurance company, it naturally tends toward more

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long-term and global perspectives when it comes to risk diversification. Climate change fits perfectly with that focus. According to Simon, “Climate change is a conservative issue with Swiss Re. It’s about caretaking, stewardship, and a fifty-year time horizon.” As a result, Swiss Re has distinguished itself through a relatively long-standing strategy of external awareness building. In fact, more so than other companies in this report, awareness building, external outreach and scientific research programs as well as innovative climate adaptation products such as the use of weather derivatives and catastrophe bonds, where they are the market leader, are perhaps the most important components of Swiss Re’s climate-related strategy.

**Strategy Development**

Swiss Re produced its first publication on climate change – *Global Warming, Elements of Risk* – in 1994. This report was ground breaking for the simple fact that it came from a financial services company and argued that the repercussions from climate change “could be enormous, with threats posed not only to citizens and enterprises, but also to whole cities and branches of the economy, even entire states and social systems.”<sup>52</sup> With that as a starting point, the company has continued to establish its leadership position on this issue through efforts aimed at building awareness with clients and the broader public. Between 1995 and 1998, the company released four publications and conducted three client seminars on the topic.

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Moving beyond education, Bruno Porro, former Chief Risk Officer (retired in 2004) tasked Walker in July 2000 to look at potential business opportunities related to climate change through a group wide feasibility study. Walker identified nine areas of possible relevance to the company's business lines and, with the support of two executive board members on his advisory board, he identified nine champions within those areas who were willing to dedicate the extra time needed to explore them. In this process, Walker took special care to make sure that he brought the right people on board, remarking that he "only wanted intrinsically motivated managers – people who would read things at night."

Six months later, Walker presented his findings to the executive board. Not surprisingly, the central question following his presentation was, "Is this going to make money?" Though Walker admits that he did not have specific numbers to back up his rationale, he said that it would. The executive board supported the creation of Greenhouse Gas Risk Solutions (GHGRS) by approving a staff of four. "Before this," says Walker, "climate change was more a scientific concern. Now it was becoming more of a business development issue." The company narrowed the original list of nine areas to four business elements: investments, third party asset management, insurance/derivatives and emissions trading. Swiss Re's general approach to climate change is centered on the elements of: research, products and services, management of its own emissions profile, and awareness building.



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**Research.** Similar to DuPont, Swiss Re seeks to better understand its business exposure to climate change by developing internal expertise in climate science. According to Bresch, “The role of science at Swiss Re is to know what is possible because it helps the company identify, analyze, mitigate, and then, if possible, transfer our risk.” Bresch also notes that while most reinsurers have scientists Swiss Re is unique in that it is one of the few that does all its modeling in-house. As a leading reinsurer, Swiss Re develops and maintains Natural Catastrophe (NatCat) state-of-the-art in-house models for all major perils worldwide, relying both on the knowledge and expertise of 30 NatCat experts in Zurich, Armonk (New York), Munich and Hong Kong as well as on active collaboration with leading scientific institutions worldwide.

The NatCat modeling did not always have such a prominent role in the company. As recently as 1980, Swiss Re employed only two full-time scientists within the NatCat unit. The staff grew over time to cope with the increasing complexity and the growing demand for detailed NatCat risk assessment and proper portfolio management. Starting from earthquake and windstorm models for key markets, the unit further developed tropical cyclone and flood models and now covers all relevant (re)insurance markets worldwide.

While climate change has been monitored by climate specialists within the NatCat team since about 1990, quantitative analysis and integration in risk assessment and management processes started only when detailed impact

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studies became available. Where Swiss Re has been able to establish quantitative relationships, it has started to account for climate change risk in reinsurance pricing. This actually happened when Swiss Re decided to adjust its hurricane model in September 2005 to reflect the effects of natural climate variability, any superimposed human induced trend, and increased modeling uncertainty. Swiss Re's NatCat experts follow and participate in actual research through collaboration with leading scientific institutions in order to identify climate effects at an early stage.

**Products and Services.** To be more proactive, Walker has adopted the mantra, "Distinguish ourselves relative to our peers." In that vein, he is searching for ways to improve underwriter's ability to bring climate change into policy decisions. "In Property and Loss (P&L), this is a stronger pitch," says Walker. "In Life and Health (L&H), it is harder."

One area where the company sees a possible link between its products and climate change is Directors and Officers coverage (D&O). According to Walker, "As soon as the obligation to reduce greenhouse gas (GHG) emissions becomes regulated, failure to comply or a mismanagement of carbon exposure could affect a company's performance and potentially create personal liabilities for directors and officers. Such regulations are already in force in some countries and are likely to become effective in the reasonably near future in the United States."

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Signifying the risks of being a leader on climate change, Walker was once misquoted in the *Wall Street Journal Europe* as stating that Swiss Re will not provide coverage for climate change related D&O risks. Instead, the company uses climate change as one measure among many to determine risk exposure. For example, with corporate clients, Swiss Re now looks to see if the applicant company has responded to inquiries from the Carbon Disclosure Project. If not, the company may add climate related questions to its standard questionnaire to D&O insurance applicants.

The company is also testing the waters of integrating climate change related risk factors into other traditional offerings. Business Interruption (BI) coverage is one promising area that Walker is evaluating. While BI insurance traditionally provides coverage for a plant that is forced to close temporarily, Walker is analyzing whether this coverage should include the value of tradable credits for ceased emissions during the shut down. In another area, the new Environment and Commodities unit has received a mandate to trade emissions. This unit is the combination of the old weather unit (insurance and derivatives) and emissions (SO<sub>x</sub>/NO<sub>x</sub> and GHG) and is presently in the process of staffing up and has not yet started to trade.

Another important area of products and services is asset management which had an investment portfolio of CHF 114.9 billion in company assets as of the end of 2005. Of these assets, 89 percent are invested in fixed-income, seven percent in

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equity, and the remaining four percent in alternative investments, including real estate. As early as 1996, Swiss Re asset management started to build up a dedicated Sustainability Portfolio comprised of investments which support sustainable development and efficient resource utilization. By 2004, approximately CHF 90 million had been invested in this area. In 2005, the company integrated the Sustainability Portfolio (including staff) into the alternative investments unit to benefit from a dedicated, institutionalized investment process.

Today, the company channels its sustainability investments 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. Lastly, the team seeks to invest in different geographical regions, with the target to reach a solid portfolio diversification in different markets. 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.

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**Emissions Reduction.** In October 2003, Swiss Re was the first company in the financial services industry to announce that it would eliminate/compensate all GHG emissions, with a goal of becoming carbon neutral by 2013.<sup>53</sup> According to Walker, “We need to do this if we are going to be seen as credible.

At present, the company’s GHG emission footprint is roughly 50 thousand metric tons, an amount management acknowledges is merely “a rounding error” of many of the companies in this survey. Direct emissions come from the combustion of office heating fuels (13 percent) and indirect sources include office electricity use (44 percent) and business travel (43 percent). Swiss Re plans to achieve a 15 percent reduction of these emissions through actual facility reductions and the remaining 85 percent through the World Bank Community Development Carbon Fund. The company is committed to increasing its purchase of renewable energy from 14 percent of the company’s total worldwide energy consumption in 2005 to 37 percent in 2006 and 50 percent in 2007. Although the majority of this energy will come from wind, the particular source and quality in each location will depend upon regional availability.

Andreas Schlaepfer, Head of Internal Environmental Management, heads up the initiative and believes that for non-manufacturing companies like Swiss Re, substantial reductions in emissions resulting from energy conservation are quite easy; “If you’ve never focused on energy efficiency before, achieving 30 percent reduction is simple.” However, for Swiss Re to achieve 15 percent will not be

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easy since this target is in addition to savings made in previous projects. To achieve the company's goals, the program will focus on two primary areas: curbing emissions from both Swiss Re's offices around the world and business travel.

Office emissions come from the nine buildings that the company owns and another 61 in which it rents space nine. While the nine owned buildings are responsible for 87 percent of the company's total energy consumption, the company includes rented office space in its carbon neutral initiative. Swiss Re employs a three-tiered approach to reduce its energy consumption. The first tier is zero-cost investments, such as turning down heating and cooling, and turning off lighting systems during non-working hours. The second tier focuses on small investments with paybacks of one year or less, such as motion sensors and compact fluorescent light-bulbs. The final tier includes refurbishments of property and buildings owned by Swiss Re, such as replacing cooling towers, generators, insulation or windows. The payback period for these investments can be as high as 10 years. Swiss Re has not established a formal budget to address these tiers, but will draw from the company's annual logistics budget.

To date, the company has conducted energy audits and provided recommendations for corrective measures in its three highest carbon-emitting offices. Based on the recommendations, local action plans have been drawn up for the next three years. Meanwhile, the company has learned some key insights

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into why some offices have more emissions than others. In some cases, it may just be age, location or that one building manager is more energy conscious than another. In other cases, operations that are split between two separate buildings with different property managers minimize the company's leverage with property management. Swiss Re is consolidating office space wherever possible and actively organizing tenant groups to create change within the management company.<sup>54</sup>

One prominent example of the company's efforts to become more energy efficient (and more visible) is its new office building at 30 St. Mary Axe in London. The building, known as the "Gerkin" after its unique shape, utilizes natural ventilation in addition to air conditioning. Due to this efficient design, it is expected that for much of the year the heating, ventilating and cooling (HVAC) systems can be switched off, thus reducing energy consumption and CO<sub>2</sub> emissions.

Emissions from business travel are the second, and more difficult, component of Swiss Re's carbon neutral initiative. Responsible for 43 percent of total company emissions, these emissions have been growing in both nominal and relative terms in recent years and are expected to overtake other emissions within the next two years. The reduction strategy is directed exclusively at reducing short distance trips for internal meetings. According to Schlaepfer, it would be unrealistic and inconsistent with Swiss Re's business growth strategy to regulate

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business travel aimed at meeting current or potential clients, particularly in rapidly growing regions of the world such as Asia.

Although the company has not created any formal incentives encouraging employees to reduce internal travel, Schlaepfer has the support of top management for this initiative. In a CEO Newsletter in 2005, CEO Coomber touted the environmental and economic benefits from reducing business travel for internal meetings. Employees are required to secure the approval and signature of an immediate supervisor before taking such a trip. According to Schlaepfer, the most significant challenge is overcoming the human hurdle and unspoken professional incentive to network face-to-face with employees in other offices. To overcome this bias, Swiss Re provides employees with the latest telephone or video conferencing technology and Schlaepfer arranges video conference training sessions to help mitigate any potential technological hurdle.

While the company plans to register its emissions reductions with the World Economic Forum's Greenhouse Gas registry, Schlaepfer states that Swiss Re will retire them rather than sell them. The company will also retire any renewable energy credits (RECS) that it purchases to meet a goal of 30 percent of its electricity purchases coming from green sources in the United States in 2006. The company may place carbon on the Chicago Climate Exchange (having joined in 2005) for trading purposes in the future but initially, the goal is to spur the market by demonstrating fungibility between markets by exchanging United



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States based carbon credits with those from another jurisdiction. Explains Schlaepfer, “Our aim is to do something for the climate. This is a voluntary action, and it is not triggered by profit thinking.”

**Awareness Building and External Outreach**

Of all the companies studied in this report, Swiss Re places the most emphasis on external awareness building within its climate-related strategy. The irony is that the company has historically sought to remain quiet and not draw attention to itself or its positions. Although the company had been in the United States for over 100 years, “no one knew who Swiss Re was,” states Walker. “We were always a B2B<sup>55</sup> company.” The company’s approach to global warming ended this anonymity.

In July 2002, Swiss Re orchestrated a watershed event by sponsoring, along with AON, Duane Morris LLP and Natsource, a two-day conference at the New York Museum of Natural History called *Emissions Reductions: Main Street to Wall Street – The Climate in North America*. Bringing together more than 200 business, government and environmental leaders, this meeting was among the first instances in which Wall Street engaged on the climate change issue. More importantly for Swiss Re, it successfully garnered enormous attention from the press, public and financial community.

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Building off this success, the company has continued to work to educate those within the financial industry. Using its in-house conference center (the Swiss Re Centre for Global Dialogue at Ruschlikon), the company creates forums to discuss “global risk issues and to facilitate new insight into future risk markets.” The center has hosted three forums on climate change, including one in 2003 cosponsored by International Emissions Trading Association (IETA) that focused on developing carbon markets.

In another ground breaking move, Swiss Re partnered with Stonehaven CCS Canada in 2003 to develop an educational video about climate change designed for the general public. *The Great Warming* is a three part (45 minute installments), television documentary highlighting the roots of climate change and its possible implications in the future. Narrated by singer/songwriter Alanis Morissette and actor Keanu Reeves, the internationally promoted series was filmed in eight countries on four continents and was endorsed by dozens of the world’s leading scientists. First aired on Discovery Canada in 2004, it was subsequently broadcast in the fall of 2005 on the Public Broadcasting System (PBS) in the United States under the title *Global Warming: the Signs and the Science*. It has also been edited into a theater version which will be showing in the spring and summer 2006. In retrospect, *The Great Warming* is considered a huge success for the company. Not only did it distribute well to major television studios around the world, but Swiss Re has received only positive feedback on the final product.

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From a more academic perspective, the company partnered with the United Nations Development Program (UNDP) and the Center for Human Health and the Global Environment at the Harvard Medical School in 2004 to host a conference involving 250 scientific and business experts. They gathered to examine the physical and health risks of climate instability and formulate climate change scenarios and potential impacts on the environment, human health and the economy. Released in 2005, the final report – *Climate Change Futures: Health, Ecological and Economic Dimensions* – explains the links between climate change and human health.

Through such events and materials, the company has steadily transitioned from producing strictly client-centered publications to producing materials for a much broader public. It is clear that climate change has significantly altered the company's approach to external outreach. In Baker's estimation, "Climate change is one issue where we moved from internal to external dialogue." For example, according to Baker, "There was a lot of soul searching within the company on whether to get into television. Reinsurance is traditionally faceless." But he believes that *The Great Warming* is largely responsible for giving "a faceless Swiss company" some public recognition, particularly in the United States. "Although people may not know what we do, they know our name." Toward this end, CEO Coomber was instrumental in helping the company overcome internal concerns.

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More importantly, the company's broader outreach approach is critical for creating awareness of climate change, and therefore its business interests. According to Baker, "Our client's clients (such as you and me) are also a part of the problem. Reinsurers are at the back end of the game. Some insurers may be under less pressure to change the behavior of their clients because it doesn't hurt their pockets as much as ours. But we can't dictate. We must try to gradually build awareness." For example, *The Great Warming* was aimed largely at a North American audience, a demographic that the company sees as in critical need of climate change awareness building. As Gerry Lemcke, Deputy Manager of the Catastrophic Perils Unit, explains, "this TV series comes at the right time in the right country."<sup>56</sup>

**Organizational Implementation**

Within Swiss Re, some of the most significant future areas of group-wide strategic relevance are categorized as "top topics." Climate change has been a top topic since the program was developed in 2001. The selection process for top topics is currently run by the Issue Management Unit. Using sources such as SONAR (Systematic Observations of Notions Associated with Risk), this group of three employees conducts four or five meetings a year with staff to get input about relevant, emerging business issues. After a brief is drafted about any particular issue, it is submitted to the 15-member Issue Steering Committee, a diverse group of senior employees, up to executive board level, from areas such

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as property, casualty, and HR. It is the responsibility of this committee to determine whether a particular suggestion is categorized internally as an “issue,” “topic,” or “top topic,” in increasing order of importance. Each categorization receives differing levels of attention and budgets. Beyond climate change, the other eight top topics, most of which come from the risk side of the business, are: natural catastrophes, water, insurance linked securities, liability regimes, mortality, nanotechnology, solvency and terrorism.

While top topics signify internal and external commitment to issues such as climate change, there are organizational challenges to generating internal consensus and support for the issue. Way argues that “internal awareness is built by making a clear link between climate change and our business bottom line.” To increase awareness within the Asset Management Division, for example, the company has worked with Sustainability Asset Management (SAM) to bring in sustainability professionals to educate portfolio managers on how climate change, environmental, and social issues impact stock prices and the valuation process.

The company also works to educate employees on the changes they can make in their own lives to benefit the environment. And again, “You have to try and link the issue to employee’s daily lives,” says Schlaepfer. “Remind them to live up to Swiss Re standards (such as integrity) and take them home with you.” Schlaepfer believes the company can do this because, in return, Swiss Re

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encourages employees to bring their diverse values and ways of thinking back to the company. But, says Schlaepfer, "the key is not telling employees what to do."

Educational efforts begin with new employees. In Zurich, a component of new employee orientation specifically focuses on climate change. In the last three years, the company has also held a series of marketing and educational initiatives during lunch hours to make the connection between climate change and employee's lives more clear. The voluntary events focus on energy, business travel, commuting, video conferencing and other issues. In one event, the company arranged for 15 hybrid-electric vehicles to be brought to the Zurich office for all employees to test drive. The company has also arranged a series of "Lunch and Learn" sessions, during which internal and external speakers present climate change related research and information to all employees over lunch. Finally, the company recently organized an on-site climate change art exhibit that depicted glacial melting in various regions of the world by contrasting postcard images from the early 20<sup>th</sup> century with photo images from the early 21<sup>st</sup> century. Although all previous marketing efforts have been in the Zurich office, the company plans to repeat similar, tailored events in offices around the world.

**Policy**

Swiss Re's foray into government relations is a relatively recent effort. In the United States, the company's operations are primarily regulated by individual states rather than the federal government. Cosette Simon, who joined the

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company in 2001, is the company's first government relation's professional. (The company has recently hired a second person to work in this area.)

