WORLD RESOURCES INSTITUTE

WRI REPORT

A CLIMATE OF INNOVATION

Northeast Business Action to Reduce Greenhouse Gases

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- To avert dangerous climate change. We promote public and private action to ensure a safe climate and sound world economy.
- To increase prosperity while improving the environment. We challenge the private sector to grow by improving environmental and community well-being.

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A CLIMATE OF INNOVATION

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FOREWORD

Climate change is a long-term, global challenge that can be addressed by starting today with practical, cost-effective actions. Carbon dioxide and other greenhouse gases are emitted into the air from every sector of economic activity, and each year these emissions continue to rise. As they accumulate in the atmosphere, greenhouse gases increase the risk of adverse impacts from climate change.

In the near term, taking steps on a manageable scale will move society along a path toward stabilizing the concentrations of greenhouse gases. The sooner these steps are taken, the quicker they will allow us to get a handle on emissions before they rise too far and too fast. In this way, sensible action today allows for more options and flexibility in making a gradual and stable transition to lower carbon emissions. In particular, we need to spur technological progress across various sectors. Time will be needed before research and development gives way to the full market uptake of new technologies, yet experience with technological advances at the end of the twentieth century offers positive signs that new ideas can be developed quickly and that costs will fall as those ideas are applied.

Businesses have a role to play in bringing about technological solutions to climate change. Business has the resources and focus on innovation to drive a clean energy future, and its global reach and marketing can help deploy new technologies on a large scale. Companies are practical in nature, using research and experiments to test new ideas in commercial markets. Businesses also take risks, often making decisions without perfect knowledge and then learning, adapting, and developing new information and ideas as they go. Successful companies understand what it means to lead. In this spirit, businesses have much to contribute toward dealing with climate change.

Many companies have had experience with lowering emissions and have identified instances where the reductions can be achieved in a cost-effective manner. Companies have also devised new management systems and new products that help reduce emissions. Businesses need to continue to develop and share this information so it can be broadly implemented.

The goal of developing and sharing knowledge on greenhouse-gas emissions is the primary driver of the Climate Northeast initiative. Our group of partners—nine corporations based in the Northeast and the World Resources Institute—came together to learn, to share practices, to keep abreast of the many facets of the climate change issue, and to find new opportunities. The initiative has allowed us to create a network of peers that support communication and the transfer of ideas. We wrote case studies, explained our emissions management systems and challenges, and looked for innovation. We also considered market and policy developments, including growth in markets for renewable power and the emerging market for tradable carbon emissions credits. We sought to understand what other companies are doing and the benchmarks being set for progressive corporate action on climate change. Through this work we have been able to gain support for emissions reduction projects and leverage diverse corporate initiatives to advance our environmental goals.

There are many benefits that individual companies can gain by taking action on greenhouse gas emissions. Businesses can become more efficient and reap financial returns while lowering emissions at the same time. Companies can also position themselves to be successful in a carbon-constrained world and capture new markets for products and services. In this way, businesses identify paths to growth while minimizing the risks they face from changes in the economy, markets, and public policy. Also, at a time when there is much discussion about using market-based policy to addressing emissions, the private sector can lead in demonstrating the use of these mechanisms. By ensuring that markets are structured to be efficient, flexible, and responsive to business needs, companies can help build the framework in which they will thrive.

Forward-thinking companies can be proactive on climate change in a manner consistent with growing their bottom lines. Business leaders recognize that taking action on environmental issues is more than being a good corporate citizen; it is also good business.

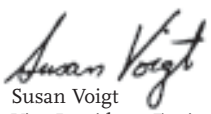
Businesses alone cannot solve climate change, though. Consumers and policy makers also have roles

to play. Consumers need to understand how their actions drive emissions and how they can be a part of the solution. Policy makers need to provide credible incentives for innovation and clear signals that reduce uncertainty so businesses can invest their time and resources with confidence.

At a time when state, regional, and national policy proposals are moving in different directions, policy makers should strive to harmonize their efforts wherever possible to promote maximum efficiency. Consensus has not yet emerged on comprehensive legislation to address climate change, yet policy makers could foster agreement between government and the private sector under which businesses commit to reductions in return for credits against future requirements. Proactive companies should not be penalized for reducing greenhouse-gas emissions. On the contrary, early actors should be encouraged by clear policies that ensure their work to reduce emissions will be rewarded. Such an approach would give businesses the confidence to invest resources in reductions and help to jumpstart a market-based trading system for carbon. Though there is no single solution to climate change, long-term success will be achieved by integrating the most effective measures that are proven through experience.

In the Northeast, companies want to operate in a region where policy makers are partners in finding solutions to climate change and where there is cooperative and constructive engagement with all stakeholders. The partners in the Climate Northeast initiative operate in different sectors and in different countries, and have useful experiences and knowledge to build upon.

In *A Climate of Innovation: Northeast Business Action to Reduce Greenhouse Gases*, the World Resources Institute draws on the combined experiences of the partners and the activities taken under the Climate Northeast initiative to provide a framework for corporate action on climate change. We hope it will be useful for other businesses getting started with greenhouse-gas management programs and will help inform policy makers about the opportunities and constraints businesses face in moving forward with climate change solutions.



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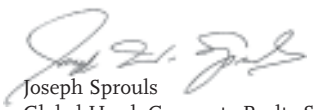

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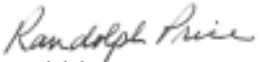

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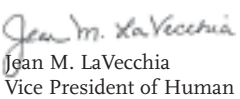

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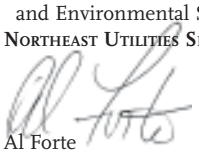

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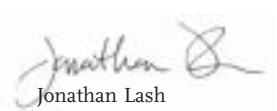

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EXECUTIVE SUMMARY

Climate change resulting from human activities is one of the world's foremost environmental challenges. If greenhouse-gas (GHG) emissions are to be reduced on a scale that will minimize the risk of dangerous climate impacts, then the resources and innovation of businesses are surely required.

Trends in GHG regulation and investor concerns related to climate change are compelling companies to take action. Although the outcome of those trends is not yet known, many companies are creating systems and strategies to manage GHG emissions. The business case for action rests on the idea that proactive work in the near term is more effective than reacting to events at a later date. Near-term action will help companies manage long-term risks and establish long-term positions. Such action is increasingly being driven by strategic thinking that goes beyond internal operations and considers markets and consumers as well.

In 2003 the World Resources Institute convened a group of large corporations based in the northeast United States to explore the various facets of private-sector action on climate change. The diverse group included companies from various sectors and of differing size and geographic reach. This "Climate Northeast" initiative was designed to share experiences and build momentum among companies for the benefit of the business community, for informing emerging regional climate policy discussions, and for devising strategies to succeed in a "carbon-constrained world." In particular, the group assessed the drivers for action, the management systems for quantifying and analyzing emissions, and the energy-related projects for reducing emissions. This report is an overview of that work.

Companies collect data and information to build GHG emissions inventories, which are a prerequisite to establishing emissions reduction goals and tracking performance over time. While collecting this information, the companies discovered new information and opportunities for efficiency and innovation, including new technologies, processes, and management systems. To begin reducing emissions, though, corporations often face barriers to allocating capital to some investments. This report provides examples in which companies found ways to couple reductions in emissions with new business opportunities, thereby lowering costs and turning in a positive financial performance.

In the future, corporations are likely to experience increased regulatory and investor-related pressure to act on climate change. In response, they will have to build and adapt their GHG emissions management systems in a variety of ways. As discussed in this report, companies may need to incorporate environmental criteria into their strategic investment decisions, improve the quality of their data and their internal communication, and evaluate market-based policy approaches, among other actions.

Communication and cooperative engagement with policy makers helps businesses meet these challenges. Policy makers should be aware of the costs and risks to businesses of reducing emissions in absence of any formal recognition. Indeed, many of the low-cost, high-return GHG investments may be delayed in the face of regulatory uncertainty. Therefore, by recognizing performance and emissions reductions, policy makers support near-term action.

Businesses have shown that they can take action in the face of uncertainty and lower emissions in a feasible, cost-effective manner. Companies from a variety of economic sectors—energy producers, manufacturers, service providers, and retailers—make valuable contributions to reducing emissions. The private sector is playing and will continue to play a vital role in addressing this critical environmental issue.

1. INTRODUCTION

Businesses face a rapidly evolving set of challenges and opportunities arising from climate change and the greenhouse-gas (GHG) emissions that are causing it. Society's expectations and emerging public policies in Europe, Canada, the northeast United States, and other regions are forcing businesses to participate in finding solutions to climate change. As a result, many business leaders are beginning to track their GHG emissions. They also are assessing their exposure to current and future risks in markets and regulation and identifying new strategic business opportunities that will allow them to thrive in a "carbon-constrained world."

In 2003 the World Resources Institute (WRI) and a group of large companies based in the northeast United States began to chart a course for corporations to tackle climate change. This project, known as Climate Northeast, brought together a variety of businesses from different economic sectors, including the Bristol-Myers Squibb Company, Citigroup, Con Edison, General Electric, Johnson & Johnson, Eastman Kodak Company, Northeast Utilities, Pfizer, and Staples. This report on the partnership's activities is intended to help other companies learn from the experiences of the Climate Northeast partners and to help them begin to chart their own course for contributing to climate protection.

The Northeast is an ideal region for learning about and implementing solutions to climate change. From Maine to New Jersey, policy makers are working to reduce GHG emissions. The attorneys general of eight states, including five in the Northeast, filed a federal lawsuit to urge action on climate change. Citing dangerous health threats, the lawsuit seeks reductions in carbon dioxide emissions. In addition, many states have issued far-reaching plans for lowering GHG emissions. Because climate change is not a local issue, the states also are collaborating at a regional level to include synergy and efficiency in their efforts. Initiatives in the northeast region include an emissions trading program to reduce emissions from power generators; a GHG registry to record corporate emissions; and a broader agreement by the New England governors and eastern Canadian premiers to cut emissions from the transportation, agriculture, and other sectors.

These initiatives have driven the Northeast to the leading edge of climate policy development in the United States and are setting the stage for change among businesses, government agencies, and consumer behavior. They also provide an important window of opportunity for companies to learn, engage, and establish themselves as leaders.

Climate Northeast partners came together to share experiences, review emission-reduction strategies, and become more informed and effective participants in policy dialogues taking place in the region and beyond. The partners identified a number of activities needed to help the private sector manage climate change, including:

- Identifying and tracking sources of GHG emissions, especially those from energy consumption.

