THE NEW CLIMATE METRIC: THE SUSTAINABLE CORPORATION AND ENERGY

Steven Ferrey∗

INTRODUCTION: THE NEW VOCABULARY

A. *The Alphabet Starts with "C"*

"C" is for "carbon," "climate," and "conundrum." The environmental vernacular at the millennium is shifted forever—"carbon footprint," "offsets," "carbon credits," "RECs," and "carbon neutral." Global warming has enveloped the corporate and collective consciousness.[1] It is, and will remain, a metaenvironmental metric, crowding out a host of other environmental issues and affecting how corporations will assess their business, their plans, and how they will be measured.[2] According to David Crane, CEO of NGR Energy Corporation, "this is

∗ Steven Ferrey is Professor of Law at Suffolk University Law School and served as Visiting Professor of Law at Harvard Law School in 2003. Since 1993, Professor Ferrey has been a primary legal consultant to the World Bank and the U.N. Development Programme on their renewable and carbon reduction policies in developing countries, where he has worked extensively in Asia, Africa, and Latin America. He holds a B.A. in Economics, a Juris Doctorate, a Masters Degree in Regional Planning, and was a post-doctoral Fulbright Fellow at the University of London on the energy implications of regional redevelopment. He is the author of seven books on energy and environmental law and policy, the most recent of which is *Unlocking the Global Warming Toolbox*, published in 2010. He also is the author of more than eighty articles on these topics published in law reviews at Harvard; New York University; Stanford; University of California at Berkeley; Boston College; William & Mary; George Washington University; University of California, Los Angeles; Notre Dame; University of Minnesota; Fordham; University of Virginia; and Duke. Professor Ferrey thanks his research assistant Christopher Ng for his research assistance with citations.

1. *See* Peter Aldhous, *Global Warming: The Buck Stops Here*, NEW SCIENTIST, June 23, 2007, at 16–19, *available at* http://woods.stanford.edu/docs/surveys/Global-Warming-New-Scientist-Poll-Article.pdf; *see generally* David J. Lynch, *Corporate America Warms to Fight Against Global Warming*, USA TODAY, June 1, 2006, at 1B; *"Carbon Footprint" Gaining Business Attention, Says Conference Board*, GREENBIZ NEWS, Oct. 18, 2006, http://www.greenbiz.com/news/2006/10/18/carbon-footprint-gaining-business-attention-says-conference-board.

2. *See, e.g.*, Press Release, Natural Res. Def. Council, Polls Show Voters Around the Country Strongly Support Measures to Reduce Global Warming (July 16, 2007), http://www.nrdc.org/media/2007/070716.asp.

the defining business issue of our generation."[3]

How far have we come in just a few years? I can bear witness to the quantum leap of the carbon issue into corporate consciousness. In 2004, I was asked to participate in a symposium at William and Mary Law School on the similar topic of the greening of American corporate environmental responsibility. This was an excellent assembly of wonderful speakers from around the United States, yet only one speaker dealt with energy, let alone carbon.[4]

In 2004, "global warming" was not much in the nomenclature of energy policy: the European Union Emission Trading System ("EU ETS") for carbon control—the first carbon control in the world—had not yet launched,[5] the Kyoto Protocol had not yet been ratified by the necessary majority of countries to make it effective,[6] and no one had won a Nobel Peace Prize or Academy Award for highlighting carbon imperatives.

In less than seven years, the dialogue in which corporate America—really America as a whole—is engaged has been significantly transformed. The global warming issue is an appropriate focus in the 21st century; it is appropriate because of both the immediacy of the possibly irreversible damage that is inflicted by greenhouse gas ("GHG") emissions and a warming planet,[7] as well as the collective nature of our dilemma. On the issue of the immediacy, James Hansen, head of the NASA climate office, and one of a group of prominently regarded world

3. John Donnelly, *Unlikely Allies Advance Global Warming Policy*, BOS. GLOBE, Aug. 22, 2007, at A2.

4. *See* Steven Ferrey, *Corporate Governance and Rational Energy Choices*, 31 WM. & MARY ENVTL. L. & POL'Y REV. 113 (2006). Even then, to fit it within what was then thought of as a legitimate topic on corporate environmental responsibility, I had to focus on the opportunities to utilize renewable energy and energy efficiency, not on the metaissue of what is a corporate "carbon footprint." At that time, I focused on the advantages of certain on-site distributed energy technologies that could make economic sense, but also limit fossil fuel use. Now, three short years later, the dialogue is about the corporate carbon footprint.

5. The EU ETS began with its initial phase in 2005. *Emissions Trading (EU ETS)*, EUROPEAN COMMISSION (Nov. 15, 2010), http://ec.europa.eu/clima/policies/ets/index_en.htm.

6. The required ratification was not achieved until February 2005. The Kyoto Protocol entered legal force on the ninetieth day after at least fifty-five parties to the Protocol, including Annex 1 parties accounting for at least 55% of total 1990 carbon dioxide emissions, ratified the treaty. Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 25 § 1, Dec. 10, 1997, 37 I.L.M. 22, *available at* http://unfccc.int/resource/docs/convkp/kpeng.pdf [hereinafter Kyoto Protocol]. One hundred eighty-two of these countries later ratified the Kyoto Protocol, which set emission targets for thirty-seven countries.

7. *See* Jonathan Rauch, *Global Warming: The Convenient Truth*, THE ATLANTIC, Mar. 13, 2007, *available at* http://www.theatlantic.com/magazine/archive/2007/03/global-warming-the-convenient-truth/5749/.

climatologists, has announced that we have less than four years left to either radically diminish annual carbon emissions or face a very different planet.[8]

The new carbon universe evolves rapidly, and the carbon footprint changes in size. In 1950, the United States and Western Europe contributed 71% of GHG emissions, but in 1998 they were found to have contributed only 38% of the total.[9] Trends have changed and the balance of GHG emissions is globalized.[10]

The globalization of commerce is manifest. The modern mission statement of many U.S. corporations is to compete in global markets.[11] Global warming impacts are the side effect of our use of finite resources and of this globalization of commerce. Global carbon is becoming a metaenvironmental metric, extending beyond the media specifics of conventional environmental regulation.[12] A 2010 report for Ceres, a leading NGO on climate change, forecasts three key energy-related goals for the future: (1) reducing GHG emissions by up to 80%; (2) reducing emphasis on fossil fuel generation of electricity; and (3) increasing implementation of smart grid and energy-efficiency technologies.[13]

B. The Sustainable Corporation

First, let us define what is meant by a "sustainable corporation." Since a corporation is a well-defined legal concept, we must define the often ill-defined adjective "sustainable." There is not a universally accepted definition.

Lester Brown, president of the Earth Policy Institute, first

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8. *See* William McKibben, *How Close to Catastrophe?*, N.Y. REV. OF BOOKS, (2006) (book review) (quoting climatologist James Hansen to the effect that we have only until 2015 to reverse carbon emissions or face radically changing the planet).

9. Gregg Marland & Tom Boden, *The Increasing Concentration of Atmospheric CO_2: How Much, When, and Why?*, *in* INTERNATIONAL SEMINAR ON NUCLEAR WAR AND PLANETARY EMERGENCIES: 26TH SESSION 283 (Richard. C. Ragaini ed., 2002) [hereinafter *Atmospheric CO_2*].

10. The UNFCCC provides GHG emission data from various parties to the Convention. *See GHG Data from UNFCCC*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php (last visited July 9, 2011).

11. *See generally Microsoft Corporate Citizenship*, MICROSOFT, http://www.microsoft.com/about/corporatecitizenship/en-us/default.aspx (follow "Our Company" hyperlink and select "Global Presence" hyperlink) (last visited June 16, 2011); *Company: About GM*, GEN. MOTORS, http://www.gm.com/corporate/about/company.jsp (last visited June 16, 2011); *Global Presence*, THE HOME DEPOT, https://corporate.homedepot.com/wps/portal/ (last visited Sept. 2, 2011).

12. Steven Ferrey, *Corporate Responsibility and Carbon-Based Life Forms*, 35 B.C. ENVTL. AFF. L. REV. 419, 419–20 (2008).

13. CERES, THE 21ST CENTURY ELECTRIC UTILITY: POSITIONING FOR A LOW-CARBON FUTURE iv (2010), *available at* http://www.ceres.org/resources/reports/the-21st-century-electric-utility-positioning-for-a-low-carbon-future-1.

defined the term "sustainability" in 1991.[14] He defined a sustainable society as one that "satisfies its needs without jeopardizing the prospects of future generations."[15] His definition looks not only to the economic performance of corporations, but to quality-of-life changes and environmental impact.[16] Brown drew an analogy comparing traditional use of environmental resources to the stakeholders in a corporate setting:

> Our economics are engaged in a disguised form of deficit financing: processes such as deforestation and overpumping of groundwater inflate current output at the expense of long-term productivity. In sector after sector, we violate fundamental principles of environmental sustainability. Relying on an incomplete accounting system, one that does not measure the destruction of natural capital associated with gains in economic output, we deplete our productive assets, satisfying our needs today at the expense of our children . . . . To extend the analogy, it is as though a vast industrial corporation quietly sold off a few of its factories each year, using an accounting system that did not reflect these sales. As a result, its cash flow would be strong and profits would rise. Stockholders would be pleased with the annual reports, not realizing that the profits were coming at the expense of the corporation's assets. But once all the factories were sold off, corporate officers would have to inform stockholders that their shares were worthless.[17]

Jeffrey Sachs argues that "[w]e must strive to increase well-being around the world through economic growth, yet do it without wrecking the planet's climate or damaging ecosystems to the point where they fail to provide the services we need and sustain the biodiversity of our planet."[18] Sachs states that "[t]he world's current ecological, demographic, and economic trajectory is unsustainable, meaning that if we continue with 'business as usual' we will hit social and ecological crises with calamitous results."[19]

Native American philosophy held that humankind should think seven generations into the future when making decisions about the environment.[20] Economist Herman Daly adds, "there is something

14. CHARLES J. KIBERT, SUSTAINABLE CONSTRUCTION: GREEN BUILDING DESIGN AND DELIVERY 14–15 n.1 (2d ed. 2008).

15. LESTER R. BROWN ET AL., SAVING THE PLANET: HOW TO SHAPE AN ENVIRONMENTALLY SUSTAINABLE GLOBAL ECONOMY 30–31 (Linda Starke ed., 1991).

16. KIBERT, *supra* note 14, at 30.

17. BROWN ET AL., *supra* note 15, at 29.

18. JEFFREY D. SACHS, COMMON WEALTH: ECONOMICS FOR A CROWDED PLANET 308 (2008).

19. *Id.* at 5. Sachs calls this the recognition that all are subject to "[a] common fate on a crowded planet." *Id.* at 3.

20. KIBERT, *supra* note 14, at 30.

fundamentally wrong in treating the earth as if it were a business in liquidation."[21] Bernd Meyer advocates considering sustainable development in three different dimensions: social, ecological, and economic.[22] The latter two dimensions both concern passing on a natural or economic capital stock to our next generation.[23]

So there are many perspectives on "sustainability." The "Triple Bottom Line" concept of measuring an organization's performance based on its impact on people, profit, and planet has become mainstream in the realm of corporate social responsibility.[24] A sustainable corporation through this lens is "one that creates profit for its shareholders while protecting the environment and improving the lives of those with whom it interacts."[25]

In 1992, virtually every country in the world signed the Rio Declaration at a United Nations conference in Brazil.[26] The agreement establishes twenty-seven guiding principles for development and policy, including Principle 1, which states that sustainability is not solely about environmental policy and preservation, but instead is anthropocentric.[27] Sustainable development has been defined as development that "meet[s] the needs of the present without compromising the ability of future generations to meet their own needs."[28]

The UNFCCC, the United Nations Kyoto Protocol administrative body, does not actually define the term "sustainable development" in the Kyoto Protocol itself, though the phrase is repeated throughout the document.[29] Instead, the document gives guidelines on how to achieve sustainable development, all of which are highlighted in Article 2: enhancing energy efficiency in the economy; protecting carbon sinks; promoting sustainable agriculture; researching and developing alternative energy sources;

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21. BROWN ET AL., *supra* note 15, at 29.

22. BERND MEYER, COSTING THE EARTH? PERSPECTIVES ON SUSTAINABLE DEVELOPMENT 7 (Baker & Harrison trans., Haus Publishing 2008) (2007).

23. *Id.*

24. *See* Benjamin Wojcikiewicz, *Examining the Triple Bottom Line,* ALLBUSINESS (Mar. 1, 2008), http://www.allbusiness.com/management/best-practices/8956309-1.html.

25. ANDREW W. SAVITZ WITH KARL WEBER, THE TRIPLE BOTTOM LINE: HOW TODAY'S BEST-RUN COMPANIES ARE ACHIEVING ECONOMIC, SOCIAL, AND ENVIRONMENTAL SUCCESS–AND HOW YOU CAN TOO x (2006).

26. MEYER, *supra* note 22, at 57. Much of the work put into the Rio Declaration was based upon the 1987 Brundtland Report, which utilized Lester Brown's definition of sustainability but only expressed vague goals for worldwide adoption. *Id.* at 56.

27. United Nations Conference on Environment and Development, Rio de Janiero, Braz., June 3–14, 1992, *Rio Declaration on Environment and Development*, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. I), Annex I (Aug. 12, 1992).

28. Rep. of the World Comm'n on Envtl. Dev., 42d Sess, Dec. 11, 1987, U.N. Doc. A/RES/42/187; GA 96th Plenary Meeting.

29. Kyoto Protocol, *supra* note 6, *passim*.

promoting policies that reduce GHG emissions; and phasing out any market imperfections, tax exemptions, or subsidies that run counter to the Convention.[30] The definition of sustainability in this case seems to be intertwined with a reduction in carbon emissions. EPA goals for sustainability are set forth as:[31]

TABLE 1: PROPOSED SUSTAINABLE OUTCOME MEASURES

Natural Resource Systems	Sustainable Outcomes
Energy	Generate clean energy and use it efficiently
Air	Sustain clean and healthy air
Water	Sustain water resources of quality and availability for desired uses
Materials	Use materials carefully and shift to environmentally preferable materials
Land	Support ecologically sensitive land management and development
Ecosystems	Protect and restore ecosystem functions, goods, and services

So how does one evaluate a "sustainable" corporation? Ultimately, the sustainable corporation will be evaluated based on inputs and outputs. The "inputs" will assess how it operates its business activities: How big is its carbon footprint? How do employees access the business? How does it use energy in the business? How does it manage its emissions to the ambient air, the water, and the soil? On a second evaluative axis of "outputs": What does it produce? How does it transport its goods or services to market? Is the good or service recyclable?

