

solutions

+ Getting Ahead of the Curve:

Corporate Strategies

That Address Climate Change

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by

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PEW CENTER

ON

Global CLIMATE CHANGE

Maintaining a Seat at the Table

The Shell Group*

Royal Dutch Shell, like all major oil producers, finds itself at the heart of the debate over climate change. In 2005, Shell's own operations emitted 105 million metric tons of CO₂ equivalents (CO₂e). The downstream combustion of the fossil fuels it produces emits another 763¹⁴³ million metric tons. Together these emissions account for some 3.6 percent of global fossil-fuel CO₂ emissions in any year—a total greater than that of the entire United Kingdom. But rather than sit on the sidelines and wait for carbon constraints to alter the company's business environment, Shell took an early position on the issue and engaged in actions that began to manage its carbon footprint. These actions have earned the company credibility and a powerful voice within policy, advocacy and market circles. And this voice grants the company a measure of control over its future business environment. In the words of David Hone, Group Climate Change Advisor, "To validly have a seat at the table, you have to bring experience. You cannot just take a seat because you are interested."

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

Company Profile

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

Table 12

Shell's Footprint (2005)

Headquarters:	The Hague, NL
Revenues:	\$307 billion
Employees:	112,000
Percentage of Emissions In Kyoto Ratified Countries:	~30 percent
Direct CO ₂ e Emissions:	105 MMtons*
Target**:	10 percent below 1990 by 2002 5 percent below 1990 by 2010
Indirect CO ₂ e Emissions***:	763 MMtons
Aggregate CO ₂ e Emissions:	868 MMtons
Year Target Set:	1998 Revisited in 2002 Recast in 2005/6

* Million metric tons.

** Direct emissions reductions only.

*** Measured as emissions from product use in 2002.

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

the CEO. More recently, to reflect the growing importance of climate change as a strategic issue, the company has developed a new CO₂ Unit. In addition, all parts of Shell coordinate on the issue through a “CO₂ Forum.”

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

Climate Change Program Implementation

Shell has been watching climate change since the early 1990’s through its Issues Management team, a group within Corporate Affairs that monitors issues that may impact the business units. In 1998, Jeroen van der Veer, then a group managing director (and now CEO), championed a more formal study of climate change and its potential impact on Shell businesses globally. This study came after the 1997 signing of the Kyoto Protocol and at a time when the company was feeling bruised over its 1996 fight with Greenpeace over the disposal of the Brent Spar oil platform. A cross-functional team that spanned the company was put together and made the business case for implementation of a greenhouse gas (GHG) management strategy. This study raised the bar for climate action and, as a result, created resistors—“There’s always a challenge to what you create,” Hone says, “but building a strong business case is key to overcoming this resistance.” The business case revolved around the trio of ideas that the company would eventually face a real price for carbon, that a leadership position on climate change would be a business opportunity in terms of building brand and reputation, and that a seat at the table with the governments that would set the rules was important for the company’s future. Out of this initiative emerged the goal of “Securing Shell’s future by seizing opportunities that arise from the climate change issue.” Achieving this goal has historically followed two tracks.

The first track, energy strategy, considers the Shell energy portfolio. Planning for energy diversification is led in part by the company’s well-established long-range planning tools like the Shell Scenarios (see “Shell Scenarios” on page 113). Like Alcoa, Shell has long thought in time horizons of half a century or more. And climate change requires a similarly long-term focus. “You can’t look at this issue in a five-year time frame, it’s almost meaningless,” says Hone. “But you can look at it in a 25-year time frame—there’s the scope for it to be different.”

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

Following the 1998 study, Shell set a long-term goal of matching the Kyoto standards of a five percent reduction in GHG emissions by 2010. The first target within that goal was a 10 percent GHG reduction by 2002. This was the first hard target for Shell and it was achieved through the elimination of associated gas venting at oil production units and the reduction of associated gas disposal by continuous flaring. The second hard target (remaining five percent below 1990 emissions through the year 2010) was a more difficult sell than the first. To address internal sentiments that the company had done enough and that further public action was unwise, with the company's various business units as well as discussions with senior leaders were arranged. The workshops considered various target-setting and implementation options for the units themselves. The greatest resistance to the idea came from business units with significant growth opportunities in their forward plans. As such, a point of significant debate centered on whether to measure emission reductions targets through an absolute (for example, MMtonsCO₂e) or indexed approach (for example, MMtonsCO₂e per unit of revenue or product). Shell decided that setting one universal standard for such a large company would be impractical, as it overlooked the company's very size and the challenge that size creates. The company chose a blend of these two approaches. Individual business units would use indexed or energy efficiency measures while the Group as a whole faced an absolute target.

