Moving the Climate Change Debate from Models to Proposed Legislation: Lessons from State Experience

John C. Dernbach

11-2000 30 ELR 10933

ELR
NEWS & ANALYSIS

ARTICLES

Moving the Climate Change Debate From Models to Proposed Legislation: Lessons From State Experience

by John Dernbach and the Widener University Law School Seminar on Global Warming

The United States is a party to the United Nations Framework Convention on Climate Change (Framework Convention),[1] which requires parties to implement programs and measures to reduce net greenhouse gas emissions. Greenhouse gases, including carbon dioxide (CO_2), trap solar energy in the atmosphere in proportion to their concentration, rather like the way glass windows in a greenhouse or a parked car trap solar heat.[2] Their increased atmospheric concentration from human emissions is believed to be affecting the earth's climate. In 1997, in Kyoto, Japan, the parties agreed to a protocol under which developed countries would reduce their net emissions by at least 5% below 1990 levels by 2008-2012, and the United States would reduce its emissions by 7% below 1990 levels.[3] Since that time, there has been a vigorous debate in the United States about the Kyoto Protocol.

To a great degree, this public debate is a case study in asking the wrong questions:

1. Are we certain that global warming is "real"? This question reduces the many science questions to just one and ignores the virtual certainty that CO_2 and other gases warm the atmosphere, that their atmospheric concentrations are increasing, and that humans are causing the increase. The question also stands common sense on its head because we nearly always act on incomplete information and avoid or minimize public risks as much as we can. We may not know precisely what effects increased greenhouse concentrations can have, or precisely when these effects will be felt, but we know enough to take prudent action. The precautionary principle stated in the Framework Convention itself recognizes this, stating that lack of complete scientific information is not a reason to avoid taking cost-effective measures.[4]

2. How much will it cost us? Because the Framework Convention's primary goal is stabilizing greenhouse gases to prevent dangerous human interference with the climate, and because we have already ratified the Framework Convention, a better question is how we can accomplish that goal at the lowest total cost. Many studies of the economic impact of the Kyoto Protocol do not appear to examine whether their projected costs are the lowest possible costs. Another question would inquire about potential benefits and opportunities. Many of these same studies do not look carefully at numerous economic and other benefits, including the substantial benefits of avoiding climate change.

John Dernbach is an Associate Professor at Widener University Law School. The students participating in the Seminar on Global Warming were Jennifer Cole, Valerie Faden, Susannah Lee, Chris Lovecchio, Sean Quinlan, Jessica Reenock, David Shumway, Kimberly Smith, Matthew Williams, David Wortman, and Brian Zulli. The seminar, which was led by Professor Dernbach, was held in the spring semester of 2000. Brenda Bishop, Valerie Faden, and Jason Schibinger provided additional research assistance. Don Brown, Alan Miller, Sonny Popowsky, Bob Power, John Rohrbach, and Kathy Yorkievitz provided helpful comments on an earlier draft. Duncan Austin and Andrew Kleit patiently answered questions on economic issues. Professor Dernbach is responsible for any errors. Please send any comments or questions to john.c.dernbach@law.widener.edu.

1. United Nations Framework Convention on Climate Change, May 29, 1992, U.N. Doc. A/AC.237/18 (1992), *reprinted in* 31 I.L.M. 849 (1992) (available in ELR Stat. 50343 [hereinafter Framework Convention].

2. John T. Houghton, Global Warming: The Complete Briefing 22-45 (2d ed. 1997) (describing source and effect of various greenhouse gases). These gases have a natural greenhouse effect, warming the earth to a greater degree than it would be in their absence. *Id.* at 11-16. Because of CO_2, Venus is much hotter and Mars is slightly warmer than it would otherwise be. *Id.* at 16-17.

3. Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, U.N. Doc. FCCC/CP/197/L.7/Add. 1, art. 3.1 & Annex B, *reprinted in* 37 I.L.M. 22 (1998) [hereinafter Kyoto Protocol]. *See* Clare Breidenich et al., *The Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 92 Am. J. Int'l L. 315 (1998). A protocol is an international agreement that implements a treaty.

4. Framework Convention, *supra* note 1, art. 3.1.

3. Should we ratify the Kyoto Protocol? Ratification of the Protocol, without more, would subject the United States to a serious international legal obligation without the statutory authority to meet it. The right question, therefore, is what types of legislative measures would meet the Kyoto Protocol target? If we better understood the answer to that question, we would also better know the benefits and costs of implementing the Protocol and whether we should ratify it as we adopt those measures. Because the benefits of many specific legislative measures exceed or greatly offset their costs, we would also recognize that the level of scientific certainty about global warming is not necessarily the most important issue in determining how the United States should respond. The debate, in other words, should not simply be about science and economics; it also should be about law.

Despite the centrality of law to climate change, we have not had a real debate about the legal measures necessary to reduce greenhouse gas emissions in the United States. Instead, the law is sidestepped or legal options are artificially reduced by assumptions in studies. Perhaps the closest the U.S. Congress has come to such a debate occurred in July 1997, approximately five months before the Kyoto meeting was even held. By a vote of 95 to 0, the Senate passed a resolution sponsored by Senators Robert Byrd (D-W.Va.) and Chuck Hagel (R-Neb.) expressing the sense of the Senate that the United States should not sign any protocol to the Framework Convention unless the protocol met several key conditions.[5] According to the resolution, the protocol must not "mandate new commitments to limit or reduce greenhouse gas emissions" for developed countries unless it also "mandates new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period."[6] In addition, the protocol should not "result in serious harm to the economy of the United States."[7] The resolution's preamble suggests that the Senate's core concern is with binding greenhouse gas emission limits on developed countries (including the United States) if developing countries are not also subject to binding limits. The "disparity of treatment," the preamble states, "could result in serious harm to the United States economy, including significant job loss, trade disadvantages, increased energy and consumer costs, or any combination thereof."[8]

The Senate's position is plain enough, but the Byrd-Hagel Resolution does not take a position on any proposed legislation, nor does it refer to any. The Kyoto Protocol that was later negotiated contains virtually no limitation on the legal instruments that a country may employ domestically. Resolution language concerning effects on the United States was based on economic models and studies that made assumptions about the laws that would be used. Most of the national studies of the impact of the Kyoto Protocol on the United States assume that the country will rely primarily on a narrow range of legal instruments, especially emissions trading and taxes on CO_2 emissions.[9] Because the major models generally have been prepared by economists, legal tools that do not involve price changes (such as those employed by states) tend to be excluded from consideration, at least in part because economists have difficulty modeling their effects.[10] Nor do these models appear to give much credence to the overall role that states could play in achieving effective and geographically tailored emissions reductions. The results of those studies, in turn, have been widely disseminated with little if any explanation of their assumptions concerning the choice of legal instruments.