There are various portals through which to evaluate sustainability. Every day, the average American throws away four-and-a-half pounds of material;[32] for every can of garbage an individual puts out, each factory that is part of the production process puts out seventy cans.[33]

This Article focuses on the inputs over which a corporation has some control, particularly the universal input of energy. Electricity production accounts for less than 5% of U.S. economic activity, yet is

30. *Id.* art. 2.
31. *See* OFFICE OF RESEARCH AND DEV., U.S. ENVTL. PROT. AGENCY, EPA 600/S-07/001, SUSTAINABILITY RESEARCH STRATEGY 16 (2007), *available at* http://yosemite.epa.gov/sab/sabproduct.nsf/36a1ca3f683ae57a85256ce9006a32d0/D24960CAEE6ECCAB852572FE00704EC0/$File/sab-07-007.pdf.
32. VAN JONES WITH ARIANE CONRAD, THE GREEN COLLAR ECONOMY: HOW ONE SOLUTION CAN FIX OUR TWO BIGGEST PROBLEMS 133 (2008).
33. *Id.*

responsible for about 25% of emission of certain criteria air pollutants.[34] The chief environmental strategist for Microsoft observed:

> For Microsoft, our biggest challenge is raising awareness among technology leaders and decision-makers (CIOs and tech purchasers for example) on the challenges presented by energy constraints. Currently, when I look across the industry, I see IT professionals who are not focused on energy; they see it as a mid-term problem rather than near term. There's a train coming down the track regarding energy consumption. Right now, they don't see it and they aren't worried, but they should be.[35]

To control GHG emissions, efficiency, better buildings, renewable generation, and a smart grid are all part of the sustainable equation of corporations:

> To meet this [climate control] goal, we must transform the way we make and use energy—we must maximize efficiency and make a major shift toward zero-GHG emissions in electric generation, smart electric transmission and distribution systems, low-carbon buildings, and zero-emission vehicles, and increase options for alternative modes of travel and land use.[36]

Energy is at the eye of the inquiry. The Ceres report foresees that sustainable corporations and utilities will (1) manage carbon reductions "across the enterprise"; (2) pursue all cost-effective energy efficiency; (3) integrate cost-effective renewable energy resources; and (4) incorporate smart grid technologies.[37] The Ceres Report also notes that[38] (1) RPS's are important policy tools; (2) net metering plays a critical role; and (3) energy efficiency can cost only

34. *See* Byron Wright, *Natural Gas Continues to be Best Choice for Generating Electricity*, http://www.elpaso.com/profile/docs/Natural_gas_doc.pdf (last visited Sept. 2, 2011) ("According to the Environmental Protection Agency . . . , in 2004, power generation was responsible for 67 percent of the oxides of sulphur (SO_x), 22 percent of the oxides of nitrogen (NO_x) and 34 percent of the carbon dioxide (CO_2) emissions in the United States."); *see also Climate Change: Greenhouse Gas Emissions*, *Human-Related Sources and Sinks of Carbon Dioxide*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/climatechange/emissions/co2_human.html (last updated Apr. 14, 2011).

35. Leslie Guevarra, *What Poses the Biggest Sustainability Challenge to Your Company in 2011?*, GREENBIZ.COM (Dec. 28, 2010, 6:00 AM), http://www.greenbiz.com/blog/2010/12/28/what-poses-biggest-sustainability-challenge-your-company-2011?utm_source=GreenBuzz&utm_campaign=f5525adf14-GreenBuzz-2011-01-03&utm_medium=email (statement of Rob Bernard, Chief Environmental Strategist, Microsoft Corp.).

36. Lisa Wood, *New York Will Need to Swap Out Fossil Fuel Units if it is to Reach GHG Goal, Report Says*, ELEC. UTIL. WK., Nov. 15, 2010, at 8.

37. CERES, *supra* note 13, at ix.

38. *Id.* at viii.

about 3 cents/kWh of energy saved, while new electricity costs 6 to 12 cents/kWh produced.[39] And these resources are concentrated around energy decisions. We will utilize the Ceres Report points above to focus on the corporation and energy use in the new vocabulary and value system of "sustainability" in a carbon-constrained economy.

I. CARBON PRESSURES ON CORPORATIONS

Carbon dioxide ("CO_2") has accounted for approximately 79% of global warming's potential effect since 1990.[40] Substantial portions of CO_2 emissions around the globe are attributable to the combustion of fossil fuels. This process alone accounts for roughly 57% of man-made CO_2 emissions.[41] It is no surprise that two industries that are heavily dependent upon fossil fuel combustion, electricity generation and transportation, account for 34% and 28%, respectively, of global GHG emissions.[42] They are the two large "gorillas" in the equation.

The importance of the electric sector to the modern industrial economy is reflected in its changing role. In 1949, only 12% of global warming gases in the United States came from the residential electric sector; by 2007, this percentage increased to more than 33%.[43] In 2008, the Energy Information Administration concluded that, compared to the transportation sector, the electric power sector offered the most cost-effective opportunities to reduce CO_2 emissions.[44] So the power sector will be the focus for carbon reduction.

The exogenous environmental pressure on corporations comes from two sources.[45] First, there is legislative and regulatory action that motivates and pressures corporate compliance and decision

39. *Id.* at iii.

40. U.S. ENVTL. PROT. AGENCY, EPA 430-R-11-005, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2009, at 2-1 (2011). Global Warming Potentials are one type of simplified index based upon radiative properties, which can be used to estimate the potential future impacts of emissions of different gases upon the climate system in a relative sense. *Id.* at ES-2 to ES-3.

41. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 36 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

42. *See* Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,539–40 (Dec. 15, 2009).

43. *See Energy Related Carbon Dioxide Emissions from the Residential and Commercial Sectors, by Fuel Type 1949–2007*, ENERGY INFO. ADMIN., http://www.eia.doe.gov/oiaf/1605/ggrpt/excel/historical_co2.xls (last visited July 9, 2011).

44. Charles Davis, *Energy Estimates Show Rise in CO_2 Emissions*, *Offer Mitigation Options*, CARBON CONTROL NEWS, June 30, 2008, at 20.

45. *See* Ferrey, *supra* note 12, at 431.

making. As submitted below, this regulation has not been particularly focused, coordinated, or effective with regard to climate control.

Indirectly, this regulation can affect access to private market capital.[46] CitiBank, J.P. Morgan Chase, and Morgan Stanley also unveiled "carbon principles" to evaluate and address carbon risks in financing electric power projects in February 2008.[47] There had been a significant upturn in litigation involving carbon emissions, even before the Supreme Court elevated carbon to a legally significant risk.[48] The prospect and actuality of this litigation is changing the legal landscape. Between 2010 and 2019, about 180 gigawatts ("GW") of wind and solar projects are expected to be added to the grid, according to the North American Electric Reliability Corporation ("NERC").[49]

The second source is the force exerted by the evolution of the common law as a driving pressure on corporate decision making. Corporations all have general counsels who are concerned about liability, risk, and exposure. And very recently, the color of such exposure has turned "green" and is denominated in carbon-equivalent units.[50] Let me note a few examples of recent litigation over GHG emissions.

Companies that make fossil-fuel-burning products were sued in *California v. General Motors Corp.*,[51] wherein the State of California

46. *See* Randy A. Nelson, Tom Tietenberg & Michael R. Donihue, *Differential Environmental Regulation: Effects on Electric Utility Capital Turnover and Emissions*, 75 REV. ECON. & STAT. 368, 368 (1993).

47. *See* Press Release, Carbon Principles, Leading Wall Street Banks Establish the Carbon Principles (Feb. 4, 2008), http://www.carbonprinciples.com/documents/Carbon%20Principles%20Press%20Release%20Final.pdf.

48. Massachusetts v. EPA, 549 U.S. 497, 526 (2007).

49. *See* N. AM. ELEC. RELIABILITY CORP., 2010 LONG-TERM RELIABILITY ASSESSMENT 14 (Oct. 2010), *available at* http://www.nerc.com/files/2010%20LTRA.pdf; *see also NERC 10-Year Assessment Sees "Significant Reduction" in Long-Term Energy Use*, POWERGEN WORLDWIDE (Oct. 20, 2010), http://www.powergenworldwide.com/index/display/articledisplay/7546437030/articles/powergenworldwide/Business/Policy/2010/10/nerc-assessment.html.

50. *See, e.g.*, Opinion, *The New Climate Litigation: How About if We Sue You for Breathing?*, WALL ST. J., Dec. 28, 2009, at A16.

51. *See* California v. Gen. Motors. Corp, No. 06CV-05755, 2006 WL 2726547, at *6 (N.D. Cal. Sept. 17, 2007) (order granting defendants' motion to dismiss) [hereinafter *Order to Dismiss*]. The State of California filed suit against six automobile manufacturers (General Motors Corporation, Toyota Motor North America, Inc., Ford Motor Company, Honda North America, Inc., Chrysler Motors Corporation, and Nissan North America, Inc.) under both the federal and California common law of public nuisance. California requested compensation for damages allegedly inflicted by vehicle greenhouse gas emissions as well as a declaratory judgment that the manufacturers be held liable for any further damages caused by climate change. California asserted that the vehicles the defendants manufactured account for 30% of California emissions, and that such emissions, a public nuisance, harm the coastline,

filed suit against six automobile manufacturers demanding compensation for indirect damage inflicted by vehicle GHG emissions. Those who purchased and drove the cars were not sued.[52] This suit was dismissed pursuant to the political question doctrine in September 2007.[53] A somewhat similar common law nuisance suit, decided by the U.S. Supreme Court in 2011, held unanimously that common law remedies for electric power plant CO_2 emissions were preempted by the Clean Air Act vesting authority in the EPA to regulate air pollutants.[54] This suit was initiated by a group of northern states against electric power utilities in more southern states, but interestingly, not against CO_2-emitting utilities in the plaintiffs' own states.[55]

While the 2011 Supreme Court opinion dismissing nuisance claims has terminated such common law suits, other suits regarding GHG emissions based on the Clean Air Act, the National Environmental Policy Act, and other statutes, remain.[56] Large industrial CO_2 emitters were the targets of litigation in Northwest Environmental Defense Center v. Owens Corning,[57] in which the plaintiff alleged that Owens Corning was constructing a manufacturing facility that would emit 250 tons of GHGs and ozone depletors without obtaining a required Air Contaminant Discharge Permit.[58] Without belaboring this point, let us next examine specific issues of sustainability presented to corporations regarding energy issues.

water supply, and treasury of California. The automobile manufacturers responded with three major arguments: (1) that the case raised non-judiciable political questions—i.e. that this is the type of issue for the (political) legislative and executive branches, not the judiciary, to decide; (2) that federal legislation has displaced federal common law on this topic; and (3) that the manufacturers did not cause the injury complained of. Defendants' Notice of Motion and Motion to Dismiss Second Amended Complaint for Lack of Subject Matter Jurisdiction and for Failure to State a Claim Upon which Relief may be Granted, California v. Gen. Motors. Corp, No. 06CV-05755, 2006 WL 2726547 (N.D. Cal. Sept. 17, 2007).

52. *See* Complaint for Damages and Declaratory Judgment, California v. Gen. Motors Corp., No. 06CV-05755, 2006 WL 2726547 (N.D. Cal. Sept. 20, 2006).

53. *See Order to Dismiss, supra* note 53, at *13–16.

54. Am. Elec. Power Co., Inc. v. Conn., 131 S.Ct. 2527 (2011).

55. *See id.*

56. *See id.*

57. 434 F. Supp. 2d 957 (D. Or. 2006).

58. *Id.* at 959–60. On July 8, 2005, Owens Corning filed a Motion to Dismiss which was denied in full by the Court on June 6, 2006. *Id.* at 974. On June 8, 2006, the parties executed a Stipulated Order of Dismissal that was incorporated into the Court's Judgment and Order on June 8, 2006. More of the recent stream of carbon litigation and its implications are discussed in my 2010 book. STEVEN FERREY, UNLOCKING THE GLOBAL WARMING TOOLBOX: KEY CHOICES FOR CARBON RESTRICTION AND SEQUESTRATION 133–44 (2010) [hereinafter KEY CHOICES].

II. RENEWABLE ENERGY

A. The Applicable Technologies

Renewable energy applications for corporations have become the signature of today's corporate "greenness."[59] Solar photovoltaic ("PV") applications adorn many corporate rooftops and more are coming.[60] Corporations are also deploying wind energy and geothermal heat pumps.[61] Renewable power is not a small investment of capital: a report to the California Public Utilities Commission estimates that causing Californians to obtain the now legally required 33% of their power from renewable resources by 2020 would require roughly $115 billion in new infrastructure spending.[62]

To put solar energy in context: solar energy is the source of all energy on earth, creating wind and water movement and ultimately creating plants,[63] biomass, and animals, which become fossil fuels when their organic matter decays. While the energy output of the sun in the direction of the earth is about 1300 W/m^2 at its source, only one-quarter of the solar constant value reaches the earth's spherical surface, one-third of which is reflected back into space by the earth's atmosphere, yielding as much as 342 W/m^2 at the surface of the earth at noon on a cloudless day, or about 170 W/m^2 of solar radiation in an average hour over the course of a year reaches the earth's oceans, and about 180 W/m^2 reaches the land surfaces.[64]

59. *See* Kerry A. Dolan, *Paying for Panels*, FORBES.COM (Aug. 16, 2007, 6:00 PM), http://www.forbes.com/2007/08/16/financing-solar-energy-tech-07egang-cz_kd_0816solarfinance_print.html.

60. *Id.*

61. *See* WORLDWATCH INST., AMERICAN ENERGY THE RENEWABLE PATH TO ENERGY SECURITY 13, 16 (2006), *available at* http://images1.americanprogress.org/il80web20037/americanenergynow/AmericanEnergy.pdf.

62. Lisa Weinzimer, *Let's Level with Ratepayers about High Costs of Renewables, California Regulator Says*, ELEC. UTIL. WK., Nov. 16, 2009, at 26.

63. Plants are a significant source of energy. Photosynthesis is an endothermic reaction requiring 2.8 megajoules ("MJ") of solar radiation to synthesize one molecule of glucose from six molecules of CO_2 and H_2O. VACLAV SMIL, ENERGIES: AN ILLUSTRATED GUIDE TO THE BIOSPHERE AND CIVILIZATION 42 (1999). Most of the terrestrial phytomass productivity in storage is in large trees in forests; phytoplankton species in the oceans store this mass in the hydrologic cycle. *Id.* at 46–48. Phytoplankton productions are 65% to 80% of the terrestrial phytomass total, but phytoplankton has a life span of only 1–5 days. *Id.* at 48. The most voluminous trees are the most massive life forms on earth, with the most phytomass, and are even larger than blue whales in mass. *Id.* at 51. Tropical forests use available nutrients rather inefficiently. *Id.* at 49–51.

