Presented:
2009 Carbon and Climate Change

February 3 and 4, 2009
Austin, TX

The Carbon Revolution

Jeff Civins
Mary Mendoza

Author contact information:
Jeff Civins
Mary Mendoza
Haynes and Boone, LLP
Austin, TX 78701

Jeff.civins@haynesboone.com
512.867.8477
Mary.Mendoza@haynesboone.com
512.867.8418

TABLE OF CONTENTS

The Carbon Revolution

An overview of the evolving physical and legal environment associated with greenhouse gases

You say you want a revolution
Well, you know
We all want to change the world
You tell me that it's evolution
Well, you know
We all want to change the world

But when you talk about destruction
Don't you know that you can count me out
Don't you know it's gonna be all right

You say you got a real solution
Well, you know
We'd all love to see the plan
You ask me for a contribution
Well, you know
We're doing what we can

But if you want money for people with minds that hate
All I can tell is brother you have to wait / Don't you know . . .

You say you'll change the constitution
Well, you know
We all want to change your head
You tell me it's the institution
Well, you know
You'd better free your mind instead

But if you go carrying pictures of chairman Mao
You ain't going to make it with anyone anyhow / Don't you know . . .
All right, all right . . .

I. Introduction

The lyrics to the Beatles song, "Revolution," can be applied, with some poetic license, to changes effected by the "Carbon Revolution," as well as to changes in the turbulent 60s about which it was written. With the belief that the generation of carbon dioxide (CO_2) by the burning of fossil fuels contributes to global warming, which in turn produces destructive changes in our environment, many are singing off the same page: "We all want to change the world," to combat increased global warming -- in an open-minded and constructive way. And society is struggling

to find real solutions, which generally will require contributions not only from governments and corporations, but from individuals as well. The solutions have to involve everyone, not only the developed world, but all countries, including especially, China.

This paper starts with the basic premise that there is now a Carbon Revolution and provides context for understanding how human activities affect the nature of things, focusing on the carbon cycle, then identifies measures an individual manufacturer can take to address carbon in the form of CO_2, and finally briefly discusses some of the legal issues raised by those measures.

II. Historical Background

In the eighteenth and nineteenth centuries, the Industrial Revolution effected significant transformations not only in agriculture, manufacturing, and transportation, but also in economic policies and social structure.[1] "[T]he development and application of steam power was undoubtedly the greatest technical achievement of the Industrial Revolution," resulting in a great leap in both manufacturing and transportation.[2] The increased utilization of the steam engine and other combustion devices led to increases in the use of fossil fuels, initially of coal and later of oil and gas.

In the later part of the twentieth century, scientists and others began to suggest 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. In a sense, those of us in the early twenty-first century are experiencing a new revolution -- the Carbon Revolution, a logical outgrowth of the Industrial Revolution, and like its predecessor, a revolution that is producing economic and social, as well as technological change.

The challenge of global warming is being addressed on a number of levels. Both the private and public sectors are exploring options to reduce or reverse the increase in atmospheric CO_2 while maintaining economic growth.[3] Nations have entered into international treaties, like the Kyoto Protocol, and developed corresponding programs on regional and national levels; state governments have developed both individual and regional cap-and-trade programs; state and local governments have developed other climate-change focused regulatory initiatives; and public and private entities have undertaken voluntary carbon reduction programs. In a recent study, the McKinsey Global Institute concludes that the increase in productivity of the Carbon Revolution needs to be three times faster than the Industrial Revolution's increase in labor productivity to stabilize carbon while maintaining growth.[4]

---

[1] *See* Joseph A. Montagna, The Industrial Revolution, Yale New Haven Teachers Institute, www.yale.edu/ynhti/curriculum/units/1981/2/81.02.06.x.html (last visited Dec. 24, 2008).

[2] *Id.*

[3] The Electric Power Research Institute, for example, has developed a "PRISM" analyses, so-called because of this graphical representation of various CO_2 reduction options, to reduce CO_2 emissions, which focuses on 7 advanced technologies: end-use energy efficiency; renewable energy; advanced light water nuclear reactors; advanced coal plants; CO_2 capture and storage; plug-in hybrids; and distributed energy resources. EPRI Energy Technology Assessment Center, The Power to Reduce CO2 Emissions: The Full Portfolio, for the EPRI 2007 Summer Seminar (August 2007).

[4] McKinsey Global Institute, The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth, at 8 (June 2008).

III. The Role of Human-Generated Greenhouse Gases In Global Warming

Although there remains a vocal minority,[5] the majority of scientists, as reflected by the Intergovernmental Panel on Climate Change (IPCC), has determined that human activities such as fossil fuel burning, animal husbandry, and fertilized and irrigated agriculture lead to increases in greenhouse gases (GHGs) that enhance the greenhouse effect and cause the surface temperature of the Earth to increase.[6] 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: adverse effects on the water cycle, including increases in snow and glacier melt, flooding, and drought, and rising sea levels; and adverse ecological effects.

Although water vapor is the most abundant GHG and the dominant contributor to the natural greenhouse effect, [7] it is not a focus of regulatory attention because human activity has little direct impact on the concentration of water vapor in the atmosphere.[8] CO_2 is considered the single largest anthropogenic contributor to global warming[9] and, therefore, from a regulatory perspective, the most important GHG.[10] The Kyoto Protocol covers CO_2 and five other GHGs, namely, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), which we collectively refer to as the "Kyoto Six." There are other GHGs, which include chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), both of which are ozone-depleting substances, as well as other gases that are GHG precursors, including carbon monoxide (CO), nitrogen oxides (NO_x), and volatile organic

---

[5] *See, e.g.,* excerpt of Senator James Inhofe remarks on Senate Floor, "Politically Left Scientists Now Rejecting Climate Fears – Global Warming 'Consensus' in Freefall," (January 8, 2009), in which he compiles a host of dissenter references. www.epw.senate.gov/public/index.cfm?FuseAction=Minority.Speeches&ContentRecord_id=b87e3aad-802a-23ad-4fc0-8e02c7bb8284&Region_id=&Issue_id (last visited 1/11/2009).

[6] *See* U. S. Forest Service Climate Change Resource Center, Frequently Asked Questions at www.fs.fed.us/ccrc/frequently_asked_questions.shtml (last visited 1/9/2009).

[7] *See* U.S. Environmental Protection Agency, Glossary of Climate Change Terms, http://www.epa.gov/climatechange/glossary.html (last visited 1/9/2009)

[8] In the vernacular of climate change, changes in water vapor are considered a "feedback," which amplifies the warming induced by climate "forcings," that is, things imposed externally on the climate system that can warm or cool the Earth. National Academy of Sciences, National Academy of Engineering, Institute of Medicine, National Research Council, Understanding and Responding to Climate Change (2008).

[9] The buildup of CO_2 in the atmosphere has become a concern for reasons other than its direct effect on climate change. The uptake of carbon by the oceans has contributed to ocean acidification, which has potentially damaging effects on marine organisms. King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks, 2007: Executive Summary. In: *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Glogal Carbon Cycle. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research* [King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks (eds.)] (hereinafter, "SOCCR") National Oceanic and Atmospheric Administration, National Climatic Data Center, Asheville, NC, USA, at p. 9.

[10] 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* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, at p. 2.

compounds (VOCs).[11] Some of the GHGs, like CO_2, CH_4, and N_2O, are naturally occurring, but their concentrations are affected by human activities; others, like the fluorinated compounds, would not exist but for man.

