

Unlocking the Latent Value of Operations Improvements and Clean Technology Projects via International Carbon Markets

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Abstract

U.S. companies are leaving money on the table. Many have been avoiding participating in emerging carbon markets and are opting to wait for a US federal regulation, but time is of the essence.

Financial managers are under more competitive pressure than ever to reduce costs, gain efficiencies, leverage assets and mitigate risks. Companies need to be ready and ahead of their competition when federal regulations are in place.

This paper digs into the many challenges companies will face around the growth of carbon markets and discusses the ways US companies are already participating in emissions trading and carbon finance globally. It is also intended to serve as an introductory guidebook to the development and management of carbon assets.

Introduction

International carbon markets, created to reduce greenhouse gas (GHG) emissions, have spurred innovation and efficiency across a range of industries, particularly those that are energy and GHG intensive. By creating price signals, carbon markets enhance the relative attractiveness of efficient, low carbon technologies. The unfortunate and persistent reality for many firms is that emissions management is viewed as a purely regulatory or compliance problem and disintegrated from core strategy considerations; improvements are viewed strictly as costs to be controlled rather than a potential to leverage reductions to build business opportunities and create new revenue streams. But many forward leaning firms are now moving to integrate GHG emissions management into core strategy.

The public discussion of carbon markets in the US has been largely limited to macro-economic impacts rather than how these markets impact the planning, operations and controls of individual enterprises. Even for those US businesses that are not engaged in energy or carbon intensive activities (such as retail and IT) – gains in efficiency can be leveraged indirectly via existing carbon finance mechanisms to unlock billions of dollars in unrecognised value. The fundamental economics of investment decisions – such as energy, logistics, production and raw-materials - are impacted now by carbon markets. This topic requires special study and consideration, and potentially costly mistakes can be avoided through the tough lessons learned from the European and international experience.

The essential character of carbon emissions markets are very simple and broadly understood. However in practice the markets are complex. Those emissions-intensive companies now doing business internationally, particularly in Europe and Japan, are advantaged because they have gained experience and competencies as they must understand and navigate cap and trade emissions markets, which are complex and at

moments counter-intuitive. This paper provides a broad-based exploration of the major macro-economic and enterprise-level considerations American companies should become familiar with under a carbon constrained future.

1. Unlocking latent value

Financial managers are under more competitive pressure than ever to reduce costs, gain efficiencies, leverage assets and mitigate risks. Engineering and operations managers are pressured to optimise – that is to move toward ever-higher levels of operational efficiency and productivity via investments in cost reducing processes and technologies.

In parallel, but in a very different part of the organisation, regulatory and environmental compliance teams, with an eye towards risk, look to comply with a patchwork of local, national and international environmental rules, usually to a minimum performance standard and at lowest cost.

What is wrong with this reality? Simply stated, it is a manifest flaw in organisational structure and a fundamental failure to link operations to corporate strategy. Few companies have come to recognise this flaw and have moved to bound and address the problem. Essentially these are problems of perspective and perceived interests. Directors, officers (prodded by smart investors), financial managers, and thought leaders of a diverse group of US firms are just now beginning to understand the need to integrate all aspects of the companies' value chain all the way through to waste emissions. The prevailing wisdom is that operational efficiency is necessary but not sufficient for long term competitiveness. Sound, insightful and linked corporate strategy is an absolute requirement for success – and carbon finance and carbon markets are becoming a central component of that strategy. Indeed the price of carbon could be the essential tool – the concentrating lens – that brings together, previously discreet, elements of corporate strategy.

Managers can view the world through many lenses and prisms. Two prisms are relevant here: 1) the risk—cost prism and 2) the opportunity—value creation prism. These cognitive approaches reduce complexity – splitting varied components so each can be categorised, examined, measured, and managed. While useful, reduction leads to the loss of information and indeed creates the above referenced lack of strategic insight.