64. *Id.* at 4–5. This results in total solar radiation annually of 2.7 x 10^{24} joules. *Id.* at 6. This amount of energy reaching the earth in the form of solar radiation is about 8000 times more than worldwide consumption of fossil fuels and electricity. *Id.*

Human capture of this energy is not efficient; energy used by humans equals only about 0.01% of the total solar energy reaching the earth.[65] Wind power's global energy potential is thirty-five times world electricity use.[66] Every seventy minutes, solar energy produces enough energy to supply humankind for an entire year.[67] In fact, no nation on earth uses more energy than the energy content contained in the sunlight striking existing buildings within the United States every day.[68] The solar energy falling on American roads each year contains roughly as much energy content as all the fossil fuel consumed in the world during that same year.[69] A study indicates that if the United States installed photovoltaic and solar-thermal systems on just 19% of the most barren desert land in the Southwest, all of our nation's electric needs would be met.[70]

Unlike finite fossil fuel, an existing stock that is diminished by it use, solar energy represents a constantly replenished flow. Tomorrow, the earth will have exactly as much solar energy as it has today, regardless of how much solar energy is used and consumed each day.[71] By contrast, burning a barrel of oil or a cubic meter of natural gas diminishes permanently that quantity of fossil fuels for the next day and for future generations.[72]

B. Direct Renewable Incentives for the 21st Century Corporation

"Sustainable" energy resources, in the form of renewable energy, are promoted by a variety of regulatory and tax incentives. There are direct tax incentive and stimulus funding for sustainable renewable energy investments by corporations.[73] By the end of 2010, the Treasury dispensed $5.44 billion in cash grants to 1387 renewable project developers, principally denominated by wind project developers ($4.6 billion of the total for wind, with another $414 million each for solar and for geothermal, landfill gas, hydroelectric, biomass and fuel cell), with another $9 billion of project eligibility in the pipeline.[74] The receipt by solar photovoltaic

65. STEVEN FERREY WITH ANIL CABRAAL, RENEWABLE POWER IN DEVELOPING COUNTRIES: WINNING THE WAR ON GLOBAL WARMING 36 (2006).

66. Amory B. Lovins et al., *Forget Nuclear*, SOLUTIONS, Apr. 6, 2008, at 6, *available at* http://www.rmi.org/Content/Files/SolutionsJournalSpring2008.pdf.

67. *Id.*

68. FERREY, *supra* note 65, at 36.

69. *Id.*

70. Robert F. Kennedy, Jr., *Foreword* to VAN JONES, *supra* note 32, at ix.

71. FERREY, *supra* note 65, at 36.

72. *Id.*

73. Farhana Hossain et al., *The Stimulus Plan: How to Spend $787 Billion*, N.Y. TIMES, May 30, 2011, http://projects.nytimes.com/44th_president/stimulus.

74. Jeffrey Ryser, *Solar Developers Seek Two-Year Extension of Cash Grant Program for New Projects*, ELEC. UTIL. WK., Nov. 22, 2010, at 9–10; Jeffrey Ryser, *Cash Grant Program for Renewable Projects Could Leave Government Owing $9 Billion*, ELEC. UTIL. WK., Dec. 13, 2010, at 3.

projects was led by projects in New Jersey, which offered the most generous state solar PV subsidies in 2009.[75] A retrenchment of New Jersey in 2010, and emergence of even more generous subsidies in Massachusetts, reshaped the flow of cash grants in 2010.[76]

At the federal level of incentives, the White House is seeking to double the amount of renewable energy used by the end of the Obama presidential term.[77] There are advantages for these additional benefits to early entrants.[78] The 30% Investment Tax Credit ("ITC") and accelerated depreciation apply to PV units placed into service in 2011.[79] Now there is Modified Accelerated Cost Recovery System ("MACRS") depreciation and bonus depreciation available.[80] The value of accelerated depreciation is worth about 26% of the installed system cost, on average.[81]

Thirty percent cash grants are available in lieu of ITCs.[82] In December 2010, Congress passed the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, which extends several expiring renewable energy and fuel tax incentives and includes some new incentives.[83] The Act extends the Section 1603 grant in lieu of tax credits, which, for solar investments, is similar to the production tax credit for wind power investments.[84] Qualifying projects include wind turbines, certain biomass facilities, geothermal facilities, landfill gas facilities, certain trash facilities, certain hydropower facilities, solar facilities, fuel cells, cogeneration facilities under 50 MW, gas microturbines, and geothermal heat pumps.[85]

75. Stacy Feldman, *New York Offers 50% Solar Subsidy, as East Coast Pulls Ahead in PV Growth*, SOLVE CLIMATE NEWS (Sept. 18, 2009), http://solveclimatenews.com/news/20090918/new-york-offers-50-solar-subsidy-east-coast-pulls-ahead-pv-growth?page=show.

76. MASS. GEN. LAWS ANN. ch. 25A, § 11F(g) (West 2011); 225 MASS. CODE REGS. 14.05(1)(a) (LexisNexis 2011).

77. Kate Galbraith, *Obama Speech Pushes Clean Energy*, N.Y. TIMES GREEN BLOG (Jan. 8, 2009, 2:41 PM), http://green.blogs.nytimes.com/2009/01/08/obama-speech-pushes-clean-energy/.

78. PHILLIP BROWN & MOLLY F. SHERLOCK, CONG. RESEARCH SERV., R41635, ARRA SECTION 1603 GRANTS IN LIEU OF TAX CREDITS FOR RENEWABLE ENERGY: OVERVIEW, ANALYSIS, AND POLICY OPTIONS 2 (2011), *available at* http://assets.opencrs.com/rpts/R41635_20110208.pdf.

79. *Id.* at 3–4.

80. *Id.* at 4.

81. JOHN WHITNEY, JR., CLEAN ENERGY ACTION PROJECT, SIGNIFICANT SUSTAINABLE ENERGY SYSTEMS: SOLAR PHOTOVOLTAIC ENERGY 11 (2010), *available at* http://web.me.com/whitneytwarc/CleanEnergyActionProject/Resources_files/CEAP%20Solar%20PV%20WP.pdf.

82. *See* BROWN & SHERLOCK, *supra* note 78, at 2.

83. Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, Pub. L. No. 111-312, §§ 701–708, 711, 124 Stat. 3296, 3310–3312, 3315.

84. *See* BROWN & SHERLOCK, *supra* note 78, at 2–4.

85. *Id.* at 3.

The United States is a price- and cost-driven economy. Many incentives are delivered through the U.S. tax system, which provides tax credits for certain investments and accelerated depreciation of costs, as set forth in Table 2 below. The tax credit is worth 2.2 cents/kWh generated; however, many projects cannot use the credit because they do not generate enough tax liability to offset it, and would have to engage in tax equity transactions to bring others into the transaction to realize the credit and cede some of its value in the transaction.[86] This is where the cash grant has particular value because it generates front-end cash, instead of operation credits.[87]

Without going into more elaborate detail about these various tax credits here—I note that the tax credits are set forth in detail in one of my books which is available electronically,[88] as is a detailed discussion of accelerated depreciation for certain renewable energy technologies.[89] It is noted that there are substantial tax benefits available for a variety of corporate investments in sustainable technologies that generate power, conserve energy, and/or accomplish transportation of corporate employees or corporate product.[90] In addition, there is a variety of additional financial aid provided by the Obama stimulus package.[91]

86. *Id.* at 8.
87. *Id.*
88. STEVEN FERREY, LAW OF INDEPENDENT POWER § 3:53.1 (2011).
89. *Id.* § 3:52.
90. *See* BROWN & SHERLOCK, *supra* note 78, at 2–4.
91. *See* Hossain et al., *supra* note 73.

TABLE 2: SUMMARY OF CREDIT FOR ELECTRICITY PRODUCED FROM CERTAIN RENEWABLE RESOURCES

Eligible electricity production activity (sec. 45)[1]	Credit amount for 2010[2] (cents per kilowatt-hour)	Expiration[3]
Wind	2.2	December 31, 2012
Closed-loop biomass	2.2	December 31, 2013
Open-loop biomass (including agricultural livestock waste nutrient facilities)	1.1	December 31, 2013
Geothermal	2.2	December 31, 2013
Solar (pre-2006 facilities only)	2.2	December 31, 2005
Small irrigation power	1.1	December 31, 2013
Municipal solid waste (including landfill gas facilities and trash combustion facilities)	1.1	December 31, 2013
Qualified hydropower	1.1	December 31, 2013
Marine and hydrokinetic	1.1	December 31, 2013

Table 2 Notes:

[1] Except where otherwise provided, all section references are to the Internal Revenue Code of 1986, as amended.

[2] In general, the credit is available for electricity produced during the first ten years after a facility has been placed in service.

[3] Expires for property placed in service after this date.

C. Renewable Portfolio Standards to Incentivize Corporate Investments

There are significant existing incentives for corporate investments in sustainable renewable energy, either for one's own use or as a corporate investment. Twenty-five states plus the District of Columbia have binding Renewable Portfolio Standards ("RPS") programs; four additional states have nonbinding RPS goals.[92] These mandatory RPS programs cover 46% of nationwide

92. RYAN WISER & GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., RENEWABLE PORTFOLIO STANDARDS IN THE UNITED STATES LBNL-154E 1, 35

retail electricity sales.[93] RPS programs were initially created in states that had restructured or deregulated (or a combination of the two) their retail power markets; however, over time, half of the RPS programs were in traditional monopolized retail electric service states.[94]

Approximately half of new renewable energy power capacity in the United States over the last decade has occurred in states with RPS programs in place,[95] which constitute 50% of the states.[96] Approximately 45% of the 4300 MW of wind power installed in the United States between 2001 and 2004 was motivated by state RPS programs, while an additional 15% of these installations were motivated by state renewable energy trust funds and subsidies.[97]

In certain states, there are substantially greater RPS incentives available to corporations that install solar photovoltaic technologies on their properties. Massachusetts, along with New Jersey and several other states, has a solar PV RPS carve-out to "require sufficient rate of return for end users, as well as project investors . . . ."[98] The stated purpose is to support solar photovoltaic installation "without the need for contracts with utility companies."[99] The carve-out forces the utilities to pay a premium price for eligible renewable power, an order of magnitude above what is paid for other renewable power resources or the bulk of non-renewable power.[100]

D. Net Metering of Corporate Renewable Power

Eighty percent of the states have electively adopted "net metering," which runs the retail utility meter backwards when a renewable energy generator puts power back to the grid.[101] Net

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(2008), *available at* http://eetd.lbl.gov/ea/ems/reports/lbnl-154e.pdf.

93. *Id.* at 1, 34.

94. *See* Steven Ferrey et al., *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 DUKE ENVTL. LAW & POL'Y F. 125, 146 (2010).

95. Ryan Wiser et al., *The Experience with Renewable Portfolio Standards in the United States*, 20 ELEC. J. 8, 12 (2007) (citing an estimate by Black and Veatch that half of the capacity equals approximately 5500 MW).

96. WISER & BARBOSE, *supra* note 92, at 1.

97. Ryan Wiser & Mark Bolinger, *Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans*, 19 ELEC. J. 48, 48 (2006).

98. *MA RPS Solar Carve-Out: Price Support Mechanism*, MASS. OFFICE OF ENERGY AND ENVTL. AFFAIRS., (Oct. 23, 2009), http://www.mass.gov/Eoeea/docs/doer/renewables/solar/MA%20RPS%20Solar%20Carve%20Out%20-%20Price%20Support%20Mechanism%20Design%20Document%20102309%20DOER.pdf.

99. *Id.*

100. *See* Steven Ferrey, *Net Metering*, *in* 2 ENCYC. OF ENERGY ENG'G AND TECH 1096 (Barney L. Capehart ed., 2007).

101. *Net Metering*, *The Green Power Network*, U.S. DEP'T OF ENERGY, http://apps3.eere.energy.gov/greenpower/markets/netmetering.shtml (last

metering can pay the eligible renewable energy source approximately three-to-four times more for this power when the meter rolls backwards at the retail rate than paid to any other independent power generators for wholesale power, and much more than the time-dependent value of this power to the purchasing utility.[102]

By turning the meter backwards, net metering effectively compensates the generator at the full retail meter service rate for transferring just the wholesale energy commodity. In 2001, the Federal Energy Regulation Commission ("FERC") held that state net-metering decisions were not preempted by federal law, because it hypothesized that no sale occurs when an individual homeowner, farmer, or similar entity installs distributed generation and accounts for its dealings with the utility through the practice of netting.[103] FERC deemed that a transfer of title to power does not constitute a "sale" in this situation.[104]

In Rhode Island, there was a challenge to net metering where the wind generator at a high school in Portsmouth was directly interconnected to the distribution grid, rather than first serving a substantial host load at the school.[105] The concern was whether, as an independent wholesale project, it could be paid no more than the avoided cost afforded to Qualifying Facilities under the Public Utility Regulatory Policies Act ("PURPA"),[106] rather than the net-metered calculation, which reflects a retail rate approximately 300% of wholesale-avoided cost.[107] The Rhode Island Division of Public Utilities and Carriers Advocacy Unit supported this complaint against the policy of the utility.

The typical net metering in the majority of states provides an additional non-tax incentive to corporations that produce surplus eligible renewable power, and monetize these credits. The costs of net-metering incentives—whereby surplus power can be "banked" or preserved, utilizing, at no cost to the corporation, the utility transmission and distribution system for such transfer and accounting—are reflected in higher electric power rates to other

visited June 3, 2011).

102. Ferrey, *supra* note 100.

103. *Id.* at 1096–97.

104. *Id.* at 1097.

105. Letter from Benjamin C. Riggs to Luly E. Massaro, Commission Clerk, Rhode Island Public Utilities and Carriers (May 19, 2010), *available at* http://www.ripuc.org/eventsactions/docket/D-10-126-Advocacy-Memorandum(2-2-10).pdf [hereinafter Riggs Letter].

106. *See generally* Memorandum from Jon G. Hagopian, Rhode Island Special Assistant Attorney General to the Rhode Island Division of Public Utilities and Carriers (Feb. 2, 2011), *available at* http://www.ripuc.org/eventsactions/docket/D-10-126-Advocacy-Memorandum(2-2-10).pdf.