The convention is to rate GHGs by comparison to CO_2. The standard unit is expressed in terms of global warming potential or GWP. According to the IPCC, GWP is an indicator that reflects the relative climate change effect of a GHG compared to CO_2, which is assigned a value of 1 -- considering a fixed amount of time such as 100 years, *i.e.*, GWP_{100}.[12] For example, on a 100 year time horizon, N_2O is about 300 times and CH_4 21 times more potent than CO_2,[13] and therefore would have GWP_{100}s of 298 and 25 respectively.[14] Other, even more potent GHGs, include HFCs (124-14800 times more potent that CO_2), SF6 (22800 times), and PFCs (7390-17700 times).[15] The GWP of a gas varies based on the time-scale considered (*e.g.*, 20-, 50-, or 100-year GWP) because some GHGs are more persistent.[16] The term CO_2 equivalent or CO_{2e} is the standardized measure of GHG emissions by weight times GWP.[17] Emissions of GHGs are measured in metric tons of CO_{2e} per year, either millions of tons (megatons) or billions of tons (gigatons).

IV. The Carbon Cycle

The movement of carbon into and out of various "reservoirs" in the environment, primarily in the form of CO_2,[18] is described by the carbon cycle, and is simplistically depicted in the attached diagram. (Exhibit A). Carbon reservoirs include the atmosphere, the oceans, the geological sediments (including fossil fuels),[19] and the terrestrial biosphere (including the plants, soils, and freshwater systems).[20] When carbon moves into a reservoir, the reservoir acts as a "sink" and when it moves out of a reservoir, the reservoir acts as a "source." The movement of carbon among these reservoirs results from chemical, physical, geological, and biological processes in reservoirs, with exchange occurring at reservoir interfaces.

---

[11] World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI), The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Ed.)

[12] U.S. Environmental Protection Agency, Glossary of Climate Change Terms, http://www.epa.gov/climatechange/glossary.html (last visited 1/9/2009)

[13] Forster, P., V. Ramaswamy, P. Artaxo, T. Berntsen, R. Betts, D.W. Fahey, J. Haywood, J. Lean, D.C. Lowe, G. Myhre, J. Nganga, R. Prinn, G. Raga, M. Schulz and R. Van Dorland, 2007: Changes in Atmospheric Constituents and in Radiative Forcing. 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* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, at 212 (Table 2.14).

[14] *Id.*

[15] *Id.*

[16] www.pewclimate.org/global-warming-basics/full_glossary/terms_d.cfm (last visited January 6, 2009).

[17] http://www.pewclimate.org/global-warming-basics/full_glossary/glossary.php?term=a (last visited January 6, 2009).

[18] CH_4 and other forms of carbon, *e.g.*, $CaCO_3$, also are involved in the carbon cycle.

[19] Different references identify different reservoirs or identify them with slightly different names. In our diagram, we treat sediments and fossil fuels collectively as a separate reservoir.

[20] King, *supra* note 9, at 2.

At the interface of the terrestrial biosphere and atmosphere, for example, the plants, through photosynthesis, take up CO_2 from the atmosphere and store it in their tissue. CO_2 is transferred back to the atmosphere through natural respiration during plant and animal metabolism and through the decomposition of dead plants and animals. During the process of decomposition, some of the CO_2 also is accumulated in the soil.[21]

At the interface of the atmosphere and the oceans, CO_2 diffuses from the atmosphere into the sea.[22] Much of the ocean's carbon storage occurs in deeper waters,[23] ultimately in the form of bicarbonate and carbonate ions.[24] Phytoplankton use carbon in tissue formation and formation of shells. As the phytoplankton die, decay releases much of this carbon into the ocean water and some back to the atmosphere, but some sinks into the deeper ocean and ultimately to the ocean sediments. This accumulation of carbon in the sediments, as well as in other depositions of decayed plants and animals, over millions of years led to the formation of the fossil fuels.[25]

Human activity impacts the carbon cycle.[26] The most important example is the burning of fossil fuel to produce energy, but various manufacturing processes also produce CO_2 as well as other GHGs.[27] Other human activities, such as deforestation and logging, also result in the transfer of carbon to the atmosphere.[28] Conversely, activities such as fire suppression, afforestation, and reforestation have increased the natural "sink" effect of forests.[29] In addition, carbon cycling is influenced by climate variables such as temperature and precipitation,[30] so, to the extent that man's activities are impacting the climate, those activities also are impacting the carbon cycle.

The global carbon budget is a tool for understanding "how much carbon is stored in a reservoir at a particular time, how much is coming in from other reservoirs, and how much is going out."[31] For example, most agree that human activities have altered the global carbon budget by the movement of carbon in fossil fuels from the sediments by combustion into the atmosphere.[32] An understanding of each reservoir's budget is critical to developing strategies to manage carbon to effect changes in the carbon cycle.

---

[21] King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks 2007: What is the Carbon Cycle and Why Care? In: *SOCCR*, at p 16.
[22] *Id.*
[23] R.A. Houghton, *Balancing the Global Carbon Budget*, Annual Review Earth Planet Science 2007.35.315.
[24] *Id*. at 316.
[25] King, *supra* note 21, at 16.
[26] Human activity also impacts the amount of other GHGs in the environment. For example, agricultural practices results in N_2O emissions; the raising of livestock, landfilling, and coal mining increases CH_4, and the use of refrigeration and air conditioning equipment increase HFCs. WBCSD, *supra* note 9, at 12.
[27] *Id.*
[28] *Id.*
[29] King, *supra* note 21, at 19.
[30] *Id.* at 17.
[31] *Id.* at 15.
[32] King, *supra* note 9, at 2.

V. Carbon Footprints

A. In General

As noted, to address anthropogenic global warming, all of the industrialized countries, except the United States, entered into the Kyoto Protocol,[33] which provides for a global cap-and-trade program that focuses on the Kyoto Six GHGs. In the United States, various regional and state GHG cap-and-trade programs have arisen, 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.

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. Another definition of "carbon footprint" contemplates a life cycle assessment of CO_2 and other GHG emissions associated with a product along its supply chain, including, for example, from use and end-of-life recovery and disposal.

There are a number of protocols to account for CO_2. The methodology on which most GHG accounting programs rely is the GHG Protocol developed by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI).[34] The GHG Protocol creates a common measuring standard for corporate-wide emissions for the Kyoto Six.[35] Although the GHG Protocol's focus is on the corporate level, its guidance is useful on the facility level also, and its drafters urge facility level GHG accounting to facilitate benchmarking and identification of improvements. Facility level accounting is also intended to serve as a tie-in to other GHG regulatory programs and to provide a foundation for other GHG policies and programs.

In carbon footprinting for a facility, a key issue is what CO_2 emissions to consider. The GHG Protocol establishes three different sets of emissions or "scopes." A Scope 1 footprint analysis accounts for direct emissions of a system or activities; a Scope 2, for indirect emissions associated with electricity, heat and steam purchased to support the system or activities; and a Scope 3, for 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.[36] Scope 3 is an optional part of the GHG Protocol, and companies have discretion over whether to report Scope 3 emissions. Present regulatory programs focus on Scope 1, direct GHG emissions. As noted, many GHG programs have been based on or informed by the GHG Protocol, for example, the International Organization for Standardization (ISO) standard for measuring a carbon footprint, ISO 14064.

---

[33] The Kyoto Protocol's cap-and-trade program is based on the Acid Rain Program that the United States Environmental Protection Agency established pursuant to the 1990 Amendments to the federal Clean Air Act.
[34] WBCSD, *supra* note 11.
[35] The WBCSD and the WRI are in the process of developing a similar guideline for measuring and managing GHG emissions throughout the life cycle of a product, as well as across the entire corporate value chain.
[36] WBCSD, *supra* note 11, at 25.