Such use of studies tends to conceal some of the very questions that most require debate: What are those assumptions, and what other legal instruments would be equally effective or more effective? This Article is intended to help focus the Kyoto Protocol debate on the legal measures needed to reduce greenhouse gas emissions, to suggest a framework for considering legal tools or instruments, and to suggest the value of legal tools now being employed by states.

The United States and other nations may choose from many dozens of different legal instruments, alone or in conjunction with others, to reduce net CO_2 emissions.[11] The United States should employ instruments that achieve most of their reductions within American borders. Because of the magnitude and complexity of the task, the country should use a suite of tools or instruments rather than rely on one or two. In addition to reducing greenhouse gases, moreover, these tools should foster economic development, job creation, technological innovation, environmental protection, and even national security. This approach is consistent with U.S. international commitments to sustainable development, but it also reflects the political reality that the country is not likely to undertake any greenhouse gas reduction ef-

5. S. Res. 98, 105th Cong. (1997); 143 Cong. Rec. S8138 (daily ed. July 25, 1997).

6. S. Res. 98, 105th Cong. §1(1)(A). During debate on the resolution, Senator Byrd stated several times that the resolution did not mean that developing country commitments would have to be the same as developed country commitments. 143 Cong. Rec. S8117 (daily ed. July 25, 1997). "[W]hile countries have different levels of development, each must make unique and binding commitments of a pace and kind consistent with their industrialization." *Id.* at S8131.

7. S. Res. 98, 105th Cong. §1(1)(B).

8. *Id.* pmbl.

9. John P. Weyant, An Introduction to the Economics of Climate Change Policy 10-14 (2000) (summarizing policy choices in models) (available at <http://www.pewclimate.org/projects/econ-introduction.pdf>); Robert Repetto & Duncan Austin, The Costs of Climate Protection: A Guide for the Perplexed 2-3 (1997) (summarizing models). *See, e.g.,* Energy Information Admin., U.S. DOE, Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity (1998) [hereinafter Impacts of the Kyoto Protocol].

The debate among academic lawyers has also tended to focus on emissions trading and taxes. *See, e.g.,* Jonathan Baert Wiener, *Global Environment Regulation: Instrument Choice in Legal Context*, 108 Yale L.J. 677, 701-35 (1999) (arguing that international allowance trading is presumptively superior to pollution taxes); *but see* David M. Driesen, *Choosing Environmental Instruments in a Transnational Context*, 27 Ecology L.Q. 1 (2000) (arguing that international allowance trading is constrained by the need for international agreement on rules and instead suggesting national compliance based on nationally chosen method).

10. Council of Economic Advisors, The Kyoto Protocol and the President's Policies to Address Climate Change; Administration Economic Analysis 46-47 (1998) [hereinafter Administration Economic Analysis].

11. *See, e.g.,* B.S. Fisher et al., *An Economic Assessment of Policy Instruments for Combatting Climate Change, in* Climate Change 1995: Economic and Social Dimensions of Climate Change 402 (1996); National Academy of Sciences et al., Policy Implications of Greenhouse Warming Mitigation, Adaptation, and the Science Base 468-72 (1992); Office of Tech. Assessment, Changing by Degrees: Steps to Reduce Greenhouse Gases (1991). *See also* Richard L. Ottinger & Mindy Jayne, Global Climate Change—Kyoto Protocol Implementation: Legal Frameworks for Implementing Clean Energy Solutions (2000) (unpublished manuscript, on file with author).

fort that it believes will hurt its security, economy, or society. Finally, these tools should be cost effective.

This Article began with a basic question in my seminar on global warming in the spring of 2000: To what extent can the United States implement the Kyoto Protocol by making more widespread use of measures that states are already implementing?[12] In general, each student wrote a paper about a particular type of tool being used at the state level that reduces net greenhouse gas emissions. The tools studied in the seminar are customer choice of electricity providers, environmental labeling requirements for electricity sources, building codes requiring energy efficiency, demand-side management, system benefit charges, cap-and-trade programs, tax credits, net metering, planning and siting preferences for renewable energy facilities, CO_2 limits for new power plants, and renewable energy portfolio standards. These tools focus on CO_2 emissions because CO_2 is responsible for more than one-half of the projected effects of global warming, and because states have significant authority for regulating fossil fuel-fired burning facilities.[13] This Article synthesizes and summarizes the student papers as well as other information[14] and then evaluates these tools. While many of these tools are generally recognized as useful in reducing greenhouse gas emissions, a great many other tools were excluded. The analysis of tools here is illustrative, not exhaustive.

Two broad conclusions emerge from this analysis. First, these tools have considerable potential to reduce greenhouse gas emissions under the Kyoto Protocol. They achieve reductions primarily within the borders of the states that enacted them, not elsewhere. These tools are often used in mutually reinforcing combinations, not as stand-alone measures. While no one of these tools is necessarily capable of achieving great reductions, the careful combination of many tools is likely to have significant effects. To be sure, the effect of state actions so far is relatively modest. Few of these instruments have achieved widespread use in states, and many of them have not been in effect for very long. Still, they have considerable potential to reduce net emissions. These tools also provide a variety of benefits in addition to mitigating climate change. Rarely are these tools accompanied by a statement of purpose that includes reducing greenhouse gases. Instead, they are intended to conserve energy, limit other air pollutants, foster local economic growth, lower energy costs on the poor, and serve other purposes. Indeed, they are notable in part because these other benefits likely equal or even exceed their benefits in reducing greenhouse gases. Finally, these tools appear to involve negligible costs.