107. Riggs Letter, *supra* note 105.

customers in that system.[108]

E. Legal Issues with Renewable Incentives

Renewable power incentives in a given state are a regulatory "asset" that is not guaranteed long term. Legal complexities can intrude: to date, key U.S. states are zero-for-three in trying to defend their promotion of renewable power or climate control through higher-than-market prices or programs that discriminate against out-of-state or in-state interests.[109]

In summary, feed-in tariffs enacted by states can run afoul of the Supremacy Clause of the Constitution and the Federal Power Act ("FPA"). The rates, terms, and provisions of any wholesale sale or transmission of electricity in interstate commerce are exclusively within federal jurisdiction and control, not state authority, under the FPA.[110] The Supreme Court in 1986, and again in 1988, 2003, and 2008, reaffirmed and enforced the Filed Rate Doctrine when states attempted to assert jurisdiction inconsistent with FERC's exclusive authority over wholesale rate and term determinations.[111] In 2010 and 2011, FERC issued its most recent ruling on state feed-in tariffs. FERC held that its authority under the FPA includes the exclusive jurisdiction to regulate the rates, terms, and conditions of sales for resale of electric energy in interstate commerce by public utilities.[112]

Several states are attempting to restrict the RPS income transfer to projects located exclusively within their state boundaries, even though electricity moves at near the speed of light, not respecting state boundaries in interstate commerce.[113] This in-state preference or limitation has been subject to legal challenge.

In a constitutional suit against the state of New York's Regional Greenhouse Gas Initiative ("RGGI") program (which also includes

108. Ferrey, *supra* note 100, at 1096.

109. MEYER, *supra* note 23, at 7.

110. *See* New England Power Co. v. New Hampshire, 455 U.S. 331, 340 (1982) (holding that "FERC has exclusive authority to determine the reasonableness of wholesale rates"). *See also* Miss. Power & Light Co. v. Mississippi, 487 U.S. 354, 371 (1988); *accord* Pub. Util. Dist. No. 1 v. FERC, 471 F.3d 1053, 1066 (2006) *aff'd in part, rev'd in part sub nom.* Morgan Stanley Capital Group, Inc. v. Publ. Util. Dist. No. 1., 554 U.S. 527, 545 (2008).

111. *See Morgan Stanley Capital Group, Inc.,* 554 U.S. at 545 (2008); Entergy La., Inc. v. La. Pub. Serv. Comm'n, 539 U.S. 39, 50 (2003); *Miss. Power & Light Co.*, 487 U.S. at 371–72 (1988); Nantahala Power & Light Co. v. Thornburg, 476 U.S. 953, 963 (1986) (holding that the Filed Rate Doctrine limitations also apply "to decisions of state courts").

112. *See* 16 U.S.C.A. § 824(a), (b)(1), (d), (e) (West 2011); *e.g.*, *Miss. Power & Light Co.*, 487 U.S. at 371.

113. *See* Amended Complaint for Injunctive and Declaratory Relief at 13–14, Am. Tradition Inst. v. Colorado, No. 1:11-cv-00859-WJMKLM (D. Col. Apr. 22, 2011).

ten Northeast states),[114] New York's quick settlement had Consolidated Edison Company agreeing to pay the cogeneration project for the cost of its additional carbon allowances through the end of their pre-existing long-term contracts.[115] The settlement allows the utility company to ask the New York Public Service Commission ("PSC") to pass through the cost of these allowances, or approximately $3 million annually, to utility customers. This would not be itemized on the bills for consumers to see, but would be included in normal charges.[116] In addition to the Indeck project, the Brooklyn Navy Yard Co-Generation Project and Selkirk Cogen Partners also received complete settlements where all economic impact shifted to the utility and its ratepayers.[117]

In April 2010, Massachusetts was sued by TransCanada alleging Commerce Clause violations in its requirement that state utilities enter long-term contracts with in-state new renewable energy projects, and that solar renewable energy credits be earned by in-state solar photovoltaic power projects.[118] Massachusetts immediately moved to settle this lawsuit rather than risk having its programs exposed to constitutional scrutiny by the federal courts handling this complaint.[119]

III. DISTRIBUTED GENERATION

Generating power at one's corporate site, whether or not done with renewable or conventional generation, can have significant financial and energy efficiency advantages for a corporation. Distributed generation generally refers to small-size power generation on the consumer's side of the utility meter.[120] The

114. A report in 2011 by RGGI claimed that of the $789.2 million raised from RGGI auctions, 52% had been invested in energy efficiency, 11% in renewable energy, 14% for assistance for energy bill payment, and 1% for greenhouse gas reduction. RGGI INC., INVESTMENT OF PROCEEDS FROM RGGI CO_2 ALLOWANCES 4 (2011), *available at* http://www.rggi.org/docs/Investment_of_RGGI_Allowance_Proceeds.pdf.

115. Press Release, Indeck Energy, Indeck Energy Sues State Questioning Legality of Regional Greenhouse Gas Program (Jan. 29, 2009), *available at* http://www.indeckenergy.com/pdfnews/RGGI%20Lawsuit%20012909%20.pdf.

116. Press Release, New York State Energy Research and Development Authority, Notice of Lodging of Consent Decree Pertaining to New York's Regional Greenhouse Gas Intitiative Regulations (Dec. 29, 2009), *available at* http://www.nyserda.org/rgginotice.asp.

117. *Id.*

118. Erin Ailworth, *State Looking to Settle Suit Over Law on Clean Energy*, BOS. GLOBE, May 27, 2010, at 9.

119. *See* Partial Settlement Agreement, TransCanada Power Mktg., Ltd. v. Bowles, No. 4:10-cv-40070-FDS (D. Mass. 2010), *available at* http://www.mass.gov/Eoeea/docs/doer/renewables/solar/Settlement-Agreement.pdf.

120. CONG. BUDGET OFFICE, PROSPECTS FOR DISTRIBUTED ELECTRICITY GENERATION, at ix (2003).

financial advantages come from avoiding the two-thirds of the utility bill that represent costs other than the generation of the power. The efficiency advantages occur from productively using on-site that two-thirds of the energy that is turned into waste heat from the centralized generation of power.

Future supply sources are less centralized and more diverse, whether these are dispersed renewable generation or on-site generation. Electricity is a signature technology of the modern era, which has existed only during the last 150 years of the entire span of human existence on the planet.[121] Electricity, unlike all other forms of energy, cannot be efficiently stored for more than a second before it is lost as waste heat.[122] Therefore, the supply of electricity must match the demand for electricity over the centralized utility grid of a nation on an instantaneous basis, or else the electric system shuts down or expensive equipment is damaged.[123]

On the customer side, self-generation and cogeneration are a critical part of the new grid. Cogeneration of electric power and usable heat by facilities on the consumer sides of the meter and grid can be more efficient than conventional power generation.[124] By generating both usable heat and power, factories and corporations can save money and significantly increase efficiency.[125] Systems already in place worldwide raised their total plant efficiency rates by 50% to 70%, and in some cases even up to 90%.[126]

Cogeneration can use any means for the production of electricity.[127] It avoids the use of transmission and distribution networks, thus avoiding about one-third of the retail charge for conventional power supply.[128] The total energy produced by the system exhibits much higher efficiency under the first and second laws of thermodynamics.[129] There also can be environmental advantages.[130] These efficiency and regulatory savings make this an attractive option to many consumers.

At its Mountain View, California offices, Microsoft Corporation

121. *See e.g.*, STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS § 12 (5th ed. 2010).

122. *Id.* at 542.

123. *Id.*

124. Steven Ferrey, *Exit Strategy: State Legal Discretion to Environmentally Sculpt the Deregulating Electric Environment*, 26 HARV. ENVTL. L. REV. 109, 118 (2002) [hereinafter *Exit Strategy*]. For a treatment of dispersed generation, *see* FERREY, *supra* note 88, at § 10:144.

125. BROWN, *supra* note 16, at 39.

126. *Id.*

127. FERREY, *supra* note 88, at §§ 4:17–4:18 (providing a definition of "small power producers" under federal law).

128. *Exit Strategy*, *supra* note 125, at 147.

129. *Id.* at 119.

130. *Id.* at 121–22.

self-generates 480 KW of power.[131] The Nestlé Japan Group built a cogeneration facility at one of its Japanese production plants that now has an efficiency rate of 92%.[132] Nestlé, upon seeing the success of the first plant, built a second similar natural gas cogeneration system in Japan in 2006 and is developing a tri-generation power plant in the Philippines that, when completed, would produce heat and power as well as cooling elements that would provide for the factory's chilled water.[133]

What is of significant potential is that American corporations can capture wasted energy sources created behind corporate retail utility meters. For example, industry expels as waste heat a significant fraction of energy use. By capturing that waste heat before it exits the stack, and converting it to electric power, there can be a substantial dispersed creation of power back into the grid.[134] New load control software allows the capability to control building management systems remotely, capture real-time energy data, and accurately compute customer baselines of energy use.[135] There is even a newly developed plug-in device that will allow a computer to control cycling of connected appliances, such as air conditioners, for any number of minutes when the system needs additional resources connected or disconnected to the grid.[136]

From a regulatory perspective, new ways of regulating transmission providers to decouple their rates and earnings exclusively from the total volume of power handled, to reflect various rate recovery mechanisms tied to explicit policy incentives, is gaining some support.[137] Decoupling the revenue stream determination of regulated distribution utilities from the volume of power they sell is a critical reform, which several states are trying in order to provide incentives for great efficiency in energy supply. Originally, there was a revenue decoupling requirement in the 2009

131. *See Microsoft Installs Silicon Valley's Largest Solar Panel System at Its Mountain View Campus*, *Microsoft News Center*, MICROSOFT (Apr. 21, 2006), http://www.microsoft.com/presspass/press/2006/apr06/04-21SolarPowerPR .mspx.

132. *Sustainability: Energy Goes Further with Cogeneration*, NESCAFÉ UK, http://www.nescafe.co.uk/energy_cogeneration_en_com.axcms (last visited June 19, 2011).

133. *Id.*

134. Tom Casten & Phil Schewe, *Getting the Most from Energy*, 97 AM. SCIENTIST 26, 30 (2009).

135. *See* FERREY, *supra* note 88, § 3:68 n.6 (discussing capabilities of load control software to manage energy use).

136. ALTERA, ECHELON & ALTIA CORPS., THE "ENERGY AWARE" APPLIANCE PLATFORM: A NEW APPROACH TO ENERGY CONTROL 4 (2009), *available at* http://www.altera.com/literature/wp/wp-01077-energy-aware-appliance-platfor m.pdf.

137. For a brief review of ratemaking procedure, see FERREY, *supra* note 121, at 543–45 (4th ed., 2007); for a review of legal precedent for ratemaking, see FERREY, *supra* note 88, § 5:44.

stimulus proposal for states to de-link utility rate of return determinations from the volume of power sales to garner competitively awarded funds, which was dropped in the version enacted to now only require an indication that the state is moving in that direction.[138]

IV. ENERGY EFFICIENCY

A. *The Basic Opportunity*

Doing more with less is a way to promote both sustainable efficiency and save costs of operation. While this is generally true, it is especially true in the use of energy. Greater efficiency could result in both the best of times and the worst of times. In the recession of 2008–09, consumers responded to a recession by cutting total power consumption: industrial demand decreased by about 10%.[139]

Corporations occupy built space, and there are fundamental efficiency options in that occupied space. In 2008, the United States was home to 114 million residential buildings and 4.7 million office buildings.[140] In a typical year, the United States adds 1.8 million new residential and 126,000 new commercial buildings.[141] Together they account for more than one-third of the total energy consumed in the United States and more than two-thirds of electricity consumption.[142] American buildings are also responsible for 39% of the CO_2 emissions in the United States, leading transportation and industry sectors as the prime contributor.[143]

138. American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5 §§ 1101–04, 123 Stat. 115, 319–21 (2009) (codified at 26 U.S.C. § 48).

139. U.S. ENERGY INFO. ADMIN., DOE/EIA-0383, ANNUAL ENERGY OUTLOOK 2011 WITH PROJECTIONS TO 2035 117 (2011), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2011).pdf.

140. *See* U.S. DEP'T OF ENERGY, ENERGY EFFICIENCY TRENDS IN RESIDENTIAL AND COMMERCIAL BUILDINGS 4 (2008), *available at* http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/bt_stateindustry.pdf; *see also Fast Facts on Energy Use*, ENERGY STAR, http://www.energystar.gov/ia/business/challenge/learn_more/FastFacts.pdf (last visited June 21, 2011).

141. *See Table A1, Summary Table for All Buildings (Including Malls), 2003*, *CBECS Detailed Tables*, ENERGY INFO. ADMIN. (June 2009), http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html; *Table 9.1, Enclosed Floorspace and Number of Establishment Buildings, 2002*, *Energy Consumption by Manufacturers—Data Tables*, ENERGY INFO. ADMIN. (June 2009), http://www.eia.gov/emeu/mecs/mecs2002/data02/pdf/table9.1_02.pdf.

142. U.S. ENERGY INFO. ADMIN., DOE/EIA-0384, ANNUAL ENERGY REVIEW 2009 40, 259 (2010), *available at* http://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf.

143. *Buildings and Climate Change,* U.S. GREEN BLDG. COUNCIL, http://www.documents.dgs.ca.gov/dgs/pio/facts/LA%20workshop/climate.pdf (last visited June 7, 2011).

There is no universally accepted definition of energy efficiency. It is somewhat in the eye of the beholder. To engineers, efficiency describes the thermodynamic "fit" between a task and the qualitative and quantitative energy needed to perform that task. An economic perspective would trade off costs and services received from efficiency. To some environmentalists, energy efficiency is the reduction of certain higher-pollution sources of electric production without much regard for the marginal cost of electricity. Some define energy efficiency as "using less energy to provide the same service."[144]

Efficiency is achieved by mandatory government codes and standards regarding appliances and new construction, and also achieved by market-driven efficiency choices made by individual consumers paying the prices of alternatives. In response to economic circumstances, the Obama Administration's stimulus package included significant incentives for the electric sector, pouring almost $80 billion in spending and $20 billion in tax incentives into renewable energy and efficiency, as part of the $787 billion stimulus plan.[145] This includes $12.35 billion for energy efficiency improvements through low-income weatherization, state block grants, public and Section 8 housing efficiency, and Department of Defense efficiency.[146]

There is $6 billion for a loan guarantee program for renewable energy projects under construction by September 2011, which should support about $60 billion of renewable loans for renewable power and transmission projects.[147] There is a 30% investment tax credit for advanced energy manufacturing; a 30% advanced energy facilities tax credit that applies to transmission and grid-related new equipment; and $1.6 billion of Clean Renewable Energy Bonds ("CREBs"), first created by the Energy Policy Act of 2005.[148]

Funding conservation incentives through higher utility rates is not new. Over the past twenty years, utility ratepayers, perhaps unknowingly, have funded energy efficiency investments.[149] Currently, thirty-five states implement ratepayer-funded energy efficiency programs with a budget of $3.1 billion in the most recent

144. *What's Energy Efficiency?*, LAWRENCE BERKELEY NAT'L LAB., http://eetd.lbl.gov/ee/ee-1.html (last visited June 2, 2011).