The Carbon Trust, a United Kingdom government-funded company set up to help entities cut carbon emissions, outlined a methodology to quantify the total emissions of GHGs from a product over its entire lifecycle, from manufacture through distribution to disposal.[37] The methodology is intended to assist entities in making informed decisions about carbon reductions, which take into account costs.[38] Among other things, the Carbon Trust has started a "carbon label" program for products, allowing buyers of those products to see the carbon impact of the product across its life cycle.[39]

The attached diagram (Exhibit B) provides an overview of various activities that affect a company's carbon footprint, focusing on a company engaged in manufacturing. The diagram also provides context for understanding the various legal issues that may be triggered.

B. Specifics

In the case of our manufacturer, the starting point is an operation that requires the combustion of fossil fuel and is supplied with electric power from a utility itself burning fossil fuel. The carbon footprint for this operation includes contributions from the combustion of fossil fuels by the manufacturing operation (Scope 1) and 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 available to it.

Both it and its utility could use a fossil fuel that generates less CO_2, *e.g.*, natural gas < petroleum < coal.[40] Both it and its utility could employ measures to conserve fuel and became more energy efficient. Although the two concepts -- energy conservation and energy efficiency -- often are used interchangeably, there arguably are differences. Energy efficiency connotes getting the same for less, for example, by using different technology, *e.g.*, using fluorescent rather than incandescent light bulbs, or by adding insulation to a building. Energy conservation connotes making do with less, *e.g.*, turning down a thermostat or turning off electrical equipment at night.

In addition to becoming more fuel efficient and conserving fuel, our facility could reduce its CO_2 by requiring its supplier to provide it electricity generated by non-fossil fired sources such as wind or solar, or by purchasing renewable energy certificates or RECs. A REC "represents the reduced emissions of renewable generation compared with those of conventional generation."[41] 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.[42]

As to transportation-related CO_2, our manufacturer and its suppliers, distributors, and waste haulers could use more fuel efficient vehicles, hybrid vehicles, or alternative fuels. In the

[37] The Carbon Trust, http://www.carbontrust.co.uk/carbon/briefing/carbon_label.htm?print=1 (last visited 1/18/2009).
[38] *Id.*
[39] *Id.*
[40] Energy Information Agency, Natural Gas 1998: Issues and Trends, April 1999, at p. 50
[41] Guide to Purchasing Green Power, a Collaboration of U.S. Department of Energy, U.S. Environmental Protection Agency, World Resources Institute, and Center for Resource Solutions (September 2004) at 10.
[42] *Id.*

alternative, each entity could instead use rail. Our manufacturer also could minimize or reuse its wastes, decreasing transportation needs and concomitant CO_2 production. It also could manage its shipments to reduce the number of trips, *e.g.*, by staging or by collaborative logistics, combining loads with other companies.

For any residual CO_2 that is generated by the manufacturer and its utility, there are several theoretical options. The company and the utility could sequester and capture CO_2, before, after, or during combustion,[43] and transport it by pipeline for underground storage or for reuse, *e.g.*, in enhanced oil recovery or as a raw material for some manufacturing process requiring CO_2. Theoretically, the manufacturer and utility could employ a treatment process that removes the CO_2. Finally, to the extent the manufacturer and utility cannot themselves effect reductions in the ultimate release of the CO_2 they generate, they can purchase emission offsets generated by others that have employed similar means to those it and its utility employed or that have developed unrelated projects that remove CO_2 or other GHGs, such as reforestation or, in the case of methane, landfill gas recovery.

VI. Legal Issues Associated with Managing Carbon Footprints

As noted in the attached diagram (Exhibit C), the range of measures the manufacturer takes to reduce CO_2 raise a number of legal issues. These issues include: regulatory issues regarding air quality permitting; regulatory and liability issues associated with carbon capture and sequestration; regulatory issues associated with energy efficiency and conservation; regulatory and transactional issues relating to the acquisition of GHG emission offsets; and regulatory and liability issues associated with carbon disclosure.

A. Carbon Regulation Generally

A key legal issue regarding the management of carbon has been whether and to what extent CO_2 and other GHGs are regulated under current law, especially the federal Clean Air Act. In *Massachusetts v. EPA*, the U.S. Supreme Court rejected contentions of the United States Environmental Protection Agency (EPA) that the Clean Air Act did not require that CO_2 and other GHGs be regulated.[44] The implications of this decision remain the subject of vigorous debate.

Massachusetts v. EPA arose out of EPA's denial of a rulemaking petition asking it to regulate four GHGs from mobile sources. The case turned, in part, on the definition of "air pollutant" under the Clean Air Act. The Court found that "greenhouse gases fit well within the Clean Air Act's capacious definition of 'air pollutant' " and that EPA thus had the authority to regulate them.[45] The Court chided EPA for "offer[ing] no reasoned explanation for its refusal to decide whether greenhouse gases cause or contribute to climate change" and concluded that EPA cannot rely upon "uncertainty surrounding various features of climate change" as a grounds for

[43] *See* Viveca Novak, *A Clean Coal Confrontation*, Newsweek, http://www.newsweek.com/id/181143/page12,(last visited January 23, 2009).
[44] 549 U.S. 497, 531-32 (2007)
[45] *Id*. at 532.

inaction.[46] The Court directed EPA to make an "endangerment" finding, that is, to determine whether those air pollutants "cause or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare," or provide some reasonable explanation why it cannot or will not.[47] If EPA determines that the GHG emissions contribute to global warming, it must then determine how to regulate them.

In response, EPA issued an Advance Notice of Proposed Rulemaking (ANPR), soliciting comments on whether and how CO_2 should be regulated.[48] The ANPR explains that any regulation of GHGs could have broad implications, well beyond the mobile source regulation at issue in *Massachusetts v. EPA.* As the Clean Air Act is currently configured, GHG regulation could sweep in a number of traditionally unregulated CO_2 emission sources, such as apartment buildings, large homes, schools, and hospitals, subjecting them to permit and other requirements. The ANPR prompted a number of federal agencies to comment on the potential economic impacts of this sweeping GHG regulation, noting that virtually no sector of the economy would go unregulated. Many expect that federal GHG legislation, which failed to pass in the last Congress,[49] may yet overtake GHG regulation under the Clean Air Act,[50] which many believe is ill-suited to regulate GHGs.

B. Carbon Permitting

The construction and operation of stationary combustion sources, for the generation of electricity or for manufacturing operations, generally trigger air quality permitting requirements. The permitting process usually requires an applicant to meet both technology-based and ambient air quality-based limitations for specified air pollutants, but historically CO_2 has not been considered an air pollutant subject to regulation. Unlike traditional air pollutants, which act regionally and produce direct effects, CO_2 and other GHGs act globally and indirectly, with adverse effects being attributable to the consequences of enhanced global warming.