Although Simon admits that climate change issues account for less than five percent of her time, the company has leveraged its resources and has been vocal on Capitol Hill. Walker has traveled to Washington D.C. no less than 25 times and has testified before the Senate. In addition, Walker has testified before the New York State legislature's Insurance committee, and the company has weighed in support of California's Greenhouse Gas initiatives by serving on the California Climate Change Advisory Board and the Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade system covering seven states in the Northeast United States. These efforts are viewed by many within the company as an extension of the "knowledge company" mantra. As Simon explains, "We feel an obligation to share our expertise with policy makers. We search for the proper public policy, not just what is good for Swiss Re. We sometimes even engage in issues where we have expertise but we may not have a dog in the fight." She adds, this allows her to go to Congress without an axe to grind.

When it comes to specific policy, the company is very open to suggestions. Given its vulnerability to the physical implications of climate change, what is most important to the company is progress of any kind. As Walker notes, Swiss Re has no vested interest in engaging conversations about "whether we need five percent or six percent reductions. We need 60 percent reductions to stabilize

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climate change. Period.” According to Simon, “Swiss Re supported McCain-Lieberman because it is progress and has been the only game in town. We’re just trying to get traction someplace. We may have supported something else if it had a chance of passage.” In short, the company is willing to endorse policies in which the government is involved, compliance is mandatory, and, according to Simon, “market mechanisms that strike the right balance between environmental and societal policy objectives.”

Swiss Re has also been involved in a number of global forums on climate change. For example, the company joined 23 multi-national companies in signing the declaration prepared by the G8 Climate Change Roundtable in 2005. The statement calls on the world’s governments to create a long-term policy framework to allow for “clear, transparent, and consistent price signals” for carbon. In addition, the company has been participating for the last four years on the issue in the World Economic Forum in Davos, and has been closely involved in the efforts of Prime Minister Tony Blair as part of the United Kingdom’s leadership in the G8 process and focusing on climate change.

**Challenges Ahead**

Given its early action on climate change, Swiss Re provides a wealth of lessons on how to act, as well as notable impediments that could be faced by a broad array of companies. Like other companies in this report, a key lesson from Swiss Re has been the importance of executive-level buy-in for the company’s strategy.



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Walker says that whenever he approached senior management for support and resources for climate change activities, “I’ve always felt like I was knocking on open doors.” According to Swiss Re’s Menzinger, upper management’s commitment to the issue is the most important factor ensuring that climate change remains a strategic area of focus. These comments were echoed by Baker who remarks that, in general, “Board level support silences internal opposition.”

But recent events have altered the internal landscape at Swiss Re for moving forward. In the summer of 2005, Swiss Re was restructured. Soon before a new CEO, Jacques Aigrain, was announced. Implications for on-going GHG initiatives include the creation of a centralized logistics department to oversee office space management and carbon neutrality. Also, the formal structure of GHGRS was dissolved. The group’s mature offerings – including carbon trading and weather derivatives – were redistributed to mainline product groups.

In addition to continuing his focus on D&O and BI insurance, Walker has been reassigned to act as a manager of Sustainability Business Development, which aims to bring other climate change and sustainability related products to market. Walker admits that “these efforts may not be huge potential revenue streams, but they will help to better manage risk both for clients and ourselves and integrate sustainability into the business and investment lines. This has benefits in technical knowledge and risk awareness, as well as leveraging the reputation of

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Swiss Re.” More succinctly, Walker sees four areas of benefits for the company: Leverage Swiss Re’s knowledge of sustainability matters to generate high quality investment opportunities and additional fee income; Attract new clients to Conning Asset Management (Swiss Re’s third party asset management company; Provide superior risk-adjusted investment returns for its investors, and; Protect Swiss Re’s brand by reinforcing its position as a leader in the corporate sustainability area, and avoid association with “sustainability laggards.”

**Moving Climate Change from the Periphery to the Core of the Organization**

Like incubators at many companies, the dissolution of GHGRS was planned. When the group was formed, the intent was for it to serve as a center of competence on the emissions reduction issue and to look for business and investment opportunities for Swiss Re’s existing areas of business. As such, it was to be a climate change knowledge facilitator for the company and was not intended to replicate existing business and investment functions. The concept was to develop lines of business in conformity with existing products and then pass them on to mainline offerings when the business was mature. With the emergence of the European ETS and Kyoto market mechanisms, the need for a separate unit was diminished as the Capital Markets and Advisory Units were convinced that the trading and derivative areas represented a complimentary businesses opportunity to their existing weather business. As such, GHGRS, was successful in integrating the issue into various core businesses within the company, such as Capital Markets and Advisory (trading related products), risk awareness (D&O insurance) and Carbon/clean energy asset management (Conning).

Walker is also working to develop applications to assist companies to achieve carbon or footprint neutrality. For example, the company tried partnering with the Commonwealth Bank of Australia to offer a GHG neutral initiative. This program offered companies three critical tools: 1) A “platform for communicating climate change issues and a way to differentiate their products in a pre-regulated

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marketplace”<sup>57</sup>; 2) A management system for calculating and obtaining the necessary offsets as well as a system to manage potential compliance obligations, and; 3) A way to better enable the creation of carbon markets by allowing project developers the opportunity to monetize the environmental benefit that the project is providing. This program has evolved into the “Footprint Neutral” concept which the company is creating along with the UNDP to enable businesses, communities and consumers to voluntarily offset their footprints.

But, while initiatives like this hold promise for the company, limits in central coordination stand in the way. Although climate change is relevant for many departments within the company, “This is very much driven by individuals who have a commitment,” says Menzinger. “The loss potential is enormous and our ability to diversify is limited. But there is also a huge opportunity in areas like weather derivatives. To get there, we need to make more internal consistency and coordinate our efforts on climate change better across the business as a whole.” Like other companies, Swiss Re is challenged by the task of directly linking climate change to the balance sheet. Says Baker, “A lot of research is lacking on modeling to connect the science and economics.” Dudgeon wants to see more work in “getting the numbers to make the business argument for investment decisions.”

But in the end, Swiss Re remains persistent. The nature of the climate change issue and the impact it can have on the company’s business model requires that

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it continue on the path it began in the early 1990's to build more robust bridges between science, human health, environment and economics on the climate change issue. At times, the company has gotten too far ahead on the issue. Walker, for example, expresses disappointment at the lost opportunities when the market for carbon collapsed with the Bush administration's refusal to ratify Kyoto. "We got in too early and lost some momentum." But, he adds, "As a change agent, you have to be willing to take your lumps. Luckily, as a reinsurer, we're patient. Now it is easier to make the business case." Recent policy developments on climate change around the world are leading to greater opportunities for the company's efforts. According to Simon, "I've seen a real change in the last 12 months. I'm sensing a real shift." So, while the company may have gotten too far ahead at times, Menzinger believes that its early approach paid off because "it moved the market and raised the company's profile."

## **Shifting From Risk Management to Business Opportunity DuPont\***

Once again, DuPont is transforming itself. One of the oldest companies in the United States, DuPont began as a black powder<sup>58</sup> company in 1802, transformed into an explosives manufacturer in 1880, turned to polymers, paint, plastics and dyes in the early 1900s, added energy to its portfolio in 1981 and now, as it enters its third century, is pursuing new business lines of agriculture, nutrition and bio-based materials.<sup>59</sup> To make this latest transition, the company has been shifting away from lower growth businesses that are heavily reliant on fossil fuels – evidenced by the sale of the Dacron<sup>®</sup>, Lycra<sup>®</sup> and Nylon<sup>®</sup>

<b>DuPont's Footprint (2005)</b>	
Headquarters:	Wilmington, DE
Revenues:	\$26.6 billion
Employees:	60,000
<b>Percentage of Emissions</b>	
In Kyoto Ratified Countries:	8 percent
<b>Direct CO<sub>2</sub>e</b>	
Emissions:	9.64 MMtons*
<b>Indirect CO<sub>2</sub>e</b>	
Emissions**:	4.02 MMtons
<b>Aggregate CO<sub>2</sub>e</b>	
Emissions:	13.66 MMtons
Target:	65 percent reduction in GHG below 1990 levels by 2010
Year Target Set:	1994 Recast in 1999

\* Million metric tons.  
\*\* Measured as purchased electricity & steam.

divisions in the early 2000s – and expanding into high-growth businesses such as bio-based materials – evidenced by the acquisition of Solae<sup>60</sup> and Pioneer Hi-bred International<sup>61</sup> in 1999.

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But at present, DuPont is still the 2<sup>nd</sup> largest chemical manufacturer in the United States, and remains heavily dependent on fossil fuels for energy and feedstock in its industrial chemicals, polymers, and high performance materials businesses. As such, climate change is an issue that the company cannot, and does not, ignore. In 2005, DuPont was listed as the “top company of the decade” (1995-2005) by *Business Week* magazine<sup>62</sup> and Ceres picked the company as the leader in its industry,<sup>63</sup> both based on accomplishments in greenhouse gas (GHG) reductions. But “DuPonters” (a name that employees use in reference to themselves) still see a pressing need to do more. In fact, the challenge they now face is the most important – transitioning their company’s treatment of climate change from one of risk management to one of business opportunity. Don Johnson, Group Vice President (VP) for Operations and Engineering, says, “We have to begin to think of energy as a value and not as a cost.” James Porter, VP of Safety, Health, and Environment and Engineering, adds that, “to shift from risk management to business opportunity you need to understand the value chain. You’ve got to discover new ways to use what you’ve got, while also developing new materials to serve new needs and concerns.”

### **Company Profile**

Based in Wilmington Delaware, DuPont has operations in more than 70 countries, 60,000 employees worldwide and 2005 revenues of \$26.6 billion. The company’s products and services span agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation

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and apparel. DuPont's corporate vision is "to be the world's most dynamic science company, creating sustainable solutions essential to a better, safer and healthier life for people everywhere."<sup>64</sup>

In fact, safety has always been a key component of DuPont's culture, stemming from the dangerous nature of the company's first product, black powder. Porter states that with respect to safety, health and environment, there is a "cultural bias to do the right thing." But it is DuPont's long history of scientific innovation that is at the center of the organization. With more than 75 research and development (R&D) and customer service labs,<sup>65</sup> the company uses integrated science to develop new products and vigorously pursue what it terms "knowledge intensity" – getting paid for what the company knows rather than simply for what it makes.<sup>66</sup>

DuPont prides itself on being at the forefront of the environmental sustainability movement, a leader in ozone layer protection (DuPont was awarded the 2002 National Medal of Technology for "CFC Policy and Technology Leadership"), and an early actor on climate change. DuPont's sustainable growth initiative is the latest evolution of strong CEO leadership on environmental issues. Former CEO Dick Heckert (1986 - 1989) led the decision to phase-out of fully halogenated chlorofluorocarbons (CFCs) in the late 1980s. Former CEO Ed Woolard (1989 - 1995) referred to himself as the "Chief Environmental Officer" and set the company on a "goal of zero" – zero injuries, illnesses, incidents, wastes and emissions. And Present CEO Chad Holliday, former chairman of the World Business Council for Sustainable Development and co-author of the

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sustainability book *Walking the Talk*, set sustainable growth goals for DuPont which require an integration of economic, social and environmental performance.

But there is more to these environmental efforts than just top-down leadership. A reinforcing loop is at work – strong leadership is born out of the committed culture, and in turn relies on the culture to set and achieve aggressive goals for initiatives. The company’s strong, goal-oriented culture “drives everything,” according to Ed Mongan, Global Manager for Energy and Environment. “We set goals and everyone feels challenged to do their part. We openly track progress by individual sites and business units to meet those goals so no one can hide.” The key to setting goals on environmental issues is strong and forward-looking leadership; the key to achieving the goals is the corporate culture.

**Strategy Development**

DuPont’s actions related to climate change were foreshadowed by its experience with ozone depletion in the 1970s and 1980s. Relying on its strong scientific expertise, the company reacted to the ozone issue when it first emerged in the scientific journals. According to atmospheric scientist and DuPont Environmental Fellow Mack McFarland, Molina and Roland’s 1974 *Nature* article linking CFCs with ozone depletion “got the ball rolling.” As the largest manufacturer of CFCs at the time, DuPont initiated an internal task force to address the issue and senior management was briefed. Realizing that regulation was imminent, DuPont began exploring alternatives. In March 1988, after the signing of the Montreal Protocol,



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DuPont announced a voluntary and unilateral phase-out of CFCs through an orderly transition to alternatives. In 1991, the company began operation of the world's first manufacturing facility for the hydrochlorofluorocarbon HFC-134a, an alternative to CFCs. Today, CFC alternatives comprise two to three percent of DuPont's portfolio.

This experience taught DuPont that understanding atmospheric science, engaging the policy arena, and realizing the market impact of future regulation was critical for its future growth. As *Business Week* describes it, DuPont is “an experienced hand at making the most out of changing regulations.”<sup>67</sup> When the Intergovernmental Panel on Climate Change (IPCC) issued its first assessment report in 1990, DuPont saw a familiar scenario playing out and, given its experience with CFCs, then CEO Woolard directed that DuPont become an early adopter of a GHG reduction strategy.

The company began measuring and tracking their largest GHG emissions – CO<sub>2</sub>, nitrous oxide (N<sub>2</sub>O) and HFC-23 – in 1991 and also made an internal commitment to reduce net emissions. This action coincided with a larger expansion of environmental efforts at DuPont. In 1992, the company published its first external environmental report and an Environmental Policy Committee was created on the Board of Directors.

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DuPont made its internal commitments to reduce GHGs and energy use (per pound of product) public in 1994 by becoming the first company to join the Environmental Protection Agency (EPA)/ Department of Energy (DOE) Climate Wise program. The initial goal was to reduce GHG emissions 40 percent below 1990 levels by the year 2000. Establishing the goals was a two step process. First, each business unit identified possible reductions. Then, the Safety, Health and Environment Excellence Center (a Corporate function comprised of policy and technical experts under the VP for Safety, Health and Environment, the role of which is to develop and facilitate implementation of corporate environmental policy) pushed those reductions further, creating a stretch goal.

The first actions taken toward achieving the GHG reduction goals were aimed at the “low hanging fruit” in the company’s operations. At the time, there was little sense of opportunity for competitive advantage other than getting ahead of the curve on regulation. DuPont’s “low hanging fruit” consisted of reducing emissions of two potent GHGs: N<sub>2</sub>O, with a Global Warming Potential (GWP) of 310 times that of CO<sub>2</sub>, and HFC-23, with a GWP value of 11,700. In fact, given these high GWPs, CO<sub>2</sub> emissions were not a major issue for the company when GHG reduction goals were first initiated.

In 1991, a scientific paper<sup>68</sup> implicated Nylon production as a source of atmospheric N<sub>2</sub>O, a GHG regulated under the Kyoto Protocol. In response, N<sub>2</sub>O producers reached an industry-wide agreement in 1993 to reduce emissions by

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1999.<sup>69</sup> To reach this goal, DuPont developed an end-of-pipe capture and destroy technique which eliminated 90 percent of emissions, at a cost of \$50 million with no payback to the business unit's profit and loss (P&L) statement. This additional burden was acknowledged by headquarters and earnings expectations for the unit were adjusted accordingly. For DuPont, accepting the \$50 million hit was not only an issue of avoiding government regulation, but also of sticking to the company's principles by "doing the right thing". DuPont shared the technology with the other N<sub>2</sub>O producers in the agreement as it was an end-of-the-pipe addition, separate from the core process, and substantial benefits required adoption by the entire industry.

The second target, HFC-23, is an unintended byproduct from the production of HCFC-22, a common refrigerant, and part of DuPont's product line.<sup>70</sup> Reductions of HFC-23 were primarily achieved through a process improvement, resulting in greater yield of HCFC-22 and therefore reduced HFC-23 byproduct. Additional reductions were accomplished through thermal destruction of all or a portion of the remaining HFC-23. Unlike the N<sub>2</sub>O reduction technology, the HFC-23 reduction was not driven by an industry-wide agreement, involved an alteration in the core process and resulted in competitive cost savings. Therefore, the technology remained proprietary.

When it was realized that the initial GHG reduction goals would be readily achieved through these two initiatives, DuPont management moved swiftly to

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establish new goals. The new targets, set in 1999, were expanded to incorporate energy efficiency goals and to fit with DuPont's sustainable growth initiative. They consist of three elements: Hold energy flat at the 1990 baseline; Source 10 percent of energy from renewable sources at cost competitive rates, and; Reduce net GHG emissions to 65 percent below 1990 levels, all by the year 2010. Maintaining the 1990 baseline for the GHG reduction goal was a deliberate move, consistent with the baseline for countries under the United Nations Framework Convention on Climate Change and also reflective of the company's desired baseline for early action credits.

To achieve these new goals, "We have to attack energy," says Linda Fisher, VP and Chief Sustainability Officer. "We have a heavy dependence on fuel, and so rising energy prices are a major concern." DuPont is vulnerable to energy prices on two fronts because much of the feedstock it uses is derived from hydrocarbons, especially natural gas. This vulnerability was reflected in DuPont's fourth quarter 2005 earnings, which were half the amount predicted due to higher energy and ingredient costs, as well as hurricane disruptions, plant outages and lower sales in some segments.<sup>71</sup> Uma Chowdhry, VP of Central Research and Development, states it simply: "What energy prices have done to us focuses the mind very quickly."

DuPont's attention to energy efficiency is currently at a point of transition. According to John Carberry, Director of Environmental Technology, energy

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efficiency efforts between 1990 and 2000 were dominated by yield, capacity and utilization gains, cogeneration and power partnering, and replacing low value/high energy products with those that are high value/low energy. For example, coatings for the auto industry are being replaced with very low VOC coatings, and commodity fibers are being replaced by Pioneer HiBred's corn and soy seeds. Since 2000, he says the focus has been more fine tuned and aimed at instrumentation changes to affect yield, capacity and utilization, process changes, continuing use of combined heat and power, and modern heat management including insulation, steam traps, waste heat recovery and modern motors. The difference between the past and the future is that the latter is highly investment intensive.