Second, a strong case can be made for applying these tools at the national level. Many state tools result from, or work within the framework of, federal energy or environmental law. National use of these tools is likely to result in deeper reductions in net greenhouse gas emissions than state-by-state action. National uniformity in rules, particularly for market-based approaches, is likely to enhance the effectiveness of such approaches. Indeed, this Article identifies some of the elements that should be contained in national legislation to address the Kyoto Protocol. National use of these tools is also more likely to reduce national security risks from climate change. If these tools can work at the state level, they surely can do so nationally. Because states have historic police power roles that are relevant to climate change, moreover, any national legislation should enlist the states in creative and effective ways.

This Article outlines the risks to the United States raised by climate change and describes both the Framework Convention and the Kyoto Protocol. The Article then explains the importance of instrument choice and provides a framework for assessing legal instruments or tools. Next, 11 different state legal instruments are described and the importance of state actions is discussed. The Article then suggests basic lessons from state experience, explaining the value of these and other tools and proposing their consideration by more states and the federal government.

I. International Agreements

A. The Problem

It is increasingly recognized that climate change will be "one of the biggest challenges facing the world in the next century."[15] As the late Elliot Richardson observed, the risks of increasing greenhouse gases should be treated in a manner that is similar to the risks of other pollutants.[16] The United States has a history of acting to protect human health and the environment based on the risk, rather than certainty, of harm. Even when those risks are relatively small (for example, a risk of cancer of 1 in 10,000 or 1 in 1,000,000), they are considered serious enough to justify regulation. For climate change, by contrast, the risk of adverse effects and the potential magnitude of those effects is much greater.

In the past century, average global surface temperatures have increased between 0.3 and 0.6 degrees Centigrade (C°) (or a little more than 0.5 and 1.0 degrees Fahrenheit (F°)), according to the Intergovernmental Panel on Climate Change (IPCC), a world body of experts organized under

12. Another set of legal and policy options would facilitate adaptation to climate change. These were not considered in the seminar. For an analysis of these options, see, e.g., NATIONAL ACADEMY OF SCIENCES ET AL., *supra* note 11, at 36-47 & 499-652. *See also* James G. Titus, *Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners*, 57 MD. L. REV. 1279 (1998) (recommending actions that state and local governments (as well as business) should take to protect publicly owned tidal shorelines from being privatized by rising sea levels from global warming that move these shorelines onto private property). For an argument that the United States and other countries should focus global warming efforts on steps to reduce human vulnerability to extreme weather events, see Daniel Sarewitz & Roger Pielke Jr., *Breaking the Global-Warming Gridlock*, THE ATLANTIC MONTHLY, July 2000, at 55.

13. STATE AND TERRITORIAL AIR POLLUTION PROGRAM ADMINISTRATORS (STAPPA) & ASSOCIATION OF LOCAL AIR POLLUTION CONTROL OFFICIALS (ALAPCO), REDUCING GREENHOUSE GASES AND AIR POLLUTION: A MENU OF HARMONIZED OPTIONS—FINALIZED REPORT xiii (1999) [hereinafter REDUCING GREENHOUSE GASES].

14. Students registered for the seminar knowing that an Article like this would be prepared afterwards. They were also asked to comment on a draft of this Article, and most did.

15. Programme for the Further Implementation of Agenda 21, U.N. GAOR, 19th Special Sess., Annex, U.N. Doc. A/S-19-29, & 49 (1997).

16. Elliot L. Richardson, *Global Warming and the Risk of Disaster: How Much Do We Care What Happens to the World After We Are Gone?*, LOOKING AHEAD (ABA Section of Natural Resources, Energy, and Environmental Law, Chicago, Ill.), Jan./Feb. 1999, at 6 (remarks at section meeting in Hilton Head, S.C., Oct. 9, 1998) (summarizing Intergovernmental Panel on Climate Change (IPCC) findings).

the auspices of the United Nations.[17] This warming has occurred at the same time that humans have emitted large concentrations of greenhouse gases into the atmosphere. CO_2 is the principal greenhouse gas, and its human sources are primarily the burning of fossil fuels (coal, natural gas, and gasoline) for energy.[18] Other greenhouse gases include methane and nitrous oxides.[19] Atmospheric concentrations of these gases in the atmosphere are much higher now than they were before the industrial revolution, and they continue to grow each year.[20] In early 1996, the IPCC concluded that the "balance of the evidence" shows "a discernible human influence" behind the observed atmospheric warming.[21] With moderate population growth and no focused international effort to reduce emissions of these gases, the IPCC said, average surface temperatures will rise 2 C° (or almost 4 F°), and sea levels will rise by 0.5 meters (or 1.5 feet) in the next century.[22] Increases in the concentration of these gases will have the effect of doubling pre-industrial concentrations of CO_2 by about the middle of the next century under a "business as usual" scenario, and quadrupling pre-industrial CO_2 concentrations soon after 2100.[23] In the first six months of 2000, the evidence that humans are contributing to global warming continued to build.[24]

The effects of global warming in the United States are likely to be significant. In June 2000, 10 federal agencies acting under the auspices of the U.S. Global Change Research Program issued a draft comprehensive assessment of the potential effect of climate change on the United States.[25] Without a major effort to reduce greenhouse gas emissions, the report concluded, average temperatures in the United States will likely increase by about 5 to 10 F° in 100 years, an increase that is greater than that projected globally.[26] The report indicated that the effects of climate change would vary greatly from region to region, and identified natural ecosystems as particularly vulnerable to harmful effects because they have difficulty adapting to large and relatively sudden changes.[27]

In 1998, the IPCC drew similar conclusions about the effect of global warming on North America. Likely effects include rising sea levels for coastal cities and beaches (requiring protective barriers or abandonment), the shift of much agricultural activity further north and into Canada, an increase in the number and severity of storms and floods, and harmful effects on wildlife and recreation. It is hard to think of economic sectors, social forces, or natural resources that would be unaffected by global warming.[28]

The U.S. Environmental Protection Agency (EPA) has prepared analyses of the likely effects of climate change on each state.[29] The Pennsylvania analysis, for example, states that the average temperature in Harrisburg has increased 1.2 F° in the past century, and is likely to increase an additional 2 to 9 F° in the next century.[30] This temperature rise could increase the number of heat-related deaths and illnesses, foster the transmission of malaria and Lyme disease, reduce river and stream flow and levels, intensify flooding, and damage ecosystems.[31]

The "yes it is/no it isn't" quality of the media-reported debate in the United States has led many to think that global warming is something in which people can simply believe, or not, as they choose—like Santa Claus or the tooth fairy. That kind of thinking is seriously misguided. It is true that uncertainties remain about the extent to which temperatures will increase, the rate at which they will increase, and the severity of its impacts. But it is virtually certain that the concentration of greenhouse gases in the atmosphere has increased, that this increase has been caused by humans, that the earth's surface has warmed in the past century, and that global warming will continue "for a long time into the future."[32]

17. Intergovernmental Panel on Climate Change, Climate Change 1995: The Science of Climate Change 4 (John T. Houghton et al. eds., 1996) [hereinafter Science of Climate Change].