Cost – the very idea of cost needs to be viewed with the aid of a converging lens – reintegrating previously divergent viewpoints and interests. It's not enough for engineering, facilities and operations groups in the interest of operational efficiency to install low power lighting, ACS (automation control systems), switch to cleaner fuels, state of the art CHP (Combined Heat and Power), or capture fugitive emissions, and then wait for these investments to pay back. It is not enough for regulatory affairs teams to view emissions compliance standards with trepidation and with an eye solely toward risk. Instead managers must understand the potential to create assets and value from these measures. Integrated with compliance costs, a sound carbon markets strategy shortens payback and accelerates rates of return for investments in efficiency, thereby reorganizing the merit order of investment projects. Just now are these seemingly discrete elements of company operations and planning converging; in some instances whole new corporate strategy groups are being established reporting directly to the CFO or the CEO. A full understanding of carbon instruments and the power of carbon finance are the concentrating lenses that enable corporate leaders to see the interlocking nature of cost and value, risk and opportunity.

In addition to the direct benefits associated with waste and cost reductions there are additional indirect benefits that can be realised. First among these is the monetization of Greenhouse Gas (GHG) emissions reductions through carbon finance instruments; this process is outlined below. In so doing enterprise value is enhanced via a greater integration of environmental and compliance considerations into core corporate strategy. The carbon finance tool not only empowers corporate leaders to see previously obscured connections but, if used properly, to proactively act on this information. Cost reductions, technology investments, and costly compliance actions (and resulting waste and emissions reductions) can be leveraged and converted to tradable, liquid, valuable financial assets. An emissions liability becomes an emissions reduction asset, and a company transforms a traditionally cost-driven function into a new profit center.

Unrecognised value – to invest, to create and not to fully benefit, not through carelessness or accounting errors but for the constraints of perspective – this is precisely the state of affairs in many US executive suites. Sophisticated, well-led, well-resourced, efficient and competitive companies are committing just this error by not recognising the financial value of carbon and energy reduction measures. It is central to enterprise competitiveness that this changes. A new “business-as-usual” baseline will emerge over the next decade and the carbon finance tool will be the central lens to examine, explore and exploit this new reality.

It is a paradox that this lack of insight persists as an increasingly common awareness has emerged that climate change impacts are important corporate strategy considerations. The coming transition to a low-carbon economy presents opportunities for new clean technology, energy efficiency and power generation as well as a broad set of interconnected risks, ranging from physical impacts on assets and macro-economic disruptions to narrow reputational considerations and loss of market position due to the rapid emergence of disruptive technologies. The causes, characteristics, and remedies for this paradox are under investigation here. Given the natural interest of business leaders to focus on new business development, wealth creation, and building asset value, the obvious starting point for increasing management awareness of climate change and impending carbon constraints is to understand the fundamentals of carbon asset creation.

2. Creation and management of carbon assets

Broadly speaking, any project, investment, or measure which reduces greenhouse gas emissions can generate a “carbon asset”. Regulated companies falling under a cap-and-trade system – such as the European Union Emissions Trading Scheme (EU ETS) – which reduce their overall, company-wide emissions below their regulatory requirements can sell the excess reductions in the form of avoided carbon allowances on comparatively liquid open markets. Alternatively, companies or third-party investors can finance specific projects (such as a methane capture facility at a municipal landfill) which reduce emissions beyond any particular requirement or business-as-usual-scenario. The resulting carbon credits may have value in certain carbon markets, yielding a financial return on the investment. Our focus here will be on the latter opportunity, carbon assets generated by emission reduction projects.

In an ideal world, carbon assets would have intrinsic value, but in practice they must be monetized through a specific legal framework and market mechanism. The monetization process depends on the particular carbon market in which a company or project operates, but typically involves at a minimum:

1. An assessment of the emissions boundaries around a particular activity that reduces emissions;
2. An evaluation of specific options and motivations to undertake an emission reduction activity [i.e. establishing the “baseline” or business-as-usual scenario];
3. A rigorous calculation methodology to quantify those reductions of emissions in tons of CO₂e;
4. Independent verification that the reductions occurred as stated by experienced 3rd party verifiers / environmental auditors;
5. Additional steps depending on the particular market mechanism employed (e.g. host government approval and additionality under the Clean Development Mechanism);
6. Contractual management of the legal title to the emissions reductions.