On November 13, 2008, the EPA's Environmental Appeals Board, in light of *Massachusetts v. EPA*, remanded an EPA-issued prevention of significant deterioration (PSD) permit for a coal-fired generating unit proposed on Native American land in Utah by Deseret Power Electric Cooperative.[51] Although the EAB rejected the Sierra Club's argument that the applicant had to demonstrate that the unit satisfied the technological standard of Best Available Control Technology (or BACT) for CO_2, EAB found that EPA had failed to adequately explain why it

[46] *Id.* at 534.
[47] *Id.* at p. 532-33 (citing 42 U.S.C. § 7521(a)(1) of the Clean Air Act).
[48] 73 Fed. Reg. 44354 (July 30, 2008).
[49] In its Fiscal Year 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110–161), Congress did direct EPA to promulgate a GHG reporting rule, to require mandatory reporting of GHGs "above appropriate thresholds in all sectors of the economy." As of January 18, 2009, EPA has yet to propose this rule.
[50] *See* John M. Broder, *Obama Team Set on Environment*, The New York Times, Dec. 10, 2008. (last visited January 26, 2009) http://www.nytimes.com/2008/12/11/us/politics/11appoint.html?scp=10&sq=%22climate%20change%20legislation%22&st=cse
[51] *In re: Deseret Power Electric Cooperative, PSD Permit No. PSD-OU-0002-04.00*, PSD Appeal No. 07-03, before the Environmental Appeal Board, United States Environmental Protection Agency, November 13, 2008.

chose not to require that CO_2 be addressed by the applicant and suggested that EPA might better address this issue on a national level.[52]

EPA did not take long to respond. On December 18, 2008, EPA Administrator Stephen Johnson issued an interpretative memorandum, offering EPA's view of pollutants subject to the federal PSD program. The December 18 memorandum conformed to and expanded on EPA's position in the *Deseret* case -- that regulated pollutants (for which BACT must be applied) do not include any pollutant, such as CO_2, that is subject only to monitoring and reporting requirements under the Clean Air Act. EPA noted that this interpretation is consistent with the applicable federal Clean Air Act provisions and with EPA practice of not imposing CO_2 limitations in its permits.

The December 18 memorandum immediately drew attack. On December 22, 2008, Senator Barbara Boxer, Chair of the Senate Committee on Environment and Public Works, sent a strongly worded letter to the Attorney General requesting that he intervene with Administrator Johnson to withdraw "his blatantly illegal memo."[53] Senator Boxer criticized the memo as "'midnight rules' that undermine the law" and a "transparent excuse for inaction on global warming."[54] EPA published a notice of issuance of the administrative interpretation in the December 31, 2008 Federal Register and designated the interpretation as "nationally significant" under section 307(b) of the Clean Air Act, so that judicial challenges must be brought by March 2, 2009.[55] Environmental groups responded on January 15, 2009, filing suit challenging the memorandum in the Court of Appeals for the D.C. Circuit.[56] The new Administration is likely to step in.[57]

As to what constitutes BACT in those forums where CO_2 is considered, an issue is whether alternative methods of generating power must be considered, for example, for coal-fired power plants, whether IGCC (integrated gasification combined cycle), which combines coal gasification and combined cycle plant design, is an alternative control that must be considered by the applicant and permitting authority, or is instead a different process. Unlike other technologies, IGCC facilitates the segregation and capture of CO_2, enabling it to be perhaps stored or reused. The issue of whether IGCC must be considered as BACT in permitting in those forums has not yet been resolved.

---

[52] *Id.* at p. 4.

[53] Letter from Sen. Barbara Boxer, Chair, Senate Committee on Environment and Public Works, to Hon. Michael Mukasey, Attorney General (Dec. 22, 2008) (available as of January 18, 2009 at http://epw.senate.gov/public/index.cfm?FuseAction=PressRoom.PressReleases&ContentRecord_id=5ff1fa60-802a-23ad-48f7-70e4f829d9a5)

[54] *Id.*

[55] 73 Fed. Reg. 80300 (December 31, 2008).

[56] *Sierra Club et al. v. Environmental Protection Agency and Stephen L. Johnson, Administrator*, No. 09-1018, Court of Appeals for the D.C. Circuit.

[57] For example, the January 26, 2009 New York Times On-line reports that President Obama directed federal regulators to move swiftly and reconsider an application by California and 13 other states, which the Bush Administration had denied, to set strict automobile emission and fuel efficiency standards. John M. Broder, *Obama Directs Regulators to Tighten Auto Standards*, New York times http://www.nytimes.com/2009/01/27/us/politics/27calif.html? (last visited January 26, 2009).

C. Carbon Capture and Sequestration

The concept of carbon capture and sequestration is viewed as a viable but costly method for effecting reductions in CO_2 that are regulatorily required or voluntarily undertaken. The transport of captured CO_2 raises issues relating to eminent domain, and CO_2 sequestration raises regulatory and liability issues.

EPA views geologic sequestration of carbon in the deep subsurface as underground injection, subject to the Underground Injection Control (UIC)[58] program of the Safe Drinking Water Act (SDWA).[59] Underground injection of fluids for enhanced oil gas recovery, including CO_2, has been occurring for some time and is permitted by EPA as UIC Class II wells.[60] Underground injection of CO_2 for the purpose of reducing carbon emissions is the subject of proposed rulemaking.[61]

In this rulemaking, EPA is proposing to separately address geologic sequestration because of its concerns that it potentially involves different technologies and may involve much greater volumes of CO_2. In making its determination to develop specific requirements for geologic sequestration, EPA cited "[t]he relative buoyancy of CO_2, its corrosivity in the presence of water, the potential presence of impurities in captured CO_2, its mobility within subsurface formations, and large [anticipated] injection volumes…"[62]

EPA's proposed rule would establish a new class of injection wells to be used for geologic sequestration, Class VI wells. In it, EPA will address issues of geologic site characterization, well construction requirements, monitoring requirements to verify that CO_2 is moving as predicted in the subsurface, mechanical integrity testing requirements, groundwater monitoring requirements, post-injection monitoring and site care, and financial responsibility.[63]

There may be other regulatory concerns as well. The preamble to the proposed rulemaking noted the possibility that impurities in the CO_2 stream could result in the injected materials being classified as hazardous wastes and thus as hazardous substances, raising the possibility of CERCLA liability in addition to RCRA regulation.[64]

In addition to regulatory considerations, the underground storage of CO_2 creates legal issues relating to the ownership of the pore space and to liability for releases. As to who owns the pore space, the law varies throughout the United States. A number of states are considering legislation to address ownership of pore space. The possibility of tort claims is an impediment to carbon storage.

---

[58] EPA has specifically asked for comments on continuing permitting EOR/EGR wells as Class II injection wells because there may be some desire to use the wells for geologic sequestration. 73 Fed. Reg. 43492, 43502 (July 25, 2008).
[59] 42 U.S.C. § 300h (also known as Section 1421 of the Safe Drinking Water Act).
[60] 73 Fed. Reg. 43492.
[61] *Id.*
[62] EPA Proposes New Requirements for Geologic Sequestration of Carbon Dioxide, EPA Office of Water, EPA 816-F-08-032, July 2008, p. 1.
[63] 73 Fed. Reg. 43492.
[64] *Id.* at 43503-43504.

D. Carbon Reduction Options

As noted, there are a number of options for our manufacturer to reduce carbon emissions, including becoming more energy efficient, conserving energy, and creating or acquiring emission offsets, including RECs. The various options pose different legal issues. The intent of the discussion that follows is to flag some of those issues, rather than to comprehensively identify and analyze them.