Through the company's efforts, energy use has decreased seven percent compared to 1990 levels, despite a 30 percent production increase, saving the company over \$2 billion since 1990 and yielding a decrease in GHG emissions of 420 million metric tons. This financial savings figure is calculated as the costs avoided through energy reductions achieved by improving yields and creating less energy intensive product portfolios versus the business as usual scenario.

Sourcing renewable energy, the second energy goal, has the potential to reduce upstream emissions, fuel costs and exposure to volatile price fluctuations. While progress in this area has led to an annual cost savings of approximately \$8 million, meeting the goal of 10 percent has proven challenging. According to

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Porter, this will be the “toughest goal, yet if we didn’t set a goal, we wouldn’t have done anything.” Cost competitive projects are relatively scarce and difficult to identify. The company has only been able to source about five percent of its energy from renewable sources, with most efforts coming from the use of landfill gas. In one example, the company partnered with a municipal landfill near its De Lisle, Mississippi plant. A third-party laid seven miles of pipeline and installed compression equipment to bring low cost gas for the plant’s boilers. Although it is a less reliable source than the local gas provider, the effort has displaced 30 to 50 percent of natural gas used to run the boilers.

With regards to the third goal of GHG emission reductions, DuPont has been quite successful. As of 2003, DuPont achieved a 72 percent reduction from 1990 GHG emissions. After the 2004 divestment of the nylon business, Invista<sup>®72</sup>, related GHG emissions were removed both from the baseline and the realized reductions and overall reductions were recalculated as 60 percent. (This practice of recalculating emissions follows the WRI/WBCSD GHG protocol as well as that of the Chicago Climate Exchange).

As the company’s programs have developed, its strategies have become more sophisticated. Going forward, the challenge for DuPont is to treat climate change and energy efficiency as business opportunities by connecting them to the overall objectives of the firm. Company leadership believes that the right product mix will offer an advantage in a carbon-constrained world. Fisher, who is tasked with

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embedding sustainable growth into strategic planning, gives her view on what climate change means at DuPont, “It’s more than just science. It is also a matter of understanding our role in both the problem itself and our opportunities to address it; and to get internal agreement on that.”

For DuPont, the business aspect of the issue has two components: risk management – will DuPont be put at a competitive disadvantage from carbon constraints? – and business opportunity – can DuPont capitalize on carbon constraints to expose new market opportunities? According to Fisher, “In developing future business plans and strategies, we need to understand the implications of GHG restraints and whether they pose a risk or opportunity for our family of products.” As regulation becomes more likely, such analyses will be further developed.

John Ranieri, VP and General Manager of the Bio-Based Materials division, sees a number of areas in which DuPont has developed “sustainable innovations” that have already shown great promise.<sup>73</sup> “The real challenge is beyond our own footprint, it is in the market opportunities,” says Fisher. “Can we measure the benefits to the customers? Are there growth opportunities? Some businesses are doing it. We need to work closely with customers to identify their needs and work to find a solution for them,” either from new uses of old material or from developing new solutions to customer problems. Since 2000, DuPont has steadily increased its revenue from new products, growing from 20 percent of

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revenue from products introduced over the previous five years in the early 1990s to 33 percent in 2005.

For example, customers in the auto industry required coatings with much lower volatile organic compounds (VOC) than previously available which, once developed, required much less organic solvents from the company's suppliers. Also, DuPont developed a special grade of Tyvek® house wrap<sup>74</sup> in response to European customers (where residential reductions are part of the national climate strategy) for a product that would lower CO<sub>2</sub> emissions and heating bills. In some cases, DuPont engineers work with customers to help them reduce their own energy use, delivering higher value to customers and ultimately enhancing business through closer customer relationships and a stronger understanding of customer needs. Such efforts have been rewarded by larger or longer-term contracts.

Looking forward, DuPont has identified the most promising growth markets in the use of biomass feedstocks that, through metabolic engineering, can be used to create new materials such as polymers, fuels and chemicals, new applied BioSurfaces in the personal care, coatings and colors areas and new Biomedical materials for use in the cardiovascular and dental fields. The company has set a goal to have 25 percent of its revenue come from such non-depletable resources and is two-thirds of the way toward meeting that goal.



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One promising development is Sorona<sup>®</sup> 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 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 materials 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.<sup>75</sup>

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 Chowdhry, 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 fuels in the next few decades.

### **Organizational Integration**

To integrate climate-related strategies into the business, DuPont employs a vast network of teams and committees. Overseeing and driving this complex structure is strong leadership from the top. CEOs Holliday and Woolard are (and were) both visionary spokesmen for the company's goals on environmental issues and personally involved in pushing the company to achieve that vision. Mongan describes one pivotal moment, "We almost missed our 2000 goal. One business said it was too expensive. The CEO and Paul Tebo (former VP of Safety Health and Environment from 1993 to 2004) sat down with the business manager and firmly stated, 'we will not miss this goal!'" That kind of personal attention to the issue leads Mongan (and many others) to list the most important ingredient in initial successes on climate change as the "CEO staying the course."

Beyond strong leadership, achievement of the goals is encouraged and diffused in several ways. First, goal setting involves a broad spectrum of representatives throughout the company. This is an effective way to create buy-in for the climate-related strategies. Second, while attaining individual goals is left largely up to the business units, their progress is tracked through the Corporate Environmental Plan (CEP); a database that captures environmental performance (such as waste, emissions, GHGs, and energy) annually from global facilities and tracks future reductions or increases in alignment with business plans. It is maintained and managed by the corporate Environment and Sustainable Growth Center (a Corporate function comprised of policy and technical experts under the VP and

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Chief Sustainability Officer whose role is to lead the development and facilitate implementation of corporate sustainable growth programs and policies.)

Third, Sustainable Growth Reviews, performed by the Environment and Sustainable Growth Center, provide an opportunity to discuss challenges and opportunities within specific business units. In these reviews, experts from the sustainable growth team meet with business leaders annually to review key performance indicators for safety, health, environment and sustainability in relation to business and corporate commitments and goals. The discussion focuses on how these goals and indicators are integrated into their business plans and strategies, especially with regards to future growth plans and opportunities.

Fourth, DuPont ensures organizational buy-in and action on its climate-related strategies by linking compensation and bonuses for key employees, such as business leaders and energy experts, to program results. This provides an incentive, but remains a small portion of overall compensation for these individuals.

Finally, local champions are a critical factor for both programmatic and cultural reasons in an organization with decentralized businesses such as DuPont. That is why DuPont created Competence Centers to operationalize its goals. For example, energy experts within each business unit combine to create the Energy

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Competence Center, a formal network of energy professionals. Their job is to incorporate the ideals of energy efficiency into the operations of DuPont by embedding climate issues into decision making, examining the entire value chain, and involving individuals wherever possible.

### **An Energy Efficiency Champion on the Ground**

One energy champion in DuPont is Craig Heinrich, leader of the global energy team for Titanium Technologies; a fast-growing division with plans to double production by 2010 from 1990 levels while increasing energy use by only 40 percent. This is no small task given that energy comprises a significant percentage of the selling price of titanium dioxide (TiO<sub>2</sub>). Heinrich must be a vigilant internal salesman, aware of everything going on in his department. In describing his job, he states, “You need to communicate, you need to network... The business case for energy efficiency has grown increasingly strong as energy prices have escalated,” says Heinrich. “Even so, we have discovered the value of having an advocate for continued emphasis on improved energy efficiency. That is the role I play. It is necessary to repeatedly communicate the value so projects receive the appropriate priority.”

One method he employs to stay ahead of new projects is Sustainability Screening, a process which evaluates a program’s energy consumption and GHG emissions as part of the capital authorization process. The screening is performed early in the process, prior to other review steps, and involves both business unit and corporate level personnel. His Energy Competency Center’s efforts have led to approximately 10 percent of the business unit’s capital budget being invested in programs that improve energy efficiency, bringing year-over-year savings of \$3 to \$5 million. According to Heinrich, some projects may have a return of 300 to 400 percent. “For example, an air cooled condenser was used to supply desuperheating water<sup>76</sup> to one of our plants. We are switching to a third-party supplied reverse osmosis system, improving energy efficiency and reducing water costs.” By outsourcing the project, DuPont avoided the capital costs.

His goal is to incorporate energy efficiency in every project possible. As he describes his projects, very few of them are exclusively energy, often having an aspect of quality, volume or other emissions. But because large capital investments are being made to facilitate business growth, Heinrich has the opportunity to add energy and environmental improvements up front, before investment occurs. “Energy efficiency needs to be integral to the process. It cannot be an add-on,” he states. But in units where energy projects are set to compete for limited resources against more mainstream investment proposals, the challenge is greater.

Reducing energy consumption in capital investments can often be met with resistance, particularly if the pool of resources is dwindling. Carberry points out that the certainty of returns in energy efficiency projects can actually become a liability. The company has ruled out such instruments as lowered hurdle rates, internal carbon shadow pricing or a

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set budget for energy efficiency projects. “Energy efficiency must meet the same hurdle rate as other 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.”

But, while energy efficiency projects are required to be cost competitive, and compete with all other capital projects for funding, many environmental projects, including those within the sustainable growth and climate change initiatives, are done with no capital return on the justification of either avoiding potential regulatory or legal liability, or avoiding reputational damage. The distinction is between projects that deal with risk management and projects that present a business opportunity.

As for the aggressive growth and efficiency goals set for Heinrich's unit, he prefers it that way. “You need the tension of a very challenging goal. Inspirational goals call an organization to act beyond conventional boundaries. These goals are built on the premise that real potential is beyond our ability to envision. An easy goal fails to challenge the creative potential of the organization.” His advice for any company undertaking a climate change program is to “get passionate people engaged and challenge them to do something really extraordinary. They need a vision beyond what they can perceive and they need leadership to get them excited about what they can achieve.”

In an organization that depends upon a common culture to achieve buy-in for new initiatives, communicating the importance of climate change is vital. One way in which DuPont achieves recognition is through the Sustainable Growth Excellence Awards, where environmental projects in business units are submitted for corporate review. Of the 400 or so projects submitted every year, 12 finalists are chosen, rewarded with a dinner with the CEO, recognition throughout the company, and \$5000 to donate to the charity of their choice. Many of the project examples mentioned in this case study were previous award winners.

**External Outreach**

As with other companies in this report, DuPont engages a number of stakeholders, including civil society, customers, trade associations and

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government. Managing these relationships helps DuPont build knowledge, convey actions and concerns, understand trends and engage more effectively in the political arena. Maintaining open communication channels enhances the company's business in the long-run.

DuPont currently engages with non-governmental organizations (NGOs) in a multitude of ways. Often, a partnership is formed to meet specific project goals, with the primary driver being the expertise and different points of view brought to the table by NGOs. According to 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." Examples include partnering with the World Resources Institute and their Green Power Market Development Group to assist in meeting the 10 percent renewable energy goal, and joining with the Pew Center as a member of its Business Environment Leadership Council.

Unlike some other companies in this report, one venue for DuPont's external outreach on the climate change issue has been through the sales and marketing departments. As publicity surrounding DuPont's leadership in climate change initiatives increases, and general awareness of these issues grows, customers

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have been calling upon DuPont to deliver new, better performing products that are relevant within a carbon-constrained world.

In an example of collaborative partnerships, DuPont is leading a four-year, \$38 million consortium (with NREL, Diversa Corporation, Michigan State University, and Deere & Co.) to develop an “Integrated Corn Bio Refinery.” With \$19 million in matching funds from the DOE, the consortium will design and demonstrate the feasibility of the world's first fully integrated bio-refinery, which will be capable of producing a range of products from a variety of plant-material feedstock; for example, converting corn into bio-derived chemicals, like Bio-PDO™, and bio-fuels, like ethanol. It “will create a new business model for sustainable production of chemicals, fuels and energy,” says CEO Holliday.<sup>77</sup> “The technology will lower reliance on petroleum, reduce greenhouse gases, and create a global and sustainable bio-based economy.”

DuPont is also a member of numerous trade associations, including the American Chemistry Council (ACC), the International Climate Change Partnership (ICCP), and the Council of Industrial Boiler Owners (CIBO). DuPont's involvement in these organizations represents the full gamut of industry issues, and the company works within these organizations to further climate change issues. Its efforts are more or less aggressive depending on the particular organization. According to John DeRuyter, Principal Consultant, Energy Engineering, “You should not become overly aggressive if you cannot get

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agreement. And with the ACC it can be very hard to get agreement with companies on either end of the spectrum.” Recognizing that the diverse set of companies within associations do not always share their views, DuPont takes a cooperative approach, focusing its climate change efforts within organizations that are actively engaging the climate issue, like the Pew Center, the ICCP and the Business Roundtable.

In spite of all these initiatives, DuPont has minimal engagement with their shareholders and the broader investment community on climate change. Instead, the company’s efforts on climate change are helping it avoid shareholder action. “We have not had to respond to proxy resolutions because of our proactive actions on the issue,” reports Mongan. According to Fisher, while “Mainstream institutional investors are not as focused on this issue in the United States as they might be. That could all change if legislation is enacted.”

**Policy**

As with trade associations, DuPont has taken a cooperative approach to engaging government on the climate change issue. In the 1990s, DuPont consulted with the Clinton administration and Capitol Hill representatives regularly. The company was quite active in the development process for the Kyoto Protocol, advocating market-based systems that shift capital to the most cost effective solutions; such as the Clean Development Mechanism (CDM), a program that has frustrated the company thus far. DuPont has played an active



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role in advising and commenting on the development of the E.U. ETS. DuPont was also very active in the development of the U.K. ETS and participated in registration and trading of U.K. allowances through its Invista<sup>®</sup> subsidiary (now divested). Because climate change is a global problem, a global solution that includes all industrialized countries is critical.

### **Frustration with the Clean Development Mechanism**

John Carberry calls the Clean Development Mechanism (CDM) “brutally political and complex” and like others in this report, feels that it is not living up to its potential. Mack McFarland believes that the principles of CDM are correct but the implementation rules need to be fine tuned. For example, he explains, under the present rules, “HFC-23 destruction [a waste byproduct] can be worth more than HCFC-22 production [a commercial product]!”

He explains, “A make-rate of 4 percent (the percentage of byproduct HFC produced) is the default value in the IPCC inventory guidelines for countries to use in plants where HFC-23 byproduct is not measured. When measured and managed, the lowest make-rate is normally just over 2 percent.” Using proprietary technology in DuPont’s Louisville plant, a make-rate of 1.37 percent was achieved, resulting in more of the desired product and less waste byproduct. The process was not expensive, but has effectively reduced the amount of HFC-23 produced. Yet three (non-DuPont) facilities with approved CDM projects are producing HFC-23 at nearly three percent.

Given that Certified Emissions Reductions (CERs) are selling at a price of about \$10/ton of CO<sub>2</sub>e, one could make more money from selling the CERs resulting from the destruction of the HFC-23 than they could selling the intended product (approximately \$3.50 for destroying the HFC-23 associated with production of one kilogram of HCFC-22 that was selling in some regions for around \$1.80). The originally approved methodology that has since been modified and would allow credit for destruction of HFC-23 up to 4 percent, providing revenue of \$4.70 for the destruction of HFC-23 associated with production of one kilogram of HCFC-22. This, in effect, rewards operations for being less efficient.

DuPont supports inclusion of HFC-23 projects under CDM but believes that CDM should not provide incentives that discourage use of Best Available Technology. The financial incentive described above would have encouraged new plants to make as much HFC-23 as possible up to 4 percent rather than optimizing the process to make as little HFC-23 as possible. The subject of the methodology for HFC-23 CDM projects for new plants is currently under discussion by the Parties to the Kyoto Protocol and UNFCCC.

McFarland concludes, “DuPont submitted comments under the CDM process on this issue. But right now CDM discourages the use of the Best Available Technology for

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reducing HFC-23 production in the manufacture of HCFC-22.” Justifying DuPont’s actions despite the CDM problems, he concludes, “We would not have looked for such a solution to reduce the amount of HFC-23 produced if not for the internal commitment to climate change and the need to meet that commitment on the most cost effective basis.”

Fisher believes that participation on the part of DuPont and other companies in domestic policy development is critical. “It is important for industry to help government find cost effective solutions to the climate issue,” she explains. “Government can’t do it alone. They don’t have the capacity to understand all the implications of the different policy options. The public comment period provides the government with critically valuable information.” More recently, Fisher describes DuPont as “somewhat engaged, but not high profile” on government lobbying related to climate. “It takes resources to lobby and, as Congressional action on this issue gets more intense, we will put more time and energy into it.”

Lobbying efforts dropped off when it became clear that the United States would not take action on climate change. Time and resources were spent on more critical issues, such as natural gas prices and availability. But renewed interest from policy-makers has DuPont stepping up its activity. Today, the company is struggling with the balance between the desire to see movement toward a federal standard with credit for early action, and the concern that comes from not wanting to alienate or adversely affect its customers by advocating aggressive actions.

Looking toward future regulation, DuPont sees an opportunity for longer-term views that encompass a global system with developing countries, including China

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and India. “This is an ideal time for renewed US leadership on the issue,” says Parr. “We won’t see China and India on board while the U.S. is on the sidelines.”

One of the most important, if not *the* most important, aspects of policy for DuPont is recognition of early voluntary action. Whether these early actions are an asset or a liability depends on the baseline set in the final form of regulation. The other major critical issue is the effect of legislation on natural gas prices, an important feedstock.

Over the past several years, the company has become more vocal on the need to tailor regulatory mechanisms for different sectors of the economy. For instance, while DuPont supports market mechanisms such as emissions trading or tax incentives as an effective way to distribute capital efficiently, it believes it is necessary to delineate between the manufacturing, buildings and transportation sectors due to differing price elasticity and responses to price signals in terms of GHG reductions. Otherwise, one sector (such as transportation) might bid carbon prices to a level high enough to adversely impact another sector (such as manufacturing) while not making the needed GHG reductions. It is critical to balance the need for reductions across all sectors with awareness that economic ramifications are unequal across sectors. And McFarland is quick to add, “You’ve got to get consumer emissions under control if you ever want to get anywhere.”

