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Getting Ahead of the Curve:

Corporate Strategies

That Address Climate Change

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PEW CENTER ON Global CLIMATE CHANGE

Shifting From Risk Management to Business Opportunity

DuPont*

Once again, DuPont is transforming itself. One of the oldest companies in the United States, DuPont began as a black powder[119] company in 1802; transformed into an explosives manufacturer in 1880; turned to polymers, paint, plastics and dyes in the early 1900's; added energy to its portfolio in 1981; and now, as it enters its third century, is pursuing new business lines of agriculture, nutrition and bio-based materials.[120] To make this latest transition, the company has been shifting away from lower-growth businesses that are heavily reliant on fossil fuels—evidenced by the sale of the Dacron®, Lycra® and Nylon® divisions in the early 2000's—and expanding into high-growth businesses such as bio-based materials—evidenced by the acquisition of Solae[121] and Pioneer Hi-bred International[122] in 1999.

Table 10

DuPont's Footprint (2005)

Headquarters:	**Wilmington, DE**
Revenues:	$26.6 billion
Employees:	60,000
Percentage of Emissions In Kyoto Ratified Countries:	8 percent
Direct CO_2e Emissions:	9.64 MMtons*
Indirect CO_2e Emissions**:	4.02 MMtons
Aggregate CO_2e Emissions:	13.66 MMtons
Target:	65 percent reduction in GHG below 1990 levels by 2010
Year Target Set:	1994 Recast in 1999

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

But at present, DuPont is still the 2nd largest chemical manufacturer in the United States, and remains heavily dependent on fossil fuels for energy and feedstock in its industrial chemicals, polymers, and high-performance materials businesses. As such, climate change is an issue that the company cannot, and does not, ignore. In 2005, DuPont was listed as the "top company of the decade" (1995-2005) by *Business Week* magazine[123] and Ceres picked the company as the leader in its industry;[124] both awards are based on accomplishments in greenhouse gas (GHG) reductions. But "DuPonters" (a name that employees use in reference to themselves) still see a pressing need to do more. In fact, the challenge they now face is the most important—transitioning their company's treatment of climate change from one of risk management to one of business opportunity. Don Johnson, Group Vice President (VP) for Operations and Engineering, says, "We have to begin to think of energy as a value and not as a cost." James Porter, VP of Safety, Health, and Environment and Engineering, adds that, "to shift from risk management to business opportunity you need to understand the value chain. You've got to discover new ways to use what you've got, while also developing new materials to serve new needs and concerns."

Company Profile

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

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DuPont's corporate vision is "to be the world's most dynamic science company, creating sustainable solutions essential to a better, safer and healthier life for people everywhere."[125]

In fact, safety has always been a key component of DuPont's culture, stemming from the dangerous nature of the company's first product, black powder. Porter states that with respect to safety, health and environment, there is a "cultural bias to do the right thing." But it is DuPont's long history of scientific innovation that is at the center of the organization. With more than 75 research and development (R&D) and customer service labs,[126] the company uses integrated science to develop new products and vigorously pursue what it terms "knowledge intensity"—getting paid for what the company knows rather than simply for what it makes.[127]

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

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

Climate Change Program Implementation

DuPont's actions related to climate change were foreshadowed by its experience with ozone depletion in the 1970s and 1980s. Relying on its strong scientific expertise, the company reacted to the ozone issue when it first emerged in the scientific journals. According to atmospheric scientist and DuPont Environmental Fellow Mack McFarland, Molina and Roland's 1974 *Nature* article linking CFCs with ozone depletion "got the ball rolling." As the largest manufacturer of CFCs at the time, DuPont initiated an internal task force to address the issue and senior management was briefed. Realizing that regulation was imminent, DuPont began exploring alternatives. In March 1988, after the signing of the Montreal Protocol, DuPont announced a voluntary and unilateral phase-out of CFCs through an orderly transition to alternatives. In 1991, the company began operation of the world's first manufacturing facility for the hydrochlorofluorocarbon HFC-134a, an alternative to CFCs. Today, CFC alternatives comprise two to three percent of DuPont's portfolio.