1. Legal Issues Associated with Energy Efficiency and Energy Conservation

As discussed, a facility may reduce its own CO_2 emissions by implementing energy conservation and energy efficiency measures. Among those measures is the utilization of so-called green buildings. The LEED (Leadership in Energy and Environmental Design) Green Building Rating System is a set of standards for sustainable construction. A number of cities, like the City of Austin, are adopting LEED certification standards for city-owned building projects.[65] And a number of cities, including Dallas, are requiring certain privately-owned buildings to meet LEED standards though not necessarily to achieve LEED certifications.[66]

CO_2 generation conceivably could be reduced too by extending product life, minimizing the generation of waste, and reusing and recycling products and wastes. A number of regulatory programs, as well as voluntary initiatives, encourage recycling, reuse, and waste reduction. For example, the European Union has enacted its Directive on Waste from Electrical and Electronic Equipment (WEEE), which requires, among other things, that producers of such equipment take responsibility for the equipment until the end of its useful life, which would include taking steps to make sure that collection infrastructure exists.[67] Presumably programs such as WEEE will encourage manufacturers to lengthen the life cycle of products and to implement design and manufacturing practices with an eye to the ultimate disposition of the material. In the United States, many states, such as Texas and California, have adopted programs providing for the "take back" of certain electronic wastes.[68] In addition, regulations promulgated by EPA under the Resource Conservation and Recovery Act regulate the management of hazardous waste and encourage reductions in the volume and toxicity of waste generally and recycling in particular, to reduce regulatory burdens, liabilities, and costs.[69]

As noted, retail electric customers have two options in dealing with their providers: they may buy renewable energy, where it is available, paying a premium, or they may buy RECs, from generators who have available renewable energy sources and who choose to sell the difference in value. One REC represents the right to describe one megawatt of electricity as renewable. Some

---

[65] 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 January 18, 2009).
[66] 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 January 18, 2009).
[67] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003, as subsequently amended by Directive 2003/108/EC and Directive 2008/34/EC.
[68] *See* 30 Tex. Admin. Code Chapter 328; Cal. Health & Safety Code §25214.9 et seq.
[69] *See e.g.*, 40 C.F.R. Part 261.

states require electricity providers to purchase a minimum percent of their electricity from renewable sources and allow providers to satisfy this requirement through the purchase of RECs.

Our manufacturer also may impose conditions on its suppliers, to require them to implement their own measures to reduce CO_2. It may also, either by contract require or on its own, decide to use transportation that generates lower CO_2 emissions, *e.g.*, hybrids or combining shipments, with regard to raw materials and fuel transport, product distribution, use, and disposal, and waste transport and disposal.

2. Legal Issues Associated with Emission Reductions

To the extent a facility cannot cost-effectively reduce its direct or indirect CO_2 emissions, it may purchase emission reductions or credits, including RECs, from others. The purchase of emission reductions creates significant legal issues, which are pertinent in the negotiation and drafting of emission credit agreements. These issues include: how are offsets created; how are they quantified and verified; how they are transferred; and how are they valued? Other pertinent legal issues include: whether the activity results in real reductions from a baseline; whether the reduction is permanent, *i.e.*, not easily undone; whether the reduction is enforceable; whether the reduction is additional, *i.e.*, whether the reduction would not otherwise result but for the transaction; and whether and how pre-regulatory reductions are to be counted when regulations ultimately are promulgated. To obtain an appreciation of these issues, it is useful to have a basic understanding of market driven offset programs.

a. Market Driven Offset Programs

Basically, under cap-and-trade programs, the regulatory authority sets a cap on total mass emissions for a group of sources for a fixed compliance period, *e.g.*, 1 year. The authority then divides the cap into allowances, each representing an authorization to emit a specific quantity of the pollutants, *e.g.*, 1 ton of CO_2, which are then distributed among the various sources in the group. For the compliance period, each source must measure and report its emissions of that pollutant, at the end of which the sources must surrender their allowances to cover the quantity of the pollutants they emitted. If a source does not have sufficient allowances to cover its emissions, the authority penalizes it, usually by reducing the number of allowances the source will receive in future years.[70] Because of the economic value of allowances, sources are encouraged to decrease their emissions and either sell the difference, to obtain an economic benefit, or bank it, to obtain future flexibility regarding the timing and location of emission reductions.[71]

A cap-and-trade program provides a number of benefits over a program of command-and-control. For example, there is greater certainty as to what the total emissions of the subject pollutants are likely to be because the authority sets the total maximum allowable amount that sources can emit.[72] A cap-and-trade program should require each source to follow protocols to

[70] U.S. Environmental Protection Agency, *A Guide to Designing and Operating a Cap and Trade Program for Pollution Control*, EPA 430-B-03-002 June 2003 at 1-3.
[71] *Id.* at 2-4.
[72] *Id.* at 1-3.

ensure completeness, accuracy, consistency of emission measurement and timeliness of reporting.[73] The authority then can compile and make public available the reported information, promoting transparency.

A key advantage of cap-and-trade programs is that they give sources the flexibility as to how best to achieve their emission targets, *e.g.*, through onsite implementation of capital or operating measures, such as installation of abatement equipment or energy efficiency measures, switching fuels, and shutdown or reduction in output from higher emitting sources, or through purchasing allowances from others, at costs lower than might be necessary to implement onsite measures. New sources may have to acquire allowances from existing ones.[74] The bottom line is that the program creates incentives for sources to find ways to reduce their emissions of the subject pollutant.

Credit or offset trading generally is used in conjunction with a regulatory project-based program to allow sources the ability to acquire offsets from sectors not in the regulatory program, *e.g.*, CO_2 offsets to be obtained from a project to protect a forest slated for deforestation.[75] Emission offsets or credits are typically calculated by comparing actual emissions against a baseline. A key challenge for such programs is establishing the baseline and insuring that emission reductions are real and not theoretical.

A key difference between project-based trading and cap-and-trade relates to the development of a baseline and the tracking of the offsets. In a cap-and-trade program, the universe of activities that need to be examined is relatively confined -- to the specific sources in the program. In a project-based program, other, more difficult to identify-and-track sources such as forests must be examined and kept track of, to insure the integrity of the program, resulting in higher administration and transaction costs.

Carbon credits are created under a legal framework for emissions trading such as the European Union Emissions Trading Scheme (EU ETS) developed under the Kyoto Protocol, or generated by voluntary action outside of legal frameworks, so-called Voluntary Emissions Reductions (VER), where voluntary action to reduce emissions has been verified by a third party, *e.g*, credits traded on the Chicago Climate Exchange (CCX).

b. Types of Trading Systems

(1) Kyoto

The Kyoto Protocol contemplates a cap-and-trade mechanism for emissions trading. Under Kyoto, parties with commitments are given their emission targets or "assigned amounts." Each Assigned Amount Unit (AAU) equates to 1 ton of CO_2.

Countries with excess AAUs under Kyoto are able to trade those emissions with others. In order to facilitate emissions trading, the EU has implemented an international trading system --

[73] *Id.*
[74] *Id.* at 2-5.
[75] *Id.* at 2-7.

the EU ETS. The EU ETS covers a number of energy intensive facilities, and collectively these facilities represent nearly 50% of the EU's CO_2 emissions.[76] The EU ETS enables these facilities to trade emission allowances received under National Allocation Plans with other facilities located in other countries participating in the EU ETS.