18. Houghton, *supra* note 2, at 22, 41; Science of Climate Change, *supra* note 17, at 14-15. Cement production and burning for deforestation are also significant human sources of CO_2 emissions. *Id.*

19. Houghton, *supra* note 2, at 33-35. *See also* Science of Climate Change, *supra* note 17, at 22 (listing these and other greenhouse gases). The Kyoto Protocol focuses on six greenhouse gases: CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Kyoto Protocol, *supra* note 3, Annex A.

20. Science of Climate Change, *supra* note 17, at 15 (table).

21. *Id.* at 4-5.

22. *Id.* at 5-6.

23. Houghton, *supra* note 2, at 136.

24. *See, e.g.,* Sydney Levitus et al., *Warming of the World Ocean*, 287 Science 2225 (2000) (finding that the Pacific, Atlantic, and Indian Oceans together warmed 0.06 C° between 1955 and 1995 from the surface to a depth of 3,000 meters, and that the top 300 meters warmed by an average of 0.31 C° in that period). "[T]he scientific case for an artificial greenhouse is growing ever more persuasive." Gregg Easterbrook, *Warming Earth, Heated Rhetoric*, N.Y. Times, June 14, 2000, at A31.

25. U.S. National Assessment Synthesis Team, Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change (June 2000) (draft) available at <http://www.usgcrp.gov> [hereinafter Climate Change Impacts on the United States].

26. *Id.* at 4.

27. *Id.* at 4 & 7. On the other hand, the report suggested that crop and forest productivity might be increased for several decades because of increased CO_2 concentrations in the atmosphere. *Id.* at 5. It is not clear, however, that such benefits can be sustained with ever-increasing concentrations of greenhouse gases.

28. *See* David S. Shriner & Roger B. Street, *North America, in* The Regional Impacts of Climate Change: An Assessment of Vulnerability (Robert T. Watson et al. eds., 1998).

29. U.S. EPA, *Global Warming: State Impacts* (last updated July 12, 2000) <http://www.epa.gov/globalwarming/impacts/stateimp/>. *See also* Union of Concerned Scientists and the Ecological Society of America, Confronting Climate Change in California: Ecological Impacts on the Golden State (1999) (concluding that winter temperatures are likely to increase by 5-6 F° by 2030-2050 and summer temperatures by 1-2 F°, and that this increase will likely lead to water shortages, worsening droughts, higher sea levels, an increase in disease-carrying animals, more frequent or intense storms, and damage to threatened and endangered species); Kelly Mella & Julia Barrett, *Warming Trends: What Global Climate Change Could Mean for Wisconsin*, Wis. Nat. Resources, Apr. 2000, at 16 (explaining, among other things, that average temperatures will likely increase by about 4 F°; that water levels in Lakes Michigan and Superior will probably fall; and that the temperature of the state's 15,000 inland lakes will likely increase, hurting aquatic life and making recreation less attractive).

30. U.S. EPA, *Climate Change and Pennsylvania* (last updated July 12, 2000) <http://www.epa.gov/globalwarming/impacts/stateimp/pennsylvania/index.html>.

31. *Id.*

32. J.D. Mahlman, *Uncertainties in Projections of Human-Caused Climate Warming*, 278 Science 1416 (1997). *See also* Houghton, *supra* note 2, at 165 ("[S]ignificant anthropogenic climate change is not an unlikely possibility but a near certainty; it is no change of climate that is unlikely. The uncertainties which mainly have to be weighed lie in the magnitude of the change and the details of its regional distribution.").

The debate is thus not primarily about whether warming has occurred and will continue to occur, but about the extent and consequences of that warming.[33] As atmospheric concentrations of greenhouse gases increase, the risks and the severity of the consequences will increase.[34] There also is a "small but unknown probability" of catastrophic impacts.[35]

B. Framework Convention on Climate Change

The Framework Convention, which took effect in 1994, has 184 parties.[36] The purpose of the Framework Convention is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [human-caused] interference with the climate system."[37] As its name indicates, the Framework Convention creates an international legal framework for the purpose of stabilizing greenhouse gas concentrations. In a set of principles stated near the beginning of the Framework Convention, the parties directly addressed the issue of scientific certainty by endorsing the precautionary principle. The "parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing" cost-effective measures.[38]

The Framework Convention establishes as its governing body a Conference of the Parties that is responsible for making "decisions necessary to promote the effective implementation of the [Framework] Convention."[39] Toward that end, each party is to submit to the Conference of the Parties information concerning its implementation of the Framework Convention.[40] Based on that and other information, the conference of the parties is to assess the "the extent to which progress toward the objective of the [Framework] Convention is being achieved."[41] The Conference of the Parties meets annually unless it decides otherwise.[42]

The Framework Convention imposes some obligations on all parties and other obligations on developed country parties. All parties are obliged to adopt and implement measures to control greenhouse gases.[43] Parties are also obliged to develop national inventories of greenhouse gas emission sources and sinks.[44] In addition, parties agreed to promote and cooperate in the development and diffusion of technologies to prevent and control greenhouse gas emissions, to promote the conservation and enhancement of greenhouse gas sinks and reservoirs, to cooperate in preparing for adaptation to the effects of climate change, to conduct appropriate research, to share relevant information, and to promote "education, training and public awareness."[45] They also agreed to formulate and implement national programs to mitigate climate change and to consider climate change in all "relevant social, economic, and environmental policies and actions."[46]