This experience taught DuPont that understanding atmospheric science, engaging in the policy arena, and realizing the market impact of future regulation was critical for its future growth. As *Business Week* describes it, DuPont is "an experienced hand at making the most out of changing regulations."[128] When the Intergovernmental Panel on Climate Change (IPCC) issued its first assessment report in 1990, DuPont saw a familiar scenario playing out and, given its experience with CFCs, then-CEO Woolard directed that DuPont become an early adopter of a GHG reduction strategy.

The company began measuring and tracking their largest GHG emissions—CO_2, nitrous oxide (N_2O) and HFC-23—in 1991 and also made an internal commitment to reduce net emissions. This action coincided with a larger expansion of environmental efforts at DuPont. In 1992, the company published its first external environmental report and an Environmental Policy Committee was created on the Board of Directors.

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

The first actions taken toward achieving the GHG reduction goals were aimed at the "low hanging fruit" in the company's operations. At the time, there was little sense of opportunity for competitive advantage other than getting ahead of the curve on regulation. DuPont's "low hanging fruit" consisted of reducing emissions of two potent GHGs: N_2O, with a Global Warming Potential (GWP) of 310 times that of CO_2, and HFC-23, with a GWP value of 11,700. In fact, given these high GWPs, CO_2 emissions were not a major issue for the company when GHG reduction goals were first initiated.

In 1991, a scientific paper[129] implicated Nylon production as a source of atmospheric N_2O, a GHG regulated under the Kyoto Protocol. In response, N_2O producers reached an industry-wide agreement in 1993 to reduce emissions by 1999.[130] To reach this goal, DuPont developed an end-of-pipe capture and destroy technique which eliminated 90 percent of emissions at a cost of $50 million with no payback to the business unit's profit and loss (P&L) statement. This additional burden was acknowledged by headquarters and earnings expectations for the unit were adjusted accordingly. For DuPont, accepting the $50 million hit was not only an issue of avoiding government regulation, but also of sticking to the company's principles by "doing the right thing." DuPont shared the technology with the other N_2O producers in the agreement as it was an end-of-the-pipe addition, separate from the core process, and substantial benefits required adoption by the entire industry.

The second target GHG, HFC-23, is an unintended byproduct from the production of HCFC-22, a common refrigerant, and part of DuPont's product line.[131] Reductions of HFC-23 were primarily achieved through a process improvement, resulting in greater yield of HCFC-22 and therefore reduced HFC-23 byproduct. Additional reductions

were accomplished through thermal destruction of all or a portion of the remaining HFC-23. Unlike the N_2O reduction technology, the HFC-23 reduction was not driven by an industry-wide agreement and involved an alteration in the core process that resulted in competitive cost savings. Therefore, the technology remained proprietary.

When it was realized that the initial GHG reduction goals would be readily achieved through these two initiatives, DuPont management moved swiftly to establish new goals. The new targets, set in 1999, were expanded to incorporate energy efficiency goals and to fit with DuPont's sustainable growth initiative. They consist of three elements: hold energy flat at the 1990 baseline; source 10 percent of energy from renewable sources at cost competitive rates; and reduce net GHG emissions to 65 percent below 1990 levels, all by the year 2010. Maintaining the 1990 baseline for the GHG reduction goal was a deliberate move, consistent with the baseline for countries under the United Nations Framework Convention on Climate Change and also reflective of the company's desired baseline for early action credits.

To achieve these new goals, "We have to attack energy," says Linda Fisher, VP and Chief Sustainability Officer. "We have a heavy dependence on fuel, and so rising energy prices are a major concern." DuPont is vulnerable to energy prices on two fronts because much of the feedstock it uses is derived from hydrocarbons, especially natural gas. This vulnerability was reflected in DuPont's fourth quarter 2005 earnings, which were half the amount predicted due to higher energy and ingredient costs, as well as hurricane disruptions, plant outages and lower sales in some segments.[132] Uma Chowdhry, VP of Central Research and Development, states it simply: "What energy prices have done to us focuses the mind very quickly."