- Prioritizing opportunities to reduce emissions and developing a plan to take action.
- Buying cost-effective "green power" and investing in profitable energy-efficiency projects.
- Establishing a clear business case for allocating scarce corporate resources to attractive projects.
- Learning about emissions trading markets and different policy options for addressing climate change.
- Identifying new, climate-friendly products and services that can be profitably developed.

For as many types of greenhouse gases and sources that exist, there are actions that can be taken by businesses to reduce emissions. To get started, businesses need to gather information, plan, and establish systems to manage greenhouse gases. Climate change is a relatively new issue to the private sector, so many companies must build these systems from scratch. But because they are similar to other corporate environmental management systems, such as those dealing with energy or waste, they are not entirely unfamiliar to corporate environmental and management professionals. Although corporate GHG programs vary by company and industry, the basic actions generally include the following:

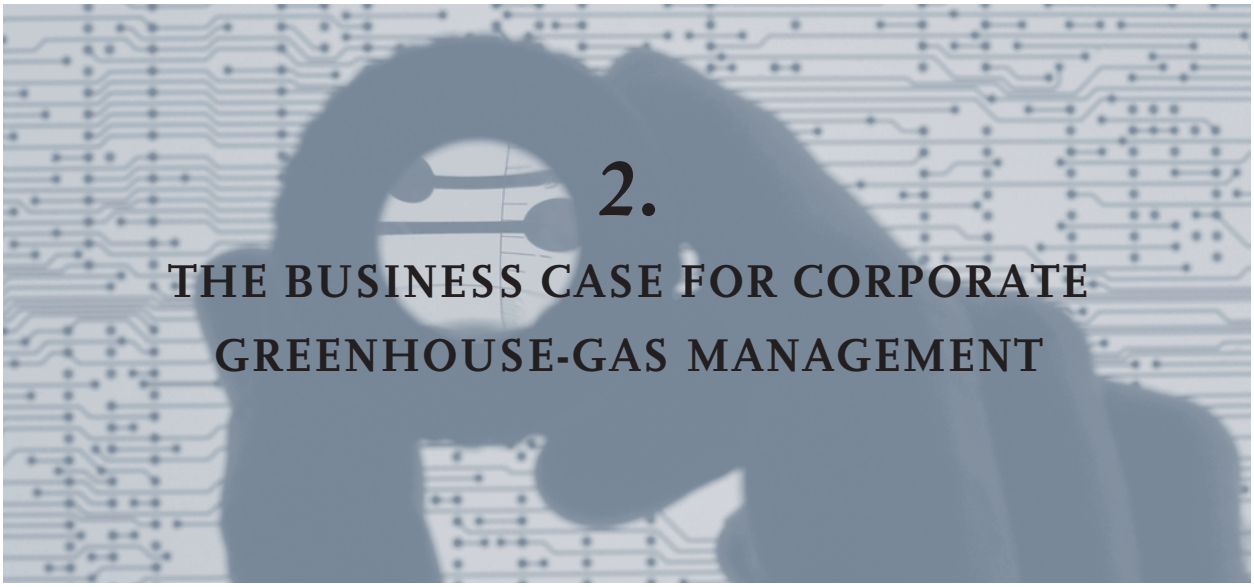
- Regularly measuring corporate GHG emissions.
- Rolling the data into a GHG inventory.
- Setting a goal for GHG reductions.
- Investing in projects that reduce emissions.
- Reporting internally and externally on emission data and actions taken.
- Auditing and verifying GHG information.
- Evaluating the overall program.

In addition, a GHG management program may have some combination of the following steps:

- Developing a corporate policy statement on climate change.
- Buying or selling tradable "carbon credits."
- Developing and marketing climate-friendly products.
- Training employees.
- Evaluating suppliers and/or modifying procurement practices, including energy diversification.

The solution to climate challenge will require business ingenuity and technological innovation as well as smart policies to create the incentives needed to build a cleaner, safer future. This report describes actions that companies can take, drawing on the experiences of the nine corporate partners in Climate Northeast. In the following chapters, four topics are considered:

- "The Business Case for Corporate Greenhouse-Gas Management" explores the drivers for corporate action, how companies can assess the benefits, and why both internal and external stakeholders need to understand the business case.
- "Accounting for Emissions: Empowering Corporate Greenhouse-Gas Management" covers the basic elements of developing a GHG inventory and how Climate Northeast partners overcame hurdles to establish effective systems.
- "Building a Clean Energy Future: Green Power and Clean Energy Projects" describes why most companies should invest in clean energy solutions, the existing opportunities, and the benefits to be captured.
- "Looking Ahead: Cutting-Edge Issues and Challenges for Corporations" proposes near-term actions that companies should consider as they move toward a carbon-constrained future.



2.

THE BUSINESS CASE FOR CORPORATE GREENHOUSE-GAS MANAGEMENT

Companies will not invest in projects, including GHG management systems, unless they see the value it will provide to their firms. An understanding of an investment's explicit or implicit positive financial outcome is what is often referred to as the "business case." For companies that are just getting started, the business case helps shape their programs and strategies. For companies that have established programs and are evaluating their performance, it supports continuing or expanding the work. Over time, the thinking behind the business case becomes part of a corporate philosophy for long-term strategic growth in a world of limited resources.

The factors shaping the business case vary depending on the type and size of the company, its sector, and its geographic location. In the Climate Northeast project, we considered the factors affecting large U.S. corporations based in the Northeast.

Many large corporations from various industrial and commercial sectors have begun measuring their emissions, setting reduction targets, and exploring market-oriented strategies to address climate change (Kolk and Pinkse 2004). This increased activity in the private sector has been spurred by regulatory action at state, national, and international levels, most notably the Regional Greenhouse Gas Initiative in the Northeast, the McCain–Lieberman Climate Stewardship Bill, emissions caps in the European Union, and the potential implementation of the Kyoto Protocol treaty.

This trend toward regulation has been bolstered by the growing body of scientific research linking human actions to global warming and other climate shifts (see box 1). As regulations begin to limit emissions, some companies will face direct compliance obligations. Even companies not directly affected by such regulations will likely see changes, such as higher electricity prices. Emissions regulations for carbon dioxide (CO_2) and other GHGs can affect some part of every company's value chain: either upstream sectors, such as energy and resource suppliers, or downstream shifts in consumer preferences and market standards.

Investor behavior also is prompting corporate action. Some studies indicate that environmental issues, including climate change, can be material to corporate share value, that significant disparities exist among companies in the same sector, and that a positive link exists between corporate environmental practices and the performance of share prices (Austin & Sauer 2002; Feltmate, Schofield, and Yachnin 2001; Repetto and Austin 2000).

Partly as a result of the risk to share value, climate-related shareholder resolutions are increasing in number and percentage of shareholder support (see figure 1) (Cogan 2003; Cogan 2004). These resolutions generally call for corporate strategies regarding climate change, cuts in GHG emissions, investment in renewable energy, and/or disclosure of GHG-related information. Between 2003 and 2004, 13 of these resolutions received 20 percent or more of shareholder support. In investment circles this

BOX 1 | **CLIMATE CHANGE**

Action on GHG emissions in the private sector and elsewhere is being driven by concern about dangerous human interference in the climate system. The scientific community reports that the concentration of atmospheric carbon dioxide (CO_2) has risen by 31 percent since the onset of industrialization (IPCC 2001). In lockstep with this increase has been a steady rise in global average temperature, which has climbed by nearly 0.6 degrees Celsius (more than 1 degree Fahrenheit) since the 1800s.

A continuation of current emissions levels will likely lead to a rise in temperature ranging from two to six degrees Celsius. Such a shift could trigger significant changes in the climate, including greatly elevated sea levels and a higher prevalence of extreme weather events. If temperatures were to reach the upper part of this range, dangerous structural changes in global weather patterns could result. For example, global warming could alter the ocean currents that help regulate temperatures. Such changes would affect communities and ecosystems in the northeast United States and around the world, potentially harming fisheries that supply food, erode beaches and shorelines, and cause salt contamination of water supplies in coastal areas, among the many possible negative impacts.

The main greenhouse gas of concern is carbon dioxide, which is largely the result of burning coal and oil. Most of the energy in the world is produced from these fossil fuels. For example, more than 70 percent of electricity production in the United States is based on coal, natural gas, and petroleum (EIA 2003b). Dependence on fossil fuels for energy is exacerbated by transportation needs, as liquid petroleum products, such as gasoline and diesel, fuel more than 97 percent of transportation-related energy consumption in the United States (EIA 2004b). In addition to CO_2, other industrial emissions, such as methane and nitrous oxide, are potent sources of global warming.

amount of shareholder interest is significant. Finally, large institutional investors such as state treasuries and pension funds have asked the U.S. Securities and Exchange Commission and private companies for greater disclosure of climate-related information (INCR 2004).

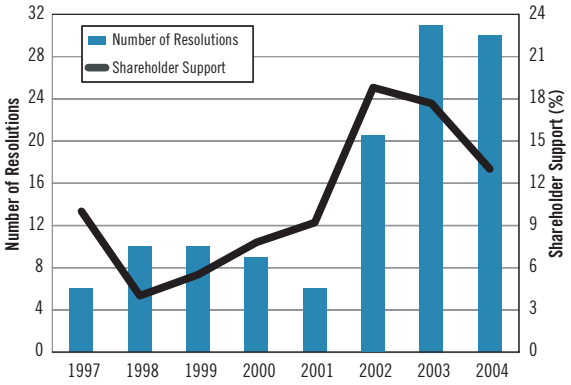
Although the future of both investment and regulatory trends is uncertain, many companies are not waiting to manage GHG emissions. Instead, they believe that acting in the near term will be more cost-effective than reacting at a later date when there is more information and less uncertainty but possibly higher costs. Near-term action to implement a corporate GHG program can serve as a hedge against future unknowns, particularly if a company is likely to be directly affected by regulations (Swisher 2002). Such a strategy helps companies manage long-term risks and establish long-term positioning.

Value Propositions

While the business case may be broadly tied to long-term interests, a company may anticipate specific benefits and returns from its GHG program. These outcomes, or value propositions, are indicators of a successful GHG program and strategy.

Value propositions can be divided into tangible returns and intangible benefits (see box 2). Tangible returns from either reducing costs or increasing revenue can be measured in dollars, particularly financial gains resulting directly from projects or products that reduce GHG emissions. Common examples are energy-efficiency projects (case study 1) and the launch of a climate-friendly product that lowers emissions when used by the consumer. For example, General Electric manufactures an array of products, including wind turbines and higher-efficiency gas turbines, that cut emissions during end

FIGURE 1 **CLIMATE-RELATED SHAREHOLDER RESOLUTIONS, U.S. AND CANADIAN COMPANIES**



use. In addition, the company recently acquired a solar photovoltaic equipment manufacturer, thus expanding its position in the market for clean energy technologies.