The Framework Convention includes a second set of commitments that is limited to developed countries and countries in transition to a market economy.[47] These countries, which are listed in Annex I of the Framework Convention and, thus, are often referred to as Annex I countries, agreed to provide developing countries with "new and additional financial resources" to help them meet their commitments under the Framework Convention.[48] The Framework Convention provides a financial mechanism to pay developing countries the additional costs of compliance.[49] In addition, developed countries agreed to help developing countries that are particularly vulnerable to climate change adapt to its adverse effects.[50] Annex I countries also agreed to "take all practicable steps" to make relevant technology and know-how available to developing countries and to enhance these countries' capacity to support such technologies.[51] Developed or Annex I countries also agreed to "the aim of"

33. A careful reading of statements made by climate change skeptics supports this conclusion. *See, e.g.,* Roy W. Spencer, *How Do We Know the Temperature of the Earth?: Global Warming and Global Temperatures, in* EARTH REPORT 2000: REVISITING THE TRUE STATE OF THE PLANET 24 (Ronald Bailey ed. 2000).

34. HOUGHTON, *supra* note 2, at 102. *See also* CLIMATE CHANGE IMPACTS ON THE UNITED STATES, *supra* note 25, at 4 ("The science indicates that the warming in the 21st century will be significantly larger than in the 20th century.").

35. Fisher et al., *supra* note 11, at 208. Scientists have identified three types of climate catastrophes. The first, a runaway greenhouse effect, would occur if, for example, atmospheric warming triggered the release of other greenhouse gases (such as methane that is now locked in permafrost). The second is disintegration of the West Antarctic Ice Sheet, which would increase sea levels 5 to 6 meters (or 15 to 18 feet). The third is structural changes to ocean currents, such as the Gulf Stream. Climate change could cause the Gulf Stream to be weakened or even stop altogether, in which case average temperatures in Europe would decrease sharply. *Id.* at 207-09.

Global climate change could even threaten our democratic form of governance. "If we do not bring ourselves to solve" global warming and other chronic environmental problems, former EPA Administrator William Ruckelshaus has stated, "all of our free institutions will be challenged. The institutions themselves will be the first things to go. . . . We could well be forced to revert to some sort of dictatorship to act in the face of the kind of problems posed by the global climate." ROSS GELBSPAN, THE HEAT IS ON 167 (updated ed. 1998).

36. Framework Convention on Climate Change–Secretariat, *The Convention and the Kyoto Protocol* (last modified June 5, 2000) <http://www.unfccc.de/resource/convkp.html>. The United States was the fourth country to submit its articles of ratification. Framework Convention on Climate Change–Secretariat, *Update on Ratification of the Convention (as at 25 May 2000)* (visited July 26, 2000) <http://www.unfccc.de/resource/conv/ratlist.pdf>.

37. Framework Convention, *supra* note 1, art. 2.

38. *Id.* art. 3.4.

39. *Id.* arts. 7.1 & 7.2. The Conference of the Parties is assisted by a Secretariat (art. 8), a Subsidiary Body for Scientific and Technological Advice (art. 9), and a Subsidiary Body for Implementation (art. 10).

40. *Id.* arts. 4.1(j) & 12.1.

41. *Id.* art. 7.2(e).

42. *Id.* art. 7.4.

43. *Id.* art. 4.1(b). No quantitative reduction is stated, however, nor are there any deadlines.

44. *Id.* art. 4.1(a). Sources are activities or processes that release greenhouse gas emissions into the atmosphere; sinks remove greenhouse gases from the atmosphere. *Id.* arts 1.8 & 1.9. Thus, forests are sinks because they absorb and store CO_2.

45. *Id.* art. 4.1(c)-(e), (g)-(i).

46. *Id.* art. 4.1(b) & (f).

47. *Id.* art. 4.2 (commitments by "developed country Parties and other Parties included in annex I"). Annex I includes Canada, the United States, Japan, and most west European countries, including the European Union (EU). It also includes former Soviet and Soviet-dominated states such as the Russian Federation, Czech Republic, and Poland. *Id.* Annex I.

48. *Id.* art. 4.3.

49. *Id.* arts. 4.3 & 11. It designates the Global Environment Facility (GEF) to be that mechanism on an interim basis. *Id.* art. 21.3. The GEF is managed jointly by the World Bank, the U.N. Environment Program, and the U.N. Development Program. *Id.*

50. *Id.* art. 4.4.

51. *Id.* art. 4.5.

reducing their greenhouse gas emissions to 1990 levels, although no timetable for achieving this aim is stated.[52] The parties were obviously aware that developed country commitments to take the lead and to "aim" for certain reductions might not prove sufficient. They agreed to review the adequacy of these commitments at the first meeting of the Conference of the Parties.[53]

United States ratification of a treaty such as the Framework Convention requires an affirmative vote of two-thirds of the Senate and executive submission of articles of ratification to the Framework Convention secretariat.[54] Under international law, a country is bound to perform in good faith a treaty that it has ratified.[55] But ratification does not, by itself, put into place domestic implementing legislation.[56] When the Senate gave its advice and consent to the Framework Convention in 1992, it recognized that the absence of quantitative limitations in the Framework Convention meant that ratification would not subject the United States to legally enforceable obligations.[57] As a result, the ratification vote was not accompanied by any proposed implementing legislation.[58]

Since ratification, the United States has taken some actions to implement the Framework Convention. It prepares an annual inventory of greenhouse gases and sinks based on authority provided in the Energy Policy Act of 1992.[59] In addition, in 1993 President Clinton and Vice President Gore announced a Climate Change Action Plan including 50 new or expanded "cost-effective domestic actions."[60] Most of these actions were to be based on voluntary partnerships between government and industry to increase energy efficiency and for other purposes.[61] The United States also submits periodic reports to the parties on actions it is taking to implement the Framework Convention.[62] Still, the United States contributes more greenhouse gases to the atmosphere than any other country—about one-fifth of the world's total.[63] Despite increased efficiency, total energy use continues to grow because of a combination of a growing population (from 151 million in 1950 to 268 million in 1997) and growing per-capita energy consumption (from 219 million British thermal units (BTUs) to 352 million BTUs in the same period).[64]