## **Challenges Ahead**

DuPont has a history of energy efficiency and climate change related action that, like its overall age as a company, is much longer than most of its peers. This puts the company in a unique position. With 15 years of experience tracking GHGs and 12 years of experience in implementing emission reduction goals, the company has achieved a great deal of success in reducing its own GHG footprint. Being further along the learning curve than most allows DuPont the ability to see the next hurdle much more clearly. DuPont must successfully transition climate change and energy efficiency from an issue of risk management to one of business opportunity.

But, in DuPont's view, it is relatively easy to set goals, measure progress, learn process improvements, and find reductions in energy use. And although work on process improvements and energy efficiency projects continue, most of the big reductions have already been realized. The real challenge lies in moving beyond reductions and identifying and evaluating business opportunities in a carbon-constrained world. "Identifying market opportunities is a different challenge from footprint reduction," says Fisher. "With footprint reduction, it's easy to clarify what you want people to do – reduce X percent of what you are emitting. Alternatively, to look at 22 businesses and envision market opportunities in a carbon-constrained world is more difficult. It starts with an analysis of what you do, looking down the value chain, understanding what your customer needs and

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meeting those needs. As with any type of innovation, you have to make sure that new ideas will meet customer needs and satisfy regulations.”

In order to understand and take advantage of this new focus, DuPont must navigate the complexity of the climate change issue, including the science, the politics, the economics and the uncertainty surrounding the timing. For example, rising energy prices this past winter have raised interest in green building and energy efficient housing, but it remains unclear if energy prices will be persistently high enough to increase demand for related products from builders. Furthermore, it is unclear how policies, ranging from Federal energy policy to local building codes, will influence the marketplace. It will be a complex issue involving both push and pull from suppliers, producers, builders, end consumers and regulators.

Sharing information internally in such a large organization also remains a challenge. Despite an extraordinary organizational structure for sharing and disseminating information, the company “is still stove-piped,” says Dawn Rittenhouse, Director of Sustainable Development. (A problem that executives feel is not unique to climate change and applies to the company in general.) Having widely distributed decision making contributes to the risk of business units acting in a bubble. The danger, especially regarding climate change and energy efficiency issues, which can be seen as add-on issues, is that technical expertise and success stories make it up, but not across, the organizational

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hierarchy. With the company being so diverse and products involved in almost every value chain, it can be difficult to make sure that all opportunities are identified and pursued across all of the DuPont businesses.

Another challenge is streamlining and fine-tuning their emissions measuring and tracking system, which many consider labor intensive. Energy related emissions are calculated based on fuel consumption according to the WRI/WBCSD GHG Protocol and fuel specific measures. The current system requires input of data from direct metering of gas, invoices for other fuel purchases, reconciliation to inventories, and the application of emissions factors for a variety of fuels to calculate emissions. Process emissions are reported separately and indirect emissions must be calculated based upon localized information. All of this information is collected once per year in a corporate database. Despite having tracked emissions since 1991, DeRuyter still sees the company's "biggest headache is in capturing and reporting data, particularly energy reporting and verification of 3<sup>rd</sup> party invoices." There is no link with the company's SAP system, which would be desirable but is currently prohibitively expensive.

In the end, the key for a science and innovation based company such as DuPont is the development of new materials that will take the company through its next transformation and into its third century. Says Fisher, "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

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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.”

## **Weaving Climate Change into the Business Case Alcoa\***

What do you do about climate change when energy comprises a major portion of the total cost to manufacture your product? That is the dilemma that faces Alcoa;

a company that spent over two billion dollars on energy last year.

Consequently, locating and securing reliable, low cost energy sources has always been among the company's most pressing strategic concerns. According to Jake Siewert, Vice President, EHS, Global Communications and Public Strategy, "the biggest differentiator in primary metals is long-term energy supply; 20 to 40 plus years." With global energy prices

<b>Alcoa's Footprint (2005)</b>	
Headquarters:	Pittsburgh, PA
Revenues:	\$26.2 billion
Employees:	129,000
Percentage of Emissions	
In Kyoto Ratified Countries:	16 percent
Direct CO <sub>2</sub> e	
Emissions*:	34.4 MMtons**
Indirect CO <sub>2</sub> e	
Emissions***:	27.0 MMtons
Aggregate CO <sub>2</sub> e	
Emissions:	61.4 MMtons
Target:	25 percent below 1990 levels (achieved and maintained since 2001)
Year Target Set:	1998
* 100 percent of the direct emissions from facilities managed by Alcoa.	
** Million metric tons.	
*** 100 percent of the indirect emissions associated with purchased electricity from facilities managed by Alcoa based on estimates of the sources of generation used by suppliers.	

continuing to rise, and climate change assuming a more prominent role in international policy discussions, energy intensive companies such as Alcoa are facing increased scrutiny by foreign governments, as well as stiffer competition

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\* We would like to thank Pat Atkins, Ken Martchek, Richard Notte, Randy Overbey, Jake Siewert, and Vince Van Son for their contributions to this case study.



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from other companies and industries for the remaining sources of abundant, inexpensive energy.

But, by leveraging its strong history of environmental leadership and responsibility, Alcoa is striving to transform this potential source of vulnerability into a competitive advantage. The company has already managed to reduce its managed direct greenhouse gas (GHG) emissions by 25 percent below 1990 levels and is being recognized for its progress: Alcoa was named one of the Top Green Companies in the world by *Business Week* magazine<sup>78</sup> in 2005 and Ceres in 2006.<sup>79</sup> But despite such praise, the company is looking toward two key developments that could result in further dramatic reductions: the development of a new aluminum smelting process and a vigorous effort on recycling and automobile light-weighting. When you combine what Alcoa has accomplished with the potential that lies ahead, Alcoa “is in a unique position and one that is very positive, given the attributes of the products we make,” says Randy Overbey, President of Primary Metals Development.

**Company Profile**

Headquartered in Pittsburgh, Pennsylvania, Alcoa is the world’s leading producer of primary aluminum, fabricated aluminum, and alumina. The company employs approximately 129,000 “Alcoans” (a term that employees use to refer to themselves) in 43 countries. The company earned revenues of \$26.2 billion in 2005 by producing approximately 11 percent of primary aluminum in the world.

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Customer segments include aerospace; automotive; packaging, building and construction; and commercial transportation. Alcoa also produces and markets consumer brands including Reynolds Wrap<sup>®</sup>, Alcoa<sup>®</sup> wheels, and Baco<sup>®</sup> household wraps. Among its other businesses are vinyl siding, closures, fastening systems, precision castings, and electrical distribution systems for cars and trucks.

Because energy is so critical to Alcoa, the company generates approximately 25 percent of its own electricity needs. Overall, its energy supply portfolio consists of hydropower (35 percent), coal (36 percent), natural gas (18 percent), and oil (9 percent). Total direct GHG emissions from company managed facilities in 2005 were approximately 34.4 million metric tons of CO<sub>2</sub> equivalents (CO<sub>2</sub>e), coming primarily from its smelting operations, power generation facilities, and refineries. In 1998, Alcoa set a target to reduce its direct GHG emissions from managed facilities 25 percent below 1990 levels, an ambitious goal when compared to other *Fortune* 500 companies actively pursuing GHG reduction strategies. Much like DuPont, Alcoa has a history of setting and attaining far-reaching targets, particularly in the environmental arena. The company achieved its GHG reduction goal in 2001 and has maintained that level ever since.

**Strategy Development**

When asked about the impetus for its climate change strategy, Ken Martchek, Manager of Life Cycle and Environmental Sustainability, states that:

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“Sustainability is a primary driver since Alcoa defines sustainability as: financial success, environmental excellence, and social responsibility. Our climate strategy is an essential part of our sustainability efforts given Alcoa's level of energy consumption particularly in an increasingly carbon-constrained world.” But it is even more than that, according to Pat Atkins, Alcoa’s Director of Energy Innovation. Reducing environmental impacts is smart business too. “Why wait for irreparable harm from climate change, or policy requirements to make strategic and operational changes if the business case is already there? Alcoa is vulnerable because of our high energy demands and our need to grow to supply the market demands for our products. If we become part of the solution rather than part of the problem, we have a much better chance of continuing to contribute in the future. Many businesses tend to focus on the next quarter or next year, not their fourth century. Alcoa has operated in three consecutive centuries so far, and if we don’t focus on climate change, we may not make it to our fourth century. Our products need to be sustainable in the broadest sense.”

This attention to the long term goes to the top of the organization, an aspect not lost on those responsible for managing Alcoa’s climate-related strategies. “On a scale of one to ten, senior level support is an eleven,” says Atkins. “Climate change is generally not chosen as a priority unless it is supported by those at the top.” While a systematic focus on energy efficiency has enabled Alcoa to reduce the amount of energy required to refine bauxite into alumina, reduce alumina into aluminum in its smelters, and fabricate aluminum into value adding products, the

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primary focus of Alcoa's GHG reduction efforts thus far rests in reducing perfluorocarbon (PFC) emissions through anode effects and increasing the use of recycled materials.

**The Anode Effect.** In 1992, then CEO Paul O'Neill, an industrial engineer turned economist (and former Treasury Secretary), asked Alcoa's engineers why the company did not eliminate the anode effect from operations. Believing that stable operations reduced waste, O'Neill challenged the company's engineers to eliminate the need for the anode effect by devising an alternative method for managing the aluminum smelting system. The engineers responded with skepticism, claiming the solution would be cost prohibitive with thousands of new, more accurate alumina feeders, as well as better algorithms in the company's computer programs. And after all, scheduling anode effects as part of the process control scheme was the way that aluminum smelters had been run for many years. Undaunted, O'Neill continued to challenge engineers to minimize the number of anode effects, and after numerous iterations engineers discovered that new feeders were not always needed. Instead, they found that what was needed were new advanced cell control algorithms to manage the feed of alumina into the cell without having anode effects. At the same time, Alcoa signed a voluntary agreement with the EPA to reduce anode effects. With every iteration of the algorithm, control engineers noticed both a reduction of anode effects and an improvement in cell efficiency and alumina quality.

### **Anode Effect: An Overview**

The aluminum smelting process is a highly energy intensive electrolytic reduction process used to break the atomic bond between oxygen and aluminum in alumina (aluminum oxide,  $\text{Al}_2\text{O}_3$ ). The smelting process uses consumable carbon anodes to reduce the alumina creating aluminum and  $\text{CO}_2$ .

A critical aspect of the aluminum manufacturing process is maintaining the proper concentration of alumina in the electrolytic bath solution. If the alumina concentration is too high, undissolved alumina falls to the bottom of the cell causing inefficiencies and potential damage to the cell lining. If the alumina concentration is too low, the electrical current starts to break down other chemical components in the bath (namely aluminum fluoride) necessary to continue making aluminum. This reaction creates the perfluorocarbon (PFC) gases  $\text{CF}_4$  and  $\text{C}_2\text{F}_6$  which form beneath the anode and increase the cell resistance. When the increasing resistance causes the cell voltage to exceed a threshold, the cell is said to be on “anode effect”. The anode effect is not extinguished until the alumina concentration has been increased and the voltage is reduced. Anode effects have three primary drawbacks: they disrupt the stability of the continuous electrolytic process, consume excess energy, and create PFC emissions.

In the past, the level of alumina concentration in the process was routinely determined by purposefully scheduling anode effects by underfeeding alumina. This practice had provided an easy and reliable means of determining the amount of alumina in solution. The anode effect would give the plant manager an exact point of reference as to the amount of alumina in solution and helps avoid the risks and consequences of over-feeding alumina into the cell.

Alcoa no longer schedules anode effects. Although they still occur periodically, the company has reduced the anode effect frequency in its best plants from approximately one or more anode effects per cell per day to one anode effect per cell every 10 to 30 days. This reduction in frequency, coupled with reductions in anode effect duration, has reduced PFC emissions by over 75 percent since 1990. To continue to improve performance, Alcoa has company and plant specific goals for minimizing the frequency and duration of anode effects. At

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some locations, a portion of each employee's annual incentive payment is tied to anode effect performance.

According to Overbey, even though Alcoa was considering the anode effect before the arrival of O'Neill, it was his leadership that made it clear that the company was ready to move beyond the climate change debate and take real action. The company needed someone to ask the right questions, help the employees overcome some in-house biases, and think about operations from a different perspective. O'Neill was that person.

Today, Alcoa is working to develop a new smelting technology based on an inert anode, which would eliminate consumable carbon anodes and related CO<sub>2</sub> emissions from the aluminum smelting process, and also eliminate all PFC emissions.

**Recycling Initiatives.** In a 2002 speech to the US Aluminum Association, John Pizzey, then Group VP for Primary Products, argued that it was his fundamental responsibility to effectively manage climate change, energy reduction, and water quality issues. He then pledged that 50 percent of Alcoa's products, other than raw ingot sold to others, would come from recycled aluminum by 2020. According to Overbey, "recycling is not only the right environmental choice; it can be the right economic choice for Alcoa." Considering that aluminum produced from recycled materials requires only five percent of the energy needed to make

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primary aluminum and that energy prices will likely continue to rise, increasing recycling rates is among the more significant long-term strategic opportunities for the company. Almost 70 percent of the aluminum ever produced is still in use today, totaling approximately 480 million metric tons. The amount of aluminum recycled in 2004 equaled the total amount of primary aluminum produced in 1974.

To meet its target for higher recycled content, Alcoa will have to overcome some of the challenges that have traditionally undermined recycling initiatives. In addition to resolving some metallurgy issues associated with recycling, Alcoa will need to devise innovative strategies for collecting large quantities of metal and ensuring that it satisfies the company's quality standards. Further, it will have to engage with external groups to increase aluminum can recycling rates, which in the United States have declined from well over 60 percent to 50 percent in the last few years. The company is currently reevaluating how to engage these customers by focusing on the long-term financial benefits offered by elevated recycling rates.

**Organizational Integration**

Alcoa relies on three dedicated teams to further its climate change and energy efficiency goals: Corporate Climate Change Strategy Team, Greenhouse Gas Network and Energy Efficiency Network. These teams complement each other under the umbrella of Alcoa's values and drive to share best practices across the

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company. And, although the company has a long standing culture of technology and best practice transfer, employee engagement is crucial. According to Vince Van Son, Manager of Environmental Finance and Business Development, “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.” Similarly, according to Atkins, Alcoa’s managers are becoming more aware of the importance of the company’s strategy because they understand how climate change impacts their respective business units. They realize that, “if you want to build a new plant, having Alcoa’s reputation helps.”

In 1997, Alcoa launched the Corporate Climate Change Strategy Team. Traditionally directed by some of Alcoa’s top-level executives, the team is comprised of eleven diverse members, including professional representation from operations, government affairs, technology, communications and finance and geographic representation from the United States, Canada, Australia, Europe, and Brazil. The team is responsible for evaluating the impacts of climate change on Alcoa’s business interests and disseminating the company’s goals and progress to internal and external audiences. According to Overbey, the current director, the secret to the success of the team 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.” The team



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meets face-to-face at least twice each year and conducts conference calls between meetings.

To build on the success of reaching its goal of reducing GHG emissions 25 percent below 1990 levels Alcoa launched the Greenhouse Gas Network in 2004 to help further reduce GHGs among locations involved in power generation, refining, and smelting – which collectively account for approximately 90 percent of Alcoa’s total emissions. The network works with global process technology teams and various regional GHG teams across the world to coordinate and share information and best practices.

One of the most important projects of the Greenhouse Gas Network is the recent launch of an internal web-based GHG information system. Alcoa has systematically collected GHG data for all operations worldwide since 1998 through its environmental data system. This system makes it easier for locations to monitor their performance through time and compare it relative to internal and external benchmarks. By increasing overall transparency, the information system provides underperforming plants with a stronger incentive to improve efficiency and to lower GHG emissions. Centralizing GHG emissions accounting also promotes consistency with protocols and enables locations to focus resources on making reductions. Alcoa also relies on the system to facilitate global networking among the participants and help stimulate sharing of best practices.

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The new GHG information system currently includes detailed process and energy consumption information for 41 facilities worldwide, including four power generation facilities, nine alumina refineries, and 26 smelters. The system uses the methodology of the E.U. ETS to calculate emissions and sweeps databases each evening to pull process and production data directly. Designated individuals at each plant are responsible for manually entering energy consumption data on a monthly basis. Reminders to update monthly energy data are issued automatically to help ensure a comprehensive overview of the performance of all facilities is available as soon as possible after the end of each month.

One example of leadership and sponsorship for GHG emission reduction is a global PFC reduction “challenge.” Each plant has been challenged with closing the gap between its 2004 average anode effect (and thus PFC emissions) performance and its best monthly performance on record. Each month, a global scorecard is published comparing smelters to themselves and others in terms of CO<sub>2</sub>e emissions, CO<sub>2</sub>e emissions per ton of aluminum, and anode effect performance. As the scorecard is a highly visible way to track the leaders and laggards, it fosters healthy competition on GHG reduction progress as plant managers strive to have their facilities be leaders. But, the company also encourages cooperation and cohesion by mandating that each facility disclose barriers to meeting its targets, as well as the actions they are taking to overcome them and reach their targets. By emphasizing transparency and the sharing of best practices, the company ensures the focus on meeting targets is sustained.

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Some of the plants making the greatest amount of improvement to date have done so in part by sending employees to smelters that have lower emissions to learn first-hand of the latest changes they have made to cell operating, maintenance and control practices.