The actual asset at hand is intangible, simply represented as the legal ownership of the rights to the emissions reductions, as well as an independent verification/certification statement that the reductions are fairly represented. In best practice, the asset is “registered” on an independent or government-backed registry which tracks the transactional flow and end uses of the credits. This ensures the proper accounting for a financial instrument which is otherwise not based on any underlying hard asset.

Examples of projects which can create carbon assets include clean / renewable energy generation facilities, switching to less carbon intensive fuel sources, energy efficiency measures, capturing fugitive methane emissions from landfills, coal mines, and oil and gas production and transmission systems. Certain “sinks” projects which remove carbon dioxide from the atmosphere may also be able to create credits, for example large-scale reforestation or avoided deforestation projects.

Common emission reduction project types:

- Renewables:
 - Wind
 - Solar
 - Geothermal
 - Biomass
- Energy Efficiency
- Fuel Switch
- Methane Sector:
 - Landfill gas to energy
 - Wastewater treatment
 - Agricultural manure management
 - Flaring reduction
 - Natural gas transmission/distribution
- Transportation Sector
- Industrial Efficiency (HFC, PFC, SF₆)
- Sinks / Land Use Change
 - Forestry
 - Land use management

The main existing mechanisms which have been created to recognize such project-based carbon assets are the Clean Development Mechanism [CDM] and the Joint Implementation [JI] markets of the Kyoto Protocol. The CDM in particular has experienced rapid growth over the past few years, with over US\$ 12 billion in public and private capital being invested into a pipeline of over 2000 projects in Asia, Latin America, and Africa, representing emissions reductions in excess of two billion tons of greenhouse gases by the year 2012. Other, smaller regulatory markets also exist, as well as an emerging voluntary market for emission reduction projects which exists outside of any particular legal framework.

3. Growth of the Global Carbon Market

Carbon represents a comparatively small but rapidly growing commodity market. The aggregated notional value of the various carbon markets worldwide grew to an estimated \$65 billion in 2007 and is expected to exceed \$100 billion in 2008. Internationally, the growth and sophistication that is developing in the international carbon markets suggest that carbon deserves to be considered as a legitimate commodities asset class in its own right.

Currently the largest of the markets are the European Union Emissions Trading Scheme (EU ETS), a cap-and-trade driven allowance market that serves as the main mechanism for EU countries to achieve their Kyoto targets; and the Clean Development Mechanism / Joint Implementation (CDM/JI) project markets, which allow developing and transitional economies to host emission reduction projects and sell the resulting carbon credits to countries/companies in the West with mandatory reduction targets.

Allowance markets – EU ETS: The EU ETS caps carbon emissions from more than 12,000 installations in five sectors of the economy (power, cement, pulp & paper, steel production, and heavy industry) representing 45% of the economy. Regulators annually issue roughly 2.2 billion allowances (EUAs), representing the total currency in the market each year. First phase (2005-07) EUA prices exceeded €30/ton before a dramatic market correction in April 2006; second phase EUAs (2008-12) trade in a comparatively stable band around €22/ton. Average daily trading volumes approached 5 million allowances in 2006, indicating the development of a relatively liquid market. Critical market infrastructure has also emerged, including competing exchanges and contracts; futures, options, swaps, and derivative instruments; as well as the entrance of speculative funds and traditional banks. The market has demonstrated the emergence of fundamental drivers, such as correlation to weather and natural gas prices and the interlinkage between gas, coal, and power prices caused by carbon carbon-based energy production. However, political drivers still dominate, as witnessed by the crash in 2006 caused by data revealing an oversupply of allowances by the regulators in the first phase. This mistake was rectified for the second phase, currently underway, and there is now a stable price on carbon in Europe, an important signal to the broader economy.