C. Kyoto Protocol

In December 1997, at their annual meeting, the parties signed a protocol containing binding greenhouse gas emission limits for developed or Annex I countries. The Kyoto Protocol, named after the Japanese city where the meeting was held, is the basis for most current discussions about actions needed to address global warming. It is the first agreement by developed countries to quantified limits of greenhouse gas emissions. Only 22 nations have thus far ratified the Kyoto Protocol, and all of them are developing countries.[65]

Under the Kyoto Protocol, developed countries agreed to reduce their net greenhouse gas emissions by at least 5% from 1990 levels by 2008-2012.[66] No comparable commitment is included for developing countries. As the text of the Kyoto Protocol acknowledges, this reduction is only a first step; the Conference of the Parties is to begin to discuss commitments for subsequent periods by 2005.[67] According to the IPCC, much greater reductions are needed to stabilize atmospheric concentrations of greenhouse gases at current levels, or even at higher levels.[68] This conclusion, moreover, applies to emissions from both developed and developing countries.[69]

---

52. *Id.* art. 4.2(b). Countries also agreed to inventory their greenhouse gas emissions and report that inventory to the Conference of the Parties. *Id.* art. 4.1(a).

53. *Id.* arts. 4.2(d) & 12.2.

54. U.S. Const. art. 2, §2, cl. 2 (stating that the President "shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, provided two-thirds of the Senators present concur"). As the constitutional text suggests, the Senate vote is not enough for ratification; an executive act is also required. Articles of ratification for the Framework Convention and any protocols are to be deposited with the U.N. Secretary General. Framework Convention, *supra* note 1, arts. 19 & 22.1.

55. Vienna Convention on the Law of Treaties, May 23, 1969, art. 26, U.N. Doc. A/CONF.39/27 (1969), *reprinted in* 8 I.L.M. 679 (1969).

56. Legislation, of course, ordinarily requires approval by both the U.S. House of Representatives and the Senate as well as signature by the president. U.S. Const. art. 1, §7, cl. 2.

57. The Senate Foreign Relations Committee report accompanying the resolution stated that any future decision by the Conference of the Parties to require targets or timetables for reduction of greenhouse gas emissions would require the advice and consent of the Senate. It also stated that any executive interpretation of the Framework Convention to apply legally binding targets and timetables "would alter the 'shared understanding' of the [Framework] Convention between the Senate and the executive branch and would therefore require the Senate's advice and consent." H.R. Exec. Doc. No. 102-55, 102d Cong., 1st Sess., at 14 (1992). *See also* 138 Cong. Rec. S17150 (statement of those understandings by Senator McConnell).

58. In addition to scientific research and financial and technical assistance, U.S. implementation was to be based on a national plan that was to be released in 1993. The Bush Administration stated that the plan would include proposed federal legislation and other measures, actions by state governments, private-sector actions, and actions taken in cooperation with other countries. H.R. Exec. Doc. No. 102-55, *supra* note 57, at 12-14.

59. 42 U.S.C. §13385(a). *See, e.g.,* U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1998 (2000) (draft); U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1997 (1999). The inventory is required by art. 4.1(a) of the Framework Convention, *supra* note 1.

60. William J. Clinton & Albert Gore Jr., The Climate Change Action Plan (1993) [hereinafter Climate Change Action Plan]. Section 4.2(a) of the Framework Convention, *supra* note 1, requires developed countries to adopt national policies and take corresponding measures to mitigate climate change.

61. Climate Change Action Plan, *supra* note 60, at 28.

62. Such reporting is required by art. 12.1(b) of the Framework Convention, *supra* note 1.

63. U.S. EPA, Emerging Global Environmental Issues 3 (1997).

64. U.S. Council on Environmental Quality, Environmental Quality: The 1997 Annual Report of the Council on Environmental Quality 169-70 (1997).

65. Framework Convention on Climate Change-Secretariat, *Kyoto Protocol: Status of Ratification (as at 13 January 2000)* (visited July 26, 2000) <http://www.unfccc.de/resource/kpstats.pdf>.

66. Kyoto Protocol, *supra* note 3, art. 3.1. The Annex I or developed countries also agreed to make "demonstrable progress" by 2005 in meeting their commitments. *Id.* art. 3.2.

67. *Id.* art. 3.9 (requiring discussion to begin seven years before the end of the "first commitment period" in article 3.1. or seven years before 2012).

68. D. Schimel et al., *Radiative Forcing of Climate Change, in* Science of Climate Change, *supra* note 17, at 82-84.

69. If the Kyoto Protocol goes into effect and all Annex I countries comply with it, "worldwide carbon emissions still would increase by 31% from 1990 to 2010." Energy Information Admin., U.S. DOE, *International Energy Outlook 2000: Environmental Issues and World Energy Use* (last updated Mar. 31, 2000) <http://www.eia.doe.gov/oiaf/ieo/environmental.html>.

The Kyoto Protocol contains somewhat different commitments for individual developed countries; the U.S. commitment is 7% below 1990 levels.[70] Because greenhouse gas emissions in the United States continue to increase, this commitment is more ambitious than it may seem at first. Energy-related carbon emissions are projected to be 33% above 1990 levels by 2010.[71] Thus, the U.S. commitment is to reduce emissions by 40% from their projected level.

The Kyoto Protocol allows developed countries, including the United States, to meet their commitments in two ways. They can reduce emissions from greenhouse gas sources and, to a limited degree, they can use sinks to remove CO_2 from the atmosphere. A country's *net* greenhouse gas emissions are thus its overall emissions less the approved amount removed by sinks. In measuring progress toward their target, developed countries are to include verifiable changes "resulting from direct human-induced land use change and forestry activities," based on changes in forests since 1990.[72] While developed countries can plant or replant forests to absorb CO_2, they must also count forest losses. In addition, developed countries can only count carbon sequestration, or the removal of carbon from the atmosphere, by forests, even though grasses, soils, and other natural features can also absorb and store CO_2.[73] The Kyoto Protocol authorizes the Conference of the Parties to expand the list of sinks a country can rely on to meet its commitment, but only if reductions from those sources can be reported with certainty in a verifiable manner.[74]