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

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

Sourcing renewable energy, the second energy goal, has the potential to reduce upstream emissions, fuel costs and exposure to volatile price fluctuations. While progress in this area has led to an annual cost savings

of approximately $8 million, meeting the goal of 10 percent has proven challenging. According to Porter, this will be the "toughest goal, yet if we didn't set a goal, we wouldn't have done anything." Cost-competitive projects are relatively scarce and difficult to identify. The company has only been able to source about five percent of its energy from renewable sources, with most efforts coming from the use of landfill gas. In one example, the company partnered with a municipal landfill near its De Lisle, Mississippi plant. A third party laid seven miles of pipeline and installed compression equipment to bring low-cost gas for the plant's boilers. Although it is a less reliable source than the local gas provider, the effort has displaced 30 to 50 percent of natural gas used to run the boilers.

With regard to the third goal of GHG emission reductions, DuPont has been quite successful. As of 2003, DuPont achieved a 72 percent reduction from 1990 GHG emissions. After the 2004 divestment of the nylon business, Invista®[133] related GHG emissions were removed both from the baseline and the realized reductions and overall reductions were recalculated as 60 percent. (This practice of recalculating emissions follows the WRI/WBCSD GHG protocol as well as that of the Chicago Climate Exchange).

As the company's programs have developed, its strategies have become more sophisticated. Going forward, the challenge for DuPont is to treat climate change and energy efficiency as business opportunities by connecting them to the overall objectives of the firm. Company leadership believes that the right product mix will offer an advantage in a carbon-constrained world. Fisher, who is tasked with embedding sustainable growth into strategic planning, gives her view on what climate change means at DuPont, "It's more than just science. It is also a matter of understanding our role in both the problem itself and our opportunities to address it; and to get internal agreement on that."

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

John Ranieri, VP and General Manager of the Bio-Based Materials division, sees a number of areas in which DuPont has developed "sustainable innovations" that have already shown great promise.[134] "The real challenge is beyond our own footprint, it is in the market opportunities," says Fisher. "Can we measure the benefits to the customers? Are there growth opportunities? Some businesses are doing it. We need to work closely with customers to identify their needs and work to find a solution for them," either from new uses of old material or from developing new solutions to customer problems. Since 2000, DuPont has steadily increased its revenue from new products, growing from 20 percent of revenue from products introduced over the previous five years in the early 1990's to 33 percent in 2005.

For example, customers in the auto industry required coatings with much lower VOC than previously available, which, once developed, required much less organic solvents from the company's suppliers. Also,

DuPont developed a special grade of Tyvek® house wrap[135] in response to European customers (where residential reductions are part of the national climate strategy) for a product that would lower CO_2 emissions and heating bills. In some cases, DuPont engineers work with customers to help them reduce their own energy use, delivering higher value to customers and ultimately enhancing business through closer customer relationships and a stronger understanding of customer needs. Such efforts have been rewarded by larger or longer-term contracts.

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

One promising development is Sorona® polymer. In a joint venture between DuPont and Tate & Lyle PLC set to go on-line in the third quarter of 2006, the company will begin producing 1,3-propanediol, the key building block for the new polymer using a proprietary fermentation and purification process based on corn sugar. This bio-based method uses less energy, reduces emissions and employs renewable resources instead of traditional petrochemical processes.

Another promising development is the 2006 creation of a partnership with BP to develop, produce and market a next generation of biofuels. The two companies have been working together since 2003 to develop materials that will overcome the limitations of existing biofuels. The first product to market will be biobutanol, which is targeted for introduction in 2007 in the U.K. as a gasoline bio-component. This biofuel offers better fuel economy than gasoline-ethanol blends and has a higher tolerance to water contamination than ethanol.[136]

Both of these developments represent the new direction in which the company is headed—one that significantly reduces the company's environmental footprint. According to Chowdhry, this is not a subtle shift, but rather a significant change in product lines and research focus for DuPont. She is hoping that DuPont will soon be known for leading the industrial biotechnology revolution and predicts that over 60 percent of DuPont's business will stem from the use of biology to reduce fossil fuels in the next few decades.

Organizational Integration

To integrate climate-related strategies into the business, DuPont employs a vast network of teams and committees. Overseeing and driving this complex structure is strong leadership from the top. CEOs Holliday and Woolard are (and were) both visionary spokesmen for the company's goals on environmental issues and personally involved in pushing the company to achieve that vision. Mongan describes one pivotal moment, "We almost missed our 2000 goal. One business said it was too expensive. The CEO and Paul Tebo (former VP of Safety Health and Environment from 1993 to 2004) sat down with the business manager and firmly stated, 'we will

not miss this goal!'" That kind of personal attention to the issue leads Mongan (and many others) to list the most important ingredient in initial successes on climate change as the "CEO staying the course."