Project markets – CDM/JI: The CDM/JI markets have also grown dramatically over the past two years, after having been seeded in the early years by the World Bank. The current worldwide pipeline of GHG reduction projects is forecasted to create over 2 billion carbon credits by 2012. Transactions are primarily over-the-counter (OTC) through structured contracts for future delivery of credits, and trading prices averaging \$15-30/ton, with a substantial spread depending on contract terms and stage of development of the project. The price of no-risk credits is driven by the price of second-phase EU ETS allowances. Over \$12 billion has been invested in the CDM/JI markets through 50 investment funds (“carbon funds”) and procurement vehicles, the majority of which are private. Almost half of the capital is managed from the US, and major institutional investors, such as Dutch pension funds ABP and PGGM, have entered the market.

Other carbon trading systems exist worldwide, but their scope and size is much less ambitious than the EU ETS and CDM/JI markets. However, emerging legislation at the state and federal level in the US, as well as in Japan, Canada, and Australia, is yielding expectations of a vastly expanded and interlinked global carbon market from roughly 2012 onwards. Recent political momentum behind mandatory climate legislation in the US indicates that a domestic cap-and-trade system is a near certainty by 2013. The scope and value of this market is expected be broad and deep. Forecasts speculate that the US carbon market alone will be over \$1 trillion by 2020. As many commentators have noticed, the market for carbon emissions credits has the potential to be the largest commodity market in the world within a generation.

4. Putting Carbon Finance to Work: Use of Carbon Assets

Carbon assets ultimately derive their value as they can be used by companies and entities to comply with mandatory emissions reduction requirements. Currently these requirements

apply only to companies with facilities covered by the European Union Emissions Trading Scheme [EU ETS], and governments which accepted binding reduction targets under the Kyoto Protocol (i.e. the EU-25 nations, Japan, and New Zealand). However, the spread of market-based policies to reduce GHG emissions is likely to expand the regulatory demand for carbon credits to new markets, regions, and sectors around the world, particularly in North America. Those corporations which have carbon intensive operations or assets in jurisdictions with such compliance obligations can either invest directly in projects which reduce emissions and take ownership of those reductions, or purchase credits from the open market.

Once management understands the cost implications of emerging carbon regulations on their companies, the decision of when and how to enter the carbon markets is best informed by a comprehensive carbon management plan. This exercise begins with an inventory of the company's emissions and reduction obligations, followed by an investment analysis of the set of direct measures to reduce emissions internally. These steps could range from complex efficiency improvements such as upgrading to more efficient production equipment or substituting less carbon-intensive input materials, to simple steps such as minimizing employee air travel and installing on-site renewable energy generation. Each realistic measure available to management should be "priced" by determining its marginal cost of reducing each ton of emissions (a technique known as "marginal abatement cost analysis" which is simply a discounted cash flow analysis of an emission reduction project to determine the cost of reducing a ton of carbon emissions).

Undertaking this analysis helps management understand the internal cost of reducing emissions, compared to purchasing emissions credits on the open market. Internal measures which are more cost effective to implement – and suitably aligned with corporate strategy as discussed above – should be green-lighted, thus reducing the company's emissions footprint when implemented. The remaining reductions required for compliance could then be achieved by purchasing credits in the open market (see the box below for a corporate manager's perspective on compliance trading strategies).

As emissions credits are a tradable financial instrument, companies need not have regulatory obligations to benefit from carbon finance. Those companies with unregulated operations in regions covered by the CDM or JI can often derive an additional revenue stream or incremental boost to their returns by funding projects which reduce emissions at their facilities (such as an energy efficiency upgrade or fuel switch) or on their properties (e.g. on-site windfarms or clean energy generation), and selling the resulting credits to the market. Independent investors seeking new capital deployment opportunities and uncorrelated returns can also finance emission reduction projects or provide liquidity to the market through a growing number of investment vehicles and carbon funds.

5. Case study illustrations

As carbon emissions are intrinsic to the use of energy, companies can profit from countless opportunities to reduce emissions from projects spanning all types of technologies, sectors of the economy, and regions of the world. Several success stories of American companies and technology suppliers investing in CDM projects abroad are discussed below.