Similar to Shell's Energise program, Alcoa launched the Energy Efficiency Network (EEN) in 2002. The EEN consists of more than 450 Alcoans worldwide. There is a set of core resources assisting plant personnel comprised of one high-level Alcoa employee and various external experts. These resources have three roles. They are invited by operating locations to conduct energy efficiency assessments that confirm and help solidify the business case for possible improvement. They also identify, document and distribute globally, any strong energy practices observed at the plant locations. Finally, they provide technical support and access to further resources as needed. As of mid-2005, assessments had been completed at more than 50 plants. To increase ownership of assessment results, plants participate in reviewing initial recommendations and reach agreement on potential savings before a final report and action plan is issued. Plants have confirmed nearly \$80 million in annual savings potential and captured sustainable annual savings exceeding \$20 million.

A principal goal of the EEN is to help Alcoans understand and value the long-term benefits of the company's energy efficiency and climate change strategy.

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According to Vice President of Energy Services Richard Notte, who manages a global portfolio of energy for Alcoa and the EEN, “The challenge is to provide a business case which influences us to make a shift on how we think about energy. The Network, including all its members globally, encourages us to consider energy as a manageable expense and also to consider life-cycle costs. As that shift occurs, we build into our business concept that production can be met using less energy per unit of output without sacrificing quality or production. Also, it encourages us to know and consider the cost of energy flowing through the equipment when making maintenance and end of life equipment replacement decisions. This shift in thinking provides significant financial and environmental paybacks.” Although the precise cost of setting up the EEN is difficult to quantify, Alcoa estimates are as high as \$500,000 after accounting for travel, human capital, and use of internal resources. Notte believes that the vast majority of companies will not require the same level of sophistication as Alcoa. “Our system is as complicated as anyone is going to get.”

Projects requiring capital investment are pursued based on their financial return and the fit with the other local needs and strategic interests. The availability of capital and the threshold financial return or internal rate of return (IRR) required therefore depends on the business situation of the individual location. The company has traditionally not pursued such projects unless they have had a payback of one year or less. However, as the program has matured, provided real returns and demonstrated its potential, Alcoa is moving beyond the “low

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hanging fruit” and investing in projects with longer payback periods. Plants have been asked to keep track of all energy efficiency projects as they can become more attractive with time (as energy prices rise). Within the Primary Metals division energy efficiency projects with an IRR as low as 20 percent can be considered even if needed funds might not be allocated as part of a given plant’s annual capital budget. According to Van Son, the identification and tracking process is critical: “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.”

Alcoa has also taken significant steps to extend the reach of its climate change strategy beyond operations and into the personal lives of Alcoans in an effort to help broaden engagement in the issue. For example, following on the heels of its successful One Million Tree program the company launched an even more ambitious Ten Million Tree program on Earth Day in 2003 to help increase employee awareness about climate change, carbon sequestration, and the importance of reducing GHGs. To reach the goal of planting 10 million trees by 2020, each participating Alcoa location purchases the trees from a supplier of choice and distributes them to employees. Alcoans are then encouraged to plant the trees in their communities and on Alcoa property. Through 2005 the number of trees planted via these internal programs is estimated at 1.5 million. The

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company also plants millions of trees each year as a part of its mine reclamation projects around the world.

Alcoa has also encouraged its employees to participate in local and regional programs such as Smart Trips<sup>80</sup> to encourage use of public transportation and car pooling and the one-ton challenge launched by the Canadian Government in 2003. The one-ton challenge enables individuals to measure their GHG footprint and pledge to pursue those actions they can take to reduce their personal emissions by one ton per year.<sup>81</sup>

**External Outreach**

As with other companies in this survey, Alcoa’s climate-related strategy reflects in part the insights it gains from its external outreach. To accomplish this, Alcoa has formed partnerships with various environmental non-governmental organizations (NGOs). Although the company acknowledges that such partnerships provide the company with credibility and third-party verification, it emphasizes that these relationships are much more than just stamps of approval. According to Siewert, “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.” Martchek believes these partnerships also provide the company with more leverage to participate in the process of shaping

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climate change policy. “Working closely with organizations like the World Resources Institute and Pew Center on Global Climate Change provides us with some insights about what the future may look like.”

Moving beyond environmental NGOs, Alcoa has worked with several external groups to further its goals of increased recycling. The company is a member of the Curbside Value Partnership (CVP). CVP is an outgrowth of the Aluminum Can Council, a trade organization comprised of companies that make aluminum can sheet and aluminum cans. CVP joins with large and small communities across the United States, and their material recovery facilities, to increase education and promotion of recycling of a variety of valuable materials through existing curbside collection channels. CVP assists communities with participant education and promotion, data collection and interpretation and understanding the value proposition of recycling, especially aluminum can recycling. While proven to increase recycling rates, deposit legislation has traditionally been opposed by some of Alcoa’s largest business customers. Alcoa and many of its customers favor a more comprehensive approach to recycling, such as that advocated through the Curbside Value Partnership. And finally, aluminum can sheet makers continue a partnership with Habitat for Humanity, which channels money earned from recycled cans into materials for homes constructed by Habitat.

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Alcoa routinely seeks the input of its key investors. Since 2003, Alcoa has convened its top five to fifteen investors during one to two visits to key facilities each year. During these visits the company has frank discussions about its corporate governance and sustainability initiatives. These events are an integral part of its communications and investor relations strategy. In addition, Alcoa's annual sustainability report is used by analysts and other interested stakeholders and documents how the company mitigates risk by reducing its footprint.

A final prong in Alcoa's outreach is directed at the aluminum industry; a highly consolidated industry and that offers a potential opportunity. As Siewert explains, "At any time, the aluminum industry can easily get 75 percent of world capacity at one table. This is not true of other industries." But despite such high industry consolidation, the industry lacks a consistent strategy or approach to addressing climate change or energy issues. Therefore, Alcoa recognizes a value both in making great strides in emissions reductions and encouraging others to follow. Mindful of competition from cheaper, less energy-intensive metals, Alcoa believes it is in its own economic interest to raise the reputation and standards of the entire aluminum industry, particularly in places like Europe. And Alcoa's international competitors are beginning to respond to the challenge by improving efficiency and reducing emissions. To increase access to certain financial markets, competitors from Russia, China, and the Middle East are increasing transparency of operations by publishing sustainability reports.



**Policy**

In general, Alcoa supports cap-and-trade systems where regulatory limits are imposed if all gases are included. Alcoa currently empowers local management to determine the company's official position within each country. And elements of these positions can vary based on local circumstances.

Of greatest concern to Alcoa is climate change legislation that does not recognize companies for taking early action. Alcoa seeks the use of a 1990 baseline for determining allocations. According to Siewert, "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." It is for this reason that Alcoa is concerned with the Department of Energy's 1605(b) program. Alcoa believes the recent DOE decision to disallow any reduction before 2003 not only discourages companies from taking early action, but potentially encourages increases in the short-term.

To prod federal action, Alcoa testified on behalf of the McCain-Lieberman Climate Stewardship Act in 2003. The company feels strongly that there must be a global standard and uniform playing field for all companies. According to Siewert, "We need to know that what happens will happen to everybody." In 2005, Alcoa called for a comprehensive national registry and mandatory emissions reporting as its internal successes have shown measurement and reporting are a fundamental part of attaining any target.

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Unlike Whirlpool, which seeks to retain credits for the improvements in energy consumption its products may offer, Alcoa does not lobby for gaining credits for emission reductions by users of its products. Since Alcoa mostly produces semi-fabricated products and not final products as Whirlpool does, the company is satisfied with increased sales if GHG reduction goals increase the market for their product. Alcoa believes that the high performance-to-mass ratio of aluminum products will become increasingly attractive to its transportation customers (such as autos, trucks, rail cars, and planes) in a more carbon and energy constrained world. This reinforces an already strong business case for aluminum, and market pull for its rolled sheet, extrusions, cast components, forged wheels, and other related products. While airplanes are comprised of 90 percent aluminum and titanium, the ratio for automobiles is only about 10 percent. Reducing a vehicle's weight by 10 percent typically yields a seven percent reduction in GHG emissions. Based on current growth rates, Alcoa projects that light-weighting coupled with increased recycling by the global aluminum industry has the potential to offset all industry direct and indirect emissions by 2017. Lighter cars and resulting improvements in fuel economy and lower emissions can potentially save 400 million metric tons of CO<sub>2</sub>e. To increase the demand for aluminum, Alcoa supports both GHG reduction standards and federal CAFÉ size-based standards for fuel economy as size and intelligent design have shown to help improve passenger safety and fuel economy (and subsequently reduce GHG emissions).

### **Challenges Ahead**

Of all accomplishments in the area of GHG reductions, Alcoans acknowledge that the development of its web-based systems for measuring and tracking emissions reductions is a major step forward in both achieving its goals and making all locations aware of their carbon footprint.

And the company is pleased it has leveraged its efforts on climate change and other sustainability issues, leading to reputation and strategic benefits. For example, the company was invited by the Icelandic government to build a smelting facility in their country; a country with an extremely low GHG electricity profile and extremely low energy prices. Alcoa's growth in Iceland is a direct reflection of its preference to use renewable energy resources (hydroelectric power) to achieve the lowest total GHG intensity per ton of aluminum possible. When Alcoa's new smelter begins operations in 2007 it will become one of the lowest GHG intensity smelters in the world. Another example of gaining from its efforts is being recognized by Innovest (along with Toyota and BP) as the world's top three most sustainable companies. The rankings were based upon how effectively companies have managed strategic profit opportunities by recognizing new environmental and social markets. Shortly after the rankings were released, Toyota approached Alcoa to discuss potential partnerships and synergies between the companies – again, a strategic aspect of the company's future plans.

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Looking forward, Alcoa seeks to make increasing progress into the light-weighting of vehicles. And the market looks bright. Over the past decade, the demand for aluminum has increased at a compound annual growth rate of 4.3 percent and the aluminum is becoming the second most used material (overtaking iron) in ground transportation vehicles after steel. For example, Alcoa developed "Dura Bright" commercial truck wheels that are lower mass than conventional wheels and don't require polish or scrubbing. These wheels have high strength to mass ratio, are visually attractive, corrosion-resistant, and require no maintenance beyond spraying with soap and water. In February 2005, Alcoa announced that Hyundai Motor Manufacturing America (HMMA) will use an Alcoa cast aluminum rear upper control arm for the Korean automakers all-new 2007 Santa Fe crossover vehicle; the first Alcoa component to be used by Hyundai Automotive.

But, Alcoa is still working to improve its GHG related-strategies. Despite recent initiatives to engage and educate its employees, some managers believe the company would have benefited from launching such programs much earlier. Atkins admits that the company would be even further ahead if we'd "done this in year two, instead of year ten. It takes time to educate 130,000 people." And looking forward, Overbey worries about the fact that the company's global reach truly requires a global answer to the GHG issue. This highlights one important challenge for the future. Political and regulatory uncertainty via the absence of a

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uniform global climate change policy creates an uneven playing field with regard to its global operations. Alcoa believes such uncertainty coupled with high energy prices provide a disincentive for companies to set up new operations in many developed countries.

But despite such challenges, Alcoa sees climate change as a major differentiating factor in the future. According to Overbey, “Whatever enterprise you represent, you must ask ‘How can I be part of the solution?’” Adds Atkins, “What would the best company in the world do? We are citizens of the world and we must act responsibly.” With this as its starting point, Alcoa continues to move forward through leadership and action to be part of the solution – and sees benefits in reinforcing its reputation for doing so.

## **Maintaining a Seat at the Table** ***The Shell Group\****

Royal Dutch Shell, like all major oil producers, finds itself at the heart of the debate over climate change. In

2005, Shell's own operations emitted 105 million metric tons of CO<sub>2</sub> equivalents (CO<sub>2</sub>e). The downstream combustion of the fossil fuels it produces emits another 763<sup>82</sup> million metric tons.

Together these emissions account for some 3.6 percent of global fossil-fuel CO<sub>2</sub> emissions in any year – a total greater than that of the entire United Kingdom. But rather than sit on the side-lines and

<b>Shell's Footprint (2005)</b>	
Headquarters:	The Hague, NL
Revenues:	\$307 billion
Employees:	112,000
<b>Percentage of Emissions</b>	
In Kyoto Ratified Countries:	~30 percent
<b>Direct CO<sub>2</sub>e</b>	
Emissions:	105 MMtons*
Target**:	10 percent below 1990 by 2002 5 percent below 1990 by 2010
<b>Indirect CO<sub>2</sub>e</b>	
Emissions***:	763 MMtons
<b>Aggregate CO<sub>2</sub>e</b>	
Emissions:	868 MMtons
Year Target Set:	1998 Revisited in 2002 Recast in 2005/6
* Million metric tons.	
** Direct emissions reductions only.	
*** Measured as emissions from product use in 2002.	

wait for carbon constraints to alter the company's business environment, Shell took an early position on the issue and engaged in actions that began to manage its carbon footprint. These actions have earned the company credibility and a powerful voice within policy, advocacy and market circles. And this voice grants the company a measure of control over its future business environment. In the words of David Hone, Group Climate Change Advisor, "To validly have a seat at

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\* We would like to thank David Hone for his contributions to this case study.

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

In order to maintain that seat, the company must continue to develop the breadth and depth of its climate change program. The company now finds itself facing the challenge of integrating what had historically been treated as two separate tracks – energy strategy and climate change strategy. Shell is seeking ways to merge the two tracks into one synergistic approach that helps them explore new business opportunities. This harmonization of strategies must also coordinate the activities of units stretched around the globe, ensuring information sharing that takes advantage of Shell’s wide and varied technical expertise.

**Company Profile**

Royal Dutch Shell plc operates in over 140 countries and employs 112,000 people. Shell is headquartered in The Hague, Netherlands and organized into six operational units: Downstream (oil refining, marketing and chemicals); Exploration and Production; Gas and Power; Renewables (including hydrogen and carbon management); Trading; and Shell Global Solutions (technology services). The executive directors of the first three (and most important) business units also sit on an executive committee, the head of which is the CEO of Shell. The primary developer of the Shell climate change strategy has historically been Corporate Affairs, which reports to the CEO. More recently, to reflect the growing importance of climate change as a strategic issue, the company has developed a

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new CO<sub>2</sub> Unit. In addition, all parts of Shell will coordinate on the issue through a “CO<sub>2</sub> Forum.”

The culture of the company centers on technology and trading, but there is also a strong sense of corporate social responsibility. In the words of Hone, “Concern [for climate change] goes quite deep. There is expectation among employees that the company is in a sustainable-development mindset. They see it as a positive thing, although it may vary by region. Employees expect Shell to uphold a high standard on progressive issues about how a company is supposed to behave.”

**Strategy Development**

Shell has been watching climate change since the early 1990s through its Issues Management team, a team within Corporate Affairs that monitors issues that may impact the business units. In 1998, Jeroen van der Veer, then a group managing director (and now CEO), championed a more formal study of climate change and its potential impact on Shell businesses globally. This study came after the 1997 signing of the Kyoto Protocol and at a time when the company was feeling bruised over its 1996 fight with Greenpeace over the disposal of the Brent Spar oil platform. A cross-functional team that spanned the company was put together and made the business case for implementation of a greenhouse gas (GHG) management strategy. This study raised the bar for climate action and, as a result, created resistors – “There’s always a challenge to what you create,” Hone



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says, “but building a strong business case is key to overcoming this resistance.”

The business case revolved around the trio of ideas that the company would eventually face a real price for carbon, that a leadership position on climate change would be a business opportunity in terms of building brand and reputation, and that a seat at the table with the governments that would set the rules was important for the company’s future. Out of this initiative emerged the goal of “Securing Shell’s future by seizing opportunities that arise from the climate change issue.” Achieving this goal has historically followed two tracks.

The first track, energy strategy, considers the Shell energy portfolio. Planning for energy diversification is led in part by the company’s well-established long-range planning tools like the Shell Scenario. Like Alcoa, Shell has long thought in time horizons of half a century or more. And climate change requires a similarly long-term focus. “You can’t look at this issue in a five-year time frame, it’s almost meaningless,” says Hone. “But you can look at it in a 25-year time frame – there’s the scope for it to be different.”

**Shell Scenarios**

Shell uses scenario planning as a strategic framework for thinking through challenges and identifying risks and opportunities. The most recent (2005) edition of Shell’s scenarios, *Shell Global Scenarios to 2025*, articulates a vision of how worldwide forces might shape markets over the next two decades. The development of scenarios provides the company with a toolkit to assess risks, make investment decisions, develop a common strategic language for leadership teams, and engage in key public policy matters. Like the other Shell Scenarios, the 2005 edition uses alternative parallel story lines to explore how politics, economics and technology relate to its energy and energy services business. Shell uses story lines because stories are how humans understand the world, and stories allow for multiple levels of understanding while still giving emotional and intellectual impact. This time, for example, the three stories are: Flags, a

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“dogmatic, follow-me world”; Open Doors, a “pragmatic, know-me world”; Low Trust Globalization, a “legalistic, prove-it-to-me world”. Through the lens of these three stories, Shell looks at issues from the US-EU-China power balance to climate change and biodiversity. On carbon, all three stories come to the same conclusion: the world (and companies) will face a price for carbon. Practically speaking, for Shell’s strategy this means focusing on increased natural gas production (especially liquefied natural gas - LNG), wind, solar, bio-fuels, coal gasification and experimentation with hydrogen delivery systems. But Shell emphasizes that it is still working to make its core business – fossil fuels – succeed in a carbon-constrained world.

The second track, climate change strategy, focuses on managing the carbon footprint of Shell, sharing experience and validating the company’s position on climate change with governments, the NGO community and the general public. The goals of this track are to build capacity for action within the company and to participate in policy development. Recognizing that carbon would have value in the future, the company began working on first, taking inventory of GHG emissions, second, developing a proficiency in carbon trading and third, integrating carbon values into financial decision-making. The logic is that there will be a business benefit to both developing the experience of operating in a carbon market and working with governments to help develop those markets.