Beyond strong leadership, achievement of the goals is encouraged and diffused in several ways. First, goal setting involves a broad spectrum of representatives throughout the company. This is an effective way to create buy-in for the climate-related strategies.

Second, while attaining individual goals is left largely up to the business units, their progress is tracked through the Corporate Environmental Plan (CEP), a database that captures environmental performance (such as waste, emissions, GHGs, and energy) annually from global facilities and tracks future reductions or increases in alignment with business plans. It is maintained and managed by the corporate Environment and Sustainable Growth Center (a Corporate function comprised of policy and technical experts under the VP and Chief Sustainability Officer whose role is to lead the development and facilitate implementation of corporate sustainable growth programs and policies.)

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

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

Finally, local champions are a critical factor for both programmatic and cultural reasons in an organization with decentralized businesses such as DuPont. That is why DuPont created Competence Centers to operationalize its goals. For example, energy experts within each business unit combine to create the Energy Competence Center, a formal network of energy professionals. Their job is to incorporate the ideals of energy efficiency into the operations of DuPont by embedding climate issues into decision making, examining the entire value chain, and involving individuals wherever possible (see "An Energy Efficiency Champion on the Ground" on page 95).

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

An Energy Efficiency Champion on the Ground

One energy champion in DuPont is Craig Heinrich, leader of the global energy team for Titanium Technologies; a fast-growing division with plans to double production by 2010 from 1990 levels while increasing energy use by only 40 percent. This is no small task given that energy comprises a significant percentage of the selling price of titanium dioxide (TiO_2). Heinrich must be a vigilant internal salesman, aware of everything going on in his department. In describing his job, he states, "You need to communicate, you need to network…. The business case for energy efficiency has grown increasingly strong as energy prices have escalated," says Heinrich. "Even so, we have discovered the value of having an advocate for continued emphasis on improved energy efficiency. That is the role I play. It is necessary to repeatedly communicate the value so projects receive the appropriate priority."

One method he employs to stay ahead of new projects is Sustainability Screening, a process which evaluates a program's energy consumption and GHG emissions as part of the capital authorization process. The screening is performed early in the process, prior to other review steps, and involves both business unit and corporate level personnel. His Energy Competency Center's efforts have led to approximately 10 percent of the business unit's capital budget being invested in programs that improve energy efficiency, bringing year-over-year savings of $3 to $5 million. According to Heinrich, some projects may have a return of 300 to 400 percent. "For example, an air cooled condenser was used to supply desuperheating water[137] to one of our plants. We are switching to a third-party supplied reverse osmosis system, improving energy efficiency and reducing water costs." By outsourcing the project, DuPont avoided the capital costs.

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

Reducing energy consumption in capital investments can often be met with resistance, particularly if the pool of resources is dwindling. John Carberry points out that the certainty of returns in energy efficiency projects can actually become a liability. The company has ruled out such instruments as lowered hurdle rates, internal carbon shadow pricing or a set budget for energy efficiency projects. "Energy efficiency must meet the same hurdle rate as other projects. The problem is that when we pitch 20 percent return with 99 percent certainty on energy, we lose to a marketing group pitch of 40 percent return with 60 percent certainty."

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

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

External Outreach

As with other companies in this report, DuPont engages a number of stakeholders, including civil society, customers, trade associations and government. Managing these relationships helps DuPont build knowledge, convey actions and concerns, understand trends and engage more effectively in the political arena. Maintaining open communication channels enhances the company's business in the long run.

DuPont currently engages with non-governmental organizations (NGOs) in a multitude of ways. Often, a partnership is formed to meet specific project goals, with the primary driver being the expertise and different points of view brought to the table by NGOs. According to Fisher, "You can learn a lot from NGOs. They can open your eyes to market opportunities. Also, they add legitimacy to our environmental commitments. A big branded corporation stating its efforts sounds like public relations, but an NGO recognizing them carries a lot of weight, both internally for employees who are passionate on the subject and externally." Examples include partnering with the World Resources Institute and its Green Power Market Development Group to assist in meeting the 10 percent renewable energy goal, and joining with the Pew Center as a member of its Business Environment Leadership Council.