Intangible benefits are more difficult to measure yet may be more important as they could have a substantial effect on corporate share value over time. For corporate GHG programs, these benefits are generally tied to three factors: sound risk management, improved reputation or brand image, and early preparation for regulation. Such benefits may be interpreted by investors as an indication of forward-looking strategy and superior business management, a perception that can be more valuable than any of the underlying factors.

Companies invest in GHG programs for their benefits, but they should consider the potential drawbacks when evaluating the business case. A GHG program incurs new costs based on the time and resources necessary to design, build, operate, and evaluate the program year after year. Although some GHG reduction projects require capital investment, much of it may be recovered and eventually deliver a positive return. There also is an opportunity cost for developing climate-friendly products and services rather than expanding or developing other options.

There are also risks with taking action on GHGs. A company that reduces emissions in advance of any regulatory requirement may expend its best, least-cost GHG reduction opportunities and then be required at a later date to implement additional and perhaps more expensive reduction projects to comply with regulations. In other words, companies can be, in effect, punished for taking early action if policy makers do not recognize their efforts. Also, a company that fails to meet performance goals, such as a GHG reduction target, may invite criticism and a public relations liability. Criticism may also come from stakeholders who oppose efforts and regulatory mandates to lower GHG emissions. Clearly, companies that are taking action on climate change see the benefits as outweighing these risks and potential costs. Policy makers should work with firms to address some of these issues and minimize the drawbacks, such as penalties for first movers.

Difficulties in Measuring Costs and Benefits

An ideal analysis of the business case for GHG emissions management would accurately quantify all the benefits, or value propositions, and compare them to all the costs. If the benefits exceeded the costs, then the effort would clearly deliver value, and additional conclusions could be drawn about its effect on corporate finances and share price.

Unfortunately, many of the benefits and costs of initiatives to reduce emissions are difficult to measure, particularly the intangibles. For example, how does one measure and value the benefit of better public relations? What is the cost if new regulations do not recognize the early action that a company has taken to cut GHG emissions? In addition to the measurement challenges, publicly available data and information about quantification techniques and conclusions are sparse, perhaps because companies view this information as proprietary. Despite these challenges, the benefits and costs of a GHG program can still be assessed, at least qualitatively, from both a bottom-up and a top-down perspective.

BOX 2 | VALUE PROPOSITIONS FOR CORPORATE GHG MANAGEMENT PROGRAMS

Businesses create a GHG strategy by gauging tangible returns and intangible benefits. Anticipated outcomes, or value propositions, are the indicators of a successful GHG program.

Tangible Returns

- Climate-friendly projects yield a positive return on investment.
- New or enhanced products or services increase revenue, capture market share, and/or deliver net income.
- Internal emissions-reduction projects allow for the sale of emissions reduction credits.
- Enhanced energy-conservation practices and fuel switching stabilize corporate energy use and protect against energy price volatility.

Intangible Benefits

- Competitive positioning
  - Low-carbon products or services improve the company's position vis-à-vis its competitors.
  - The public perceives the corporate brand as environmentally friendly, leading to improved public relations.
  - Strong environmental performance results in higher employee recruitment, retention, and productivity.
- Shareholder-related benefits
  - Shareholders drop climate resolutions as their conditions are satisfied.
  - Investors perceive strong environmental performance as an indicator of superior business management, resulting in a premium on the stock price and a lower cost for capital.
  - The company's stock is included in a specialized stock index, such as the Dow Jones Sustainability Index, and is held by investment funds that track the index.
  - The company receives higher stock ratings from "socially responsible investment" (SRI) analysts, resulting in more stock purchases by SRI investors.
- Regulatory preparedness
  - Company staff are trained to manage GHG emissions, thereby broadening the company's experience and enabling it to adapt more easily to future regulations.
  - The company's GHG emissions are at or below legal requirements at the time the GHG regulations go into effect, thereby making compliance easier.
  - A strong GHG management program gives the company greater credibility and thus a greater voice in policy discussions and an opportunity to influence policy outcomes.
- Management benefits
  - Coordination of GHG management across business units and jurisdictions improves learning, identifies opportunities, leads to innovation, and offers unexpected efficiencies.
  - The company is protected against potential class-action lawsuits related to corporate governance, specifically claiming breach of fiduciary responsibility for failing to manage GHG emissions and their associated liabilities.

A bottom-up approach begins with identifying and reviewing specific GHG projects, many of which will have a positive return on investment. Generally, the most profitable projects will be funded and will ultimately reduce the company's GHG emissions. Nonetheless, the return on investment for some projects can be strong and still not meet the company's threshold for approval of capital expenditures. For these projects, a company may want to modify its criteria for capital allocation, perhaps creating a weighting system that integrates or boosts environmental factors. Alternatively, a company may

decide to consider certain GHG projects case by case. How a company decides to adjust its capital allocation practices to account for GHG value propositions is an indication of the extent to which GHGs are factored into its overall business operations.

A top-down approach to assessing GHG management analyzes the greater issues and trends associated with climate change. These long-range analyses consider potential regulation, the direction of markets, consumers' attitudes, and sustainable development. Based on such an analysis, a company may then decide how it wants to position itself and design its GHG program and strategy accordingly. In this way, a company may select and approve more strategic GHG projects for capital allocation. Broad vision and corporate positioning on climate change can be critical to supporting individual projects and new product development that normally would not pass muster for capital expenditures. As a result, a top-down approach ultimately supports bottom-up action.

Analyzing environmental issues, regulations, and their effect on markets and business sectors is gaining interest in the investment community. More than 11 percent of professionally managed U.S. assets are invested in "socially responsible investing," meaning investment strategies that rely on screening of funds, shareholder advocacy, and/or community investing. Between 1995 and 2003, socially responsible investments grew 40 percent faster than did all professionally managed investment assets in the United States, and the use of social screens appears to be on the rise (SIF 2003).

The analytical underpinning of "green investing" is supported by investment analysts who compile research on environmental issues and the connection between the environmental performance and stock performance of corporations. This research is sold to and used by institutional investors, mutual funds, and specialized stock indexes. At a broad level, it serves to monetize some of the intangible aspects of environmental performance. In the automotive industry, for example, the potential impact of GHG emissions constraints can either increase or decrease future corporate earnings by 10 percent or more, depending on the company and its product mix (Austin et al. 2004). Companies can use and adapt these analytical methods to their own work on setting paths for strategic growth.

Communicating the Business Case

Persons both inside and outside the company need to understand the business case. Internally, senior executive management needs to understand and help drive the business case. Their endorsement sends a signal to staff responsible for program implementation that the necessary support exists within the company, especially when it comes to coordinating business units and allocating capital. To obtain their support, business unit managers also need to understand how GHG management builds value. Likewise, investor relations staff must be able to explain the company's work to shareholders. Employees, as well, should understand why a company is managing GHGs, especially if the company uses incentives or rewards employees for ideas and innovation that help the company meet its environmental goals.

Making the business case for creating a GHG program is important also to external audiences. Once a company has decided how to evaluate and set a strategy guided by environmental concerns, it can tell its investors and stock analysts about its environmental performance and the value that it is creating. Other interested stakeholders include policy makers, nongovernmental organizations (NGOs), and the communities in which companies operate. Given the concern about climate change, a corporate GHG program can be an asset to public relations.

CASE STUDY 1

THE BOTTOM LINE ON GHGS: HOW CITIGROUP SAVED MONEY WHILE REDUCING EMISSIONS

Citigroup has over 270 retail branches in the greater New York City metropolitan area, including Connecticut and New Jersey. Many of these branches have different control systems for lighting and heating, ventilation, and air conditioning (HVAC). The use of these systems varied from location to location, often without consideration of energy efficiency by branch personnel. In addition, the systems were not automated. If the lighting or HVAC equipment went outside of its control limits, the only option for Citigroup was to deploy a maintenance crew to identify and fix the problem, which often required nothing more than restarting the system. Overall, the lack of standardized energy controls and automation resulted in lost energy savings opportunities and higher operation costs.

Several years ago, retrofitting the system control units would have required expensive rewiring and disruption to operations. The costs could have reached $25,000 per branch, and if a retail branch were to close or move, the capital investment would be lost. In 2002 Citigroup's Northeast region reexamined its options and found that a new wireless satellite technology could provide a cost-effective solution. The new lower-cost technology could be installed over the existing systems and provide remote control to personnel in a central office. There was no need to extensively rewire the branches, so the total installation time was significantly reduced and business operations were not interrupted. If a retail branch were to close or move, the "clip on" system could be removed and reused at another location.

System monitoring, maintenance, and help-desk activities for all branches became centrally managed, and the lighting and HVAC systems were programmed to hourly operation schedules for specific branches. The cost of the retrofit project totaled $2.5 million, but Citigroup was able to apply for $469,000 in energy efficiency rebates from the New York State Energy Research and Development Authority. An additional $38,000 in energy rebates was received from the Long Island Power Authority. These rebates offset part of the cost of the project, which has an estimated payback of one year.

Quantifying the actual financial savings on a large number of locations is difficult and requires significant time and resources after a system goes into service. Variable factors include the timing of the installation, changes in energy rates, changes in operating hours as directed by the business, expanded branch operations, and weather. Any business considering installing a central control and monitoring system should recognize these difficulties and structure an automated reporting system that can capture relevant data. Additionally, other benefits should be factored when considering a centralized monitoring and control system. These include reduced maintenance, reduced service calls, alarm detection, and service quality improvements.