Associated Gas Recovery at Oil and Gas Production Sites: ConocoPhillips has jointly sponsored a greenhouse gas reduction project at the Rang Dong Oil Field in Vietnam. Large quantities of fugitive natural gas associated with oil extraction and which were traditionally flared into the atmosphere are being captured, treated, and recovered for energy use. The

**FOCUS: INVESTING AND TRADING MOTIVATIONS FOR A CARBON PROJECT
Q&A with Andrew Roberts, ConocoPhillips**

What was the motivation for ConocoPhillips' involvement with the Rang Dong gas flaring reduction clean development management (CDM) project?

ConocoPhillips is a partner in the Rang Dong field. This was not a case of a third party buying into a CDM project for access to certified emissions reduction (CER), but simply a way of making it economic to implement good environmental and product stewardship by virtue of the anticipated value of the CER.

Regarding whether to use CERs for compliance or trading opportunity: The market price of CERs sets a base value whether the credits are used for compliance or trading, since the least value of a given CER is the same regardless of the way it is used. However, it may have a higher opportunity cost value for compliance purposes if the next best alternative for reducing emissions is either the deployment of more expensive technology, or shutting in production and forgoing revenue.

On the basis described above, for a company with compliance obligations, the decision of whether to use CERs for compliance or to generate revenue is a tactical one which could change monthly or yearly, depending on whether it was long or short of credits, the cost and availability of alternative emissions abatement projects, and according to the different rules in countries where it operates. For example, in Germany, compliance obligations can be met by using up to 20% CERs, whereas in the UK it is only permissible to use up to 8%. Consequently, the strategy used in the UK may be different than in Germany.

This description applies to a company with compliance obligations. Clearly there can be CDM project participants who are traders, banks or carbon funds whose only interest is financial and who have no compliance costs or physical abatement options to consider as alternatives, and so their motivations may be different.

An additional factor to consider in making the tactical choice between compliance and trading is the day to day variance in the differential in price between CERs and European allowances (EUAs). CERs and EUAs are interchangeable up to the relevant limits for compliance purposes, but they trade at different prices since CERs always have some element of delivery risk. Therefore, so long as a company already has a sufficient quantity of EUAs to meet its compliance needs, and the CER price is below the EUA price, it would always make financial sense to swap these out for CERs up to the maximum extent allowable (by the country rules) and tolerable (according to the company's own delivery risk tolerance) to gain the arbitrage value and lower the overall cost of compliance.

project activity involved building a pipeline and compression facility to recover the various gas byproducts and transport them for use in local power stations and for home cooking fuel and gasoline in local markets. Over the ten year crediting period of the project, a massive 8 million tons of greenhouse gas credits will be generated, enough to compensate for the annual emissions from a large coal-fired power plant. An in-depth first-hand description of the motivations of ConocoPhillips in participating in this project is given in the box below.

Renewable Energy: Virginia-based AES Corporation, a power company with generation assets worldwide, is aggressively investing in renewable energy and methane capture CDM projects throughout Asia and Latin America. AES has committed over \$3 billion to CDM investments, choosing to focus on renewable facilities on a build-own-and-operate basis. AES-funded CDM projects range from a series of biomass projects that will generate over 75 MW using rice-husk and rice-straw gasification power plants in Bali, Indonesia, to methane recovery projects from wastewater treatment facilities in Malaysia. AES has amassed a portfolio of carbon credits that is expected to exceed 20 million tons by the year 2012. AES recently also partnered with GE to launch an initiative to develop greenhouse gas reduction projects for the domestic US market.

Geothermal power: Chevron's Darajat Unit III geothermal power plant in Indonesia is an example of the opportunities facing American companies to profit by integrating carbon finance into their business operations. The 110 MW geothermal power plant built and operated by Chevron generates clean, baseload power that displaces the need for fossil fuel generation, generating over 600,000 tons of GHG reductions (credits) per year. At current market prices the value of these reductions could exceed \$10 million per year, a healthy additional revenue stream. By monetizing the environmental benefits generated by this project through carbon finance, Chevron has been able to boost the economics of the project and increase its return on investment by over 20%. In this instance, Chevron will likely use the resulting carbon credits for compliance with mandatory targets at its regulated operations in Europe.