In addition to the cap-and-trade system, the Kyoto Protocol also includes 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), each equivalent to one ton of CO_2e. CDM involves investment in sustainable development projects that reduce emissions in developing countries (known as non-Annex I countries) and results in the creation of Certified Emission Reductions (CERs) credits, each also equivalent to 1 ton of CO_{2e}.[77]

These three mechanisms provide a range of options for the countries with Kyoto Protocol obligations, and the entities regulated by those countries, to meet their commitments. Under each of the mechanisms, emission reductions must be real, measurable, long-term, and additional.[78]

(2) State and Regional Programs

In the absence of federal GHG legislation, states, individually and in conjunction with other states in a region, have developed a range of programs to address GHG emissions. Regional programs with cap-and-trade mechanisms include the Regional Greenhouse Gas Initiative (RGGI), the Western Climate Initiative, and the Midwestern Regional GHG Reduction Accord. State programs range from taxation to goal setting to actually imposing CO_2 and other GHG caps on particular industrial sectors. RGGI, which comprises 10 states, has held the first mandatory cap-and-trade auctions of CO_2 emissions in the United States, in September and December 2008, and has scheduled another in March 2009.[79]

(3) Voluntary Markets

In addition to mandatory GHG initiatives, many companies are taking voluntary actions and participating in voluntary emission offset markets. Prominent among these markets is the CCX.[80] Although membership in the CCX is voluntary, those who join make legally binding commitments to reduce emissions, and, to the extent they reduce emissions beyond their commitment, have surplus allowances to sell. Additional emissions offsets may be generated through offset projects, such as range management and reforestation, which are registered with the CCX and verified by an independent third party verifier. The CCX uses standardized rules

[76] European Union, Questions and Answers on Emissions Trading and National Allocation Plans, http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/05/84&format=HTML&aged=1&language=EN&guiLanguage=en (last visited January 12 2008)
[77] United Nations Framework Convention on Climate Change, Clean Development Mechanism: 2008 In Brief at 1.
[78] *See* Kyoto Protocol, Articles 6, 12 and 17.
[79] *See* http://www.rggi.org (last visited 1/18/2009).
[80] Other voluntary markets include the European Climate Exchange and the Montreal Climate Exchange.

for determining qualifying projects and for quantifying the offset amount. In addition, to protect against double selling, each offset is given a unique identification number.

E. Carbon Related Disclosure and Marketing Liabilities

As noted, driven by a variety of stakeholders, many companies have undertaken voluntary measures to reduce their carbon footprint. And obviously those companies have strong incentives to inform those stakeholders that they have been listening to them and have implemented responsive measures. Companies may disclose this information in a variety of ways. Companies may disclose information to investors in SEC filings, in stand-alone sustainability or climate change reports, and on their websites, and via non-governmental organizations or NGOs such as the Carbon Disclosure Project.[81] Companies may disclose information about their products or services to consumers in product marketing and through labeling.

Although disclosure generally is not presently mandatory, untrue or misleading disclosures may give rise to liabilities. These disclosure-based liabilities may arise under state deceptive practice statutes and the common law, under the Federal Trade Commission Act, and under securities law. In addition, companies face reputational and related risks for inaccurate disclosures of carbon-related information.

1. State Deceptive Practice Statutes/Common Law

Regardless of whether the focus of a corporation's carbon disclosures is on its investors, its consumers, or other stakeholders, the company faces the potential for liability under both common law and fraud-based statutes for statements that prove to be untrue. A key case cited for this proposition is *Nike v. Kasky*.[82]

In *Nike v. Kasky*, Nike made claims in advertising and other communications regarding steps taken to improve conditions for overseas workers. Nike's statements were challenged under California's false advertising laws. Nike was unsuccessful in its efforts before the California Supreme Court to obtain a ruling that its statements were First Amendment-protected political speech, and the case settled. While the case did not involve a carbon disclosure issue, the principles of *Nike* can easily be expanded to communications regarding carbon footprints and carbon mitigation.

A key issue likely to arise relates to the state of mind necessary to give rise to liability, *e.g.*, knowing versus negligent dissemination of false information. If the standard is negligence, then the pertinent inquiry is whether, before making a representation as to being carbon neutral for example, a corporation is under an obligation to independently determine if the underlying facts upon which it relies for its claim are correct. This question might affect whether it needs to independently evaluate the assumptions and methodology of its carbon credit provider, assuming it purchases credits, or of its own professionals, if the company is relying on reductions it itself creates.

---

[81] *See* http://www.cdproject.net/ .

[82] *Nike v. Kasky*, 27 Cal.4th 939 (2002), cert. dismissed, 539 U.S. 654 (2003).

2. FTC

As noted, many companies have launched "green" marketing campaigns that tout, among other things, carbon neutrality or carbon footprint reductions. Under the Federal Trade Commission Act, liability arises from the general prohibition against unfair and deceptive trade practices.[83] The Federal Trade Commission (FTC) has determined that "a representation, omission, or practice is deceptive if it is likely to mislead consumers acting reasonably in the circumstances and is material."[84] To provide guidance on whether environmental claims are unfair or deceptive under Section 5 of the Federal Trade Commission Act,[85] the FTC has issued "Green Guides,"[86] which "outline general principles that apply to all environmental marketing and then provide guidance regarding specific environmental claims." The Green Guides provide safe harbors to marketers that follow them.[87] The FTC is in the process of reviewing and updating the Green Guides to specifically address claims regarding carbon offsets, but as of January 12, 2009, has not updated the Guides.

The FTC explains that "all marketers making express or implied claims about attributes of their product or service must have a reasonable basis for their claims at the time they make them."[88] Reasonableness is determined from the perspective of the consumer. Further, the FTC explains that in green marketing, competent and reliable scientific evidence may be required, including tests, research, and studies, performed by qualified professionals using generally accepted procedures that produce accurate and reliable results.[89] The FTC is considering whether to incorporate existing GHG measuring protocols.

3. SEC

Another federal regulatory program, which focuses on investors rather than consumers, also creates the potential for liability based on inaccurate marketing. Section 10(b) of the Securities Exchange Act of 1934, and Rule 10b-5 promulgated under that Section, makes it unlawful to make an untrue statement or to omit to state a material fact in connection with the purchase or sale of any security. Rule 10b-5 is one of the most important general anti-fraud rules of the Securities and Exchange Commission (SEC).

To establish fraud, a plaintiff must plead and prove a misrepresentation or omission of material fact, made with the intent to defraud, on which plaintiff relied, that proximately caused the plaintiff's injury. In certain circumstances, such as when a company's securities are regularly traded in an efficient public market, the requirements for showing a plaintiffs' individual reliance have been relaxed and a plaintiff may be granted a rebuttable presumption of reliance. Liability under the Securities Exchange Act includes exposure to third party actions and civil and criminal sanctions and injunctive relief. It also is the likely basis for a complaint or a judicial attack by

[83] 15 U.S.C. § 45.
[84] *See FTC Policy Statement on Deception* appended to *Cliffdale Associates, Inc.*, 103 F.T.C. 110, 174 (1984) (http://www.ftc.gov/bcp/policystmt/ad-decept.htm). *See also* 15 U.S.C. §45.
[85] 15 U.S.C.§ 45.
[86] 16 CFR Part 260.
[87] 16 C.F.R. §260.3.
[88] 72 Fed. Reg. at 66096.
[89] *Id.*.

plaintiffs on a company's allegedly false green or carbon neutral claims. The key element is likely to be whether a misrepresentation of carbon-neutral or green claims could rise to the level of materiality under Rule 10b-5.

In addition to what to report, there is a legal issue whether to report regarding GHGs and climate change. In 2007, New York Attorney General Cuomo launched an investigation of five major energy companies, questioning whether their disclosures adequately informed investors, under state law, of the risks and liabilities posed by CO_2 emissions from new power plants – and settled with two – Excel and Dynegy. Many companies are voluntarily including discussions of climate change risks in the "Management's Discussion and Analysis" or MD&A portion of their SEC filings. The MD&A typically identifies and discusses "known trends or any known demand, commitments, events, or uncertainties that will reasonably result in or that are reasonably likely to result in the registrant's liquidity increasing or decreasing in any material way," and known trends or uncertainties reasonably expected to have a material impact on sales, revenues or income.[90]

4. Reputational and Related Liabilities

Because so much of what is seen in the market place regarding carbon disclosures is driven by consumers, investors, and other stakeholders rather than by regulation, the greatest risks to a company of an untrue disclosure are perhaps as much to its reputation in the market place as to its exposure to liabilities from government enforcement actions or third party claims. These reputational liabilities are more likely to arise in representations that involve the purchase of credits and estimation of GHGs associated with the lifecycle of a product, rather than with estimation of direct GHG emissions, because of the uncertainties associated with verifying those representations. It also is possible, depending on the circumstances, that reputational liabilities could form the basis for shareholder actions.