Unlike some other companies in this report, one venue for DuPont's external outreach on the climate change issue has been through the sales and marketing departments. As publicity surrounding DuPont's leadership in climate change initiatives increases, and general awareness of these issues grows, customers have been calling upon DuPont to deliver new, better performing products that are relevant within a carbon-constrained world.

In an example of collaborative partnerships, DuPont is leading a four-year, $38 million consortium (with NREL, Diversa Corporation, Michigan State University, and Deere & Co.) to develop an "Integrated Corn Bio Refinery." With $19 million in matching funds from the U.S. DOE, the consortium will design and demonstrate the feasibility of the world's first fully integrated bio-refinery, which will be capable of producing a range of products from a variety of plant-material feedstock; for example, converting corn into bio-derived chemicals, like Bio-PDO™, and bio-fuels, like ethanol. It "will create a new business model for sustainable production of chemicals, fuels and energy," says CEO Holliday.[138] "The technology will lower reliance on petroleum, reduce greenhouse gases, and create a global and sustainable bio-based economy."

DuPont is also a member of numerous trade associations, including the American Chemistry Council (ACC), the International Climate Change Partnership (ICCP), and the Council of Industrial Boiler Owners (CIBO). DuPont's involvement in these organizations represents the full gamut of industry issues, and the company works within these organizations to further climate change issues. Its efforts are more or less aggressive depending on the particular organization. According to John DeRuyter, Principal Consultant, Energy Engineering, "You should not become overly aggressive if you cannot get agreement. And with the ACC it can be very hard to get agreement with companies on either end of the spectrum." Recognizing that the diverse set of companies within associations do not always share their views, DuPont takes a cooperative approach, focusing its climate change efforts within organizations that are actively engaging the climate issue, like the Pew Center, the ICCP and the Business Roundtable.

Frustration with the Clean Development Mechanism

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

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

Given that Certified Emissions Reductions (CERs) are selling at a price of about $10/ton of CO_2e, one could make more money from selling the CERs resulting from the destruction of the HFC-23 than they could selling the intended product (approximately $3.50 for destroying the HFC-23 associated with production of one kilogram of HCFC-22 that was selling in some regions for around $1.80). The originally approved methodology has since been modified and would allow credit for destruction of HFC-23 up to 4 percent, providing revenue of $4.70 for the destruction of HFC-23 associated with production of one kilogram of HCFC-22. This, in effect, rewards operations for being less efficient.

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

McFarland concludes, "DuPont submitted comments under the CDM process on this issue. But right now CDM discourages the use of the Best Available Technology for reducing HFC-23 production in the manufacture of HCFC-22." Justifying DuPont's actions despite the CDM problems, he concludes, "We would not have looked for such a solution to reduce the amount of HFC-23 produced if not for the internal commitment to climate change and the need to meet that commitment on the most cost-effective basis."

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

Policy Perspectives

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

(CDM), a program that has frustrated the company thus far (see "Frustration with the Clean Development Mechanism" on page 97). DuPont has played an active role in advising and commenting on the development of the E.U. ETS. DuPont was also very active in the development of the U.K. ETS and participated in registration and trading of U.K. allowances through its Invista® subsidiary (now divested). Because climate change is a global problem, a global solution that includes all industrialized countries is critical.

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

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

Looking toward future regulation, DuPont sees an opportunity for longer-term views that encompass a global system with developing countries, including China and India. "This is an ideal time for renewed U.S. leadership on the issue," says Michael Parr, Senior Manager of Government Affairs. "We won't see China and India on board while the U.S. is on the sidelines."

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

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

Challenges Ahead

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

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

In order to understand and take advantage of this new focus, DuPont must navigate the complexity of the climate change issue, including the science, politics, economics, and uncertainty surrounding the timing. For example, rising energy prices this past winter (2006) have raised interest in green building and energy-efficient housing, but it remains unclear if energy prices will be persistently high enough to increase demand for related products from builders. Furthermore, it is unclear how policies, ranging from Federal energy policy to local building codes, will influence the marketplace. It will be a complex issue involving both push and pull from suppliers, producers, builders, end consumers and regulators.