The Kyoto Protocol imposes no other limitations on the choice of legal tools that a country may employ to reduce net emissions within its own borders. The Kyoto Protocol even contains an illustrative list of measures that countries might use. These include increased energy efficiency, protection and enhancement of greenhouse gas sinks and reservoirs, increased use of renewable energy and carbon sequestration technologies, and phasing out of subsidies, tax exemptions, and other market distorting incentives for the use of fossil fuels.[75]

The Kyoto Protocol does, however, provide a structure for developing three legal mechanisms—joint implementation, the Clean Development Mechanism, and emissions trading—that would enable countries to reduce net greenhouse gases in partnership with other countries.[76] These provisions are attractive because they would allow countries to take advantage of lower costs in other countries and provide a means of moving financial and technical resources to poorer countries. But these tools are not a substitute for domestic reductions, and they are unlikely to see widespread use until significant technical and political obstacles are overcome. Joint implementation allows one country to get credit toward its emissions reductions commitment by reducing net greenhouse gas emissions in another country.[77] Joint implementation is available under the Kyoto Protocol only between developed or Annex I countries.[78] The Clean Development Mechanism[79] differs from joint implementation because it would allow developed and developing countries to enter into agreements in which emissions reduction or carbon sequestration projects would occur in developing countries. Developed countries could apply the net reduction toward their quantified commitments under the Kyoto Protocol.[80] The third mechanism is emissions trading between Annex I countries.[81] Under an emissions trading scheme, a country could get credit toward its required emissions reduction by reducing CO_2 emissions in another country. Like the other two mechanisms, it is particularly attractive when it is cheaper to reduce emissions in another country than it is to reduce one's own emissions.

U.S. implementation of the Kyoto Protocol requires both ratification and adoption of appropriate implementing legislation. The Kyoto Protocol will not be binding on the United States until it is ratified. If the United States ratifies the Kyoto Protocol, but does not put in place a law or laws to achieve the 7% reduction, it would have a quantitative international obligation without a domestic legal mechanism to achieve it. As a practical and legal matter, that situation would be untenable.[82] Thus, when other treaties have been approved by the Senate that require implementing legisla-

---

70. Kyoto Protocol, *supra* note 3, Annex B. The United States committed to a 7% reduction below 1990 levels—a greater reduction than its earlier proposal of simply returning to 1990 levels—in order to "at the very least, open the door to reduction obligations for developing countries." Michael R. Molitor, *The United Nations Climate Change Agreements, in* THE GLOBAL ENVIRONMENT: INSTITUTIONS, LAW, AND POLICY 210, 227-28 (Norman J. Vig & Regina S. Axelrod eds., 1999). However, language that would have allowed developing countries to agree voluntarily to greenhouse gas emission limits was removed from the draft protocol near the end of negotiations after China and other developing countries objected. *Id.*

71. Energy Information Admin., U.S. DOE, *Annual Energy Outlook 2000: Issues in Focus* (last updated Dec. 19, 1999) <http://www.eia.doe.gov/oiaf/aeo/issues.html>.

72. Kyoto Protocol, *supra* note 3, art. 3.3.

73. Intergovernmental Panel on Climate Change, *Land Use, Land Use Change, and Forestry: Summary for Policymakers* (2000) (last visited July 26, 2000) <http://www.ipcc.ch/pub/SPM_SRLULUCF.pdf>.

74. Kyoto Protocol, *supra* note 3, art. 3.4.

75. *Id.* art. 2.1(a). The list also includes sustainable agriculture, transportation measures, and methane controls. *Id.*

76. The developed countries subject to quantified emission reduction commitments in the Kyoto Protocol are allowed to meet these commitments "individually or jointly." *Id.* arts. 3.1 & 4. If a joint effort fails, each country is individually responsible for meeting its specific commitment. *Id.* art. 4.6.

77. *Id.* art. 6. Among other things, the project must be approved by the parties involved and must provide an addition to any net greenhouse gas emission reduction that would otherwise occur. *Id.* Because the EU and each of its member countries agreed to an 8% reduction, moreover, the EU as a whole could decide to reduce net emissions by a greater degree in some countries than in others, so long as the overall 8% commitment is met. *Id.* Annex B.

78. *Id.* art. 6. Among other things, the project must be approved by the parties involved and must provide an addition to any net greenhouse gas emission reduction that would otherwise occur. *Id.* Joint implementation is the only mechanism for international cooperation in emissions reduction specifically mentioned in the Framework Convention itself. Framework Convention, *supra* note 1, art. 4.2(a) (developed country parties may implement required policies and measures "jointly with other Parties and may assist other Parties in contributing to the achievement of the objective of the [Framework] Convention . . ."). *See* Alex G. Hanafi, *Joint Implementation: Legal and Institutional Issues for an Effective International Program to Combat Climate Change*, 22 HARV. ENVTL. L. REV. 441 (1998).

79. Kyoto Protocol, *supra* note 3, art. 12.

80. *Id.* art. 12.2. The Clean Development Mechanism also is intended to provide financial and technical help to developing countries to help them achieve sustainable development. *Id.*

81. *Id.* art. 17.

82. The Byrd-Hagel Resolution states that any protocol containing quantified emissions reduction limitations must be "accompanied by a detailed explanation" of laws needed to implement the protocol. S. Res. 98, 105th Cong. §1(2) (1997). An explanation of the necessary laws would almost surely be insufficient unless those laws were enacted at the same time.

tion, the executive branch has refrained from submitting the articles of ratification.[83]

The Clinton Administration has refrained from submitting the Kyoto Protocol to the Senate for ratification until commitments from developing countries are obtained. At the 1998 Conference of the Parties, Argentina and Kazakhstan stated that they would be willing to limit their emissions of greenhouse gases. But most developing countries, including China and India, have not budged.

Although no implementing legislation for the Kyoto Protocol has been proposed in Congress, two bills would authorize companies to receive credit for early voluntary reductions of greenhouse gas emissions.[84] If it provided credit for early reductions, Congress would also enhance the likelihood of Kyoto Protocol ratification and the adoption of implementing legislation. In connection with electric utility restructuring, the Clinton Administration and others have proposed legislation that would, among other things, reduce greenhouse gas emissions.[85] None of these proposals has moved forward. In the meantime, Congress has used appropriations riders for fiscal years 1998, 1999, and 2000 to prohibit EPA from adopting any regulations or other requirements "for the purpose of implementation, or in preparation for implementation" of, the Kyoto Protocol.[86] That prohibition has led some members of Congress to question certain state activities that EPA may have funded.[87] Because the Framework Convention requires parties to develop and implement programs to address climate change, regardless of protocols, these appropriations riders are probably inconsistent with the nation's obligation under international law to implement the Framework Convention in good faith.