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

Shell Scenarios

Shell uses scenario planning as a strategic framework for thinking through challenges and identifying risks and opportunities. The most recent (2005) edition of Shell's scenarios, *Shell Global Scenarios to 2025*, articulates a vision of how worldwide forces might shape markets over the next two decades. The development of scenarios provides the company with a toolkit to assess risks, make investment decisions, develop a common strategic language for leadership teams, and engage in key public policy matters. Like the other Shell Scenarios, the 2005 edition uses alternative parallel story lines to explore how politics, economics and technology relate to its energy and energy services business. Shell uses story lines because stories are how humans understand the world, and stories allow for multiple levels of understanding while still giving emotional and intellectual impact. This time, for example, the three stories are: Flags, a "dogmatic, follow-me world"; Open Doors, a "pragmatic, know-me world"; Low Trust Globalization, a "legalistic, prove-it-to-me world". Through the lens of these three stories, Shell looks at issues from the U.S.-E.U.-China power balance to climate change and biodiversity. On carbon, all three stories come to the same conclusion: the world (and companies) will face a price for carbon. Practically speaking, for Shell's strategy this means focusing on increased natural gas production (especially liquefied natural gas—LNG), wind, solar, bio-fuels, coal gasification and experimentation with hydrogen delivery systems. But Shell emphasizes that it is still working to make its core business—fossil fuels—succeed in a carbon-constrained world.

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power stations. When the economics are right, these gases can also be converted into LNG, a major growth area for the company. Through these actions, Shell hopes to reduce its CO₂ emissions by a further 13 MMtons (from 2005), but recognizes that this reduction makes room for future growth, such as the expansion of its oil sands facilities in Canada. Shell had a global goal of ending all but small-scale continuous flaring of associated gas by 2008 but has said that it will miss this deadline in Nigeria, where the government has set elimination of flaring as a country-wide goal.¹⁴⁴

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

For this effort, the company also engaged its internal consulting arm, Shell Global Solutions (SGSi). SGSi consultants have helped develop many of the Group's technical solutions while also offering its consulting expertise to external clients. The consultants can be called in for projects as large as the design of refineries or as small as individual unit efficiencies. One of the SGSi programs, Energise, works specifically on energy efficiency strategies. At the request of unit managers—typically at refineries—Energise deploys teams to evaluate possible efficiency improvements. The work of these teams is similar to Alcoa's Energy Efficiency Team, which recommends operational, equipment and behavioral changes. Site management decides whether and how to implement the recommendations. Energise personnel are drawn from all areas of Shell, giving a broad range of technical expertise.

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

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By way of illustration Hone explains how the value of carbon can be a significant driver in energy efficiency decisions. One barrel of oil produces about 0.36 metric tons of CO₂. At current (early 2006) crude prices of around \$60/bbl, an E.U. Emissions Trading Scheme (E.U. ETS) CO₂ price of 25 Euros is like adding a further \$11/bbl to the price of oil, which makes an energy saving project even more compelling. The company uses long-term premise values for both oil and carbon when valuing internal efficiency projects (the actual numbers used by Shell are confidential and change with the market).

But to realize the full benefits of carbon shadow pricing and monetize the cost of carbon, emissions trading has become an important prong of Shell's strategy. "It is an enabler of energy efficiency projects," states Hone. For that reason, the company was one of the early innovators in both internal and external GHG emissions

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allowance trading. These experiences are a good example of how the climate change issue started at the periphery of the company and moved to the core of its operations. Carbon trading began as an issue for the Health, Safety & Environment (HSE) group within Corporate Affairs with the creation of a company-wide internal trading system (ended in 2002), and then for Shell Trading with creation of a CO₂ trading desk at the end of 2001. The new trading desk allowed Shell to participate in both the Danish and U.K. emissions trading schemes, which ran prior to the E.U. ETS, hence gaining valuable experience. Shell made the first swap between the Danish and UK systems in 2002 and, while the market did not formally open until 2005, Shell made the first actual market trade in E.U. Allowances in 2003. By moving from HSE to Shell Trading, “GHG is becoming more and more internalized” according to Hone.