Following the 1998 study, Shell set a long-term goal of matching the Kyoto standards of a 5 percent reduction in GHG emissions by 2010. The first target within that goal was a 10 percent GHG reduction by 2002. This was the first hard target for Shell and it would be achieved through the elimination of associated gas venting at oil production units and the reduction of associated gas disposal by continuous flaring. The second hard target (remaining 5 percent below 1990 emissions through the year 2010) was a more difficult sell than the first. To

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address internal sentiments that the company had done enough and that further public action was unwise, a process of workshops with the company's various business units as well as discussions with senior leaders were arranged. The workshops considered various target-setting and implementation options for the units themselves. The greatest resistance to the idea came from business units with significant growth opportunities in their forward plans. As such, a point of significant debate centered on whether to measure emission reductions targets through an absolute (for example, MMtonsCO<sub>2e</sub>) or indexed approach (for example, MMtonsCO<sub>2e</sub> per unit of revenue or product). Shell decided that setting one universal standard for such a large company would be impractical, as it overlooked the company's very size and the challenge that size creates. The company chose a blend of these two approaches. Individual business units would use indexed or energy efficiency measures while the Group as a whole faced an absolute target.

To reach its first target, Shell looked first at the lowest-hanging fruit, achieving a sizable portion of its pre-2002 emissions reductions by ending venting of associated gas (methane) from its exploration and production facilities and most significantly, from its Nigerian operations. As the company heads toward its 2010 target, the emphasis has shifted to ending the flaring of the same gas. The company devotes energy and resources into capturing these gases and either pumping them back underground or feeding them into nearby facilities for small power stations. When the economics are right, these gases can also be

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converted into LNG, a major growth area for the company. Through these actions, Shell hopes to reduce its CO<sub>2</sub> emissions by a further 13 MMtons (from 2005), but recognizes that this reduction makes room for future growth, such as the expansion of its oil sands facilities in Canada. Shell had a global goal of ending all but small-scale continuous flaring of associated gas by 2008. Shell has said that it will miss this deadline in Nigeria, where the government has set elimination of flaring as a country-wide goal.<sup>83</sup>

The Group wanted to involve all operations in its efforts to meet the second GHG target and wanted to shift attention away from a sole focus on gas flaring. So, it sought further involvement and further reductions through individualized attention to energy use at local units. To spur reductions, Shell has set 2002 to 2007 energy efficiency targets in the refining and chemicals operations at five and eight percent improvements, respectively.

For this effort, the company also engaged its internal consulting arm, Shell Global Solutions (SGSi). SGSi consultants have helped develop many of the Group's technical solutions while also offering its consulting expertise to external clients. The consultants can be called in for projects as large as the design of refineries or as small as individual unit efficiencies. One of the SGSi programs, Energise, works specifically on energy efficiency strategies. At the request of unit managers – typically at refineries – Energise deploys teams to evaluate possible efficiency improvements. The work of these teams is similar to Alcoa's Energy

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Efficiency Team, which recommends operational, equipment and behavioral changes. Site management decides whether and how to implement the recommendations. Energise personnel are drawn from all areas of Shell, giving a broad range of technical expertise.

To gain access to available capital, energy efficiency and GHG emissions reduction projects must meet the same internal hurdle rate as other investments. However, the company uses internal shadow prices for carbon in evaluating its investments that then give such projects additional impetus. Shell currently uses three different (proprietary) carbon prices for valuing climate change in its investment decisions; one for the E.U., a second for other developed countries and a third for the developing world. Mandatory carbon regimes such as the Kyoto Protocol have helped to drive these internal pricing models and have made GHG and energy efficiency projects more attractive on a bottom-line basis since GHG emissions now have a real price in an external market.

By way of illustration Hone explains how the value of carbon can be a significant driver in energy efficiency decisions. One barrel of oil produces about 0.36 metric tons of CO<sub>2</sub>. At current (early 2006) crude prices of around \$60/bbl, an EU-ETS CO<sub>2</sub> price of €25 is like adding a further \$11/bbl 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).

But to realize the full benefits of carbon shadow pricing and monetize the cost of carbon, emissions trading has become an important prong of Shell's strategy. "It is an enabler of energy efficiency projects," states Hone. For that reason, the company was one of the early innovators in both internal and external GHG emissions allowance trading. These experiences are a good example of how the climate change issue started at the periphery of the company and moved to the core of its operations. Carbon trading began as an issue for the Health, Safety & Environment (HSE) group within Corporate Affairs with the creation of a company-wide internal trading system (ended in 2002), and then for Shell Trading with creation of a CO<sub>2</sub> trading desk at the end of 2001. The new trading desk allowed Shell to participate in both the Danish and U.K. emissions trading schemes, which ran prior to the EU-ETS, hence gaining valuable experience. Shell made the first swap between the Danish and UK systems in 2002 and, while the market did not formally open until 2005, Shell made the first actual market trade in EU Allowances in 2003. By moving from HSE to Shell Trading, "GHG is becoming more and more internalized" according to Hone.

The results of Shell's internal trading experience are mixed. They show less-than-satisfactory results on its intended outcome: gaining the greatest reductions at the lowest cost (see box). But the company feels that internal trading was successful in making people aware of the need to reduce GHG emissions and the use of trading mechanisms to do it. This expertise also gave Shell credibility

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in policy circles and meant that its views were considered in the development of the E.U. Emissions Trading Scheme (ETS) that went into effect in 2005.

Beyond its internal and external trading, Shell also became actively involved in early initiatives under the Kyoto Protocol's Clean Development Mechanism (CDM). Initial success here was also limited. The company faced problems both related to the CDM structure and of their own making. In one solar project, the company determined that the cost of going through the CDM process exceeded the benefits of the carbon offsets. In an energy efficiency project in Buenos Aires, the company has been in the CDM Executive Board process for over a year (as of January 2006), leading to some frustration with the process. In addition, Hone feels that the Group "wasted" effort on early (1999-2000) internal CDM workshops but couldn't produce concrete results because of the slow start to the CDM market. Now, with the CDM market emerging and beginning to look like a success story, the company is working to reengage its businesses and capitalize on the opportunities that CDM offers. Early in 2006 Shell Trading was the recipient of the first physical forwarding of Certified Emission Reductions to an account on the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat's Clean Development Mechanism Registry.

**Internal Trading Shows Limited Success<sup>84</sup>**

The Shell Tradable Emissions Permit System (STEPS), the company's first attempt at GHG emissions trading, had decidedly mixed results. Begun in 2000, STEPS was an internal cap-and-trade scheme designed to last three years. Units within Shell joined STEPS voluntarily and were allocated tradable emissions permits based on their past history of emissions. These units accounted for 70 percent of Shell's emissions in Kyoto Annex I countries. The goal was to reduce the emissions of these units to 2 percent below 1998 levels using declining caps on permit allocations under the trading system.

STEPS offered some benefits to the company. It gave Shell's units practical experience in both trading and calculating the cost curves for GHG abatement. The program also helped train Shell units for mandatory trading systems under the EU and Kyoto. While it provided these benefits, the program did not live up to expectations for several reasons:

- 1) The voluntary nature of the program meant there were not enough participants and not enough liquidity in the permits market. Only units that could easily reduce their emissions tended to participate – making the market price for permits artificially low.
- 2) Shell units in different countries could not monetize the internal GHG emissions trades because of the tax liability it would generate.
- 3) Midway through the scheme, some units asked for – and received – extra permits from company headquarters. This “going back to the government” created uncertainty and softness in the already illiquid market.

Beginning in 2005, the company found itself at a crucial crossroad as the carbon issue began to figure significantly in the Group's forward-looking strategy. An internal “CO<sub>2</sub> study” concluded that the Group must step up its efforts on GHGs. It must find ways to integrate its energy strategy and climate change strategy tracks into one cohesive strategy that helps them identify and capture new business opportunities as well as maintain its core fossil fuel business.

In a January, 2006 *Financial Times* editorial,<sup>85</sup> Shell CEO Jeroen van der Veer articulated Shell's conclusion that future production of liquid fossil fuels would increasingly depend on unconventional sources, such as oil sands, gas-to-



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liquids, oil shale and coal gasification. The days of “easy oil” are over. The more difficult oil is “dirtier” and the company will subsequently have to address their associated higher GHG output. Van der Veer stresses the importance of carbon sequestration – both underground and combined to make inert materials, as a technical solution. It has become clear that the energy portfolio will have a significant impact on its GHG profile. Conversely, the company’s climate change strategy has created the expectation of a company able to manage GHG emissions and government action has created carbon value in the market. These two tracks must now be intertwined. The Group’s future depends on it.

One important acknowledgement of this increased importance is the creation of a new CO<sub>2</sub> unit led by a senior executive. Graeme Sweeney, also head of Hydrogen and Renewables at Shell, has filled the post. His role will be to attend to the development of Shell’s CO<sub>2</sub> strategy and the technologies that support it. The Group’s CO<sub>2</sub> unit under Sweeney is viewed as a place to kick-start and foster GHG reduction technology until it is sufficiently integrated in the business units to stand on its own.

External demand for lower-carbon energy has led the group to look toward key growth product lines. The first is continued attention to “developing LNG and natural gas businesses as a very easy way to help transition to a low carbon world” since natural gas has half the carbon footprint of coal in electricity production. As part of its broader energy portfolio, Shell has a strategy of having

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many technological irons in the fire. “A lot of energy technologies have come and gone,” Hone says, “and it’s hard to predict what the next big hit will be.” The company has invested over \$1 billion in new technologies such as wind, solar, bio-fuels and hydrogen, and is now stepping up investment in underground sequestration and IGCC/coal gasification.

Within the last two years, there has been a growing realization that coal is going to be an integral part of the global energy mix, particularly in China and India. As gasification is a chemical conversion, an existing proficiency of the company, and has applications across a broad range of products and markets, the company sees a significant opportunity in this area. Shell’s experience with gasification dates back to the 1950’s when the first gasification unit was commissioned with oil as feedstock. There are now over 150 Shell Gasification Process (SGP) gasifiers licensed worldwide. The experience gained on oil gasification provided a firm theoretical and practical base for the start of the coal gasification development in 1972. In fact, the technology has been utilized in a coal gasification pilot plant in the Netherlands. The process can be used to make “syngas” which can be used to make everything from electricity to plastics and importantly liquid transport fuels or even hydrogen for transport. Further, the process could be altered (with further R&D) to accommodate feedstocks of wood chips, municipal waste or other materials that could be gasified into useable fuels.

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The company's solar operations are an outgrowth of solar research that started after the energy crises of the 1970's and is now focused primarily on non-silicon based, copper indium diselenide (CIS) "thin-film" panels. Shell is also one of the ten largest wind farm owners in the world with capacity greater than 350 MW. Its wind portfolio is planned to grow at the market rate of expansion to 500MW by 2007.

However, as advances are made, the company finds that some renewables clash with the existing business model. For example, electricity generation is not part of Shell's core business, yet wind power is fundamentally an electricity business. Similarly, Shell Solar has undergone both expansions and contractions, buying Siemens Solar in 2001 and then selling its silicon-based solar activities in 2006 to SolarWorld AG. The remaining thin-film business line has sought a partner in the form of Saint-Gobain, a company with "film-on-glass" technology expertise. And, as Hone puts it, "Can an oil company like Shell compete in a market where an electronics company like Sony or Sharp can bring a lot of R&D and manufacturing expertise to bear?"

Hydrogen production is an area where Shell is developing critical expertise and is seeking to leverage that expertise in its investments. Shell already produces 7,000 tons of hydrogen per day, mostly from natural gas, and mostly for use in refinery operations. Shell hopes to use this existing source of hydrogen in some of its early efforts to make hydrogen more widely used as a fuel. Right now, says

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Hone, “98 percent of homes within the E.U. are within 100 kilometers of someone’s hydrogen production site.” Because the existing infrastructure is already there, all that is necessary for this opportunity to realize itself is an awakened demand and continued refinement in hydrogen handling and distribution technology. Before that happens, Shell recognizes that it needs to be up-and-running and prepared to meet the demand. So, for example, the Group now operates four hydrogen filling stations -- in Tokyo; Amsterdam; Washington DC; and Reykjavik – and is planning to build one in Shanghai in partnership with Tongji University. Further stations are also planned for the United States.

### **Organizational Integration**

To help diffuse and incentivize climate change initiatives, Shell has incorporated climate change related goals into individual business scorecards. Scorecards use a number of criteria to evaluate performance of business units and individual managers, and focus on two or three principal metrics, such as financial performance. A particular climate change initiative (e.g. preparation for the EU-ETS by EU refineries) might account for five percent of a given score in a particular year – an amount Hone describes as “modest”. But the measures are constantly changing, reflecting a particular year’s goals. The scorecards are used for calculating bonuses more so than promotions and are revised each year to reflect new concerns.

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Beyond scorecards, three other devices foster information flow and innovation: the Annual Report, the *Shell Sustainability Report* and an internal *Climate Change Newsletter*.

The *Shell Sustainability Report*, produced annually, serves three purposes: to be the company's public face, reporting its activities to the outside world; to act as an internal coordinating mechanism, giving staff and the various business units a guiding vision; and to allow those units to communicate their concerns and ideas during the process of compiling the *Report*. To develop the report, which is published each year in April, cross-business workshops are organized the preceding October to identify key issues to discuss and report on. "The goal is not simply to record accomplishments or make people feel good," says Hone. "It is meant to be self-challenging."

The *Climate Change Newsletter* is a purely internal e-mail document that reaches a community of 300+ employees each month. Employees with an interest in climate change issues can find out about the newsletter on the Shell internal climate change website and subscribe. The newsletter discusses specific technologies, developments within the company, and external climate change information. Anyone within the company can receive the newsletter, yet subscribers tend to come from four categories: corporate, including legislative affairs personnel; technology development (including CO<sub>2</sub> sequestration and

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energy efficiency); commercial units such as trading; and business areas with GHG-focused projects such as the Canadian oil sands units.

**External Outreach**

The full gains from Shell's efforts at carbon management would not be realized without a concerted effort to engage with external groups. Shell directs its external relations regarding carbon management to four primary areas – trade associations; shareholders; NGOs and, most importantly, government.

First, Shell works through its trade associations to further develop action on climate change. At times, trade associations have taken positions that are not aligned with Shell's viewpoint. But Shell has typically chosen not to publicly break with such organizations (an exception being the Global Climate Coalition in 1998). The company instead focuses their efforts on practical measures on which there is consensus, like standardizing measures for reporting GHG emissions. Trade associations are not solely the domain of industry's large players. Hone stresses that trade associations are important to smaller players who he believes must stay involved in the regulatory development process.

Second, to allow itself the space to make forward-looking decisions about climate change, Shell believes it must convince shareholders of the merits of being environmentally responsible. The company does get climate change questions from investors and investor groups (such as the Carbon Disclosure Project) and

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climate change appears to be a rising issue. In addition, by watching shareholder resolutions at competitors such as ExxonMobil or Chevron, the company knows it is an issue they cannot ignore. At the request of his own internal investor relations department, Hone has given presentations to investor groups on climate change and energy development.

Third, Shell is working with non-governmental organizations (NGOs) on climate change issues. “NGOs,” Hone says, “can expose the company to a range of views on how we are doing.” Shell’s work with Pew, for example, opens some doors for the company that wouldn’t otherwise be available. “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.”

Shell Canada has set up a Climate Change Advisory Panel, made up of representatives of NGOs (including a First-Nation, Native American representative) to address concerns over GHG emissions at the Athabasca oil sands project. Shell sees this as part of the integration of its energy and climate change strategies, acknowledging that this new fuel source will impact its carbon footprint, its public credibility, its unofficial license to operate and ultimately its ability to expand operations. Hone says there has been tension on the Panel from time to time, but calls it “healthy”. For example, when the company was

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considering its second hard target on GHG reductions, the Panel was a good sounding board for ideas they were considering.

**Policy**

Governments are the fourth, and most important, area at which Shell directs its external affairs activity. As governments act on climate change, Shell wants a seat at the table to discuss future regulation. “Particularly in emissions trading, these are the people you’re doing a major trade with through the allocation process,” Hone says of governments. “If you’re doing a deal with somebody and they’re setting the rules, then you want to have a say.” And because climate change cuts across many issues ranging from the location of new LNG facilities to energy prices, Shell’s government relations offices spend an increasing amount of their time on climate change/GHG issues with the most involvement in the U.K., strong involvement with the E.U. in Brussels and then moderate involvement in Washington. Overall, says Hone, “Our role is not to advocate that policy be enacted. We don’t set policy. But if a government decides that policy is necessary, we will help them understand the best mechanisms to reach their goals.”

Shell (and other corporate representatives) worked with the U.K. government to help set up the U.K. Emissions Trading Group to develop rules on trading in the U.K. Further, Shell has worked with the Corporate Leaders Group in the U.K. who, in conjunction with the Prince of Wales Business and Environment program,



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wrote a letter to the Prime Minister recommending more aggressive action on climate change.

Shell doesn't advocate voluntary reductions as a long-term strategy to reduce GHG emissions. "Government needs to get involved through a variety of mechanisms," says Hone. A balanced approach of market incentives, tax incentives, and subsidies is needed to create strong encouragement." Mandatory programs, such as the EU Emissions Trading System, will help ensure the playing field is level, define price and monetize the advances Shell makes in reducing its GHG emissions. Without the government pushing it, he says, the business case for GHG reductions is harder to make, "and action cannot take place without the business case." By contrast, Hone says, a business case driven by higher energy prices may not lead to lower carbon emissions, as higher prices may merely push companies to exploit heavier 'unconventional' oil resources, dig for more coal or drill deeper oil and gas wells.

**Challenges Ahead**

In looking over its initiatives thus far on climate change, Hone sees the failure of the company's internal trading system as one useful lesson. While its failure was a surprise, he feels the company should have seen its limitations beforehand. But rather than dismissing the entire venture as lost, he sees benefits in the way it helped the company develop the expertise to become a leader in emissions trading in Europe.