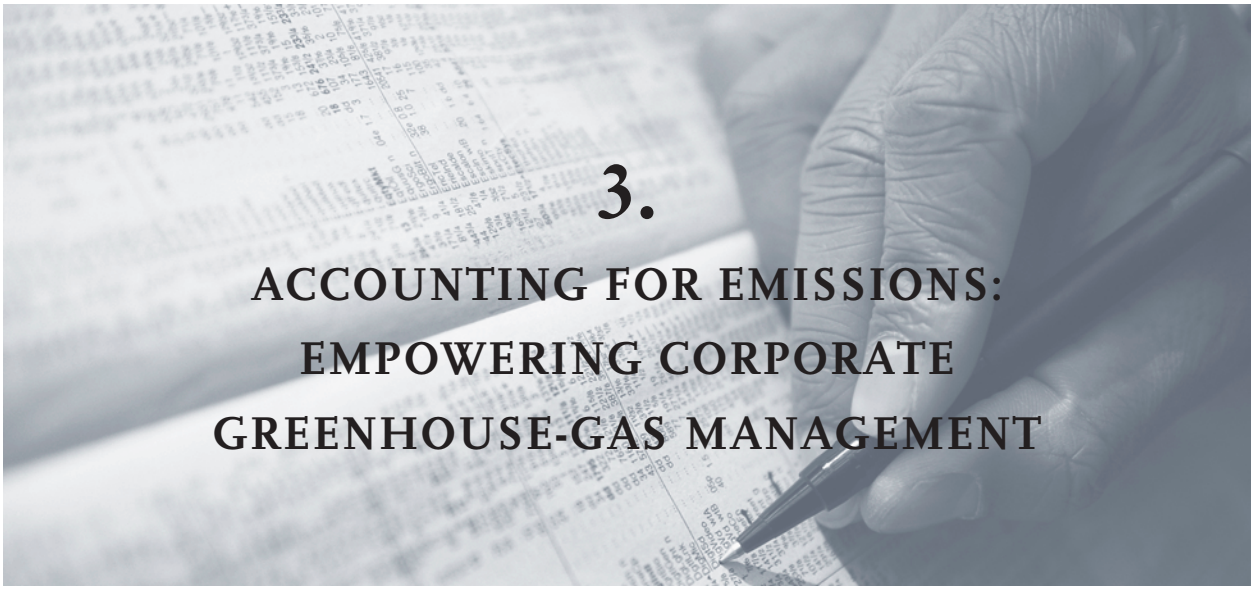
Despite the quantification challenges, Citigroup estimates that the improved performance of its HVAC system has reduced electricity and natural gas use by 15 percent. Furthermore, the ability of central office managers to remotely monitor and restart the HVAC systems has reduced the number

of service calls by 30 percent. Citigroup believes that the system can be further optimized based on familiarity and experience.

In addition to saving energy and operating cost reduction, Citigroup's investment is also helping to reduce GHG emissions by reducing the amount of fossil fuels used to generate its electricity needs. In addition, the project is reducing GHG emissions from vehicles used by maintenance crews on service calls.

The investment also assists Citigroup in enhancing its corporate environmental management practices. The control systems have the ability to track electricity use and heating and cooling temperatures, which is then sent via satellite to a central location. While this type of energy use data is often valuable to management, it can be difficult to obtain, especially when a building is leased as is frequently the case with Citigroup. With this project, Citigroup can capture the data and use it to populate a company-wide energy management system called the "Environmental Database."

This database tracks the energy and materials consumption at all of Citigroup's 13,000 sites worldwide. Although Citigroup is still working to standardize reporting procedures and improve data quality, the database is able to provide a baseline for energy consumption. This helps Citigroup field managers to better control consumption and track progress towards environmental goals. Ultimately, Citigroup expects that the data they collect in the Environmental Database will allow them to easily produce environmental activity reports as well as to compare environmental performance between facilities. This will help in identifying inefficient energy use and ultimately target the best projects for environmental and financial gains.



3.

ACCOUNTING FOR EMISSIONS: EMPOWERING CORPORATE GREENHOUSE-GAS MANAGEMENT

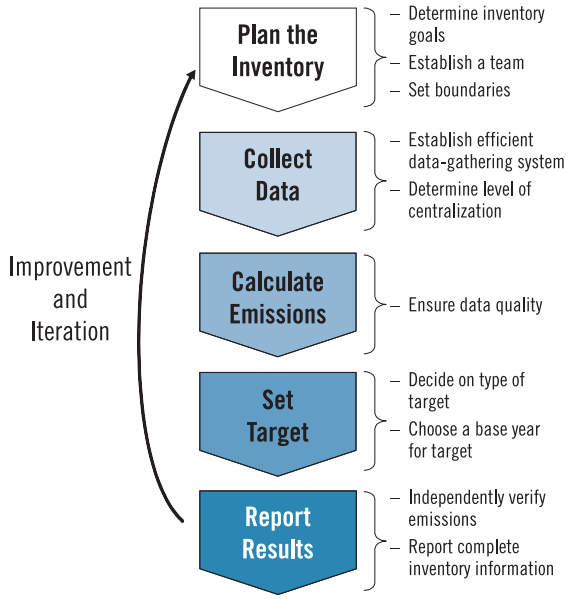
Once a company commits to taking action on climate change, one of the first steps is developing an inventory of its greenhouse-gas emissions. An inventory helps the company determine the extent of its GHG emissions and options for reducing them and helps track its emissions performance over time. In sum, the information provided by the inventory is vital to making decisions and to implementing an effective climate change strategy.

Building and managing an inventory is a series of steps, each with its own set of considerations (see figure 2). (For detailed information on GHG accounting standards, refer to the GHG Protocol Initiative described in box 3.) From streamlining data collection procedures to improving data quality, Climate Northeast partners have learned valuable lessons and devised innovative systems to overcome challenges.

DETERMINING GOALS FOR A GHG INVENTORY AND ESTABLISHING A TEAM

A company may have several goals for its inventory process, from managing GHG risks to participating in GHG markets. Establishing these goals and forming a team early in the process will help a company manage its inventory process efficiently. Since it will need to obtain data from all parts of the company, it should assemble a team that has access to the appropriate records. The team may include people from the accounting department as well as energy and environment staff and facility managers. It should also decide how closely the facility personnel will be involved in calculating the emissions, as opposed to simply passing activity data to a central manager, perhaps in a corporate headquarters office, where the emissions are calculated and the data are aggregated.

FIGURE 2 **STEPS IN DEVELOPING A CORPORATE GHG INVENTORY**



SETTING BOUNDARIES

Developing a corporate GHG inventory can present significant challenges, especially if the company is large and many of its facilities are involved. A company must decide whether to include subsidiaries, joint ventures, franchises, and other partnerships in the inventory and according to what criteria these decisions will be made, a process known as defining the "organizational boundaries" of the inventory. Companies sometimes decide to include operations based on their share of equity ownership (an equity share approach). Alternatively, decisions are sometimes based on whether the company has financial or operational control of an entity (a control approach). The GHG Protocol recommends that companies account for emissions using both approaches, even though eventual reporting of emissions may use only one method.

Companies also must identify and categorize the sources of its emissions to determine whether they are "direct" or "indirect." This is known as defining the inventory's "operational boundaries." Direct emissions—also referred to in the GHG Protocol as "scope 1" emissions—are created by sources that the company owns or controls, such as the combustion of fuel in a company-owned furnace. Indirect emissions arise from sources not owned or controlled by the company. A major source of indirect emissions for many companies is purchased electricity. These emissions are known as "scope 2" in the GHG Protocol. All other indirect emissions are known as "scope 3" and cover items such as employee business travel in commercial aircraft and the use of products manufactured by the company.

The difference between direct and indirect emissions is important to avoid "double-counting." Emissions registries, emissions trading systems and any future regulation of emissions should distinguish between the two so that different companies do not report the same emissions as direct emissions. According to the GHG Protocol, a company should report its scope 1 and scope 2 emissions. Including Scope 3 emissions is optional, but inclusiveness is encouraged since Scope 3 emissions may present greater opportunities for reductions by some companies.

BOX 3 THE GHG PROTOCOL: TOWARD A COMMON STANDARD FOR BUSINESS REPORTING

The GHG Protocol Initiative is a unique, multistakeholder partnership of businesses, NGOs, and governments led by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The protocol is the premier source of information about corporate reporting and accounting of greenhouse gases. It draws on the expertise and contributions of individuals and organizations from around the world. The protocol's latest edition of the *Corporate Accounting and Reporting Standard*, published in 2004, provides detailed GHG accounting and reporting standards, guidance on how to apply the standards, and several cross-cutting and sector-specific calculation tools. The tools, which are available at no cost, represent international best practice. They are extensively road tested and peer reviewed, and companies can use them for their own data collection and calculation systems. For more information, visit **www.ghgprotocol.org**.

The various scopes of emissions will inspire different reduction strategies. For example, most of the emissions by Con Edison and Northeast Utilities are direct (scope 1) and result from power generation plants that they own or control. Scope 1 emissions are the type most likely to be subject to regulation. In contrast, the GHG inventory of a company like Staples is more likely to be made up of indirect emissions (scope 2). Staples' reduction activities are therefore likely to be directed to projects to reduce or alter its consumption of purchased electricity. WRI has only indirect emissions in its inventory (case study 2). A company like General Electric, which manufactures a diverse range of energy-efficient products, might consider including scope 3 emissions in its inventory to capture the downstream emissions reductions from the use of its products. In similar fashion, Citigroup is committed to publishing a carbon intensity index on new power generating projects that it finances.

CASE STUDY 2

WRI AND INNOVATIONS IN ESTIMATING EMPLOYEE COMMUTING EMISSIONS

In 1999 the World Resources Institute committed to "walk the talk" by reducing its emissions to "net zero" through internal emissions-reduction and efficiency measures in combination with external purchases of carbon credits to offset emissions from electricity consumption, paper use, and employee travel. WRI occupies leased office space and has no direct, scope 1 emissions. Each kilowatt-hour of electricity that the organization uses is "greened up" by ensuring that energy generated from clean, renewable sources is put into the electricity mix. By 2003, WRI emissions were 21 percent below its 2000 base year. WRI has reached its target each year since 2000.

Gathering data for some indirect sources, such as employee commuting, has been a key challenge. Employees are surveyed once each year to determine their average annual commuting habits. In the first two years of the initiative, WRI used an Excel spreadsheet accessible to all its employees on a shared internal network but had only a 48 percent participation rate. A simplified, Web-based survey that was downloaded into a spreadsheet improved participation to 65 percent in the third year. Using feedback on the survey design, WRI further simplified and refined the questions, made it more user-friendly, and reduced the time needed to complete the survey to less than a minute. The employee participation rate rose to 88 percent.

Designing a survey that was easily navigated and had clearly articulated questions significantly improved the completeness and accuracy of the employee commuting activity data. An added benefit was that employees felt a certain amount of pride at having contributed to the inventory development process. The experience also provided a positive internal communications opportunity.