Recent Wall Street Journal articles have raised questions of companies' green claims.[91] Among points raised in these articles were the lack of clarity in announcements about what carbon emissions were being counted as the company's emissions and whether the total included suppliers' emissions and consumers' emissions from use of the product. And one article was specifically critical of the use of emissions credits from certain projects, where it was not clear that the emission offsets were truly "additional." These articles make the case for a careful consideration of green marketing claims.

VII. 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. In response to those concerns, nations, states, local governments, corporations, NGOs, and individuals have undertaken measures to reduce GHG

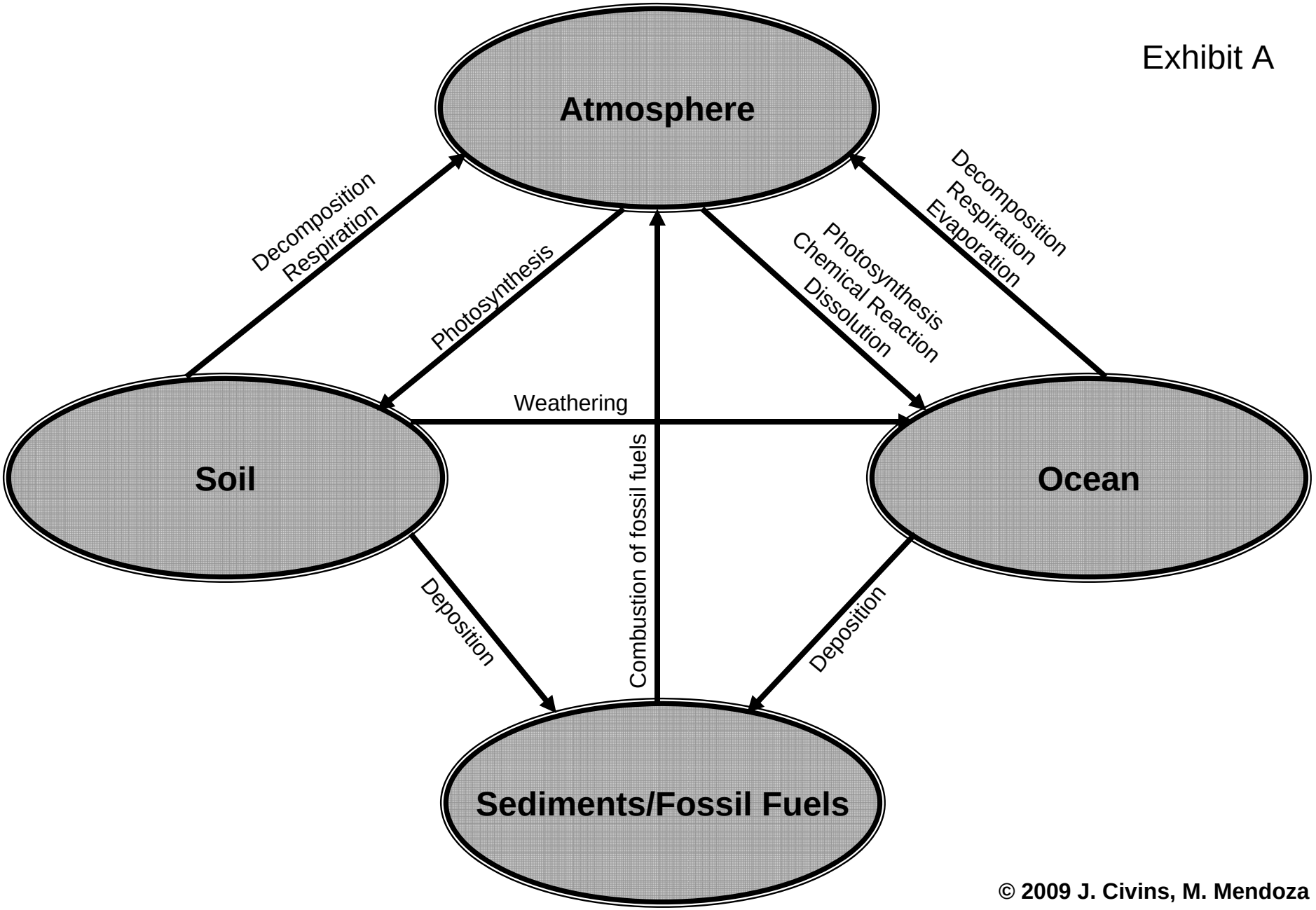
[90] 17 C.F.R. § 229.303(a)(1), (a)(3)(ii); Securities Act Release No. 33-6835.

[91] "Green Goal of 'Carbon Neutrality' Hits Limit", Wall Street Journal, December 30, 2008, Jeffrey Ball, Wall Street Journal, http://online.wsj.com/article/SB123059880241541259.html ; (last visited January 26, 2009), Ben Charney, "How Green is Apple?", Wall Street Journal, December 31, 2008, http://online.wsj.com/article/SB123066532721343231.html by Ben Charney (last visited January 26, 2009)

emissions. For an individual manufacturer, there are a number of different options for reducing CO_2 and other GHG emissions attributable to its operations, and these options have varying legal ramifications. Like the physical environment it seeks to protect, the legal environment regarding GHG emissions control continues to change.

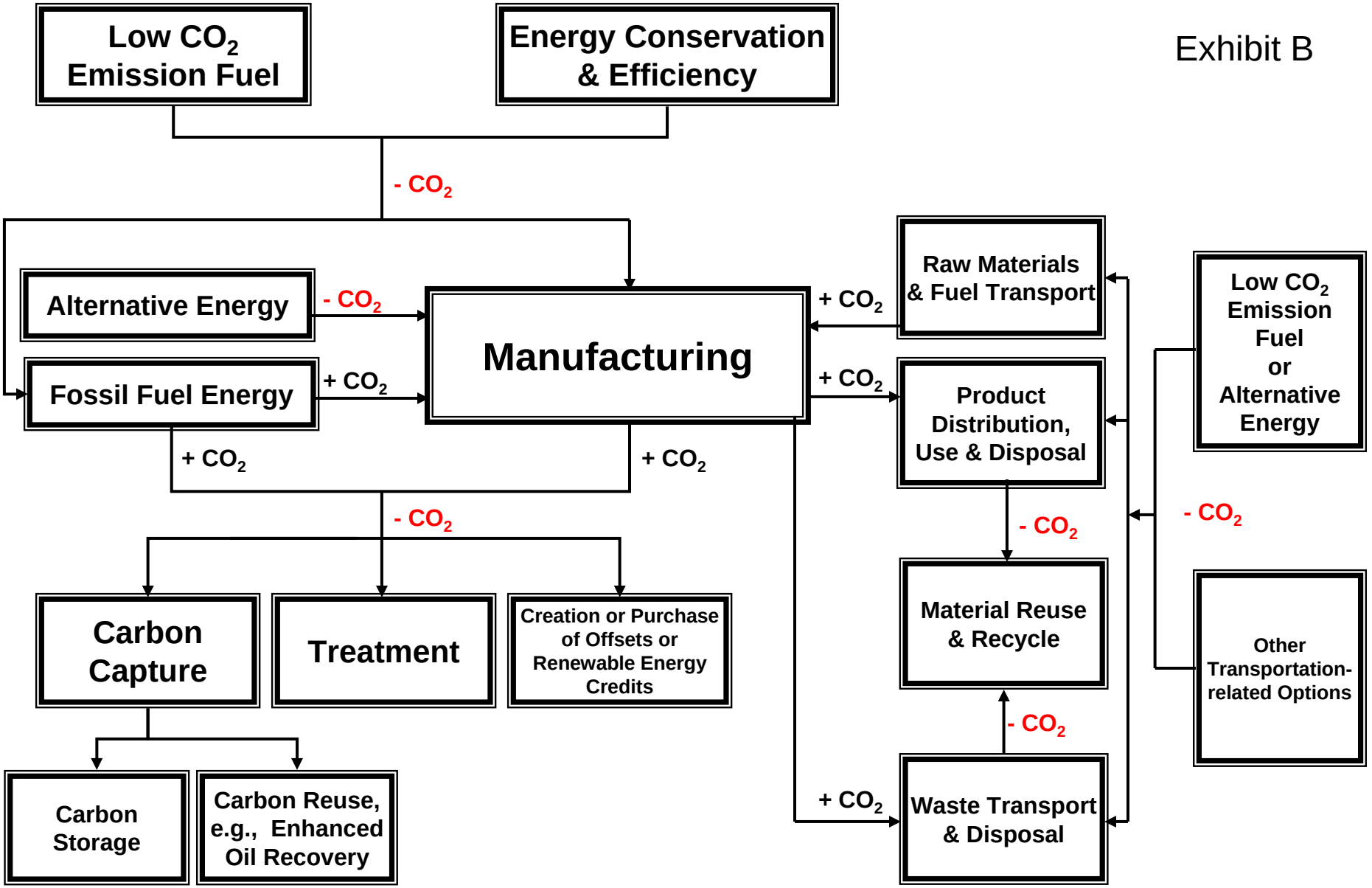
The Carbon Cycle – A Simplistic Overview