Reflecting on all his company has done, Hone ponders “When addressing climate change, the question is not just how will you manage your own GHGs, but how will you change the game? Ultimately, we’ll have to get out of fossil fuels, but that is almost certainly many decades away. Maybe hydrogen is the answer. But you have to make the right change at the right time and in the right way. People will not get rid of cars and people will always want more energy. The key is both influencing the rules of the game and timing your shift to a new carbon-constrained strategy. It’s knowing what the next technology for energy production is, and shifting when the market is ready to reward it. We’re not going to get out of the oil business in the near term.” But you have to ask, says Hone, “What is the iPod® for energy? Is it out there? You have to be on watch.”

## **Don't Switch Tracks When the Train is Already Moving *Whirlpool\****

At the ninth meeting of the Conference of the Parties of the Kyoto Protocol in 2003, Whirlpool became the world's first appliance manufacturer to announce a greenhouse gas (GHG) reduction

strategy. But unlike many other companies that have made similar pledges, Whirlpool's approach to climate change involves neither dramatic changes to its operations nor significant bottom line costs. Its strategy is laser focused on leveraging its current core competencies, and continuing down the same path it has been on for

<b>Whirlpool's Footprint (2005)</b>	
Headquarters:	Benton Harbor, MI
Revenues:	\$14.3 billion
Employees:	65,682
Percentage of Emissions in Kyoto Ratified Countries: 31 percent	
Direct CO <sub>2</sub> e Emissions:	0.8 MMtons*
Indirect CO <sub>2</sub> e Emissions**:	146.5 MMtons
Aggregate CO <sub>2</sub> e Emissions:	147.3 MMtons
Target:	Three percent below 1998 levels by 2008 while increasing sales 40 percent.
Year Target Set:	2003

\* Million metric tons.  
\*\* Measured as emissions from product use.

years: bringing the most energy efficient products to the market and, in so doing, reducing GHG emissions through its consumers. In fact, given the company's on-going drive for energy efficiency, the words "climate change" are not often stated as an explicit concern among the workforce. The mantra is "energy efficiency"

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\* We would like to thank Tom Catania, Dick Conrad, Mark Dahmer, JB Hoyt, Bob Karwowski, Casey Tubman and Steve Willis for their contributions to this case study.

At the time of writing, Whirlpool was in the process of acquiring Maytag Corporation. However, because of Securities and Exchange Commission rules, the merger could not be discussed until approval. Maytag is also a member of The Pew Center on Global Climate Change's Business Environmental Leadership Council, though they have not set a definitive GHG reduction target.

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plain and simple. In the words of Mark Dahmer, Director of the Laundry Technology Division, “We’ve got a train moving on efficiency. We’d just start confusing things if we tried to throw more on the train or start a new train.”

**Company Profile**

Based in Benton Harbor, MI, Whirlpool is the world’s largest home appliance manufacturer. With annual sales of over \$14 billion and nearly 50 manufacturing and research facilities worldwide, the company sells to consumers in more than 150 countries. Among its 11 major brand names are Whirlpool®, KitchenAid®, Kenmore®, Brastemp®, Bauknecht®, and Consul®. The company’s broad vision is to have the company’s products in “every home, everywhere.”

Two aspects of Whirlpool’s culture above all others drive the company’s attention to addressing climate change. The first is a continual search for ever increasing energy efficiencies. This is born out of the company’s historic focus on cost and quality in a low margin industry. The second is a close connection to its Midwestern roots, out of which emerges a strong belief in corporate citizenship. According to Dahmer, one of the core corporate principles is that there is “no right way to do a wrong thing.” The company’s Corporate Social Responsibility (CSR) statement expresses it simply as an aim to operate in “ways that honor ethical values and respect people, communities and the natural environment. Equal to protecting the health and safety of our employees, we consider environmental stewardship among our most important business

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responsibilities.”<sup>86</sup> That aim is echoed in the statements of employees as the primary reason for addressing climate change. In the words of many, the company is just trying to “do the right thing.” According to Dahmer, “the company is about providing for the country and the customer.”

**Strategy Development**

In 2003, the company announced a plan to decrease total GHG emissions from global manufacturing, product use and end-of-life by three percent from a 1998 baseline by 2008, while increasing sales by 40 percent over the same period. According to Whirlpool, these reductions were equivalent to the CO<sub>2</sub> emissions of 28 coal-fired plants or 10 million cars. On announcing the reductions, Tom Catania, Vice President of Government Relations, commented, “whatever political solution the global community agrees to as the best mechanism for collectively addressing climate change, our company will continue its efforts to do our part, while at the same time bring unique, innovative and energy-efficient products to our customers.”<sup>87</sup>

And customers are the key to Whirlpool’s efforts to address climate change. Studies have shown that the majority of lifecycle GHG emissions from home appliances come from the use phase. Whirlpool’s internal studies conclude that of the nearly 30 metric tons of CO<sub>2</sub>e emitted over the life of an average washing machine, over 93 percent come from the use phase. Of the remaining amount, two percent come from manufacturing and five percent come from end-of-life

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disposal. This is corroborated by a 1992 study by the United Kingdom-based PA consulting group which also shows that over 93 percent of washer emissions come from use.<sup>88</sup>

The concentration of emissions in the use phase presents an opportunity for focused efforts toward reducing those emissions. While the company still seeks energy reductions throughout the supply chain, it has determined that further improvements in the manufacturing process would be hard to find. Bob Karowski, Director Environmental Health and Safety for North America, relates a story from the late 1990s when a group of Enron energy analysts came to evaluate Whirlpool's opportunities for further efficiencies. None were found.

Driven by mandatory (such as national energy efficiency standards) and voluntary (such as Energy Star™) programs, as well as competitor pressures and consumer demand, Whirlpool has been engaged in a constant search for energy efficiencies with its appliances. The company (and the industry) has achieved dramatic energy savings over the past 30 years. Compared to models from 1970, today's refrigerators use less than half as much energy and washing machines and dishwashers use approximately one-third as much. Since 1980, the overall percentage of the United States home energy use that is dedicated to appliances has dropped by two-thirds, to between 18 and 20 percent.

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Yet these improvements have not always been easy. In the past, the company has felt that it was paddling upstream against consumer demand. For example, in 1993 the company was the winner of the Super Efficient Refrigerator Program (SERP) competition sponsored by the Environmental Protection Agency (EPA), the Department of Energy (DOE) and 27 national utilities. Though the company received the \$30 million prize for winning the challenge and enjoyed the accolades that came with it, some in the company felt that the corporate investment far outweighed the reward. In the end, the prize money barely defrayed the development dollars and the company was forced to go to great lengths to elicit consumer interest in the product. This experience planted concerns within the company that you cannot get too far ahead of the market; efficiency gains must not exceed manufacturing costs or consumer demand.

According to Mark Dahmer, Director of Laundry Platform Technology, American consumers believed that efficiency was tied to inferior performance. Like the falsehood that higher automobile fuel efficiency necessitates compromised performance, customers believed that an efficient machine would not clean as well. At one point, the situation was so disconcerting that the company engaged in an internal debate over the merits of featuring the Energy Star™ label so prominently on its products. In the end, they decided to keep the label to educate the consumer. While using less water and less energy could elicit concerns from some consumers, the company felt that it had merits as a proxy for quality and performance.

Just after this dampening experience with efficient refrigerators, the company faced a challenge from competitors on efficient washers that, in the end, had a positive effect. In the early 1990s, small European-style front loading, horizontal axis washers were sold in the United States in limited quantities. The sales volume was low, as these products lacked the size or features preferred by consumers. In the late 1990s, the introduction and early consumer acceptance of a new full-sized, front load washer led Whirlpool to rapidly leverage its European technology to introduce a American-style product of its own. This technology was available to Whirlpool through its 1989 acquisition of the Philips business in Europe. The Whirlpool Duet<sup>®</sup> is a front loading washing machine that uses the more efficient horizontal axis orientation to yield efficiencies of 68 percent less energy, 67 percent less water and 50 to 70 percent less detergent than traditional top loading machines. Most importantly, the machine has been extremely successful in the marketplace and served to counter internal resistance that had been generated by the earlier SERP experience.

Over the past two years, Whirlpool executives sense a market shift as consumers have become increasingly interested in energy efficiency. This, they believe, is driven by both increasing awareness of climate change and environmental issues as well as increasing energy costs. According to Casey Tubman, Brand Manager of Fabric Care Products, “In the 1980s, energy efficiency was number ten, eleven or twelve in consumer priorities. In the last



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four or five years, it has come up to number three behind cost and performance, and we believe these concerns will continue to grow.” But energy efficiency still requires education of the consumer. The most efficient washers can cost up to \$500 more than traditional washers (absent any rebates). But, depending on utility rates, they can save between \$75 and \$100 per year, yielding a payback of five years. According to Catania, “We are getting better and better at making this visible to consumers. This is good for the environment, good for the consumer and good for Whirlpool.”

Going forward, Whirlpool believes that the focus on efficiency will have other long-term benefits for the company in terms of market share. According to Tubman, energy efficiency is becoming a source of competitive advantage by building brand loyalty; “Once someone buys a high efficiency device, they never go back to buying a traditional machine.” Whirlpool’s market research supports this conclusion. According to Steve Willis, Director of Global Environment, Health and Safety, Whirlpool surveys have demonstrated that “there is a strong correlation between a company’s performance in appliance markets and their social response to issues such as energy efficiency and pollution.” While not uniform across products or regions, Whirlpool believes that environmental attributes (water and energy conservation) yield customer loyalty and repeat purchases.

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As an added benefit, Whirlpool executives believe that the company's focus on energy efficiency, like its other responsibility efforts, helps to draw and retain people who feel good about the company and perform better. In Tubman's words, "The values stay here because the people stay here and the people stay here because the values stay here."

All of this leads to the conclusion that a focus on GHG reductions through energy efficiency is central to the company's core strategy. The company states that it will continuously develop new energy efficiency technologies, and at times, license them to competitors. If necessary, the company will also aggressively guard those innovations. In the summer of 2003, Whirlpool sued Korea based LG Electronics for patent infringement, claiming that LG copied technology developed by Whirlpool that delivers sharply higher energy and water savings to customers. When commenting on the suit, David L. Swift, Whirlpool's executive VP for North America, remarked, "Whirlpool has invested heavily in developing innovative fabric care wash technology that delivers meaningful benefits to our customers ... Whirlpool will tirelessly and aggressively work to protect our assets from competitors who choose to disregard U.S. patent law."<sup>89</sup>

The motivation behind the lawsuit, according to Catania, is both to protect the company's assets but also to maintain a level playing field where he thinks the company can win. Toward that end, Whirlpool has worked aggressively through

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its trade association to develop rigorous techniques for measuring energy efficiency, keeping them up to date and uniformly applied.

**Organizational Integration**

Unlike other companies in this report, the impetus to address GHG emissions at Whirlpool did not come from the CEO's office. Though JB Hoyt, Director of Regulatory and State Government Relations, admits that top down leadership would have been important to the company if it were starting from scratch, he says that the company had already been working on energy efficiency for years. There was no need to push a new mindset through the organization. In fact, some at the company believe that introducing the concept would do more harm than good, confusing what is already an on-going initiative.

Whirlpool first began attending to climate change in the same way it addresses other environmental issues: through the company's Environmental Council. Comprised of representatives from the six business units (North America, Europe, China, India and Brazil white goods and compressors), the group meets by phone, six to eight times per year to consider the environmental and employee safety concerns facing the corporation. These issues are brought before the Council through suggestions from the Council members based on their efforts to identify best practices, new challenges and emerging trends. In 2003, the Council selected climate change as an issue that necessitated review, particularly in terms of developing better tracking and control of GHG emissions.

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In addition, the company was motivated by their involvement with the Business Roundtable's challenge to commit to the voluntary Climate RESOLVE initiative. Since Whirlpool's commitment to energy efficient appliances was central to its long term strategy, the additional focus on GHG emissions was a natural step to take, and had the potential to help create a competitive advantage.

To develop targets for GHG reductions, Willis went to each of the product groups (refrigeration, fabric care (washers/dryers), dishwashers, cooking, air conditioning, and portables) and compiled data on sales volume projections, consumer use, average age of each type of product when taken out of use, and introduction schedules for new, more energy efficient models. He then calculated total energy consumed by all the products over their average life and converted that energy consumption to GHG emissions using country specific conversion factors. The result was the determination that the total GHG emissions from product sold in 2008 would be three percent less than the total GHG emissions from the product actually sold in 1998.

Willis admits that the three percent goal will not be a tremendous stretch for the company, but according to Hoyt, they may commit to a stretch goal "after we get a track record." Nevertheless, Willis is extremely confident they will meet their target. Returning to the company's mantra of producing efficiency improvements for its consumers, he comments, "We were going to do this stuff anyway. Energy efficiency is one of our priorities."

And this leads to one final and important point about Whirlpool’s global appliance portfolio. Catania points out that “You’d be hard pressed to tell the difference between a Whirlpool appliance sold in a Kyoto ratified and a Kyoto non-ratified country. We’re trying to get as much global leverage on our factories as possible.” So, whether the United States ratifies Kyoto or not, the most efficient technologies the company produces (such as seals, the primary source of cooling loss in refrigerators) will migrate around the world. According to Catania, “When we build a factory, we want to milk it and use the technology throughout our product line.”

### **External Outreach**

Whirlpool, like other companies in this study, places great emphasis on external outreach. But the direction of that outreach is critically focused on enhancing consumer awareness and demand. For example, to address consumer misconceptions about the efficacy of energy efficient appliances, the company has actively worked to educate retailers (such as Lowe’s and Sears) and consumers on their benefits, including their average five year payback period. Since the more efficient machines need high efficiency detergents to attain the best cleaning experience (at no additional cost per load, the company is quick to point out), Whirlpool worked closely with Proctor & Gamble to help educate consumers and assure availability of the detergents. Further, the company was

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pivotal in convincing *Consumer Reports* magazine to include energy efficiency in the rankings of appliances.

Like other companies in this report, the company has not shied away from stepping out in front of its industry on these issues. This has not always been welcome by its competitors. Early on, the company faced criticism by some who felt that Whirlpool was trying to use energy efficiency as a way to disadvantage the competition, particularly those with lower capital spending plans. This criticism played out with the American Home Appliance Manufacturers (AHAM), the industry lobbying organization in Washington, D.C. of which Whirlpool is the largest member. In 1993, Whirlpool introduced highly efficient refrigerators in the belief that this would spur federal mandates to require manufactures to meet its efficiency level. However, following the Gingrich revolution of 1994, other manufacturers convinced the AHAM to lobby against the new regulations. Since the organization had a policy of one vote per company regardless of market share, Whirlpool's interests were overruled. The organization was successful in convincing the DOE to hold off on the new regulations and, in response, Whirlpool withdrew from the organization in March 1997. After months of negotiations, the company rejoined the AHAM following amendments to the organization's bylaws that require 75 percent membership approval (by market share) of all public policy positions. Today, Catania points out that much of the industry shares Whirlpool's concern for energy efficiency.

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Finally, the company has also worked closely with some non-governmental organizations (NGOs) to develop and promote energy efficiency incentives. For example, the company worked closely with the Sierra Club, Natural Resources Defense Council, the Alliance to Save Energy and others to promote manufacturers tax credits within the recently passed Energy Policy Act of 2005. Unlike consumer tax incentives, these credits can offset substantial manufacturer development investments, allowing producers to provide a less expensive product to the end consumer. In the words of Tom Catania, the credits provide a “win-win for everyone. NGOs and the government get environmental gains while the consumer gets a better product.”

**Policy**

Whirlpool has a long history of working with the government. Since 1975, the company has played a leadership role in crafting every major appliance efficiency regulation, and has been an Energy Star™ Partner of the Year every year since 1999.

On the issue of climate change, the company’s primary focus on end-use emissions leads executives to feel strongly that any national policy aimed at addressing climate change must include credit for use-cycle reductions. “Who gets the use credits?” asks JB Hoyt. “Should the utility get it? The user? The Manufacturer? We’re feeling our way along on CSR and climate change. We want to provide a leadership voice.” Catania adds, “If the government wants to

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motivate appliance manufacturers to participate in a meaningful cap-and-trade program, then it needs to provide credit for the power plant emissions reduced or avoided through the increased energy efficiency of our products.” Willis echoes this sentiment, “If the company is going to move forward on climate change, we need to get credits for indirect emissions.” This is the number one issue, even though the company has been working on emissions reductions for a long time. Says Hoyt, “We would love to get credit for the gains we’ve made in the 1980s and early 1990s, but the real line in the sand for us is the 1998 baseline for our GHG reduction commitments.”

When pressed, Catania adds that the company would be just as satisfied with manufacturer’s tax credits rather than carbon credits. In either case, the company will be rewarded for producing energy efficient products. The least attractive solution, in Catania’s view, would be consumer credits for efficient products. “The consumer credit does not have nearly the stimulative effect that the manufacturer’s credit.” Competitors could easily undercut the stimulus of a consumer rebate by cutting margins.

One area where Catania has very strong feelings is the topic of state-level climate change regulations. “This would be a huge misdirection of resources and much less can be achieved if we are subjected to a Balkanized set of standards from fifty different sources.” In his view, 50 separate policies would benefit neither consumers nor businesses.



### **Challenges Ahead**

Whirlpool is still struggling with the growing pains of recent expansion and acquisitions. Coordination among the various divisions of the company is loose. While each plant has an “energy facilities engineer,” for example, there is presently no one person in the company who focuses on company-wide energy conservation. (The company is considering creating such a position.) Whirlpool has a highly decentralized culture and its units value and protect their autonomy. Technology sharing, when it does occur, is limited, and there is little technology transfer among plants domestically or globally. In the aggregate, these factors have cemented the belief within Whirlpool that the company has reached the limits on energy efficiency in manufacturing process.