145. *See* Hossain et al., *supra* note 73.

146. *Id.*

147. American Recovery and Reinvestment Act of 2009, §§ 1101–1104.

148. Press Release, The White House Office of the Press Secretary, President Obama Awards $2.3 Billion for New Clean-Tech Manufacturing Jobs, (Jan. 8, 2010), *available at* http://www.whitehouse.gov/the-press-office/president-obama-awards-23-billion-new-clean-tech-manufacturing-jobs.

149. GALEN BARBOSE ET AL., LAWRENCE BERKELEY NAT'L LAB., LBNL-2258E, THE SHIFTING LANDSCAPE OF RATEPAYER-FUNDED ENERGY EFFICIENCY IN THE U.S. 1 (2009).

year surveyed.[150] Budgets have been up to 1% of revenues from utility retail sales, with annual savings of about 0.5% of retail sales.[151] These budgets are expected to rise to between $5.4 and $12 billion by 2020.[152]

B. Demand-Side Management ("DSM") and Response

One approach to control energy inputs is to manage one's demand for energy both as to amount and as to time of use. First, some context. Both sides of the grid are in play.

In 1994, per capita consumption in America was 339 MMBtu of energy, making this per capita consumption higher than for any other major country except for Canada and the Netherlands.[153] What is the relevance of this disparity? If the United States used energy as efficiently as Japan, it would lower the US national fuel bill by more than $300 billion per year.[154] In 1986, the United States used 10% of its GNP to pay the national fuel bill, while Japan used only 4% of its GNP.[155] The difference was $200 billion that United States corporations did not have available to invest in other areas.[156] As a result, the average Japanese product then had an automatic cost advantage of about 5% in the United States market. Japan is not only richer for its efficiency, it also has positioned itself to influence the world market for many high-efficiency technologies.

Money has been devoted to fund energy efficiency in the United States in the past, and again recently. Prior expenditure for energy efficiency programs in the United States peaked at $1.7 billion in 1993–94 and then began a steep decline after the California Public Utilities Commission remarked in April 1994 that it intended to restructure California's electric industry; eighteen other states followed.[157] By 1998, annual additional DSM expenditures had been halved.[158] This has since been reinvigorated. In 2009, the

150. *Id.*

151. *Id.*

152. *Id.*

153. *Table E.1c, World Per Capita Total Primary Energy Consumption, 1980-2006*, *International Energy Annual 2006*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/iea/wecbtu.html (last visited June 7, 2011).

154. Amory B. Lovins, *Four Revolutions in Energy Efficiency*, VIII CONTEMP. POL'Y ISSUES 122, 125 (1990).

155. Ellyn R. Weiss & James Salzman, *The Greening of American Energy Policy*, 63 ST. JOHN'S L. REV. 691, 700 n.44 (1989); *see also Macroeconomics in Japan*, FACTS AND DETAILS, http://factsanddetails.com/japan.php?itemid=896&catid=24&subcatid=154 (last visited June 10, 2011) (Japanese energy consumption per unit of GDP is the smallest of any nation in the world, half that of the United States.).

156. Lovins, *supra* note 154, at 123–25.

157. CARL BLUMSTEIN ET AL., LAWRENCE BERKLEY NAT'L LAB., LBNL-53597, WHO SHOULD ADMINISTER ENERGY EFFICIENCY PROGRAMS? 6–7 (2003), *available at* http://eetd.lbl.gov/ea/ems/reports/53597.pdf.

158. Clark W. Gellings et al., *Assessment of U.S. Electric End-Use Energy*

Department of Energy awarded more than $155 million in stimulus funds to forty-one industrial efficiency projects, including district energy systems and combined heat and power facilities.[159]

DSM and conservation can be effective on both a corporate and national scale. Since the 1970s, electricity use per capita in the United States has increased by about 50%, while in California, with aggressive energy conservation programs, it has remained relatively flat.[160] In the summer of 2001, California ratepayers used approximately 8% less electricity during peak periods than during the summer of the prior year; 32% of ratepayers qualified for the rebate program where they received a rebate of 20% on their bills by using 20% less than they consumed one year before.[161] In 2002, about one-half of the conservation savings initiated in 2001 persisted.[162] The Duke Power Company, an electric utility, captured reductions of 18% during the summer and 24% during winter peak hours through DSM programs.[163]

By the year 2000, California energy demand per capita closely mirrored the peak levels of 1973, prior to the energy crisis of the 1970s.[164] Since that period, the average size of new homes increased by more than 25%, appliance saturation proliferated,[165] commuting distances increased by 33% on average, and vehicle horsepower and

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Efficiency Potential, 19 ELEC. J., 55, 62 (2006) (citing a 2005 ACEEE study).

159. *Secretary Chu Announces More than $155 Million for Industrial Energy Efficiency Projects*, U.S. DEPT. OF ENERGY (Nov. 3, 2009, 12:00 AM) http://energy.gov/articles/secretary-chu-announces-more-155-million-industrial-energy-efficiency-projects.

160. Howard Geller et al., *Policies for Increasing Energy Efficiency: Thirty Years of Experience in OECD Countries*, 34 ENERGY POL'Y 556, 569 (2006).

161. CHARLES A. GOLDMAN ET AL., LAWRENCE BERKELEY NAT'L LAB.,LBNL-49733, CALIFORNIA CUSTOMER LOAD REDUCTIONS DURING THE ELECTRICITY CRISIS: DID THEY HELP TO KEEP THE LIGHTS ON? 13 (2002), *available at* http://eetd.lbl.gov/ea/EMS/reports/49733.pdf.

162. CAL. ENERGY COMM'N, 100-03-019, 2003 INTEGRATED ENERGY POLICY REPORT 7 (Dec. 2003), *available at* http://www.energy.ca.gov/reports/100-03-019F.pdf.

163. *See* ERIC HIRST, OAK RIDGE NAT'L LAB., ORNL/CON-285 ELECTRIC-UTILITY ENERGY-EFFICIENCY AND LOAD-MANAGEMENT PROGRAMS: RESOURCES FOR THE 1990S 4 (1989). These savings had been accomplished through emergency load-control interruption programs, commercial sector lighting and heating programs, and industrial programs. *Id.*

164. *See* Geller et al., *supra* note 160, at 569–70 fig.8.

165. American consumers pay more than $3 billion annually in electric energy operating costs for appliances that have an "instant-on" feature. Essentially, these appliances can be dispatched immediately by remote control, but an efficiency price is paid for such convenience. This is equivalent to keeping ten power plants operating just to keep appliances ready when they are not being used. New micro-processor technology is being developed that would reduce such stand-by appliance energy use. ALAN MEIER, WOLFGANG HUBER & KAREN ROSEN, LAWRENCE BERKELEY NAT'L LAB., REDUCING LEAKING ELECTRICTY TO 1 WATT (1998), *available at* http://standby.lbl.gov/pdf/42108.html.

speed limits increased between 2006 and 2009.[166] Commercial sector DSM energy impacts are concentrated in indoor lighting, heating, space cooling, and whole-building end uses.[167]

The investment in electric efficiency equipment would cost between one-quarter and one-half the price of power supplied from construction of new power plants.[168] This could produce a kilowatt-hour of increased efficiency, thus freeing a kilowatt-hour of capacity of an existing power plant, for less than or equal to utilities' costs of producing a kilowatt-hour of electricity from new and existing generating plants.[169]

DSM programs typically cost less to implement than building new generating facilities.[170] In one region, power supplied through installation of high-efficiency equipment costs on average between one-quarter to one-half the price of power supplied from new power plants.[171] These savings have significant secondary effects, including national debt reduction and cost control.[172] Least-cost strategies provide investment dollars for other opportunities[173] and promote national security by reducing reliance on imported oil.[174]

An assessment of potential conservation savings for electricity indicated that the median technical potential is 33%, the median economic potential is 21.5%, and the median achievable potential is 24%.[175] Focusing just on building energy use in cities, the U.S.

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166. Andreas Schafer, *Regularities in Travel Demand: An International Perspective*, J. TRANSP. & STAT. (2000), *available at* http://ntl.bts.gov/lib/10000/10900/10907/1schafer.pdf.

167. Ahmad Faruqui et al., *Clouds in the Future of DSM,* 7 ELEC. J. 54, 60 (1994). Industrial-sector DSM energy impacts are concentrated in motor-drive improvements and whole-plant innovations. *Id.* at 62.

168. NEW ENGLAND ENERGY POLICY COUNCIL, POWER TO SPARE, A PLAN FOR INCREASING NEW ENGLAND'S COMPETITIVENESS THROUGH ENERGY EFFICIENCY 4–6 (June 1987) [hereinafter POWER TO SPARE]. The Council's analysis considered what savings could be realized if "all cost-effective electrical efficiency improvements were fully implemented." *Id.*

169. *Id.* The economic comparison amortizes the cost of the conservation devices and methods for various energy end-uses, and categorizes these for their useful lifetimes over a given number of years.

170. *Id.*

171. *Id.* at 6.

172. C. Flavin & A. Durning, *Raising Energy Efficiency*, *in* STATE OF THE WORLD, 1988: A WORLDWATCH INSTITUTE REPORT ON PROGRESS TOWARD A SUSTAINABLE SOCIETY 6, 9 (Lester Brown et al. eds., 1988).

173. *See* POWER TO SPARE, *supra* note 168, at 15.

174. WORLDWATCH INST., AMERICAN ENERGY THE RENEWABLE PATH TO ENERGY SECURITY 8 (2006*), available at* http://images1.americanprogress.org/il80web20037/americanenergynow/AmericanEnergy.pdf.

175. STEVEN NADEL ET AL., AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., THE TECHNICAL, ECONOMIC, AND ACHIEVABLE POTENTIALS FOR ENERGY EFFICIENCY IN THE UNITED STATES: A META-ANALYSIS OF RECENT STUDIES (2004), *available at* http://www.dleg.state.mi.us/mpsc/electric/capacity/cnf/demand/ee_%20potentialjul_2004.pdf. Both the Gas and Electric Institute and the Rocky Mountain Institute have predicted that the technical potential of electricity

Congress Office of Technology Assessment forecast that by using existing technologies and feasible investments, seven quadrillion Btu of energy annually could be saved through greater efficiency.[176] This represents a potential efficiency savings equal to more than half the current energy consumption of these buildings.

There is a significant dispute as to what the cost of energy conservation is. Some analysts, such as Amory Lovins, argue that the cost is less than $0.01/kWh savings achieved, while analysis by Electric Power Research Institute ("EPRI") puts the amount closer to $0.04/kWh saved; research by Joskow argues that this may understate the true achieved cost by a factor of two.[177] Because of the prevalence of "free riders" in energy conservation programs, other research by Loughran and Kulick in 2004 estimated that the cost was between $0.14 and $0.22/kWh actually achieved after factoring out the free rider subsidy from the realized benefit attributable to the energy conservation financing incentive.[178]

In 2009, the American Council for an Energy-Efficient Economy ("ACEEE") reported that the cost of energy conservation had been maintained at about $0.025/kWh saved.[179] It is generally concluded that energy efficiency is available at a cost of approximately $0.03/kWh saved by the efficiency investment.[180] Comparatively, the investment in electric efficiency equipment would cost between one-quarter and one-half the price of power supplied from construction of new power plants.[181] The EPA has determined that energy efficiency reductions can be made at approximately half the cost that new generation can be implemented, making energy efficiency a cost-effective solution for utilities looking to reduce their

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saving of certain appliances is as great as 75% of U.S. electricity use. Ten to forty percent of electric motor electricity consumption could be conserved with cost-effective conservation changes; motors consume approximately two-thirds of corporate industrial electricity. Paul E. Scheihing et al., *United States Industrial Motor-Driven Systems Market Assessment: Charting a Roadmap to Energy Savings for Industry*, *Industrial Technologies Program*, U.S. DEP'T OF ENERGY, http://www1.eere.energy.gov/industry/bestpractices/us_industrial_motor_driven.html (last visited Sept. 1, 2011).

176. U.S. CONG., OFFICE OF TECH. ASSESSMENT, ENERGY EFFICIENCY OF BUILDINGS IN CITIES 45 (1982). "Feasible" investments were defined as those demonstrating cost-effectiveness over a twenty-year period, assuming no real increases in energy prices and a 3% real return on investment. *Id.*

177. Gellings, *supra* note 158, at 64–65.

178. *Id.*

179. *See* KATHERINE FRIEDRICH ET AL., AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., REPORT NO. U092, SAVING ENERGY COST-EFFECTIVELY: A NATIONAL REVIEW OF THE COST OF ENERGY SAVED THROUGH UTILITY-SECTOR ENERGY EFFICIENCY PROGRAMS 15 (2009).

180. EPA, ENERGY EFFICIENCY ACTION PLAN – CONTEXT AND FRAMEWORK 12 (2005), *available at* http://www.epa.gov/cleanenergy/documents/suca/lg-dec-05_background.pdf (presuming $0.03/kwh).

181. POWER TO SPARE, *supra* note 168, at 4, 6.

GHG production.[182]

This total DSM potential, if implemented, could trim 7.5% of peak-period electric consumption.[183] The North American Electric Reliability Corporation estimates that interruptible load and direct control load management now reduces national summer peak by about 2.5%.[184] In 2006, FERC assessed the demand-responsive potential within the United States as 37,500 MW.[185] This varied by region, with most regions of the United States having between 3% and 7% peak demand-response capability.[186] Reducing peak demand can have a more than proportionate influence in decreasing consumer costs, because making the electric system more efficient by shaping load saves a disproportionate amount of consumer cost. San Diego Gas & Electric Co. is expected to have in place in 2011 a peak-time rebate plan for those who shift load to off-peak times, and by 2012, have a peak-pricing plan as the basic plan for all commercial and industrial customers.[187] Currently, companies such as EnerNOC provide energy management services that enable companies to profit by lightening their electrical loads at times of peak demand.[188] Twenty-four states currently offer DSM incentive mechanisms.[189]

One ambitious estimate claims that if all cost-effective energy efficiency measures were implemented by 2025, these measures alone would meet 50% of the expected load growth and achieve over $500 billion in net savings.[190] A report to FERC in 2009 concluded that with demand-response resources, peak electric demand in the United States could be cut 38 to 188 GW.[191] This would occur if all

182. U.S. ENVTL. PROT. AGENCY, NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY 6-5 (2006), *available at* http://www.epa.gov/cleanenergy/documents/suca/napee_report.pdf.

183. Steven Ferrey, *Restructuring a Green Grid: Legal Challenges to Accommodate New Renewable Energy Infrastructure*, 39 LEWIS & CLARK ENVTL. L. REVIEW 977, 995 (2009).