Transportation-related emissions are the fastest-growing GHG emissions category in the United States, including commercial, business, and personal travel as well as commuting. By accounting for commuting emissions, companies may find several practical opportunities for reducing them. For example, when WRI moved to new office space, it selected a building located close to public transportation. In its lease, WRI also negotiated access to a locked bike room for those employees who cycle to work, and the building provided shower and changing facilities to all building residents. For some companies, telecommuting programs may also greatly lower commuting emissions by circumventing or decreasing employee travel.

WRI publishes a full inventory report each year which is available from its Web site at http://pubs.wri.org/pubs_description.cfm?PubID=3972.

Another issue in setting boundaries is selecting the types of greenhouse gases that will be included. The GHG Protocol recommends the six major types of gases: carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Although many companies will find that most of their emissions are in the form of carbon dioxide, other gases can be significant as well. Because they are far more potent than carbon dioxide in trapping heat energy and causing global warming, they can be important, cost-effective sources for major reductions in emissions (case study 3).

GATHERING DATA AND CALCULATING EMISSIONS

In order to calculate its emissions, a company must first gather data on all its emissions sources. This task can be difficult, especially when multiple facilities are involved. Companies should strive to be as inclusive as possible while maximizing efficiency in the data collection system.

General Electric operates nearly 6,000 facilities in 56 countries. After weighing the resources that would be

required to develop an exhaustive inventory, it determined that the most resource-efficient solution was limiting its data collection to the more manageable number of manufacturing plants and offices, which are responsible for approximately 95 percent of the company's emissions. As a result, emissions data are gathered from approximately 11 percent of its facilities, and estimates are used to approximate emissions from the company's small sites. To do this, GE identified approximately 5,000 small sites worldwide that were not included in the company's GHG inventory database. Emissions for these facilities were estimated using an emissions factor based on determining the average GHG emissions per site for a number of typical small facilities. This emissions factor was then multiplied by the total estimated number of small facilities each year. Small facility emissions were assumed to be 75 percent indirect (purchased electricity) and 25 percent direct (combustion of natural gas), which was consistent with the emissions profile of the typical small facilities used to calculate the small facility emissions factor.

The inventory team at Pfizer had a similar experience. They determined that although Pfizer has 102 facilities worldwide, just 30 of those facilities comprise the majority of the company's energy use, with just two facilities responsible for nearly one-quarter of both its global energy consumption and its emissions.

Eastman Kodak Company (Kodak), also a global concern, has conducted a GHG inventory for several years. It, too, concluded that gathering emissions data from its smaller sites, which make up only about 2 percent of its inventory, would not be efficient. Instead, using its emissions data at hand, Kodak estimates its per capita emissions and applies this formula to its smaller sites to complete its inventory.

Companies must also determine the most appropriate level of centralization or decentralization. A centralized approach, in which business units provide activity data such as megawatt-hours of electricity used or gallons of fuel consumed to their corporate headquarters at regular intervals, can ease the burden for facility staff. For example, after Kodak's business units report their activity data to their headquarters, it then becomes the responsibility of Kodak's inventory manager to review the information for accuracy and to apply appropriate emissions factors to complete the calculations and aggregate the information to produce corporate-wide emissions information. This centralized approach gives Kodak more control over how the data are compiled, thus avoiding the potential pitfalls of a decentralized approach, such as calculation errors and inconsistent record keeping.

Developing tools and using online capabilities to facilitate data gathering can help companies calculate their inventory more efficiently. Pfizer has devised an online, user-friendly tool for this purpose. Employees at their facilities worldwide—usually from the Environment, Health and Safety team—enter the energy data each year, and the inventory team at the headquarters office completes the process by applying the appropriate emissions factors.

The design of such systems needs to consider the links among record keeping, internal auditing of information, and, ultimately, data quality, which is critical to an accurate inventory. Climate Northeast partners have instituted measures for ensuring the quality of their inventory data. GE discovered that employees charged with entering data into their online data-gathering tool need to be familiar with the data type. For example, an employee who is not familiar with energy units but is responsible for entering energy data will have difficulty spotting errors. To minimize data quality problems, GE is enhancing the tool so that a user can view the previous year's data, enabling obvious discrepancies to be detected more easily. Pfizer's tool has a built-in algorithm that automatically compares new data with historical data and flags potential errors for further investigation by the inventory team.

CHOOSING A BASE YEAR

Selecting a year for which complete and reliable information is available enables a company to compare its emissions performance over time. This becomes the company's base year. The year that is selected is less important than ensuring data integrity. A number of companies have established 1990 as a base year, since this year figures prominently in the goals of

CASE STUDY 3

CAPTURING MAJOR REDUCTIONS IN NON-CO_2 GASES: CON EDISON'S WORK TO REDUCE METHANE RELEASES

Con Edison is a utility that provides electricity, steam, and natural gas to its customers. Like many energy companies, Con Edison has various types of GHG emissions from its operations, including emissions of methane, a potent greenhouse gas. Through its work with the U.S. Environmental Protection Agency (EPA) Natural Gas STAR Program, Con Edison began to evaluate best practices for reducing methane releases. The company discovered a number of ways of managing these releases and implemented projects across various company operations, including

- Inspection and maintenance at pipeline interconnection and metering stations.
- Repair and replacement of more than 500 miles of leaky natural gas mains and distribution pipes.
- Installation of computerized, remotely operated regulators to lower pipeline pressure during periods of low demand for gas.

Since 1993, Con Edison has reduced its emissions of methane by more than 47,000 metric tonnes, which is equivalent to over 1 million tonnes of carbon dioxide. This reduction of methane emissions has helped Con Edison save about $5 million in avoided leakage costs. Con Edison also won the "Distribution Partner of the Year" award from the EPA for excellence in implementation, outreach efforts, and promotion of the economic, safety, and environmental benefits of the STAR program.

Con Edison is building on its success. Working with other New York State gas utilities through the Northeast Gas Association, Con Edison cofunded the design, development, and assembly of a new technology to capture natural gas in pipelines undergoing maintenance and repair work. Maintenance crews can remove the gas from a section of pipeline being repaired and feed it back into the active part of the pipeline, thus avoiding the release of the gas into the atmosphere. The technology is currently being field-tested, and it will help the gas industry and Con Edison further reduce methane emissions.

international agreements to reduce GHG emissions (including the United Nations Framework Convention on Climate Change and the associated Kyoto Protocol). Many companies have been unable to find reliable data from 1990, though, leading some to use more recent base years. For example, Pfizer's base year is 2000 and Bristol-Myers Squibb Company's is 2001. Kodak set one CO_2 reduction goal using 1997 as the base year (with the goal to be achieved in 2002) and subsequently set a second reduction target for the period from 2002 to 2008 using 2002 as the base year.

ESTABLISHING AN EMISSIONS REDUCTION TARGET AND FINDING REDUCTION OPPORTUNITIES

Like any other business target, establishing a GHG target helps a company focus its activities. There are two general types of emissions-reduction targets. The first is an "absolute" target to reduce emissions below those from a selected base year, and to be achieved by some target year in the future. For example, the company will lower its emissions 10 percent below 1998 levels by 2005. The primary advantage of the absolute target is that the environmental benefits from achieving the target are clear and concrete: the company is emitting fewer GHGs into the atmosphere. Absolute targets also are easier to understand and communicate.

The second type is an "intensity" target, or a commitment to cut emissions relative to some measure of business activity. For example, the company will reduce its emissions by 10 percent per unit of product manufactured by 2005. This type of target can be useful for comparing intrasector performance. Although some companies favor intensity targets because they accommodate growth, the environmental benefit is ambiguous because a company's absolute emissions may increase even if the goal is met.

Once a target has been set, companies can explore ways of reducing emissions. One of the benefits of developing a comprehensive GHG inventory is that it helps reveal emissions reduction opportunities. The more inclusive an inventory is, the more reduction opportunities are likely to exist. Before GE conducted its first inventory, corporate environmental managers did not know that the company was in fact emitting some very potent GHGs in specific manufacturing operations. After reviewing its inventory results, GE identified the source of the emissions and began a process aimed at achieving some large reductions at the small number of sites where these emissions were occurring.

Kodak has also undertaken a variety of small reduction projects across the spectrum of company operations. Most of its reductions have resulted from various forms of energy efficiency measures, including building-use efficiency. Kodak's effective real estate management, which includes consolidating sites to eliminate buildings not being maximized, has reduced the company's need for energy.

At Pfizer, each site—including the small ones—participates in the company's comprehensive energy program, in which each is encouraged to identify energy-saving projects (case study 4). Pfizer currently has approximately 600 energy-saving projects pending at all levels of the company.

VERIFYING EMISSIONS

Verifying a corporate inventory can improve data quality, system design, credibility, and transparency and can demonstrate to stakeholders that the reported information is a true accounting of emissions. The process may begin with an internal review of data and regular quality-control checks, but to achieve independent verification of a corporate GHG inventory, it is necessary to bring in a third party. Independent verifiers may be private consultants, perhaps from an environmental or accounting firm, or they may work for a public GHG reporting or registration program.

Independent verification may take different levels of scope and effort depending on the objectives of the company seeking the review. The practice of third party verification is relatively new, though common standards are emerging (ERT 2004). Verification may involve, for example, an examination of the procedures used to set inventory boundaries, the methods and calculations used to estimate emissions, the supporting data and documentation, and the systems for data collection, management, and record keeping. Some corporate objectives, such as trading in verified emissions reductions, may require extensive verification.

Whatever the level of verification that a company chooses, a sample of data and/or facilities is selected for review. Because most companies have too many data and facilities to review every detail, an audit sample serves as a representative subset. After reviewing the company's profile, a verifier may select an audit sample based on criteria such as type and size of emissions sources in the inventory.

REPORTING EMISSIONS

One factor that managers must consider when designing their inventory is to whom they intend to report their emissions data, especially because different programs may have different reporting requirements. An inventory that is designed to be flexible will be able to accommodate multiple needs. For that reason, companies should develop inventory systems that capture as much information as possible while allowing for it to be assembled and disassembled in various ways.

A lack of standardization among GHG emissions-reporting programs is a significant concern in the private sector. The GHG Protocol strives to define standards that can be used universally, and most reporting programs have converged around these standards. According to the GHG Protocol, the reported information should include organizational and operational boundaries, calculation methodologies, emissions factors, emissions data for each source, the base year, the company's reduction goal, and the company's emissions performance over time. Based on a recent review of corporate GHG reporting, though, many companies do not report enough detail to be consistent with the protocol's standards.

Companies may be required or may choose to report their emissions to a number of different entities, including public registries, investor groups, nongovernmental organizations, and government agencies (see box 4). To which organization a company chooses to report depends on a variety of factors, such as the location of the company's operations, its interest in obtaining credit for lowering emissions, and public relations.

