The Carbon Revolution
Answering the Call

BY JEFF CIVINS AND MARY MENDOZA

In the 18th and 19th centuries, the Industrial Revolution produced radical transformations not only in technology, including an ever-increasing use of fossil fuels, but also in economic policies and social structure. In the latter part of the 20th century, scientists and others suggested that the burning of fossil fuels could result not only in localized and area-wide conditions of air pollution, but also in increases in global warming, and society began to respond. This response may be characterized as the Carbon Revolution, and, like its predecessor, it is producing economic and social, as well as technological, changes. Answering the call of this revolution are governments, corporations, non-governmental organizations (NGOs), and individuals who are battling to reduce or reverse the increase in atmospheric carbon dioxide (CO_2) and other greenhouse gases (GHGs) while maintaining economic growth.

This article provides basic information regarding GHGs, touching on the science and the law. It then identifies measures an individual manufacturer can take to address GHGs, especially carbon in the form of CO_2, discussing some of the legal issues raised by those measures. Finally, it explains the relationship between carbon management and sustainability and then offers a conclusion.

The Role of Human-Generated Greenhouse Gases in Global Warming

Although there remains a vocal minority, the majority of scientists have determined that human activities, such as fossil fuel burning, lead to increases in GHGs that enhance the greenhouse effect and cause the surface temperature of the Earth to rise.[1] The greenhouse effect is the phenomenon by which a portion of solar radiation that reaches the Earth's surface and that would otherwise be reradiated and escape to space is instead trapped in the atmosphere by GHGs, which results in a warming of the Earth. Concerns related to enhanced global warming and associated climate change include both adverse effects on the water cycle — including increases in snow and glacier melt, flooding and drought, and rising sea levels — and adverse ecological effects.

CO_2 is considered the single largest anthropogenic contributor to global warming and, therefore, the most important GHG, from a regulatory perspective.[2] The Kyoto Protocol addresses CO_2, as well as five other GHGs — methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The term "CO_2 equivalent" is the standardized measure for expressing emissions of a GHG as a function of its global warming potential compared with CO_2.[3] The term "carbon" often is used as shorthand not merely for CO_2 and CH_4, but for non-carbon GHGs as well.

GHGs — Legal Framework

To address anthropogenic global warming, all industrialized countries, except the United States, entered into the Kyoto Protocol, which provides for a global GHG emission cap-and-trade program. The United States does not currently regulate GHG emissions,[4] but, in *Massachussetts v. EPA*,[5] the U.S. Supreme Court required the U.S. Environmental Protection Agency (EPA) to make an endangerment determination to decide if regulation of GHGs is required under the federal Clean Air Act. On July 30, 2008, the EPA issued an advanced notice of proposed rulemaking (ANPR), soliciting comments on whether and how CO_2 and other GHGs should be regulated under the act.[6]

Many believe that federal GHG legislation, which failed to pass during the last session of Congress, will and should overtake GHG regulation under the Clean Air Act, because the Clean Air Act is ill-suited to address GHGs and climate change. In the meantime, various states have taken the initiative and begun developing regional and state GHG cap-and-trade programs, which focus on CO_2 emissions of specific sources. Driven by a variety of stakeholders, many companies have undertaken voluntary measures to reduce CO_2 and other GHGs attributable to their operations — that is, their carbon footprint.

Carbon Footprints

The term "carbon footprint" is defined as the total emissions of CO_2 and any other GHGs, expressed in terms of CO_2, for a defined system, activity, or product. A facility's carbon footprint depends on what CO_2 emissions are included. Although there is no standard for carbon footprinting, the GHG Protocol, developed by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI),[7] is frequently used. The GHG Protocol establishes three different sets of emissions or "scopes."

A Scope 1 footprint analysis includes direct emissions of a system or activities; a Scope 2, indirect emissions associated with electricity, heat, and steam purchased to support the system or activities; and a Scope 3, indirect emissions resulting from operations that do not originate at sources owned or controlled by the company, e.g., transportation by suppliers or the use of sold products and services. Under the Protocol, companies have discretion whether to include Scope 3 emissions; regulators generally focus on a facility's Scope 1 emissions from its stationary sources.