184. N. AM. ELEC. RELIABILITY CORP., DATA COLLECTION FOR DEMAND-SIDE MANAGEMENT FOR QUANTIFYING ITS INFLUENCE ON RELIABILITY 1 (2007), *available at* http://www.nerc.com/files/Demand-response.pdf.

185. FED. ENERGY REGULATORY COMM'N, STAFF REPORT, DOCKET NO. AD-06-2-000, ASSESSMENT OF DEMAND RESPONSE & ADVANCED METERING viii (2008), *available at* http://www.ferc.gov/legal/staff-reports/demand-response.pdf.

186. *Id.*

187. *The Benefits of Smart Meters*, CAL. PUB. UTIL. COMM'N, http://www.cpuc.ca.gov/PUC/energy/Demand+Response/benefits.htm (last visited June 4, 2011).

188. *Energy Management Solutions*, ENERNOC, http://www.enernoc.com/solutions/ (last visited June 4, 2011).

189. ENERNOC, UTILITY INCENTIVES FOR DEMAND RESPONSE AND ENERGY EFFICIENCY 6–7 (2009), *available at* http://www.enernoc.com/resources/files/wp-util-incnt-final.pdf.

190. U.S. ENVTL. PROT. AGENCY, *supra* note 182, at ES-2.

191. FERC, STAFF REPORT, A NATIONAL ASSESSMENT OF DEMAND RESPONSE POTENTIAL at x (2009), *available at* http://www.ferc.gov/legal/staff-reports/06-09

customers had advanced metering and the ability to respond to price incentives.[192] Whichever side of the debate that one subscribes to, the potential is large.

Subsidies for corporate conservation are not equally promoted by the states. In 2009, an ACEEE report ranked California, Massachusetts, and Connecticut as the top three states in energy efficiency efforts.[193] The least productive energy efficiency states were dominated by Southern states.[194] Currently, thirty-five states implement ratepayer-funded energy efficiency programs with a budget of $3.1 billion in the most recent year surveyed.[195] Total budgets have been up to 1% of revenues from utility retail sales, with annual savings of about 0.5% of retail sales. This is expected to rise to between $5.4 and $12 billion annually by 2020.[196] The Electricity Policy Research Institute estimates that energy efficiency programs have the potential to reduce the annual electricity use growth rate by 22% from 2008 to 2030, yielding an approximately 5% reduction in total US 2030 electricity consumption.[197] Efficiency is forecast to be able to reduce summer peak demand by 14%.[198]

C. Corporate Actions for Efficiency

McKinsey concluded that it is possible to reduce emissions dramatically, with existing and emerging technologies, at a reasonable cost: a half-trillion dollar investment in energy efficiency would result in a 23% reduction in energy consumption and a savings of twice the expenditure.[199] McKinsey estimates that approximately 40% of the abatement below fifty dollars per ton could be achieved at zero or negative marginal costs; in other words, "investing in these options would generate positive economic returns over their life cycle."[200] The cumulative savings created by these negative-cost options could "substantially offset" (on a societal basis)

-demand-response.pdf.

192. *Id.* at ix–x.

193. Am. Council for an Energy-Efficient Econ., THE 2009 STATE ENERGY EFFICIENCY SCORECARD, REPORT NO. E097 (2009), http://www.aceee.org/sites/default/files/publications/researchreports/E097.pdf.

194. *Id.*

195. BARBOSE ET AL., *supra* note 149.

196. *Id.*

197. ELEC. POWER RES. INST., ASSESSMENT OF ACHIEVABLE POTENTIAL FROM ENERGY EFFICIENCY AND DEMAND RESPONSE PROGRAMS IN THE U.S.: 2010–2030, 7 (2009), *available at* http://www.edisonfoundation.net/iee/reports/EPRI_SummaryAssessmentAchievableEEPotential0109.pdf.

198. *Id.*

199. U.S. GREENHOUSE GAS ABATEMENT MAPPING INITIATIVE, REDUCING U.S. GREENHOUSE GAS EMISSIONS: HOW MUCH AT WHAT COST? ix (2007), *available at* http://www.mckinsey.com/en/Client_Service/Sustainability/Latest_thinking/~/media/McKinsey/dotcom/client_service/Sustainability/cost%20curve%20PDFs/US_ghg_final_report.ashx.

200. *Id.* at xii.

the additional spending required for the options with positive marginal costs.

Some examples of this sustainability are illustrative. General Mills turned its solid waste into profits. The company used to pay $100 per ton to dispose of its oat hulls, a Cheerios by-product.[201] However, the company realized the hulls could be burned as fuel.[202] Now customers compete to buy what was once waste. In 2006, General Mills recycled 86% of its solid waste, earning more than it spent on disposal.[203]

The Xerox Corporation has a strategic environmental plan that seeks to achieve "waste-free products and waste-free facilities for waste-free workplaces."[204] Its first foray is the DocuColor iGen2 Digital Press, which uses nontoxic ink and 97% of its components can be recycled or reused.[205] In addition, the company has launched a recovery program to take back printers and copy machines at the end of their useful lives for recycling.[206]

Ford Motor Company's environmentally sustainable choices include soy foam seating, which is standard on at least six models the company produces, as well as 100% post-industrial recycled materials in its seat coverings including superfluous plastic from the soda bottle manufacturing process and un-dyed polyester fibers.[207] The company is also completing more life-cycle analyses of products and, as such, is beginning to revamp its paint and electronic strategies for vehicles to utilize more biomaterials and recyclable content.[208] Ford's overall mission for sustainability is to reduce its footprint at each of its plants, and to do so means standardized reporting on their ability to satisfy environmental regulations, the amount of waste created (and actually disposed of), the amount of water used, and its GHG and other emissions.[209] Initial pilot programs to create energy use reductions at factories included lighting upgrades, air compressor controls, and more Energy Star products and education; this led to a 30% reduction in facility energy use from 2000–07 and a 39% reduction in the amount of CO_2

201. Mark Borden et al., *50 Ways to Green Your Business*, FAST COMPANY (Oct. 22, 2007), http://www.fastcompany.com/magazine/120/50-ways-to-green-your-business.html.
202. *Id.*
203. WORLD ECONOMIC FORUM, GROWTH THROUGH SUSTAINABILITY 3 (2008), *available at* http://www.bain.com/WEFweb/WEF_Growth_through_sustainability.pdf.
204. KIBERT, *supra* note 14, at 32.
205. *Id.*
206. *Id.*
207. Jeanette Clute, *Sustainable Manufacturing Practices and Business Strategies: Sustainable Business Strategies* (Sept. 24, 2008), http://www.oecd.org/dataoecd/46/48/41503412.pdf.
208. *Id.* at 10.
209. *Id.* at 13.

generated by Ford's factories in the same time period.[210] The electricity demand for its Cologne, Germany plant is entirely satisfied by renewable energy sources on site.[211]

At the climate change conference of parties in Cancun, Mexico, in 2010, at a side meeting for business leaders, Dow Chemical CEO Andrew Liveris announced that his company is reaping $50 billion in annual revenue from the sale of its clean-tech products, such as solar shingles and coatings for energy-saving "cool" roofs, and sugarcane-based plastic, the production of which emits far fewer greenhouse gases than petroleum-based plastic.[212] Siemens' portfolio likewise topped $37 billion in 2010. Nearly half of its 8,000-plus inventions last year involved technologies that improve energy efficiency and sustainability—innovations such as coatings for power plant turbine blades, ultra-efficient lighting systems, and electric car charging technologies.[213]

Caterpillar conducted a life-cycle analysis on one of its bulldozers, concluding that 97% of the negative environmental impact created by the product was due to use, which is out of the manufacturer's control.[214] The remaining roughly 3% was a result of the maintenance and replacement of tires during the expected life (eight years) of the product and from manufacturing.[215] The company identified innovative methods to reduce even its 3% share and also influence the amount of impact caused by regular usage—it recycled parts of the body at the end of life (reduction of 1% achieved), it implemented changes that can reduce fuel usage by 20% per hour, it reduced the number of moving parts in the drive train by 60%, and it increased the efficiency of design so as to allow for 25% more material to be moved per gallon of fuel used by the bulldozer.[216] The company recycled its paint powder and increased the efficiency of the automatic spray guns to save half a million dollars a year, create 30% less GHG emissions, and use 40% less energy.[217]

Coca-Cola performed a study to analyze the amount of water it

210. *Id.* at 15.

211. *Id.* at 17.

212. Mindy S. Lubber, Op-Ed, *Support U.S. Businesses Making Green Investments*, ATLANTA J. CONST. (Jan. 7, 2011), http://www.ajc.com/opinion/support-u-s-businesses-798485.html?cxtype=rss_opinion_82093.

213. *Id.*

214. Jody Howard, *Sustainable Manufacturing*, 8 (Sept. 24, 2008), *available at* http://www.oecd.org/dataoecd/47/4/41503487.pdf. Almost all of this impact is due to engine use. *Id.*

215. *Id.*

216. *Id.* at 9. At the time of the presentation (2008), Caterpillar was also recycling 79% of its generated waste. *See 2009 Sustainability Report: Goals and Progress*, CATERPILLAR, http://producttour.cat.com/Microsites/US/ARSR2009/SR2009/performance.html (last visited Sept. 1, 2011).

217. Howard, *supra* note 214, at 14.

was using in the creation of a liter of Coke.[218] Though it wanted to decrease the amount from 3 liters to 2.5 liters, the company realized that it took an additional 200-plus liters to water the sugar cane that the company later added to make their signature product. The corporation teamed up with the World Wildlife Fund to conduct a water footprint analysis and as a result, the company decided to alter the way it irrigates its sugarcane fields.[219] Coca-Cola announced that it has removed the potent global warming pollutant HFC from 200,000 of its refrigeration units, and that it hopes to make its entire supply chain of ten million refrigeration units completely HFC-free by 2015.[220]

According to one study, companies practicing corporate sustainability had a stronger share price performance.[221] The Economist Intelligence Unit conducted a survey of corporations and those who rated their efforts in the sustainability arena highest saw their share price grow 45% during the test period and realized an annual profit increase of 16% as opposed to those who ranked themselves worst (only 12% and 7%, respectively).[222]

There are tax incentives for investments in energy efficiency. Internal Revenue Code section 179D provides a deduction equal to energy-efficient commercial building property expenditures made by the taxpayer.[223] Energy-efficient commercial building property expenditures are defined as property (1) that is installed on or in any building located in the United States that is within the scope of Standard 90.1-2001 of the American Society of Heating, Refrigerating, and Air Conditioning Engineers and the Illuminating Engineering Society of North America ("ASHRAE/IESNA"); (2) that is installed as part of (i) the interior lighting systems, (ii) the heating, cooling, ventilation, and hot water systems, or (iii) the building envelope; and (3) that is certified as being installed as part of a plan designed to reduce the total annual energy and power costs with respect to the interior lighting systems, heating, cooling, ventilation, and hot water systems of the building by 50% or more in

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218. *Product Water Footprint Assessments: Practical Application in Corporate Water Stewardship*, COCA-COLA CO. (2010), http://www.thecoca-colacompany.com/presscenter/TCCC_TNC _WaterFootprintAssessments.pdf.

219. *The Coca-Cola Partnership,* WORLD WILDLIFE FUND, http://www.worldwildlife.org/what/partners/corporate/coke-old/ (last visited Sept. 1, 2011).

220. Lubber, *supra* note 213. Four hundred global consumer goods manufacturers joined their effort for a "gigaton-scale commitment" to phase out HFC refrigerants by 2015. *Id.*

221. PAUL KIELSTRA, DOING GOOD: BUSINESS AND THE SUSTAINABILITY CHALLENGE 6 (Gareth Lofthouse & James Watson eds., 2008), *available at* http://graphics.eiu.com/upload/Sustainability_allsponsors.pdf.

222. *Id.*

223. I.R.C. § 179D (2006).

comparison to a reference building which meets the minimum requirements of Standard 90.1-2001 (as in effect on April 2, 2003).[224] The deduction is limited to an amount equal to $1.80 per square foot of the property for which such expenditures are made, and allowed in the year in which the property is placed in service.[225]

If a deduction is allowed under this section, the basis of the property is reduced by the amount of the deduction. The deduction is effective for property placed in service prior to 2014.[226] In the case of a building that does not meet the overall building requirement of a 50% energy savings, a partial deduction is allowed with respect to each separate building system that comprises energy-efficient property and that is certified by a qualified professional as meeting or exceeding the applicable system-specific savings targets established by the Secretary of the Treasury.[227] The maximum allowable deduction is $0.60 per square foot for each separate system.[228]

D. LEED

LEED, an acronym for Leadership in Energy and Environmental Design, is a leading green building rating system administered by the U.S. Green Building Council.[229]

"Sustainable construction considers the role and potential interface of ecosystems to provide services in a synergistic fashion."[230] The seven principles of sustainable construction are: (1) Reduce resource consumption (reduce); (2) Reuse resources (reuse); (3) Use recyclable resources (recycle); (4) Protect nature (nature); (5) Eliminate toxics (toxics); (6) Apply life-cycle costing (economics); and (7) Focus on quality (quality).[231]

Green buildings tend to yield higher rents, lower vacancies and quicker tenant absorption rates.[232] Data suggests that green buildings have 13% higher rental rates, tenants take close to three fewer sick days per year, and if the building uses separate metering for tenants, it typically lowers energy costs by 21% per year and yields a $4 per square foot increase in rent.[233] The Empire State

224. *Id.*
225. *Id.*
226. *Id.*
227. *Id.*
228. *Id.*
229. *What LEED Is*, U.S. GREEN BUILDING COUNCIL, http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988 (last visited June 23, 2011).
230. KIBERT, *supra* note 14, at 10.
231. *Id.* at 9.
232. Norm G. Miller & Dave Pogue, *Do Green Buildings Make Dollars and Sense?* 5 (C. B. Richard Ellis, Working Paper 09-11, Nov. 6, 2009), *available at* http://www.cbre.com/NR/rdonlyres/BDFE965C-10DF-455A-82BC-4CD5A14F938A/794420/DoGreenBuildingsMakeDollarsandSensedraftNov102009.pdf.
233. *Id.* at 3.

building is currently going through a retrofit costing $20 million to make it more energy efficient, but the building is expected to reduce its energy consumption by about 40% ($4.4 million annually) and repay the cost in less than five years.[234]

The U.S. Green Building Council's ("USGBC") LEED building assessment standard started in 2000 and has gained wide acceptance.[235] States including Rhode Island, Connecticut, Maryland, Nevada, and Hawaii enacted state-wide green building codes requiring LEED Silver certification or higher on certain new projects.[236] To date, about 35% of USGBC-certified buildings are in the private sector.[237] Private sector acceptance, coupled with support from federal and many state governments, has resulted in a near doubling of LEED certifications each year since 1998.[238]