Exhibit A

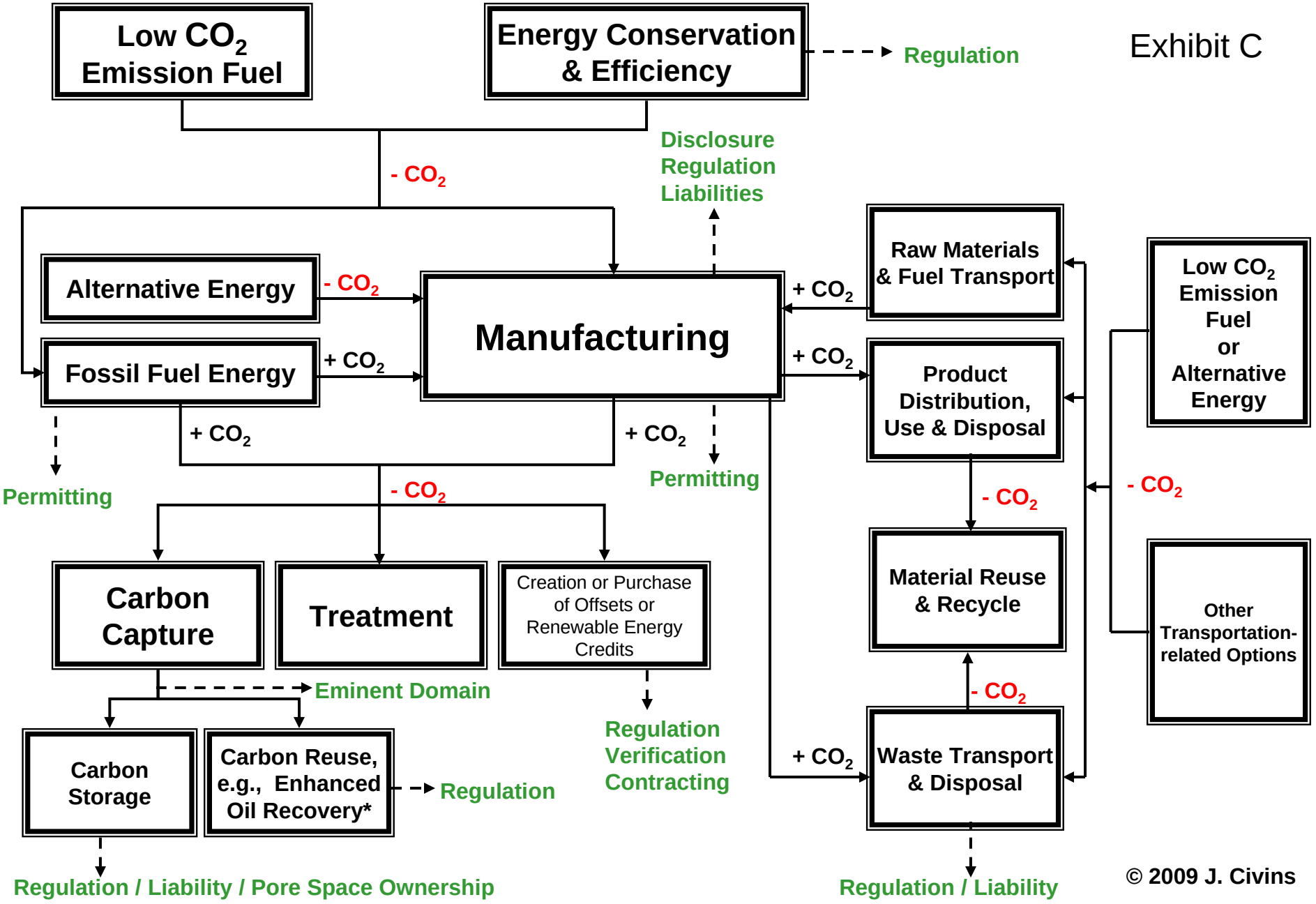


Inputs to a Manufacturer's CO_2 Footprint

Exhibit B



Inputs to Manufacturer's CO_2 Footprint -- Legal Issues



haynesboone
Setting precedent.

About the Authors

Jeff Civins
Partner
jeff.civins@haynesboone.com
512.867.8477 - Phone

Jeff Civins is a partner in the Austin office of the international law firm of Haynes and Boone, LLP and is chair of the firm's Climate Change and Corporate Sustainability Practice Group. Jeff's practice includes regulatory counseling, transactional work, and litigation. Jeff has been an adjunct professor at the University of Texas School of Law since 1992. He is co-editor of the Thomson West two-volume treatise on Texas Environmental Law and is a frequent author and speaker on environmental laws topics. He is a former chair of the Environmental and Natural Resources Law Section of the State Bar of Texas and has been chair of the Annual Texas Environmental Superconference since its inception 21 years ago.

Jeff received his AB in Chemistry from Brandeis University, his MS in Organic Chemistry from Penn State and his JD from the University of Texas School of Law. Prior to attending law school, Jeff taught science in public and private schools in New York City.

Mary Mendoza
Partner
mary.mendoza@haynesboone.com
512.867.8418 - Phone

Mary Mendoza is a partner in the Austin office of the international law firm of Haynes and Boone, LLP. She is a member of the firm's Climate Change and Corporate Sustainability Practice Group and its Clean Tech Practice Group. Mary's practice includes transactional work, regulatory counseling and litigation. She represents clients in a wide range of environmental issues associated with real estate, corporate and other transactions, as well as on hazardous and solid waste cleanups, contested case hearings and enforcement matters.

Mary is the former chair of the Environmental and Natural Resources Law Section of the State Bar of Texas and is a frequent speaker and author on environmental law topics.

Mary received her B.S., with highest honors, in Civil Engineering from the University of Texas and her J.D. from The University of Texas School of Law.

For full biography information, please select: Jeff Civins and Mary Mendoza.