BOX 4 EXAMPLES OF GREENHOUSE GAS REPORTING PROGRAMS

- Business Roundtable Climate RESOLVE Program (http://www.businessroundtable.org)
- California Climate Action Registry (http://www.climateregistry.org)
- Carbon Disclosure Project (http://www.cdproject.net)
- Chicago Climate Exchange (http://www.chicagoclimatex.com)
- Dow Jones Sustainability Index (http://www.sustainability-index.com)
- European Union Emissions Trading System (http://europa.eu.int/comm/environment/climat/home_en.htm)
- Global Reporting Initiative (http://www.globalreporting.org)
- Northeast Regional Greenhouse Gas Registry (http://www.rggi.org)
- Trade associations
- U.S. Department of Energy 1605(b) Registry (http://www.eia.doe.gov/oiaf/1605/frntvrgg.html)
- U.S. Environmental Protection Agency Climate Leaders Initiative (http://www.epa.gov/climateleaders)
- World Wildlife Fund Climate Savers (http://www.worldwildlifefund.net/climate/projects/climate_savers.cfm)
- World Economic Forum Emissions Registry (http://www.weforum.org)

CASE STUDY 4
REAPING THE BENEFITS OF A GHG INVENTORY: PFIZER'S EXPERIENCE WITH GLOBAL DATA COLLECTION

Since 1993, Pfizer's Energy Conservation Guidelines have required the company to reduce its environmental footprint by lowering energy consumption. To do this, Pfizer began laying the groundwork for a corporate GHG inventory. Armed with this information, Pfizer then decided on an emissions reduction target using the intensity approach, specifically a 35 percent reduction in GHG emissions per dollar of revenue, starting with 2000 as its base year and aiming to achieve the target by 2007. The company also set a goal of obtaining 35 percent of its electricity from "clean technology," including combined heat and power, by 2010.

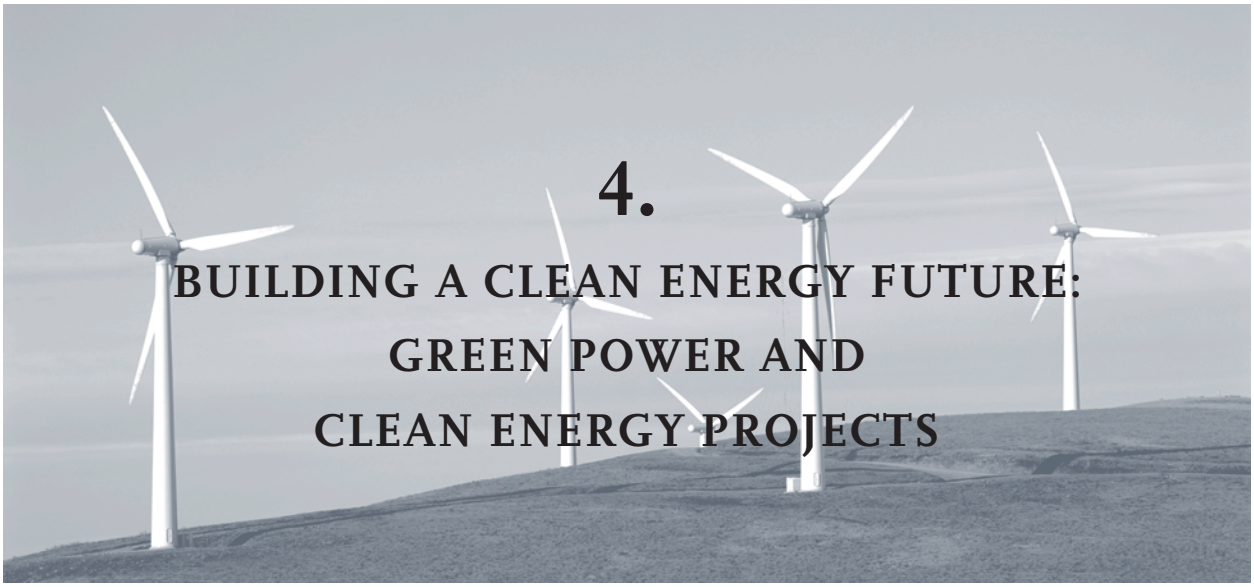
Environmental Health and Safety (EH&S) personnel serve as the core of the GHG inventory team. With operations in many countries and facilities of differing size and purpose, it was important for Pfizer to design an efficient, flexible, and user-friendly tracking and reporting system for its emissions. Given its complex structure, Pfizer used Web technology to capture worldwide emissions data. It also tried to keep the data collection process simple in order to minimize errors and obtain high-quality information.

The company built a computer application with a custom-designed database and a user-friendly Web interface. Pfizer designed the Web site so employees do not have to convert data. Each year EH&S employees at designated facilities use the standard Web page to report raw activity data, such as fuel oil and electricity consumption. Once this information has been collected, the GHG computer application converts it into emissions and compares it with the company's targets. The application also uses a built-in algorithm to automatically compare the new data with historical data and to flag potential errors for further investigation. For the personnel at the company headquarters, the system provides valuable information on Pfizer's overall emissions performance.

The facilities use the GHG inventory to find possible emissions reduction projects. Once a year, large facilities are required to report their conservation and efficiency projects through an energy database. Small facilities are required to do so every other year. The project reports are rolled up at the corporate level for analysis and possible replication. Participation is encouraged by evaluating projects using a generous five-year payback. As a result of these efforts, Pfizer has identified more than 600 energy-saving projects at all levels of the company.

For the smaller facilities, Pfizer discovered a number of benefits from requiring participation in its GHG emissions program. The inclusion of the smaller, less visible facilities has helped foster a more positive corporate culture throughout the company. Employees get excited about the conservation and efficiency efforts and the company's green power purchases. Another benefit is that the employees of smaller facilities have offered useful ideas. A small plant in Arnprior, Canada, for example, installed an innovative solar heating wall and is studying the feasibility of having an on-site wind turbine, both of which have never been done at Pfizer. Even though the small facilities account for only a fraction of GHG emissions, they act like laboratories, acquiring valuable experience with new technologies and GHG reduction activities, which Pfizer can later implement at its larger plants.

With the GHG data collection system up and running, Pfizer began working on the accuracy and quality of its data. This can be improved by using a third party to provide independent verification that emissions data has being properly collected, converted, and reported. Four Pfizer facilities in Ireland and the United Kingdom are required to have third party verification under the European Union Emissions Trading System for GHG emissions. Pfizer is considering extending third party verification to a global scale in order to keep up with demands for GHG information.



4.

BUILDING A CLEAN ENERGY FUTURE: GREEN POWER AND CLEAN ENERGY PROJECTS

Once a company has developed its GHG inventory, set a GHG reduction goal, and charted its strategy on climate change, it can begin exploring its emissions reduction opportunities. Most companies find that the bulk of their emissions is related to energy consumption, either on-site generation of electricity and steam (scope 1 emissions) or purchased electricity and steam (scope 2 emissions).

Commercial and industrial users consume more than 50 percent of all energy in the United States (EIA 2004a). In addition, CO_2 emissions from the combustion of fossil-fuel energy resources account for more than 80 percent of total GHG emissions (EPA 2004). Given the prevalence of emissions from energy consumption, it is not surprising that most strategies for reducing emissions, whether at the company, state, national, or international level, begin with an analysis of energy use and ideas for reducing the related CO_2.

The private sector plays an important role in driving the demand for new technologies and helping shape a clean energy future. Corporations can buy or develop green, renewable power and thereby help to diversify energy resources away from traditional fossil fuels. In addition, companies can invest in energy efficiency and distributed generation, such as combined heat and power, to lower the amount of energy needed to produce goods and services.

GREEN POWER SOLUTIONS

Some companies are turning to green power solutions to help meet reduction goals for GHG emissions. Green power refers generally to electricity generated by renewable energy sources that do not emit greenhouse gases, such as wind, solar, biomass, and geothermal. There are three ways to buy green power: on-site generation systems, green electricity delivered through the power grid, or renewable energy certificates.

On-site generation can use various renewable resources. For many years the pulp and paper industry used biomass extensively to generate electricity and steam at its manufacturing plants. Solar photovoltaic (PV) arrays can be used for a wide variety of applications and are often mounted on rooftops. Johnson & Johnson, for example, is the second largest corporate consumer of solar PVs in the United States, and it has several rooftop arrays, including a 500-kilowatt system at its pharmaceutical-manufacturing plant in Titusville, New Jersey. Wind turbines can also be constructed on-site as long as there is adequate wind. Kodak, for example, erected a wind monitor at its flagship Kodak Park facility in Rochester, New York. The information collected will be used to determine the feasibility of developing an on-site wind farm.

An important consideration for on-site generation is the up-front capital cost required to engineer, procure, and construct the system. Although renewable generation projects can deliver a positive return on

investment, the rate of return may fall short of the company's standards for allocating capital to company projects. One way of addressing this is to factor in some of the benefits of renewable power, such as zero emissions and the possibility of hedging against price fluctuations in purchased electricity. In addition, many states offer incentives, such as rebates, that directly offset some of the cost of on-site generation projects.

Another approach that helps overcome resistance to investing in lower-return renewable energy projects is the "services model," in which a company can host an on-site generation system and agree to buy the power without actually owning the equipment. For example, Staples initiated a solar PV project using a services model. The project developer, SunEdison, Inc., arranged for the financing, design, and construction of a 260-kilowatt solar rooftop array at a Staples facility. In return, Staples signed a ten-year power purchase agreement with SunEdison, with the option to renew for five-year intervals. Staples will avoid all capital and maintenance costs. The price for power in the contract is competitive with local commercial rates, and the agreement has a fixed cost structure that acts as a hedge against price volatility in retail electricity.

The second option for buying green power is to have it delivered through the electricity grid. In both restructured and regulated markets, many power suppliers offer their customers green power products. For example, Con Edison Solutions, a subsidiary of Consolidated Edison in New York State's restructured electricity market, offers green power to its commercial and industrial electricity customers in New York City and adjacent counties. The company partners with a wind power marketer and developer to buy wind power from wind plants in northern New York. The green power product is branded and thus distinct from the conventional offer for commodity electricity, and corporate customers can choose, for a premium, to include anywhere from 1 to 100 percent green electricity in their power mix.

In regulated markets, such as Vermont, where the local utility has a monopoly on power customers, the utility may offer a "green pricing" program. As of April 2004, there were more than 580 green-pricing programs in 34 states. Among leading programs, the price premium for the green power is in the range of about $10 per megawatt-hour (DOE 2004).