The results of Shell’s internal trading experience are mixed. They show less-than-satisfactory results on its intended outcome: gaining the greatest reductions at the lowest cost (see “Internal Trading Shows Limited Success” on this page). But the company feels that internal trading was successful in making people aware of the need to reduce GHG emissions and the use of trading mechanisms to do it. This expertise also gave Shell credibility in policy circles and meant that its views were considered in the development of the E.U. ETS that went into effect in 2005.

Beyond its internal and external trading, Shell also became actively involved in early initiatives under the Kyoto Protocol’s Clean Development Mechanism (CDM). Initial success here was also limited. The company faced problems both related to the CDM structure and of their own making. In one solar project, the company determined that the cost of going through the CDM process exceeded the benefits of the carbon offsets. In an energy efficiency project in Buenos Aires, the company has been in the CDM Executive Board process for over a year (as of January 2006), leading to some frustration with the process. In addition, Hone feels that the Group “wasted” effort on early (1999-2000) internal CDM

Internal Trading Shows Limited Success¹⁴⁵

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

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

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



workshops but couldn't produce concrete results because of the slow start to the CDM market. Now, with the CDM market emerging and beginning to look like a success story, the company is working to reengage its businesses and capitalize on the opportunities that CDM offers. Early in 2006 Shell Trading was the recipient of the first physical forwarding of Certified Emission Reductions to an account on the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat's Clean Development Mechanism Registry.

Beginning in 2005, the company found itself at a crucial crossroad as the carbon issue began to figure significantly in the Group's forward-looking strategy. An internal CO₂ Study concluded that the Group must step up its efforts on GHGs. It must find ways to integrate its energy strategy and climate change strategy tracks into one cohesive strategy that helps the company identify and capture new business opportunities as well as maintain its core fossil fuel business.

In a January, 2006 *Financial Times* editorial,¹⁴⁶ Shell CEO Jeroen van der Veer articulated Shell's conclusion that future production of liquid fossil fuels would increasingly depend on unconventional sources, such as oil sands, gas-to-liquids, oil shale and coal gasification. The days of "easy oil" are over. The more difficult oil is "dirtier" and the company will subsequently have to address its associated higher GHG output. Van der Veer stresses the importance of carbon sequestration—both underground and combined with other materials to make inert materials, as a technical solution. It has become clear that the energy portfolio will have a significant impact on its GHG profile. Conversely, the company's climate change strategy has created the expectation of a company able to manage GHG emissions and government action has created carbon value in the market. These two tracks must now be intertwined. The Group's future depends on it.

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One important acknowledgement of this increased importance is the creation of a new CO₂ unit led by a senior executive. Graeme Sweeney, also head of Hydrogen and Renewables at Shell, has filled the post. His role will be to attend to the development of Shell's CO₂ strategy and the technologies that support it. The Group's CO₂ unit under Sweeney is viewed as a place to kick-start and foster GHG reduction technology until it is sufficiently integrated in the business units to stand on its own.

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External demand for lower-carbon energy has led the group to look toward key growth product lines. The first is continued attention to "developing LNG and natural gas businesses as a very easy way to help transition to a low carbon world" since natural gas has half the carbon footprint of coal in electricity production. As part of its broader energy portfolio, Shell has a strategy of having many technological irons in the fire. "A lot of energy technologies have come and gone," Hone says, "and it's hard to predict what the next big hit will be." The company has invested over \$1 billion in new technologies such as wind, solar, bio-fuels and hydrogen, and is now stepping up investment in underground sequestration and IGCC/coal gasification.