An additional challenge is Whirlpool’s current difficulty in analyzing emissions data. In order to analyze data collected in 2003 and 2004, the company solicited bids for a data management system to track emissions and conservation. When the proposals came back with costs between \$75,000 and \$225,000, the company decided to develop a system in-house. These efforts have so far been unsuccessful. According to Willis, a data management system and international GHG conversion factors are the company’s biggest current needs with regard to climate strategy.

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The company is also alert to the balance it must strike between leading and not leading too much. Consumers care about energy efficiency but cannot be pushed too hard to purchase more efficient models. Requiring sacrifices or greater effort of the consumer so as to attain greater efficiency is out of the question. According to one customer survey conducted by Whirlpool, “Consumers expect a comfortable solution with a minimum of inconvenience. Whoever is the bearer of news to the contrary, is subject to consumer disdain and ridicule.”<sup>90</sup>

Looking forward, a focus on energy efficiency gives Whirlpool a premium product well suited for a carbon-constrained future. Though there is relative technological parity between the product offerings of domestic and European manufacturers, the company is concerned that Asian-based manufacturers could overrun the domestic market with cheap, less energy efficient, machines. But increased home energy prices resulting from efforts to reduce GHG emissions could potentially be a windfall to Whirlpool as consumers place an even higher premium on energy efficiency. Banking on this future, Whirlpool has stayed the course and continued to do what it does best -- bringing energy efficiency into the home.

## **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 in order to achieve recognition of achievements (from both regulators and stakeholders), inform the public debate on climate change, or to participate in educational exchanges.

**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):** are 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.

**CO<sub>2</sub> equivalents (CO<sub>2</sub>e):** Carbon dioxide equivalents (CO<sub>2</sub>e) 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 CO<sub>2</sub>e. Global Warming potentials for the greenhouse gases regulated under the Kyoto Protocol under a 100 year timeframe are as follows:

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Carbon dioxide has a GWP of 1; Methane has a GWP of 23; Nitrous oxide has a GWP of 296; Halocarbons (HFC) has a GWP of 120 to 12,000; Sulphur Hexafluoride has a GWP of 22,200.<sup>91</sup>

**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 CO<sub>2</sub>, under pressure into stable geologic formations where it is expected to remain indefinitely.

**Global Warming Potential (GWP):** The relative impact on climate over 100 years of the emission of one kilogram of a compound compared to the emission of one kilogram of CO<sub>2</sub>. Each greenhouse gas differs in its atmospheric lifetime and ability to absorb heat in the atmosphere. CH<sub>4</sub> has a GWP of 21. GWP values for N<sub>2</sub>O = 310; HFC = from 140 for HFC-152a to 11,700 for HFC-23; PFC = from 6,500 to 9,200 and SF<sub>6</sub> = 23,900.<sup>92</sup>

**Greenhouse Gases:** There are six focal greenhouse gases. Greenhouse gases that are both naturally occurring and manmade include *carbon dioxide* (CO<sub>2</sub>), *methane* (CH<sub>4</sub>), and *nitrous oxide* (N<sub>2</sub>O). Greenhouse gases that are not naturally occurring include *hydrofluorocarbons* (HFCs), *perfluorocarbons* (PFCs), and *sulfur hexafluoride* (SF<sub>6</sub>).

**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 ranging 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.

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**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.<sup>93</sup>

**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-Leiberman Climate Stewardship Act** is 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 (N<sub>2</sub>O):** N<sub>2</sub>O is among the six greenhouse gases to be curbed under the Kyoto Protocol. N<sub>2</sub>O 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 N<sub>2</sub>O is over 100 years, and its GWP is 310.

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**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<sub>x</sub> 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 CO<sub>2</sub>, either through biological processes (e.g. plants and trees), or geological processes through storage of CO<sub>2</sub> in underground reservoirs.

## Endnotes

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- <sup>1</sup> BELC survey respondents are AEP, Air Products, Alcan, Alcoa, Baxter, BP, Cinergy, DTE Energy, DuPont, Entergy, Exelon, Georgia-Pacific, Holcim, IBM, Intel, Interface, Maytag, PG&E, Rio Tinto, Rohm and Haas, SC Johnson, Shell, Sunoco, TransAlta, United Technologies, Whirlpool, and Wisconsin Energy.
- <sup>2</sup> Non-BELC survey respondents are Advanced Micro Devices, Calpine, Fairchild Semiconductors, and Staples.
- <sup>3</sup> BELC case studies are Alcoa, Cinergy, DuPont, The Shell Group and Whirlpool.
- <sup>4</sup> Non-BELC member case study is Swiss Re.
- <sup>5</sup> Op. cite., Hoffman (2005).
- <sup>6</sup> Lemonick, M. 2005. "Has the Meltdown Begun?" *Time*, February 27: 58-59.
- <sup>7</sup> Mintzer, I J. Leonard and P Schwartz. 2003. *U.S. Energy Scenarios for the 21<sup>st</sup> Century* (Washington, D.C. Pew Center on Global Climate Change).
- <sup>8</sup> Carbon Trust. 2004. *Brand Value at Risk from Climate Change*. (London: Carbon Trust).
- <sup>9</sup> Lemonick, M. 2005. "Has the Meltdown Begun?" *Time*, February 27: 58-59.
- <sup>10</sup> Deutsch, C. 2005. "Goldman to Encourage Solutions to Environmental Problems." *New York Times*, November 22, Section C3, 3.
- <sup>11</sup> Smith, J. 2005. "The Implications of the Kyoto Protocol and the Global Warming Debate for Business Transactions," *NYU Journal of Law & Business*, 1(2): 511:550; Ewing, K., J. Hutt and E. Petersen. 2004. "Corporate Environmental Disclosures: Old Complaints, New Expectations." *Business Law International*, 5(3): 459-515.
- <sup>12</sup> BELC survey respondents are AEP, Air Products, Alcan, Alcoa, Baxter, BP, Cinergy, DTE Energy, DuPont, Entergy, Exelon, Georgia-Pacific, Holcim, IBM, Intel, Interface, Maytag, PG&E, Rio Tinto, Rohm and Haas, SC Johnson, Shell, Sunoco, TransAlta, United Technologies, Whirlpool, and Wisconsin Energy.
- <sup>13</sup> Non-BELC survey respondents are Advanced Micro Devices, Calpine, Fairchild Semiconductors, and Staples.
- <sup>14</sup> BELC case studies are Alcoa, Cinergy, DuPont, The Shell Group and Whirlpool.
- <sup>15</sup> Non-BELC member case study is Swiss Re.
- <sup>16</sup> Austin, D. and A. Sauer. 2002. *Changing Oil: Emerging Environmental Risks and Shareholder Value in the Oil and Gas Industry* (Washington DC: World Resources Institute).
- <sup>17</sup> DeCicco, J., F. Fung and F. An. 2005. *Automakers' Corporate Carbon Burdens: Update for 1990-2003*. (New York: Environmental Defense).
- <sup>18</sup> Moran, M. , A. Cohen, N. Swem, and K. Shaustyuk, 2005. "The Growing Interest in Environmental Issues is Important to Both Socially Responsible and Fundamental Investors." *Portfolio Strategy*. Goldman Sachs, August 26: 5.
- <sup>19</sup> Some companies use both indexed and absolute measures.
- <sup>20</sup> 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.
- <sup>21</sup> Griscom Little, A. 2005 "It Was Just My Ecoimagination." *Grist Magazine*, May 10  
"<http://www.grist.org/news/muck/2005/05/10/little-ge/index.html>
- <sup>22</sup> For a description of the one-ton challenge, see:  
<http://www.climatechange.gc.ca/onetonne/english/index.asp?pid=179>
- <sup>23</sup> Aston, A. & Helm, B. 2005. "The Race Against Climate Change," *Business Week*, December 12: 59-66, 132.
- <sup>24</sup> Op. cite, Smith, J. 2005.
- <sup>25</sup> Deloitte Research. 2005. *Which Way to Value? The U.S. Power and Utility Sector, 2005-2010* (Washington DC: Deloitte Development LLC)
- <sup>26</sup> Op cite, National Commission on Energy Policy. 2004, 21.
- <sup>27</sup> Bodansky, D. S. Chou and C. Jorge-Tresolini. 2004. *International Climate Efforts Beyond 2012: A Survey of Approaches* (Washington DC: Pew Center on Global Climate Change).
- <sup>28</sup> Op. cite, Deloitte Research. 2005.

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- <sup>29</sup> Tully, S. 2005. "Commercial Contributions to the Climate Change Regime: Who's Regulating Whom?" *Sustainable Development Law and Policy*, 5(2): 14-27.
- <sup>30</sup> Op. cite., Hoffman (2005).
- <sup>31</sup> Cinergy 2005. *About Cinergy, Cinergy at a Glance*, [http://www.cinergy.com/About\\_Cinergy\\_Corp/Corporate\\_Overview/default\\_at\\_a\\_glance.asp](http://www.cinergy.com/About_Cinergy_Corp/Corporate_Overview/default_at_a_glance.asp), viewed 10/9/05.
- <sup>32</sup> Ibid, Cinergy 2005. *About Cinergy, Cinergy at a Glance*
- <sup>33</sup> Based upon the Department of Energy (Energy Information Administration) figure of 1.016 billion tons of coal consumed for electric power in 2004.
- <sup>34</sup> Based upon Department of Energy (Energy Information Administration) 2004 data, combustion of coal accounted for approximately 85 percent of CO<sub>2</sub> emissions from the electric power sector in the United States in 2004. The electric power sector accounted for approximately 40 percent of CO<sub>2</sub> emissions in the United States. Total CO<sub>2</sub>e emissions in the United States were approximately 7.6 billion tons in 2004.
- <sup>35</sup> Ibid, Cinergy. 2004, *Air Issues Report*: 26.
- <sup>36</sup> David, J. and H. Herzog. 2002. *The Cost of Carbon Capture*. (Washington DC: US DOE, National Energy Technology Laboratory) [http://www.netl.doe.gov/publications/proceedings/01/carbon\\_seq\\_wksp/David-Herzog.pdf](http://www.netl.doe.gov/publications/proceedings/01/carbon_seq_wksp/David-Herzog.pdf), viewed 2/7/06
- <sup>37</sup> Cinergy. 2004. *Air Issues Report to Stakeholders*. (Cincinnati, OH: Cinergy Corp.): 29
- <sup>38</sup> Ibid, Cinergy. 2004, *Air Issues Report*: 2.
- <sup>39</sup> Ibid, Cinergy. 2004, *Air Issues Report*: 2.
- <sup>40</sup> Ibid, Cinergy. 2004, *Air Issues Report*: 26.
- <sup>41</sup> Ibid, Cinergy. 2004, *Air Issues Report*: 26.
- <sup>42</sup> Cinergy. 2004. *Annual Report*. (Cincinnati, OH: Cinergy Corp.): pp. 14-15
- <sup>43</sup> Op. cite, Cinergy. 2004, *Air Issues Report*.
- <sup>44</sup> Op. cite, Cogan, D. 2006.
- <sup>45</sup> The full scale of Duke Energy is changing as it has announced the sale of Duke Energy North America (DNA) and its 6,200 MW of generating capacity for \$1.54 billion. Duke Energy 2006. "Duke Energy Announces Sale of DNA Power Generation Assets to LS Power." <http://www.duke-energy.com/news/releases/2006/jan/2006010901.asp>, viewed 2/1/06
- <sup>46</sup> UNFI. 2002. *CEO Briefing on Climate Change*. <http://unepfi.org>, viewed 1/29/06.
- <sup>47</sup> Swiss Re. 2004. *Sustainability Report 2004*, <http://www.swissre.com>, viewed 1/29/06.
- <sup>48</sup> Swiss Re. 2004. *Climate Change Matters to All of Us: The Great Warming*, <http://www.swissre.com/>, viewed 1/24/06.
- <sup>49</sup> Schmidheiny, S. and F. Zorraquin. 1996. *Financing Change: the Financial Community, Eco-Efficiency, and Sustainable Development*. (Cambridge, MA: MIT Press).
- <sup>50</sup> Aston, A. and Helm, B. 2005. "Financial Services Leaders." *Business Week*, December 12.
- <sup>51</sup> At the time of writing this case, Swiss Re was completing the acquisition of General Electric's Reinsurance division. Upon completion of the merger (expected for June 2006), Swiss Re will surpass Munich Re as the world's largest reinsurer.
- <sup>52</sup> Swiss Re. 1994. *Global Warming, Elements of Risk*. (Zurich: Swiss Re).
- <sup>53</sup> In December 2004, HSBC made a commitment to become the world's first major bank to achieve carbon neutrality. The target was achieved in 2006.
- <sup>54</sup> Swiss Re also works to meet MINERGIE® standards, the European equivalent of LEED®, in all its new buildings in Switzerland, and in refurbishing projects whenever financially, technically, and architecturally feasible. MINERGIE® certified buildings are 60 percent more efficient in their heating systems than is required by current Swiss regulations. Also, the standard requires that construction costs not exceed standard costs by more than 10 percent, and in practice they tend to be only about two to four percent higher. Since 2000, the company has received MINERGIE® certification for 13 real estate projects with a total floor space of 151,000 square meters (1,625,350 square feet).
- <sup>55</sup> Business to business, as opposed to B2C – Business to customer.
- <sup>56</sup> Swiss Re. 2004. *Swiss Re Climate Specialist on TV*, <http://www.swissre.com>, viewed 1/29/06.
- <sup>57</sup> Swiss Re. 2003. *Becoming Carbon Neutral*, <http://www.swissre.com>, viewed 1/29/06.



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- <sup>58</sup> Black powder is the oldest ballistic propellant for muzzleloaders and early cartridge arms composed of a mixture of potassium nitrate (saltpeter), charcoal and sulfur.
- <sup>59</sup> DuPont. 2006. *DuPont Heritage*, <http://heritage.dupont.com/>, viewed 1/8/06.
- <sup>60</sup> Solae is a manufacturer of soy protein and fiber ingredients in a joint venture with Bunge.
- <sup>61</sup> Pioneer Hi-bred International is a seed company specializing in biotechnology and genetic engineering.
- <sup>62</sup> Op. cite, Aston, A. and B. Helm. 2005.
- <sup>63</sup> Op. cite, Cogan, D. 2006.
- <sup>64</sup> DuPont. 2006. *Company at a Glance*, [http://www2.dupont.com/Our\\_Company/en\\_US/glance/index.html](http://www2.dupont.com/Our_Company/en_US/glance/index.html), viewed 1/8/06.
- <sup>65</sup> Ibid, DuPont. 2006. *Company at a Glance*.
- <sup>66</sup> DuPont. 2006. *Sustainable Growth*. [http://www2.dupont.com/Our\\_Company/en\\_US/glance/sus\\_growth/sus\\_growth.html](http://www2.dupont.com/Our_Company/en_US/glance/sus_growth/sus_growth.html), viewed 1/21/06
- <sup>67</sup> Op cite, Aston, A. and B. Helm. 2005.
- <sup>68</sup> Thiemens, M. and W. Trogler. 1991. "Nylon Production: An Unknown Source of Atmospheric Nitrous Oxide." *Science*, 251(4996): 932-934.
- <sup>69</sup> The industry-wide agreement of N<sub>2</sub>O producers included Asahi, BASF, Bayer, DuPont, ICI and Rhone-Poulenc.
- <sup>70</sup> HCFCs are generally considered interim replacements for CFCs. Their phase-out schedule is delayed compared to CFCs under the Montreal Protocol.
- <sup>71</sup> Warren, S. 2006. "DuPont Warns High Energy Costs will Hurt Profit", *The Wall Street Journal*, January 12: A6.
- <sup>72</sup> 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.
- <sup>73</sup> Ranieri, J. 2005. *DuPont BioSciences: A Climate Change Best Business Practice*, Speech delivered to the California Utility Board, February 23, San Francisco, CA.
- <sup>74</sup> Tyvek<sup>®</sup> 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<sup>®</sup> 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.
- <sup>75</sup> DuPont. 2006. *Press Release: DuPont and BP Announce Partnership to Develop Advanced Biofuels*. (Wilmington: DuPont).
- <sup>76</sup> 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.
- <sup>77</sup> Speech delivered to the Clinton Global Initiative Panel on Climate Change, New York City, September 17, 2005.
- <sup>78</sup> Op. cite, Aston, A. and B. Helm. 2005.
- <sup>79</sup> Op. cite, Cogan, D. 2006.
- <sup>80</sup> For more on the Smart Trips program, see: <http://www.smarttrips.org/>, viewed 3/3/06.
- <sup>81</sup> For more on the One Ton Challenge, see: <http://www.climatechange.gc.ca/onetonne/english/index.asp?pid=179>, viewed 3/3/06.
- <sup>82</sup> Calculated for 2002.
- <sup>83</sup> 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.
- <sup>84</sup> *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.
- <sup>85</sup> Van der Veer, J. 2006. "A Vision for Meeting Energy Needs Beyond Oil." *Financial Times*, January 25: 21.

<sup>86</sup> 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.

<sup>87</sup> *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.

<sup>88</sup> PA Consulting Group. 1992. *Ecolabelling Criteria for Washing Machines*. (London: PA Consulting Group).

<sup>89</sup> *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.

<sup>90</sup> Horst, G. 2005. "Consumer 'White Goods' in Energy Management." <http://ciee.ucop.edu/dretid/Whirlpool.pdf>, viewed 10/28/05.

<sup>91</sup> CO2e.com. 2006. "What are Carbon Dioxide Equivalents (CO2e)?" [www.co2e.com/common/faq.asp?intPageElementID=30111&intCategoryID=93](http://www.co2e.com/common/faq.asp?intPageElementID=30111&intCategoryID=93) viewed on 1/24/06

<sup>92</sup> Greenhouse Gas Inventory Program. 2002. *Greenhouse Gases and Global Warming Potentials* (Washington DC: US Environmental Protection Agency): 9

<sup>93</sup> Energy Information Administration. 1997. *Mitigating Greenhouse Gas Emissions: Voluntary Reporting* (Washington DC: US Department of Energy).