Consider a manufacturer that requires the combustion of fossil fuel and is supplied with electric power from a utility also burning fossil fuel. Its carbon footprint includes emissions from the combustion of fossil fuels by the manufacturing operation — stationary as well as mobile sources — (Scope 1) and from the utility supplying it (Scope 2), as well as from the transportation by fossil-fueled vehicles of products, raw materials, and manufacturing wastes and used products destined for disposal (Scope 3). To reduce this carbon footprint, the manufacturer has a number of options.

Both the manufacturer and its utility could use a fossil fuel that generates less CO_2, e.g., natural gas as opposed to fuel oil or coal.[8] Both also could use alternative energy sources, such as wind or solar. Finally, both could employ measures to conserve fuel and become more energy efficient. Energy efficiency connotes getting the same for less (e.g., using fluorescent rather than incandescent light bulbs). Energy conservation connotes making do with less (e.g., turning down a thermostat).

Among energy conservation and energy efficiency measures is the utilization of "green" buildings. The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is a set of standards for sustainable construction. A number of cities, such as Austin, are adopting LEED certification standards for city-owned building projects;[9] other cities, such as Dallas, are requiring certain privately owned buildings to meet LEED or similar standards.[10]

A manufacturer also may impose conditions on its suppliers to require them to implement their own measures to reduce CO_2. For example, Wal-Mart has implemented a program to require its suppliers to reduce packaging to conserve natural resources.[11]

As to transportation-related CO_2, the manufacturer and its suppliers, distributors, and waste haulers could use more fuel-efficient vehicles, hybrid vehicles, or alternative fuels, or each entity could use rail instead. The manufacturer also could manage its shipments to reduce the number of trips (e.g., by staging or by collaborative logistics, combining loads with other companies). Finally, the manufacturer could minimize or reuse its wastes, decreasing transportation needs.

For any residual CO_2, both the manufacturer and the utility could capture CO_2 — before, during, or after combustion — and transport it by pipeline for underground storage or for reuse, such as in enhanced oil recovery or as a raw material for a manufacturing process requiring CO_2. Geologic sequestration of carbon in the subsurface is subject to the Underground Injection Control (UIC) program of the Safe Drinking Water Act (SDWA),[12] for enhanced oil and gas recovery as a Class II well,[13] and for storing carbon as a proposed Class VI well.[14] Legal issues associated with underground storage of CO_2 relate to, among other things, the use of eminent domain for pipelines, the ownership of the pore space of the formation into which the CO_2 will be injected, and liability for CO_2 releases.

Finally, the manufacturer and utility can purchase carbon credits or offsets, including using renewable energy certificates or RECs.[15] Carbon credits represent emission reductions generated by others that have taken steps to reduce their GHGs or that have developed projects that remove GHGs from the atmosphere, such as reforestation or, in the case of methane, landfill gas recovery.

Carbon credits are created and may be traded under a regulatory framework such as the European Union Emissions Trading Scheme (EU ETS), developed to implement the Kyoto Protocol, or domestic regional programs such as the Regional Greenhouse Gas Initiative (RGGI), a mandatory cap-and-trade system affecting power plants in 10 northeastern states. Carbon credits also may be generated by voluntary action outside of regulatory frameworks. In the case of such a Voluntary Emissions Reduction (VER), a voluntary action to reduce emissions is verified by a third party, and the credits or financial instruments representing that reduction are traded on voluntary markets such as the Chicago Climate Exchange (CCX).

In addition to cap-and-trade systems, project-based mechanisms also may be used to create carbon credits. Under Kyoto, for example, there are two project-based mechanisms: Joint Implementation (JI) and the Clean Development Mechanism (CDM). JI enables entities in industrialized countries (known as Annex I countries) to carry out projects with those in other developed countries and results in the creation of Emission Reduction Units (ERUs). CDM involves investing in sustainable development projects, such as reforestation, that reduce emissions in developing countries (known as non-Annex I countries) and results in the creation of Certified Emission Reductions (CERs) credits.[16]

The purchase of carbon credits creates significant legal issues for attorneys negotiating and drafting carbon credit agreements. These issues include how offsets are created, how they

are quantified and verified, how they are transferred, and how they are valued. Other legal issues include whether the activity results in real reductions from a baseline, whether the reduction is permanent or not easily undone, whether the reduction is enforceable, and whether the reduction is additional, (i.e., whether the reduction would not otherwise result but for the transaction). For those engaged in the voluntary market, as well as those implementing their own CO_2 reduction measures, an issue of particular concern is whether and how pre-regulatory reductions are to be counted when regulations ultimately are promulgated.