An exemplary LEED-certified building is the National Resources Defense Council office in Santa Monica, California.[239] The building uses about one-third the energy of other Santa Monica office buildings by cooling mainly with ocean breezes, and maximizing day-lighting. The building is powered by renewable resources, largely through a 7.5 kW solar array on its roof.[240] The building that was on the site before was deconstructed and 98% of the materials were recycled into the new NRDC building.[241] In terms of water conservation, the toilets have a dual-flush option, the building uses rainwater and gray water for the toilets and irrigation, and the building saves about 40,000 gallons of water a year by utilizing waterless urinals.[242]

Bank of America Tower, which is the second-tallest building in New York, is the first skyscraper in America to pursue LEED Platinum certification.[243] It has a geothermal heat-exchange system that is the first of its kind in a high-rise. In the winter, pumps draw heat from groundwater to help warm the building; in the summer, the process will work in reverse, pumping excess heat into the bedrock beneath the tower. The system contributes to the building's goal of using just half the electricity of a conventional building its size.[244] Another green building, Solaire, is a twenty-seven-story residential high-rise in New York City's Battery Park. The building

234. *Id.* at 4.
235. KIBERT, *supra* note 14, at xi.
236. *Green Building and Energy Efficiency Requirements for Public Buildings,* NATIONAL CONFERENCE OF STATE LEGISLATURES, http://www.ncsl.org/default.aspx?tabid=12987 (last visited Sept. 1, 2011).
237. KIBERT, *supra* note 14, at 3.
238. *Id.*
239. *Id.* at 4.
240. *Id.*
241. *Id.*
242. *Id.*
243. Borden, *supra* note 201.
244. *Id.*

itself has photovoltaic cells on its façade, uses 35% less energy than other comparable buildings, and uses a rainwater recovery system to water its roof gardens.[245]

In terms of corporate energy strategies to reduce carbon emissions, Starbucks plans to obtain half of its energy for company-owned stores from renewable sources and reduce energy usage in new stores 25% by the end of 2015.[246] In 2009, 25% of the electricity was from renewable sources, and overall the company saw a decrease in usage of 1.7% during 2009 by improving HVAC efficiency and beginning to install LED lighting in its stores.[247] The company expects that percentage to be much larger in 2010 as the LEED upgrading project is completed.[248]

The federal government plans to open the largest zero-energy office building in August 2011. The building, located at the Department of Energy's National Renewable Energy Laboratory in Golden, Colorado, will be 222,000 square feet and an estimated 800 employees will use the building when it opens.[249] By utilizing passive design techniques such as day-lighting and sending computer reminders to employees to open and close their windows at certain times to keep an efficient temperature in relation to the outside temperature, the building is designed to use 50% less energy than similar commercial buildings in the area.[250] Though the building costs $259 per square foot, the Department of Energy is hoping to recoup those additional costs with a zero expenditure for energy.[251]

There has been extensive litigation regarding green buildings, primarily surrounding a failure to meet LEED standards.[252] Design professionals may be subject to a higher standard of care if they present themselves as LEED-accredited and may face a heightened liability if there are design defects,[253] and contractors risk liability if they fail to perform up to standards [254] under tort, contract, or

245. KIBERT, *supra* note 15, at 14.

246. *Starbucks Shared Planet Goals & Progress 2009*, STARBUCKS COFFEE CO., http://www.starbucks.com/responsibility/learn-more/goals-and-progress/energy#open (last visited June 6, 2011).

247. *Id.*

248. *Id.*

249. Jim Witkin, *For a Premier Lab, A Zero-Energy Showcase*, N.Y. TIMES GREEN BLOG (July 6, 2010), http://green.blogs.nytimes.com/2010/07/06/for-a-premier-lab-a-zero-energy-showcase.

250. *Id.*

251. *Id.*

252. Kate Galbraith, *The Legal Risks of Building Green*, N.Y. TIMES GREEN BLOG (May 29, 2009), http://green.blogs.nytimes.com/2009/05/29/the-legal-risks-of-building-green/.

253. KATE BOWERS & LEAH COHEN, THE GREEN BUILDING REVOLUTION: ADDRESSING AND MANAGING LEGAL RISKS AND LIABILITIES ii (Mar. 10, 2009), *available at* http://www.mgkflaw.com/Green%20Building%20Revolution.pdf.

254. *Id.*

statutory theories. Tort claims include allegations of fraud or negligence.[255] Breach of contract claims include failure to deliver a promised level of certification, failure to meet energy standards, and breach of an implied warranty for workmanship.[256] Statutory claims made on green buildings are usually based on consumer protection statutes.[257]

LEED and Energy Star standards can be integrated into local building codes.[258] In 2008, Massachusetts Governor Patrick issued Executive Order No. 484, requiring, among other things, that all new construction at state agencies and significant renovation projects over 20,000 square feet meet the Massachusetts LEED Plus building standard.[259] The Executive Order acknowledges that sixty-four million square feet of building space owned by the state results in greenhouse gas emissions totaling more than one million tons per year, or the equivalent of more than 200,000 cars driven for one year.[260] This standard includes, in relevant part: "Certification by the U.S. Green Building Council Leadership in Energy and Environmental Design . . . program for all new construction and major renovation projects over 20,000 square feet," and "Energy performance 20% better than the Massachusetts Energy Code."[261]

There is much that is being done and can be done for greater energy efficiency in corporate new construction and substantial rehabilitation projects. Going forward, building codes will make more of these steps mandatory.

V. TRANSPORTATION SECTOR

A. *The Challenge for Transportation*

Transportation is a sector of the economy that has distinct impacts on corporate operations. Modern industrial transportation has been powered almost exclusively by liquid fuels. These liquid fuels are derived from petroleum. Oil has particularly been the energy source of the world economy over the past century, although electricity arguably is becoming a dual *foci* of the modern economy. For decades, the EPA has distinguished between mobile (transportation sector) sources and stationary sources in the

255. *Id.*
256. *Id.*
257. *Id.*
258. PATRICIA E. SALKIN, SMART GROWTH AND THE GREENING OF COMPREHENSIVE PLANS AND LAND USE REGULATIONS 3 (2008), *available at* http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1162499_code83276.pdf?abstractid=1162499&mirid=1.
259. Gov. Patrick, Mass., Exec. Order No. 484, 9 (Ap. 18, 2007), *available at* http://www.mass.gov/Agov3/docs/Executive%20Orders/Leading%20by%20Example%20EO.pdf.
260. *Id.* at 1.
261. *Id.* at 9.

regulation of air quality.[262] The U.S. transportation sector, constructed around these mobile sources operating on petroleum-driven transportation modalities, has encouraged sprawled and dispersed land-use patterns, which lengthen commutes and product deliveries.[263]

There are limits to a fossil-fuel-based modern economy centered on use of oil. Consider the curve of world oil use. The oldest continuously operated oil well in the world, McClintock #1, is located south of Titusville, Pennsylvania, where modern oil extraction was discovered at the time of the Civil War (starting operations in 1861). Its initial output was about fifty barrels of oil per day and after nearly 150 years, the well produces about one barrel per day.[264] Oil is a finite and dwindling resource.

Geophysicist King Hubbert developed an algorithm in 1956 to forecast oil production: it rises to a peak that can never be surpassed, and then declines while prices go up.[265] Hubbert predicted well in advance that oil production in the United States would peak between 1965 and 1970. It peaked in 1971. On this Hubbert curve, global oil production was expected to peak in 2010,[266] with others arguing it will be somewhat later.[267]

With total historic oil reserves estimated to be 1800 to 2200 billion barrels, about 1080 billion barrels were already extracted between the beginnings of commercial exploitation in 1860 and 2005.[268] Another 1500 to 1600 billion barrels remain to be extracted, of which 1000 billion barrels are proven reserves; the remaining 500 to 600 billion barrels are reasonable assumptions about potential additions.[269]

Of note, however, use of oil over its 150 years is not evenly distributed over time. About 50% of all petroleum consumption took place after 1984, while about 90% of all petroleum consumption occurred after 1958 in the most recent trimester of oil usage.[270] Under such trends, most of the remaining oil could be extracted and consumed by 2060. No significant new oil reserves have been found since the 1970s, which does not bode well for the oil reserves that could be added to the 1000 billion barrels of proven reserves.[271]

262. Clean Air Act, 42 U.S.C §§ 7401–7671q (2006).
263. JAMES M. MCELFISH, JR., ENVTL. LAW INST., TEN THINGS WRONG WITH SPRAWL 3 (2007).
264. Dr. Jean-Paul Rodrigue, *The Geography of Transport Systems*, HOFSTRA UNIVERSITY, http://people.hofstra.edu/geotrans/eng/ch5en/appl5en/worldoilreservesevol.html (last visited Sept. 1, 2011).
265. *Id.*
266. *Id.*
267. Rodrigue, *supra* note 264.
268. *Id.*
269. *Id.*
270. *Id.*
271. *World Oil Capacity to Peak in 2010 Says Petrobras CEO,* THE OIL

Current estimates are not locked in: in 2005, Kuwait admitted that its largest field had peaked and that the extent of its reserves could be one-half of what was expected.[272] The Cantarell oil field, Mexico's largest, has also peaked, with its output dropping to 1.7 million barrels per day in 2007, down from its peak output of 2.1 million.[273]

CEO Gabrielli of oil supplier Petrobras suggested that the world needs oil volumes the equivalent of one additional Saudi Arabia-sized oil field every two years to offset future world oil decline rates.[274] Sadad al-Husseini, former Aramco oil executive, concluded that world oil production already is on a peak plateau.[275] Notwithstanding declining supply, transportation has environmental impacts. Burning a gallon of gasoline, which weighs 6.3 pounds, releases to the atmosphere 5.5 pounds of carbon, which in the atmosphere combines into more than 20 pounds of CO_2.[276] There also is a cost in time and money to transportation. Some of this cost benefits government—there is an 18.4 cent/gallon federal tax on gasoline, plus an average 31.1 cent/gallon state tax on gasoline.[277]

B. Corporate Transportation Issues

Transportation has increased. In the U.S. alone, the number of car trips on major highways increased 96% since 1968.[278] A study reported that congested roads in the twenty-five largest U.S. urban centers cost commuters an estimated $43 billion annually in wasted time and fuel costs.[279] As of 2009, the U.S. transportation sector consumed about 13.27 million barrels of petroleum per day, 86% more than the 7.27 million barrels produced in the U.S. per day.[280] According to the U.S. Census in 2000, "among the 128.3 million workers in the U.S. in 2000, 76 percent drove alone to work."[281] The

DRUM, (Feb. 4, 2009), http://www.theoildrum.com/node/6169.

272. *Id.*

273. *Id.*

274. *Id.*

275. *Id.*

276. Tom Stodola, *How Can 6.3 Lbs. of Gasoline Turn Into 20 Lbs. of Carbon Dioxide?*, PRINTING INDUS. ASS'N OF S. CAL., http://www.piasc.org/pdf/green/Gasoline2CarbonDioxide.pdf (last visited Sept. 1, 2011).

277. *Gasoline Taxes*, AM. PETROLEUM INST. (May 2011), http://www.api.org/statistics/fueltaxes/upload/May2011%20gasoline%20and%20diesel%20summary%20pages.pdf.

278. JIM MOTAVALLI, BREAKING GRIDLOCK: MOVING TOWARD TRANSPORTATION THAT WORKS 3 (2003).

279. *Id.* at 4.

280. *Overview of U.S. Petroleum Production, Imports, Exports, and Consumption*, BUREAU OF TRANSP. STATISTICS, *available at* http://www.bts.gov/publications/national_transportation_statistics/html/table_04_01.html (last visited June 25, 2011).

281. U.S. CENSUS BUREAU, C2KBR-33, JOURNEY TO WORK: 2000 (2004), *available at* http://www.census.gov/prod/2004pubs/c2kbr-33.pdf (last visited

report determined that "12 percent carpooled, 4.7 percent used public transportation, 3.3 percent worked at home, 2.9 percent walked to work, and 1.2 percent used other means (including motorcycle or bicycle)."[282]

Increased traffic congestion has implications for individuals and businesses, costing the American economy $87.2 billion annually.[283] Total U.S. CO_2 emissions in 2008 were 5802 million metric tons of carbon, with the transportation sector responsible for one-third of that.[284] Combined, "rail and truck transport consume over 35 billion gallons of diesel fuel per year," which creates "over 350 million metric tons of carbon dioxide annually."[285]

The transportation choices of corporate employees also have an impact. A 2010 study found that the typical household in the Boston area spends about $22,000 on housing annually, and this amount represents about 35% of the annual median household income.[286] When the study added in the amount that the typical household spent on transportation, approximately $12,000, the household costs for combined housing and transportation rose to 54% of household income.[287] The burden and cost of long commutes or excessive car trips can negate any savings realized in housing costs by living farther from work.[288] There was a similar study concentrating on the suburbs of San Francisco,[289] where homebuyers could expect to find a similar home for about $5000 less every mile they moved east of the city center.[290] In contrast to the American transportation model, Europeans take four to eight times as many public-transit trips than Americans do.[291]

For new activities that require permits and have a significant impact, environmental impact assessments in Massachusetts under

Sept. 1, 2011).

282. *Id.*

283. Press Release, U.S. House of Representatives Committee on Small Business Subcommittee on Investigations and Oversight, Traffic Congestion Costing U.S. $87.2 Billion a Year (July 16, 2009), *available at* http://democrats.smbiz.house.gov/PressReleases/2009/pr-7-16-09-highway-bill.html.

284. U.S. ENERGY INFO. ADMIN., U.S. CARBON DIOXIDE EMISSIONS FROM ENERGY SOURCES 2008 FLASH ESTIMATE 16 (2009), *available at* http://www.eia.gov/OIAF/1605/FLASH/pdf/flash.pdf.

285. *SmartWay Transport*, EPA, http://www.epa.gov/smartway/ (last visited Sept. 1, 2011).

286. BOSTON REGIONAL CHALLENGE, URBAN LAND INST. 1 (2009), http://bostonregionalchallenge.org/wp-content/uploads/BostonChallenge04092010.pdf.

287. *Id.* ULI performed similar studies in Washington, D.C., and San Francisco and found a burden of 47% and 59%, respectively. *Id.*

288. *Id.* These commutes also increase greenhouse gas emissions. *See id.*

289. MOTOVALLI, *supra* note 278, at 26.

290. *Id.* (analyzing data from Tracy, a distant suburb of San Francisco).