6. Trends and insights from current markets

International Carbon Markets

Internationally, the CDM remains the flagship carbon market for project-based reductions. The current pipeline is healthy and billions of dollars of capital continue to flow into the market. There is considerable uncertainty, however, in the status of the CDM after 2012, when its parent framework of the Kyoto Protocol is currently set to expire. This is suppressing forward demand for credits created by CDM projects from 2013 onwards, increasing the financing hurdle for new projects. However, the European Union has strongly indicated that it intends to continue linking the third phase of its ETS, running from 2013-2020, to the CDM, and capital flows into the sector do not yet show significant signs of abatement. Some parts of the investment community have taken steps to bridge the gap between pre- and post-Kyoto reductions by launching investment funds aimed at purchasing emission reductions from the post-Kyoto period.

There is also an ongoing shift in the nature of projects financed by the CDM. To date the majority of the credits created by the CDM have come from industrial gas capture projects, such as HFC destruction, which create large amounts of emissions reductions for comparatively little investment. These projects, which have come under heavy criticism for delivering large investment returns but marginal environmental returns, have largely been identified and exploited. As a result, the market opportunity is moving away from prospecting for comparative goldmines and towards more traditional project finance.

Comparatively untapped project opportunities include:

- Flaring reduction in the oil and gas sector,
- Large scale fuel switching projects,
- Methane capture from coal mines,
- Waste management and waste heat recovery,

- Natural gas distribution systems.

Uncertainty persists over the eligibility of carbon capture and storage and nuclear power in the CDM, as well as meaningful investment opportunities in the transportation sector. Forestry-sector projects have also been conspicuously absent from the current pipeline of CDM projects due to concerns over measurement and permanence of the emissions reductions in these sectors; steps are being taken to acknowledge these concerns and the first viable forestry carbon projects are beginning to appear. And finally, the trend towards “programmatic” CDM, which will facilitate the bundling together of many smaller emission reduction projects or initiatives is noteworthy for its potential to scale efficiently and deliver larger amounts of reductions. Programmatic CDM would also allow the inclusion of projects under national or regional renewable energy policy in carbon markets.

United States Regulatory Scene

The United States is of course the 800 pound gorilla in the climate arena, and the eyes of all those involved in the carbon markets are on when and how the US will begin regulating its carbon emissions. The key questions from a carbon finance/trading perspective are what the role of cap-and-trade will be in the US system and in which sectors, what the nature of its own project mechanisms will be, and what scope there will be for linking the US domestic trading system to international project markets, the CDM in particular.

Although two state-level initiatives have emerged in the midst of a federal leadership vacuum on climate, neither the Regional Greenhouse Gas Initiative (RGGI) of the north-eastern states, nor California’s AB32 law give enough of an insight to predict with confidence the direction of broader US carbon regulations. A number of the Congressional proposals have called on a mandatory federal cap-and-trade system with provisions for accepting international emission reduction projects, most notably the ultimately unsuccessful 2008 Lieberman-Warner bill, but they are as yet in an early stage in terms of achieving legislative consensus.

The US dialogue will benefit from the vast intelligence on designing project-based mechanisms built up from the CDM, but will also likely take a cautious view on fully linking to the CDM in its existing form. Legitimate concerns about the environmental integrity of individual projects as well as structural limitations of its project-by-project review process will likely require significant reforms to the CDM before US companies can use post-2012 CDM credits in complying with domestic requirements.

The market for US domestic emission reduction projects is also likely to be significantly different from the current composition of the CDM/JI pipeline, as many project types are either already mandated here (such as large-scale landfill gas projects), or not applicable to the US economy (such as renewable energy, which will fall under the scope of renewable portfolio standards).

Despite these trends towards a different flavour of carbon trading in the US, the broad principles of project-based mechanisms and emissions trading are now well understood as a result of the CDM and JI markets. Carbon finance has proven to be a meaningful policy mechanism for regulating emissions and an asset class delivering return on investment. US companies which enter the international carbon markets today will thus gain invaluable trading experience with project mechanisms as well as unlock value from existing emission reduction opportunities overseas.