The Relationship of Carbon Management Strategies to Sustainability Initiative

Although public attention has been focused on global warming and GHGs, carbon management is but one aspect of the broader concept of environmental sustainability — preserving the environment and natural resources for future generations.[17] And while carbon reduction measures may provide broader environmental benefits, in some instances, strategies that focus only on carbon management may result in unintended, adverse impacts on other aspects of the environment. For example, the production of biofuels, which offer potential GHG reductions compared to petroleum-based fuels, requires significant amounts of water, straining a scarce resource.[18]

Instead of focusing solely on carbon management, many commentators advocate a holistic life-cycle analysis (LCA) to determine the sustainability of a product, process, or activity. An LCA is a systematic process for identifying, quantifying, and assessing environmental impacts, including energy and material uses and releases to the environment from cradle to grave, i.e., from raw material extraction through manufacturing, transportation, use, and disposal.[19] A holistic LCA, because it gives a more complete picture of overall environmental impacts, enables a company to develop a sustainability strategy that is more comprehensive than a strategy based solely on carbon management.

Conclusion

We are in the midst of a Carbon Revolution, fueled by concerns that emissions of CO_2 and other GHGs are enhancing global warming. Answering the call of this revolution are governments, corporations, NGOs, and individuals, who have undertaken measures to reduce GHG emissions. Like the physical environment it seeks to protect, the legal environment regarding GHG emissions control continues to change, and those affected by it should stay engaged and current on ongoing developments.

Notes

1. IPCC, 2007: *Climate Change 2007: Synthesis Report. An Assessment of the Intergovernmental Panel on Climate Change* [A. Allali, R. Bojariu, S. Diaz, I. Eligizouli, D. Griggs, D. Hawkins, O. Hohmeyer, B. Jallow, L. Kajefez-Bogataj, N. Leary, L. Hoesung, and D. Wratt (eds.)] Cambridge University Press, Cambridge, U.K. and New York, N.Y.
2. IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)] Cambridge University Press, Cambridge, U.K. and New York, N.Y., at p. 2.
3. http://www.pewclimate.org/global-warming-basics/full_glossary/glossary.php?term=a (last visited Jan. 6, 2009).
4. In its Fiscal Year 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110–161), Congress did direct the EPA to promulgate a GHG reporting rule, to require mandatory reporting of GHGs "above appropriate thresholds in all sectors of the economy." On March 10, 2009, the EPA Administrator signed a proposed rule commencing that rulemaking.
5. 549 U.S. 497 (2007).
6. 73 Fed. Reg. 44354 (July 30, 2008).
7. World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI), *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (Revised Ed.)
8. Energy Information Agency, Natural Gas 1998: *Issues and Trends*, April 1999, at p. 50
9. Robin Suttell, "America's Cities 'LEED' the Way," May 2005 (article may be accessed at http://www.buildings.com/articles/detail.aspx?contentID=2475, last visited Jan. 18, 2009).
10. Allyson Wendt, "Cities Mandate LEED But Not Certification," July 30, 2008 (article may be accessed at http://greensource.construction.com/news/080730CitiesMandateLEED.asp, last visited Jan. 18, 2009).
11. Press Release, Wal-Mart, Inc. "Wal-Mart Unveils 'Packaging Scorecard' to Suppliers" (Nov. 1, 2006), available at http://wwww.walmartsstores.com/FactsNews/NewsRoom/6039.aspx.
12. 42 U.S.C. §§300h *et seq.*
13. 40 C.F.R. §144.22.
14. 73 Fed. Reg. 43491 (July 25, 2008), to be codified at 40 C.F.R. §146.5(f).
15. An REC "represents the reduced emissions of renewable generation compared with those of conventional generation." RECs may be sold separately from the electricity. When they are, the power that is sold is treated like any other electricity and no longer can be claimed to be renewable energy.
16. United Nations Framework Convention on Climate Change, Clean Development Mechanism: 2008 In Brief at 1.
17. The term sustainability broadly encompasses societal and economic aspects, as well as environment ones. See Jeff Civins and Mary Mendoza. "Corporate Sustainability and Social Responsibility," *Texas Bar Journal* (May 2008).
18. The National Academies, *Water Implications of Biofuels Production in the United States, Report In Brief*, October 2007.
19. *See, e.g.*, International Organization for Standardization (ISO) 14040:2006

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