Sharing information internally in such a large organization also remains a challenge. Despite an extraordinary organizational structure for sharing and disseminating information, the company "is still stove-piped," says Dawn Rittenhouse, Director of Sustainable Development. (This is a problem that executives feel is not unique to climate change and applies to the company in general.) Having widely distributed decision making contributes to the risk of business units acting in a bubble. The danger, especially regarding climate change and energy efficiency issues, which can be seen as add-on issues, is that technical expertise and success stories make it up, but not across, the organizational hierarchy. With the company being so diverse and products involved in almost every value chain, it can be difficult to make sure that all opportunities are identified and pursued across all of the DuPont businesses.

Another challenge is streamlining and fine-tuning their emissions measuring and tracking system, which many consider labor intensive. Energy related emissions are calculated based on fuel consumption according

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

In the end, the key for a science and innovation based company such as DuPont is the development of new materials that will take the company through its next transformation and into its third century. Says Fisher, "We need to understand, measure, and assess market opportunities. How do you know and communicate which products will be successful in a GHG-constrained world? How should we target our research? Can we find creative ways to use renewables? Can we change societal behavior through products and technologies? The company that answers these questions successfully will be the winner."

116. B2B—Business to business, as opposed to B2C—Business to customer.

117. Swiss Re. 2004. *Swiss Re Climate Specialist on TV*, http://www.swissre.com, viewed 1/29/06.

118. Swiss Re. 2003. *Becoming Carbon Neutral*, http://www.swissre.com, viewed 1/29/06.

119. Black powder is the oldest ballistic propellant for muzzleloaders and early cartridge arms composed of a mixture of potassium nitrate (saltpeter), charcoal and sulfur.

120. DuPont. 2006. *DuPont Heritage*, http://heritage.dupont.com/, viewed 1/8/06.

121. Solae is a manufacturer of soy protein and fiber ingredients in a joint venture with Bunge.

122. Pioneer Hi-bred International is a seed company specializing in biotechnology and genetic engineering.

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

124. Op. cite, Cogan, D. 2006.

125. DuPont. 2006. *Company at a Glance*, http://www2.dupont.com/Our_Company/en_US/glance/index.html, viewed1/8/06.

126. Ibid, DuPont. 2006. *Company at a Glance.*

127. DuPont. 2006. *Sustainable Growth.* http://www2.dupont.com/Our_Company/en_US/glance/sus_growth/sus_growth.html, viewed 1/21/06.

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

129. Thiemens, M. and W. Trogler. 1991. "Nylon Production: An Unknown Source of Atmospheric Nitrous Oxide." *Science*, 251(4996): 932-934.

130. The industry-wide agreement of N_2O producers included Asahi, BASF, Bayer, DuPont, ICI and Rhone-Poulenc.

131. HCFCs are generally considered interim replacements for CFCs. Their phase-out schedule is delayed compared to CFCs under the Montreal Protocol.

132. Warren, S. 2006. "DuPont Warns High Energy Costs will Hurt Profit", *The Wall Street Journal*, January 12: A6.

133. Reasons for shedding the nylon business were that the technology was "socialized" and it was not seen as a growth area for the company; it generated 25 percent of revenue but represented 40 percent of assets and was heavily dependent on fossil fuel.

134. Ranieri, J. 2005. *DuPont BioSciences: A Climate Change Best Business Practice*, Speech delivered to the California Public Utilities Commission, February 23, San Francisco, CA.

135. Tyvek® is a synthetic material made of high-density polyethylene fibers; the name is a registered trademark of the DuPont Company. It is a spunbonded olefin product that offers maximum protection and durability at a very light weight. For example, 100 10" x 12" envelopes weigh the same as 57 envelopes of the same size in 28 pound Kraft. Tyvek® is unaffected by moisture and inert to most chemicals. It has a number of uses, including siding for houses, envelopes, floppy disk and microfiche carriers where protection from acid, lint, and abrasions is needed.

136. DuPont. 2006. *Press Release: DuPont and BP Announce Partnership to Develop Advanced Biofuels.* (Wilmington: DuPont).

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

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

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

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

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

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

143. Calculated for 2002.

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

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

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

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

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

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

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

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

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

153. CO_2e.com. 2006. "What are Carbon Dioxide Equivalents (CO_2e)?" http://www.co2e.com/common/faq.asp?intPageElementID=30111&intCategoryID=93, viewed 1/24/06.

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

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