291. *Id.* at 193.

the Massachusetts Environmental Policy Act require corporations to calculate transportation-related emissions when analyzing the carbon footprint of a company, with a list of measures that corporations can take to reduce the amount of emissions created as a result of transportation. This includes changes in siting and project design to emphasize transit options, subsidizing transit passes, bicycle storage and shower areas, a reduction in idling or a prohibition of engine idling in loading areas, an increase in telecommuting, rightsizing parking capacity, alternative fuel, and a concentration on pedestrian access.[292]

At the beginning of 2011, Massachusetts unveiled a new concept for a transportation plan for GHG emission reductions by floating the concept of auto insurance whereby annual miles driven would be a factor in setting individual consumer auto insurance rates.[293] This pay-as-you-drive concept was developed in a 2008 Brookings Institute study and MIT research.[294] The Boston Globe responded with an editorial position that insurance rates based on greater miles driven disadvantages those with long commutes, and encouraging purchase of more efficient gas-saving cars should be pursued instead.[295] This editorial does not discuss that there is a differential environmental impact based on lack of incentives supporting sustainable alternatives.

To attack the problem of longer travel times, increased transport costs, and the lack of reliable delivery which compel manufacturers and businesses to hold more inventory or to add extra time for shipments, many companies are looking to technologies that improve transportation efficiency both to help their bottom lines as well as their environmental profiles.[296] For instance, Land O'Lakes, a national farmer-owned food and agricultural cooperative, increased its "overall transportation efficiency by six percent between 2006 and 2009, by focusing on energy-efficient transportation, optimizing routing, and improving the efficiency of transportation resources."[297] An effort is underway

292. ALICIA MCDEVITT, MASSACHUSETTS ENVIRONMENTAL POLICY ACT (MEPA) GREENHOUSE GAS (GHG) EMISSIONS POLICY AND PROTOCOL OVERVIEW 11–14 (2008), *available at* http://www.mass.gov/Agov3/docs/smart_growth/conference08/a1_mcdevitt.pdf.

293. *See* EXECUTIVE OFFICE OF ENERGY AND ENVTL. AFFAIRS, MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN FOR 2020 11 (2010), *available at* http://www.mass.gov/Eoeea/docs/eea/energy/2020-clean-energy-plan.pdf.

294. *Id.* at 51.

295. Editorial, *Driving: No 'Pay as You Go' Premiums*, BOS. GLOBE, Jan. 13, 2011, http://articles.boston.com/2011-01-13/bostonglobe/29339373_1_greenhouse-gases-premiums-drivers-face.

296. TRANS. RES. BD., CRITICAL ISSUES IN TRANSPORTATION 2–3 (2009), *available at* http://onlinepubs.trb.org/Onlinepubs/general/CriticalIssues09.pdf.

297. *Land O'Lakes CSR Report: Energy Use Down 7%*, FIELD TO MARKET (Sept. 20, 2009), http://www.fieldtomarket.org/news/2010/land-o-lakes-energy

to encourage similar action among a broad collection of companies.

The EPA SmartWay Transport Partnership is a "collaboration between EPA and the freight sector designed to improve energy efficiency, reduce greenhouse gases, and improve energy security."[298] The program has close to 3150 partners and affiliates.[299] The program's "projected savings of between 3.3 and 6.6 billion gallons of diesel fuel per year represents a savings of as much as 150 million barrels of oil per year."[300]

One of the program partners is Wal-Mart, owner of the second largest shipping fleet in the country. The company is providing funding to create the first heavy-duty diesel-hybrid truck and the worldwide corporation states that its overall goals include having zero waste, being supplied 100% by renewable energy, and to create products that encourage sustainability for both the product and the environment.[301] Wal-Mart announced its plan to cut twenty million metric tons of GHG emissions from its supply chain by 2015.[302] Retrofits of supplier's factories and energy audits allowed Wal-Mart's suppliers to eliminate over 3,000 metric tons of GHG emissions and saved $200,000 on energy costs in the first year.[303] Wal-Mart achieved a fleet that is 65% more efficient in 2010 compared to 2005 by loading trucks and cases more efficiently, lowering the number of empty truck miles driven, improving routing, and installing fuel-saving technology in its trucks.[304] In 2009, the corporation added several alternatively fueled trucks into its fleet to analyze its footprint; it is testing fifteen trucks that run on waste grease, five trucks powered by liquid natural gas, one full-propulsion hybrid truck, and five diesel-electric hybrid assist trucks.[305]

Sun Microsystems' Open Work Program gives employees the option to work from home and, in 2006, Sun saved $67.8 million in real-estate costs, prevented nearly 29,000 tons of CO_2 emissions, and increased worker productivity by 34%.[306] Bayer, Inc. notes that

-use-down/.

298. *SmartWay Transport*, *supra* note 285.

299. *Id.*

300. *Id.*

301. John Gartner, *Diesel-Hybrid Trucks to Green Wal-Mart's Fleet*, MATTER NETWORK (Feb. 6, 2009), http://www.matternetwork.com/2009/2/diesel-hybrid-trucks-green-wal.cfm.

302. WALMART, BUILDING THE NEXT GENERATION WALMART . . . RESPONSIBLY: 2011 GLOBAL RESPONSIBILITY REPORT 97 (2010), *available at* http://walmartstores.com/media/factsheets/fs_2311.pdf.

303. *Greenhouse Gas Elimination: Fact Sheet*, WALMART (Feb. 25, 2010), http://walmartstores.com/media/factsheets/fs_2311.pdf.

304. WALMART, *supra* note 302, at 14.

305. *Walmart Takes Lead on Environmental Sustainability*, WALMART (March 1, 2010), http://walmartnewenglandcan.com/sustainability/Sustainability_Fact_Sheet.pdf.

306. Borden, *supra* note 201.

the company limits the number of business trips and increasingly uses teleconferences as an alternative.[307] Microsoft reduced the traffic in Seattle by over ten million car miles per year by introducing Microsoft Connector, a free shuttle service for commuting employees.[308] The company also runs a hybrid-vehicle shuttle service throughout its large campus.[309] Additional transportation solutions the company uses are assisted carpooling, subsidizing carpools, and offering free public transportation to its employees and vendors.[310] Transportation-related solutions include developing Microsoft Office Live Meeting and other technologies that can, according to a joint study by Microsoft and Forrester Research, reduce corporate travel by 10% to 30%.[311]

As part of Dole's mitigation efforts, the company is updating its 13,000-container fleet with replacements that are 35% more energy efficient.[312] In addition, the corporation is using larger vessels with a 1000-container capacity to limit the number of sea trips made and minimize the footprint per unit.[313] Japan Airlines is trying to utilize the "Eco-flight" concept using optimal speeds, routes, and altitudes to reduce energy usage.[314]

CONCLUSION: THE METAVALUE OF CARBON AND ENERGY

Corporations will respond to price incentives and requirements under law. What are the relative costs and benefits of different "sustainable" measures for a corporation? On the "benefits" side, a federal RPS is estimated to reduce greenhouse gases by 508 million metric tons of CO_2 equivalent a year by 2020, and energy efficiency measures would be expected to cut emissions an additional 425 million metric tons of carbon dioxide-equivalent ("$MMtCO_2e$").[315] These are equally effective tools if effectively implemented. Strong building codes also have a savings impact of 161 $MMtCO_2e$.[316]

307. *Bayer AG*, UNEP CLIMATE NEUTRAL NETWORK, http://new.unep.org/CLIMATENEUTRAL/Default.aspx?tabid=903 (last visited Sept. 1, 2011).
308. *Microsoft*, UNEP CLIMATE NEUTRAL NETWORK, http://www.unep.org/climateneutral/default.aspx?tabid=566 (last visited Sept. 1, 2011).
309. *Id.*
310. *Id.*
311. *Id.*
312. *Dole Fresh Fruit International*, UNEP CLIMATE NEUTRAL NETWORK, http://www.unep.org/climateneutral/default.aspx?tabid=239 (last visited Sept. 1, 2011).
313. *Id.*
314. *Japan Airlines*, UNEP CLIMATE NEUTRAL NETWORK, http://www.unep.org/climateneutral/default.aspx?tabid=.896 (last visited Sept. 1, 2011).
315. *See* CENTER FOR CLIMATE STRATEGIES, 23 ENERGY POLICIES THAT COULD SAVE AMERICANS $5 BILLION A YEAR 3 (2010), *available at* http://www.climatestrategies.us/library/library/view/613.
316. *Id.*

There also may be other internal benefits in a carbon-constrained environment for certain U.S. industries.

On the cost side, the cost for reducing a ton of CO_2 from different techniques is (1) renewable portfolio standards are projected to cost $17.84 per ton of greenhouse gases removed,[317] (2) energy efficiency measures and demand side management are estimated to create CO_2 savings at $40.71 per ton reduced,[318] (3) high performance buildings standards can save CO_2 at an estimated cost of $24.99 per ton saved in the building sector that consumes about 40% of energy used in the United States,[319] (4) stricter building codes for new buildings achieve CO_2 savings for $22.86 per ton saved,[320] and (5) combined heat and power (cogeneration) CO_2 savings cost $13.18 per ton.[321]

Self-generation, cogeneration of power, and RPS incentives appear to be very cost-effective means to achieving sustainability, meeting their goals at less than $25 per ton saved.[322] Energy efficiency appears almost equally as cost-effective. U.S. policy, in its effort to change the energy infrastructure of the United States, is likely to pursue and provide incentives for all of these energy conservation, cogeneration, self-generation, carbon reduction, and renewable power options. All are likely on the horizon as part of the new sustainable energy vector.

There are additional energy incentives. The Waxman-Markey bill narrowly passed the House of Representatives by a vote of 219–212, in 2009; the subsequent 2010 Kerry-Boxer bill[323] was similar in design, if less successful, legislatively.[324] These bills would move industry to a phased-in more "sustainable" energy-use base, by awarding free CO_2 emission allowances until 2035, to trade-sensitive, energy-intensive U.S. industries.[325] The Waxman-Markey bill allocated 15% of all carbon emission allowances (for free) to such trade-sensitive energy-intensive industries until 2026, and then phased down such free allowance distribution, in favor of future auction of emissions allowances to these companies, phased in between 2026 to 2035.[326] In addition, the legislation included

317. *Id.*
318. *Id.*
319. *Id.*
320. *Id.*
321. *Id.*
322. *Id.*
323. *See, e.g.*, *The Mendacity of Al Gore's Rolling Stone Article, Part 2: Special Interests and Climate Policy*, COOLER HEADS DIGEST, (June 27, 2011), http://www.globalwarming.org/2011/06/27/the-mendacity-of-al-gore's-rolling-stone-article-part-2-special-interests-and-climate-policy/.
324. Ryan Lizza, *As the World Burns*, NEW YORKER, Oct. 11, 2010, at 70.
325. American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 401 (2009).
326. *Id.*

eventual possible trade sanctions beginning in 2018 against goods imported to the United States from countries that do not implement similarly restrictive levels of carbon regulation as required by these bills.[327]

Third, this proposed legislation would take a proactive approach with regard to the use of power to shift the economy to a quantifiable base of more sustainable renewable resources through a mandatory renewable energy requirement for retail electric power supply nationwide in the United States.[328] Utilizing a renewable energy portfolio requirement, these bills would require that U.S. retail power entities have 6% new renewable power (constructed after passage of the bill) by 2012, and 20% in place by 2020.[329] Energy conservation and efficiency measures were defined so as to be able to constitute up to 40% of the "renewable" projects that could satisfy this percentage.[330] Cogeneration of power by a corporate entity would qualify as energy conservation, which in turn could qualify as a share of new renewable power percentage. Therefore, cogeneration, because it generates energy more efficiently, qualifies as efficiency, and efficiency can constitute a significant fraction of the new renewable requirement to shift the energy infrastructure of the country. All promote the goal of a more sustainable foundation for energy use.

The sustainable corporation could benefit from incentives under such proposed new federal legislative enactments. The sustainable corporation can realize regulatory and financial benefits, fit into new energy initiatives, and position itself for comparative economic advantages. Sustainable corporations are the new metric, and the key to this is centered on corporate energy use.

While this legislation may not reemerge for a couple of years in the current environment, certain elements of this legislation that feature a more sustainable renewable energy infrastructure, packaged in different formats, are likely to be reconsidered in the near term.[331] Moreover, in the next year, two hundred nations must consider whether to allow the Kyoto Protocol to expire of its own design, or extend carbon control. As the only significant industrialized nation not ratifying coverage of this Protocol, the United States and its "sustainable" initiatives will be under intense scrutiny this year and next. Notwithstanding the lack of progress at the 2009 Copenhagen Conference of the Parties ("COP") under the Kyoto Protocol or the 2010 COP, the December 2011 COP in South

327. *Id.*
328. *Id.* § 101 (amending § 610 of the Clean Air Act).
329. *Id.*
330. *Id.*
331. Katie Howell, *Energy Policy: Senate Energy Chairman "Anxious" to Work with White House on CES*, E&E NEWS (Jan. 26, 2011), http://www.eenews.net/public/eenewspm/2011/01/26/6.

Africa and the final 2012 COP will put sustainable corporate behavior under scrutiny. In this short-term horizon, unprecedented amounts of federal stimulus funds for sustainable energy investments are still being utilized.

And in the interim and beyond, the majority of states in the United States are providing corporate incentives, if not requirements, to implement individual or collective adjustments for more sustainable use of energy:

> More than 80% of the states allow net metering of electric power,[332] which significantly increases the value of self-generated renewable power, with certain states going even further.
>
> Sixty percent of the states have RPS requirements that provide incentives for renewable power development, with some states earmarking solar PV and other technologies for added incentives.[333]
>
> Thirty percent of the states have system benefit charges that finance certain sustainable investments.[334]
>
> Twenty percent of the states collectively regulate carbon emissions associated with energy production,[335] with an additional 25% of the states scheduled to follow in 2012 with broad corporate and transportation-related regulation of carbon emissions.[336]

The vector of future requirements and incentives for sustainability energy use are fairly clear. These can have significant advantage when implemented at the corporate level. These incentives have become particularly prominent, and some are opportunities, rather than requirements. The sustainable corporation is a societal change, of significant dimension, in the near-term future.

332. *See Summary Maps*, DSIRE SOLAR, http://www.dsireusa.org/summarymaps/index.cfm?ee=1&RE=1selectnetmeteringpolicies (last visited Sept. 1, 2011).

333. *See RPS Policies*, DSIRE SOLAR, http://www.dsireusa.org/documents/summarymaps/RPS_map.pptx (last visited Sept. 1, 2011).

334. *See Public Benefits Funds for Renewables*, DSIRE SOLAR, http://www.dsireusa.org/documents/summarymaps/PBF_Map.pptx (last visited Sept 1., 2011).

335. *See generally* STEVEN FERREY, UNLOCKING THE GLOBAL WARMING TOOLBOX ch. 7 (2010).

336. *See generally id.* at ch. 9.