7. Why should US companies pay close attention?

The rapid growth and broad reach of carbon markets into critical regions and sectors of the world economy is increasingly catching the attention of US companies. For business leaders looking to move their companies away from a cost and compliance driven energy/emissions management strategy towards proactive carbon management there are a number of compelling reasons to actively enter the international carbon markets.

- *Compliance exposure:* US corporations with existing operations or considering M&A activity in Europe or Japan may have compliance obligations requiring them to reduce emissions or participate in the CDM/JI markets to satisfy their targets. Such companies include AES and ConocoPhillips.
- *Unlock carbon value:* US corporations with international business operations can unlock additional value from reducing the carbon intensity of their operations and monetizing the corresponding reductions through the CDM or JI mechanisms. An example would be Chevron, which has been actively developing CDM projects in Asia such as its Indonesian geothermal project discussed above.
- *New investment class:* US investors and financial institutions can participate in investment vehicles and carbon funds directly active in the CDM/JI/EU ETS markets, or with exposure to carbon, such as in global infrastructure funds or real estate investment trusts. Nearly all the major investment banks have established carbon finance teams and investment products open to accredited investors.
- *Technology markets:* US-based technology providers and venture/private equity investors can benefit from increased markets for their low-carbon products and services. Wind turbines, gas turbines, and methane digesters are all examples of products used in emission reduction projects under the CDM. Providers such as General Electric and Caterpillar are well positioned to profit from the growing carbon markets. Smaller innovative technology providers can also exploit new global opportunities through linking with experienced project developers.
- *Capacity building:* US corporations without compliance obligations or international market exposure can also enter the international carbon markets in any of the above pathways to gain experience with project-based carbon trading mechanisms prior to the advent of climate change legislation in the US. The regulatory dialogs at both the state and federal level are evolving towards cap-and-trade systems, of which project mechanisms are a fundamental component. Building knowledge and capacity to identify carbon assets, navigate the monetization process, and manage project risks should be an integral part of any corporation's strategy to prepare for domestic carbon constraints.
- *Information management:* An active carbon management strategy requires a company to re-evaluate its need and use of all energy and process-related information, and enforce its analytical capacity to identify, structure and leverage this information to spawn carbon related business opportunities.
- *Compliance positioning:* Finally, a number of corporate investors are exploring opportunities to secure rights to emission reduction opportunities in the US which may become valuable carbon assets under a future mandatory cap and trade system here in North America.

US business executives are in good position to leverage the rapidly expanding knowledge base around emissions trading by making use of existing opportunities in the international carbon markets and embracing the new tools emerging from carbon finance. However, this will require a significant change in the mindset of the average US manager - switching from looking at carbon emissions only as part the policy/risk-management process, to making carbon management a profit-centre.

There are a number of ways US entities can participate, and indeed are participating, in global carbon markets. Project-based carbon credit generation presents a unique opportunity to enhance the economics of environmental and energy projects in addition to monetizing the benefits gained from waste and cost reduction strategies.

Suggested Resources for Further Information

- "State and Trends of the Carbon Market 2008", *World Bank* (2008).
- "Oil and Natural Gas Industry Guidelines for Greenhouse Gas Reduction Projects", *American Petroleum Institute* (2007).
- "Start Thinking About Carbon Assets – Now!", *Harvard Business Review*, **86**, (Sept 2008).
- United Kingdom's Department for Environment (DEFRA) guidance website on the CDM and EU ETS:
<http://www.defra.gov.uk/environment/climatechange/internat/kyotomech/cdm.htm>
<http://www.defra.gov.uk/environment/climatechange/trading/eu/index.htm>
- "The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard", *World Business Council for Sustainable Development / World Resources Institute* (2001).
- Michaelowa, A, et al. "Understanding CDM Methodologies: A guidebook to CDM Rules and Procedures", *UK DEFRA* (2007).
- Carbon Disclosure Project: <http://www.cdproject.net>
- Emissions trading and climate change news coverage on Bloomberg: [TNI ECREDITS](#), [EU <GO>](#), [NI EMIT <GO>](#), [NI CLIMATE <GO>](#), [TNI US CLIMATE <GO>](#).
- "Global Clean Energy Investment Overview", *New Energy Finance* (2007).