Utility green-pricing programs can present several challenges to large commercial and industrial customers. The premiums can be expensive. There also can be administrative complexity with structuring the contracts, especially if many locations are involved, which drives up transaction costs. In addition, some markets have few options and/or little competition.

The difficulties of delivered green power have prompted greater interest in another product: the renewable energy certificate (REC). Every megawatt-hour of renewable power that is generated displaces a megawatt-hour of power that would have been generated from fossil fuels like coal or natural gas. As a result, new renewable power can help clean up the electricity supply. Energy buyers who want to support these renewable electricity sources can buy a REC, the revenue from which helps make renewable energy projects financially secure. The REC gives the buyer a guarantee that the renewable energy was generated and was put into the electricity grid. All the pollution that was avoided because of that renewable energy source can be calculated, and companies can "green-up" their electricity supply by matching some amount of electricity use with a REC purchase.

RECs are in high demand in states that have a mandatory renewable portfolio standard, such as Connecticut and Massachusetts, where power suppliers are required to supply a minimum amount of green power. In these states, power companies buy RECs for compliance purposes, making RECs generated from local renewable resources expensive.

RECs generated in other areas are sold in the "voluntary market," which is driven by corporations, organizations, universities, and other buyers seeking to support renewable energy and lower the pollution associated with their energy use. In these markets RECs generally are much cheaper. In addition, RECs are attractive because they offer simplified transactions, a wide selection of suppliers, and a greater

CASE STUDY 5
EXECUTING A LARGE CORPORATE PURCHASE OF RECS: JOHNSON & JOHNSON'S EXPERIENCE

In 2003 Johnson & Johnson completed one of the largest purchases of renewable energy certificates (RECs) by a U.S. corporation. Twelve business units within the company combined to purchase biomass RECs over three years. The RECs are provided by a national REC marketer, which contracts with renewable generators to act as their agent for bringing the RECs to the market. The total purchase was equivalent to more than 162,000 megawatt-hours during a three-year period.

Purchasing RECs allowed Johnson & Johnson to overcome a number of challenges that the company faced while exploring different options for expanding their existing clean energy purchases.

If Johnson & Johnson opted for a traditional green power purchase involving delivered electricity, then the different business units might have had to contract with many different local retail electricity suppliers, and several significant obstacles would have arisen. Some facilities would have had to wait for their electricity contracts to come up for renewal before switching to green power sources, or they would have had to pay a fee for breaking or renegotiating their existing contracts.

Business units acting independently in different states and regions would not have been able to benefit from the economy of scale provided by a large aggregate purchase. When buying green power, companies are often restricted by a price premium. The unbundled aspect of RECs, however, breaks down geographic constraints on renewable generation and thus provides access to less expensive resources.

Johnson & Johnson faced several complications in the RECs purchasing process due to the company's decentralized operational structure. With over 200 operating companies in approximately 57 countries, projects are initiated and funded at the company level, not from a central corporate office. For Johnson & Johnson to complete a large RECs purchase, the corporate energy team could not select individual business units and projects, but had to coordinate a program through which the business units could act in concert. This posed a challenge for Johnson & Johnson because of the complexity of completing many different RECs contracts and the potential for terms and conditions to vary.

To overcome this obstacle, the company worked with WRI to craft a master agreement, consisting of 12 separate subcontracts for each business unit participating in the RECs purchase. The master agreement allowed Johnson & Johnson to work with one REC provider which offered the company a three- to six-month window in which the price quotes were fixed. The master agreement and the firm REC pricing allowed the corporate energy team to approach each of its affiliates with actual cost figures. The responses by the affiliates were positive, as evidenced by the significant amount of RECs that were bought.

This large RECs purchase also provided Johnson & Johnson an efficient and cost-effective means of addressing the company's climate change commitment. Under Johnson & Johnson's CLIMATE FRIENDLY Energy Policy, the company committed to reduce absolute GHG emissions by 7 percent below a 1990 base year by 2010. As a result of the RECs purchase, Johnson & Johnson offset over 68,000 metric tonnes of CO_2 emissions, or roughly 6 percent of the company's total annual emissions in 2003.

variety of renewable resource options from different geographic areas. The advantages of RECs have spurred recent market growth, including the largest ever corporate purchase of RECs in 2003 (more than 265,000 RECs per year) involving ten large corporations and WRI. Case study 5 describes Johnson & Johnson's experience assembling its own large purchase.

INVESTING IN ENERGY EFFICIENCY AND COMBINED HEAT AND POWER

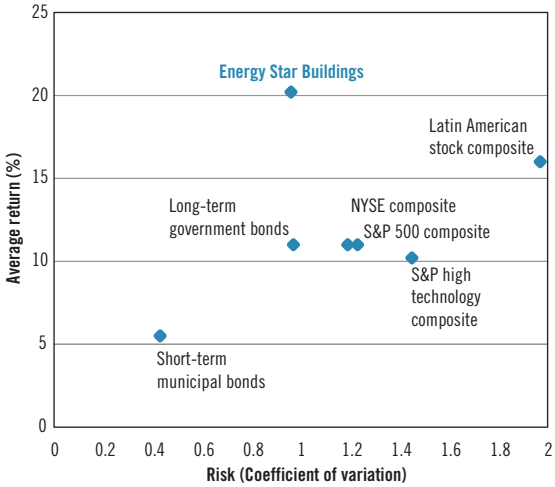
Energy costs can be both expensive and volatile. As a result, reducing energy consumption through efficiency and conservation investments can provide significant value that goes straight to the bottom line. As energy consumption falls, so too do CO_2 emissions.

Despite strong financial returns, companies may overlook investments in energy efficiency while allocating capital. In some instances the returns may not rise to the company's required rate of return for investments, and the company may not be factoring in certain intangible benefits, such as lower GHG emissions, or analyzing energy efficiency across the system.

Efficiency projects can take many forms. Long-term projects with large capital outlays may include upgrades to on-site utility plant equipment and control systems or the replacement of heating, ventilation, and air conditioning (HVAC) systems. Smaller projects, for which the capital may be approved more quickly, may mean replacing pumps and valves, improving building exteriors and insulation, fixing leaks in HVAC systems, and retrofitting the lighting, including occupancy sensors. Efficiency projects may also involve operational adjustments such as equipment calibration, evaluation of systems to see whether they match the original design criteria, operator training, and automation.

Although energy efficiency is built on individual projects, it also applies to whole systems and can be part of strategic business investment and planning. For buildings in particular, there are detailed rating systems for evaluating overall efficiency. For example, the U.S. Environmental Protection Agency provides guidance for building efficiency through its "Energy Star" ratings, which allows for buildings to be ranked according to their actual energy performance. Building retrofits that adhere to these ratings have been shown to be excellent investments (Rickard et al. 1998). As figure 3 illustrates, whole-building efficiency upgrades have an excellent risk-return profile when compared with typical financial investments. In this comparison, 14 projects were analyzed based on their initial performance data and projected ten-year returns, taking into consideration various risk factors that could alter the returns. This risk-return profile was then plotted against historical investment returns and risk associated with stock and bond portfolios.

FIGURE 3 **RISK-RETURN COMPARISON FOR VARIOUS INVESTMENTS**



Source: Reprinted with permission from ACEEE, Summer Study, 1998.

System-wide approaches to energy efficiency can be more practical and help alleviate the hurdles associated with project-specific calculations of return on investment (ROI) and the subsequent approval of capital expenditures. For example, rather than ranking efficiency projects by ROI and then reviewing only the top tier, energy managers can bundle a whole set of energy projects, including renewable energy investments, and have the entire package approved at once. This scales up the efficiency investment and allows some of the lower ROI projects to receive funding rather than being set aside for later consideration and possibly delayed indefinitely. The bundling approach can save time in the approval process as well as spread project performance risk among a basket of investments, as a mutual fund does. Linking energy projects together can also lead to much greater GHG reductions (case study 6).

CASE STUDY 6
PARLAYING EFFICIENCY INTO GREEN POWER: STAPLES' EXPERIENCE WITH OPTIMIZING GHG PERFORMANCE

Staples established its Office of Environmental Affairs in 2002 to set company policy and drive environmental commitments. One of the biggest challenges for the new office was justifying initial capital investment for projects that did not appear to deliver returns meeting the company's internal hurdle rate. To overcome this challenge, project champions used a "whole systems" approach to understand project benefits. For energy management, this included looking at the difference between anticipated budgets and actual expenditures and recognizing that these variances would cost the organization in planning and performance. They also looked at synergies among multiple projects as well as overall project costs, including both up-front and maintenance costs. Finally, Staples weighed a project's long-term affect on reducing their overall GHG emissions profile, and therefore overall risk.

Staples has been steadily acquiring knowledge on energy efficiency and load reduction, including its experience with a California demand reduction program during the 2001 energy crisis. As a result, the Office of Environmental Affairs began to systematically implement best practice approaches to energy management in all company stores. These projects ranged from control technology retrofits for lighting and HVAC load to incorporating more green design principles into new construction. In one project, Staples increased the energy efficiency of a warehouse by installing motion- and sound-activated fluorescent lighting instead of installing traditional spot lighting from halogen bulbs, and this quickly became the standard for all future warehouses. Another simple but noticeable change was made in its lighting fixture specifications. At no cost, changing the specifications saved two watts for every lamp used in more than 1,500 locations. Combined with a 30 percent longer life, the small shift in equipment specifications amounted to large savings.

Since 2001, Staples reduced energy consumption by 12.3 percent per square foot of floor space. This included 46,000 megawatt-hours in the first year and an additional 19,000 megawatt-hours in the second, with savings of $4.5 million and $2.0 million, respectively. By reducing energy consumption, Staples also reduced the indirect GHG emissions that are released when electricity providers burn fossil fuels to generate power. Using the average emissions factor for the United States, Staples' energy efficiency avoided more than 41,000 metric tonnes of GHG emissions over two years. This is equivalent to taking nearly 8,000 cars off the road.

The effort to reduce emissions did not stop with energy efficiency. The company leveraged the money it saved from its efficiency investments to purchase renewable power, including renewable energy certificates equivalent to 46,000 megawatt-hours each year. Consequently, in 2003 Staples was able to increase its renewable power use from less than 2 percent of its annual electricity consumption in the United States to an industry-leading 10 percent. The use of green power resulted in an additional 35,000 metric tonnes of avoided GHG emissions.