Within the last two years, there has been a growing realization that coal is going to be an integral part of the global energy mix, particularly in China and India. As gasification is a chemical conversion, an existing proficiency of the company, and has applications across a broad range of products and markets, the company

sees a significant opportunity in this area. Shell's experience with gasification dates back to the 1950's when the first gasification unit was commissioned with oil as feedstock. There are now over 150 Shell Gasification Process (SGP) gasifiers licensed worldwide. The experience gained on oil gasification provided a firm theoretical and practical base for the start of the coal gasification development in 1972. In fact, the technology has been utilized in a coal gasification pilot plant in the Netherlands. The process can be used to make "syngas" which can be used to make everything from electricity to plastics and importantly liquid transport fuels or even hydrogen for transport. Further, the process could be altered (with further R&D) to accommodate feedstocks of wood chips, municipal waste or other materials that could be gasified into useable fuels.

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

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

Hydrogen production is an area where Shell is developing critical expertise and is seeking to leverage that expertise in its investments. Shell already produces 7,000 tons of hydrogen per day, mostly from natural gas, and mostly for use in refinery operations. Shell hopes to use this existing source of hydrogen in some of its early efforts to make hydrogen more widely used as a fuel. Right now, says Hone, "98 percent of homes within the E.U. are within 100 kilometers of someone's hydrogen production site." Because the existing infrastructure is already there, all that is necessary for this opportunity to realize itself is an awakened demand and continued refinement in hydrogen handling and distribution technology. Before that happens, Shell recognizes that it needs to be up-and-running and prepared to meet the demand. So, for example, the Group now operates four hydrogen filling stations—in Tokyo; Amsterdam; Washington, DC; and Reykjavik—and is planning to build one in Shanghai in partnership with Tongji University. Further stations are also planned for the United States.

Organizational Integration

To help diffuse and incentivize climate change initiatives, Shell has incorporated climate change related goals into individual business scorecards. Scorecards use a number of criteria to evaluate performance of business units and individual managers, and focus on two or three principal metrics, such as financial performance. A particular climate change initiative (e.g. preparation for the E.U. ETS by E.U. refineries) might

account for five percent of a given score in a particular year—an amount Hone describes as “modest”. But the measures are constantly changing, reflecting a particular year’s goals. The scorecards are used for calculating bonuses more so than promotions and are revised each year to reflect new concerns.

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

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

The *Climate Change Newsletter* is a purely internal e-mail document that reaches a community of 300 or more employees each month. Employees with an interest in climate change issues can find out about the newsletter on the Shell internal climate change website and subscribe. The newsletter discusses specific technologies, developments within the company, and external climate change information. Anyone within the company can receive the newsletter, yet subscribers tend to come from four categories: corporate, including legislative affairs personnel; technology development (including CO₂ sequestration and energy efficiency); commercial units such as trading; and business areas with GHG-focused projects such as the Canadian oil sands units.

External Outreach

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

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

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

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

Third, Shell is working with NGOs on climate change issues. “NGOs,” Hone says, “can expose the company to a range of views on how we are doing.” Shell’s work with Pew, for example, opens some doors for the company that wouldn’t otherwise be available. “Once you go through Pew,” Hone says, “it’s like you’ve gone through a filtering process—you have additional credibility. Shell provides Pew with credibility. And likewise, Shell gets the same. There is less suspicion than if Shell went it alone.”

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

Policy Perspectives

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

Shell (and other corporate representatives) worked with the U.K. government to help set up the U.K. Emissions Trading Group to develop rules on trading in the U.K. Further, Shell has worked with the Corporate Leaders Group in the U.K. who, in conjunction with the Prince of Wales Business and Environment program, wrote a letter to the Prime Minister recommending more aggressive action on climate change.

Shell doesn’t advocate voluntary reductions as a long-term strategy to reduce GHG emissions. “Government needs to get involved through a variety of mechanisms,” says Hone. A balanced approach of market incentives, tax incentives, and subsidies is needed to create strong encouragement.” Mandatory programs, such as the

E.U. ETS, will help ensure the playing field is level, define price and monetize the advances Shell makes in reducing its GHG emissions. Without the government pushing it, he says, the business case for GHG reductions is harder to make, “and action cannot take place without the business case.” By contrast, Hone says, a business case driven by higher energy prices may not lead to lower carbon emissions, as higher prices may merely push companies to exploit heavier “unconventional” oil resources, dig for more coal or drill deeper oil and gas wells.

Challenges Ahead

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

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

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

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

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

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

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

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

143. Calculated for 2002.

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

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

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

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

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

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

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

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

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