These actions have led to considerable recognition and positive publicity. In 2004, the Department of Energy and the Environmental Protection Agency selected Staples for the annual Green Power Leadership Award, a competitive award that recognizes outstanding commitments and achievements in the green power marketplace. The work by Staples has also been covered in investment press, for example, by the Millstone Evans Group of Raymond James & Associates and by *The Progressive Investor*, an e-journal by **SustainableBusiness.com**. News about Staples' green energy purchase also appeared in several newswires, publications, and Web sites. Positive recognition like this can improve Staples' brand image, improve its relationships with stakeholders, and help the company to establish itself as a leader in business and on the environment.

When analyzing energy efficiency, one consideration for corporate energy users is on-site generation. In addition to improving efficiency, on-site power can lower costs, improve reliability, and hedge against fluctuations in power prices. Solar PV arrays are one form of on-site generation. For large commercial and industrial demands, though, combined heat and power technology offers perhaps the greatest gains.

Combined heat and power (CHP), also known as cogeneration, is a technology for producing both electricity and heat (in the form of steam or hot water) for industrial processes. The turbine for producing the electricity is usually powered by steam. Once the steam passes through the turbine, it is then used for industrial operations. CHP is very efficient and, if used at the source of consumption, minimizes transmission losses. CHP makes sense, though, only if the energy user needs steam or can sell the steam to a nearby facility. While CHP holds the promise of significant efficiency and environmental gains for companies (case study 7), the diffusion of the technology has been slowed by permitting and interconnection barriers. With the removal of these barriers, new CHP construction could greatly reduce GHG emissions throughout the U.S. economy while saving energy and money (Elliott and Spurr 1999).

CAPTURING THE BENEFITS OF GREEN POWER AND CLEAN ENERGY PROJECTS

When a company buys green power or finances clean energy projects, it will want to capture the GHG emissions reductions. To do that, the company must track both its scope 1 and 2 emissions. For example, if a company invests in constructing a new CHP unit to generate its own electricity, the company has effectively imported GHG emissions into its site. Even though the generation is likely to be much more efficient than grid-delivered power, the company needs to track the net effect on both its scope 1 and 2 emissions to demonstrate the emissions reduction benefit.

Green power purchases and energy efficiency projects do not always lower a company's direct scope 1 emissions. Rather, these investments often reduce the emissions by power companies that feed electricity into the grid. As a result, the project investors need to calculate the reduction of GHG emissions in the larger geographic region covered by the power pool.

One way that a company can support its energy project investments is to create a public record of its direct and indirect emissions performance. This can be facilitated by a public GHG emissions registry. For instance, the Northeast States for Coordinated Air Use Management (NESCAUM) is creating the Northeast Regional Greenhouse Gas Registry. Among its goals is supporting voluntary corporate action to cut GHG emissions. Companies can use the registry to record their actions and emissions over time and potentially gain credit from policy makers at a later date when GHG policies take effect.

CASE STUDY 7
COMBINED HEAT AND POWER: RELIABILITY, EFFICIENCY, AND GHG REDUCTIONS AT BRISTOL-MYERS SQUIBB COMPANY

Bristol-Myers Squibb Company operates a 1 million square-foot pharmaceutical research and development facility in Wallingford, Connecticut. The site covers 180 acres and houses a state-of-the-art research laboratory. It is staffed by approximately 1,200 employees working to discover cures for diseases such as cancer and HIV. The site requires a significant amount of energy, both electricity and steam, and consumes more than 48,000 megawatt-hours of power and 280 million pounds of steam annually.

Many research studies span multiple years and are in a continuous state of operation. As a result, research facilities require a constant, regulated environment, including controls on temperature, humidity, and non-recirculated ventilation. Utility interruptions could be detrimental to the operations, so highly reliable utility services—electricity, steam, and chilled water—are vital.

To optimize reliability, efficiency, economics, and environmental performance, Bristol-Myers Squibb Company constructed a combined heat and power (CHP) plant at its Wallingford site. An engineering analysis determined that a 4.8-megawatt combustion turbine and heat recovery system (waste heat boiler) would meet the company's various requirements. In addition to the financial advantages, the CHP plant relieved a shortfall in backup steam-generating capacity. It also provided a large standby generator that could be used if the public utility was unable to provide electrical power. The turbine uses clean-burning natural gas for fuel, and it has a dual-fuel capability that allows for burning oil as a backup. The unit is also very efficient and can handle the site's peak steam load, thereby eliminating the need to continuously operate an additional boiler.

The installation of the CHP system provided flexibility that allowed the utility plant staff to redesign the sequence of equipment operation and supply of utility services, thus achieving optimal efficiency. During the winter months, all the waste heat from the gas turbine is recovered to make steam to heat the complex. This has resulted in large reductions in the amount of fuel used in the standby boilers. During the spring and fall months, the facility is often able to meet its total steam and chilled water requirements by solely using the CHP steam to simultaneously meet process and chiller plant loads. This results in several months of "run time" during which no boilers are needed to support steam demands.

The CHP investment has delivered environmental benefits as well. Producing electric power "inside the fence" is more efficient than electricity supplied through the power grid, and there are no transmission line losses. The efficiency of the Wallingford CHP facility is approximately 72 percent. In comparison, the efficiency of the entire U.S. electric power system is estimated at 32 percent (EIA 2003a). Considering the amount of electric and steam energy that Bristol-Myers Squibb Company draws from its CHP plant and comparing this with the alternative (buying power from the New England power pool and generating steam through a typical boiler), the CHP project has reduced GHG emissions by 20 percent, or roughly 6,600 tonnes per year. These reductions are helping Bristol-Myers Squibb Company meet its Corporate goals of reducing GHG emissions and energy use.

In addition, when Bristol-Myers Squibb Company installed the CHP unit, it realized that advancements in gas turbine technology would allow for reductions in emissions of nitrogen oxides (NO_x). The facility voluntarily upgraded the combustor section of the turbine to cutting-edge technology, which resulted in approximately a 33 percent reduction in NO_x emissions.

5.

LOOKING AHEAD: CUTTING-EDGE ISSUES AND CHALLENGES FOR CORPORATIONS

Work to reduce greenhouse-gas emissions will continue for decades. In the near term, though, a variety of regulatory and voluntary proposals and programs will emerge for addressing climate change, including approaches based on technology standards, markets, taxes, and other measures to rein in emissions. In the United States, state and regional efforts include GHG emissions registries, a CO_2 cap-and-trade program in the Northeast, and a CO_2 standard for automobiles in California. At the national level, the McCain-Lieberman Climate Stewardship Bill will continue to stir debate among federal policy makers. For corporations, this myriad of regulatory actions has created uncertainty about their investments and corporate strategy. Markets and consumer behavior may also continue to change as investors, communities, and consumers seek greater action on GHG emissions.

In response, companies require flexible GHG management systems that can adapt over time. They also need to consider strategic investment and planning, especially with new products and services. Companies need to make the business case for their actions and consider drawing on some of the analytical techniques being used in the investment research community. Specific quantitative analyses of the business case on climate change are not widely available to the public, and companies should help to build this body of knowledge. The private sector can support technological progress for new energy sources, new building designs, and new energy management systems, to name a few areas. How and when companies will address these challenges requires vision, leadership, and pragmatic business goals.

Many companies have already begun to control their GHG emissions and to recognize the implications of climate change for their businesses. In the coming years, a number of GHG management issues will challenge corporate environmental and energy professionals:

- **Setting and updating performance targets**. Emissions and energy targets help companies focus on their investments and track their progress. As the regulatory and market environments continue to evolve, companies may need to reevaluate and redesign their targets so that they remain relevant and useful.
- **Managing internal communication**. As a company's response to climate change begins to touch on many corporate divisions, including EH&S, energy management, accounting, investor relations, and public relations, internal communication will become more complicated. A company may benefit by consolidating program oversight, management, and coordination under a team or person empowered to champion the company's climate goals and strategy.
- **Verifying and registering data**. Many companies have constructed data collection and reporting systems and are continuing to improve those systems over time. The external verification of data and practices is a logical next step. Verification standards for corporate GHG inventories are

beginning to emerge, and companies will need to test them. Furthermore, the public registration of GHG emissions data will be more accessible with the development and improvement of registries, and companies will need to review and test these databases.

- **Capturing new business opportunities**. Over time, low-emission products and services, especially clean energy technologies, are likely to gain favor worldwide. Incentives and funds for research and development can help companies experiment with and promote new business opportunities.
- **Identifying cost-effective emissions reductions**. Allocating scarce financial and human resources to reducing emissions is a challenge. Aligning corporate investment and incentives to recognize the benefits of reducing emissions is difficult and requires new analytical processes and a clear strategic vision. Companies will benefit from internal management systems that identify the best emissions reduction projects, allocate capital to them, and accurately quantify and capture the reductions.
- **Adapting to market-based solutions**. Some complex environmental issues can be tackled with flexible policy solutions that maximize the environmental benefit for the least economic cost. In particular, emissions cap-and-trade programs allow companies to reduce emissions while structuring compliance around their own circumstances. Creating markets for carbon that recognize actions across multiple business sectors will also help lower costs. In addition, the integration and harmonization of international market-based approaches to addressing climate change may provide even greater flexibility, cost-effectiveness, and environmental protection. As carbon markets continue to emerge, companies will need to assess their own internal costs of GHG emissions reductions relative to the price for carbon set by the markets.

Cooperative engagement with policy makers can help businesses overcome these challenges. Policy makers should be aware that reducing emissions without any formal recognition poses both costs and risks to businesses. Many of the lowest-cost, highest-return GHG investments may be forgone in the face of regulatory uncertainty. By recognizing performance and reductions, policy makers can support near-term action.

Companies from various sectors can reduce emissions through changes in electricity use and on-site electricity generation. To harness the innovation and resources of these companies in addressing climate change, policy makers should recognize their potential role and create appropriate incentives. Public emissions registry programs in northeastern states and other regions could take steps in this direction by working with companies to draw up guidelines for emissions from energy consumption as well as emissions offsets, such as the purchase of renewable energy certificates. Likewise, policy makers working on market-based approaches to climate change should recognize companies' diversity and their various emissions reduction opportunities, and then create incentives for an array of corporate investments.

To say that climate change is a complex issue for companies is an understatement. It is a long-term problem that requires near-term action to gain control of emissions. At the same time, strategic corporate decisions and investments require long-term thinking, and shareholders demand short-term results. Despite these complexities, businesses have shown that they can take action in the face of uncertainty and lower emissions in a feasible, cost-effective manner. The private sector plays a vital role in addressing this critical environmental issue.

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