II. Framework for Instrument Choice

A key issue behind the reluctance of the United States to ratify the Kyoto Protocol is the choice of legal instruments that would be employed. The choice of legal instruments will profoundly affect the costs, economic opportunities, effectiveness, and political feasibility of responding to climate change. In the United States and elsewhere, virtually every argument about costs—as well as the political feasibility of implementing the Kyoto Protocol—is grounded on assumptions about the choice of legal measures.

Instrument choice is also an important subtext of the scientific debate over climate change. Much of the scientific debate about climate change is not really motivated by the science at all; rather, it is prompted by fears about what government is likely to do if the science is considered good enough to warrant action.[88] Those who believe that government will respond stupidly or ineffectively are less likely to be persuaded that the risks of climate change are real. It follows that a thoughtful and attractive governmental response might make it easier for many to accept the available scientific evidence.

Legislation to reduce greenhouse gas emissions should be: (1) capable of achieving substantial domestic reductions; (2) based on a suite or portfolio of legal instruments rather than one or two; (3) capable of achieving social, economic, and other goals at the same time; and (4) cost effective.[89]

A. Significant Domestic Reductions

For practical and legal reasons, instruments utilized by the United States to reduce net greenhouse gas emissions should focus first and foremost on sources and sinks within the United States. This conclusion is an outgrowth of the international law principle that countries are responsible for the international effects of actions that occur within their own boundaries.[90] Significant domestic reductions are also necessary if the United States is to have the credibility needed to play any constructive role in international negotiations under the Framework Convention. In addition, domestic reductions provide the United States with a variety of domestic benefits, including reduced emissions of other air pollutants, that are not available to the extent that reductions occur in other countries.

83. Deborah Zamora Grout, *The Benefits of Basel*, ENVTL. F., Jan./Feb. 1999, at 19 (describing the unwillingness of the United States to deposit articles of ratification for the Basel Convention because of the absence of complete legislative authority to implement it).

84. H.R. 2520, 106th Cong. (1999) (Rep. Rick Lazio (R-N.Y.)); and S. 547, 106th Cong. (1999) (Sen. John Chafee (R-R.I.)). Both bills assume that eventually there will be a greenhouse gas regulatory statute that would oblige companies to reduce their greenhouse gas emissions. Under these bills, companies that take action to reduce greenhouse gas emissions now would receive credit toward their required reductions under the regulatory statute. Otherwise, companies that reduce their emissions now might be required to make further reductions under a regulatory statute without any credit for their initial reduction. The bills have attracted support from both the business community and environmental groups. Cheryl Hogue, *Climate Change: Bills to Credit Voluntary Emission Cuts Expected to Move in Late 1999, Early 2000*, Nat'l Env't Daily (BNA), Sept. 14, 1999. *See also* Alvin J. Alm & Bennett Johnston, *The Efficiency Ratio Approach*, ENVTL. F., Mar./Apr. 1999, at 21. Alm and Johnston (a former U.S. senator) argue that Congress should now require that any subsequent regulatory legislation limiting greenhouse gas emissions be based on energy efficiency ratios of units of production to units of energy required. Under this proposal, a company making energy efficiency improvements now would be more likely to have an acceptable energy efficiency ratio under subsequent legislation. Another bill would provide funding for new energy-efficient technologies. S. 882, 106th Cong. (1999) (Sen. Frank Murkowski (R-Alaska)).

85. *See* Manimoli Dinesh, *Utility Deregulation Debate Heats Up*, *in* 1999 ENVIRONMENT & ENERGY ISSUES GUIDEBOOK 12 (1998) (summarizing proposed legislation).

86. *See, e.g.,* Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1999, Pub. L. No. 105-276, §432, 112 Stat. 2461, 2496. Congress also prohibited the executive branch from using funds to support country participation in the Kyoto Protocol unless the appropriations committees were notified. Omnibus Consolidated and Emergency Supplemental Appropriations Act, 1999, Pub. L. No. 105-277, §573(a), 112 Stat. 2681, 2681-198. In addition, Congress required that the president's proposed budget for Fiscal Year 2000 include an agency-by-agency accounting of "climate change activities and associated costs by line item." *Id.* §573(b).

87. Pamela Najor, *Climate Change: State Actions Should Not Be "Misconstrued" as Kyoto Implementation, Group Tells Critics*, Nat'l Env't Daily (BNA), June 2, 2000.

88. *See, e.g.*, GELBSPAN, *supra* note 35 (describing tendency of many skeptics of the science concerning climate change to have conservative political views). This point also was raised in the seminar. Similarly, the defeat of the BTU tax proposed by the Clinton Administration in 1993 "reflected Congressional resistance to new taxes, not just skepticism on the climate change hypothesis." Richard L. Paarlberg, *Lapsed Leadership: U.S. International Environmental Policy Since Rio, in* THE GLOBAL ENVIRONMENT: INSTITUTIONS, LAW, AND POLICY, *supra* note 70, at 236, 242.

89. For somewhat different criteria, see, e.g., Fisher et al., *supra* note 11, at 405-07; Robert N. Stavins, *Policy Instruments for Climate Change: How Can National Governments Address a Global Problem?*, 1997 U. CHI. LEGAL F. 293, 296-97.

90. RESTATEMENT (THIRD) OF THE FOREIGN RELATIONS LAW OF THE UNITED STATES §601 (1987).

Moreover, it will not do for the United States to adopt symbolic, trivial, or ineffective domestic measures to reduce net greenhouse gas emissions. Order-of-magnitude improvements in energy efficiency and the use of renewable energy by 2050 will be needed just to keep future pollution from a growing population and economy at present levels.[91]

In the Framework Convention, developed countries such as the United States committed to take the lead in reducing greenhouse gas emissions.[92] They did so for two reasons. First, developed countries contribute the "largest share of historical and current global emissions of greenhouse gases," and "per capita greenhouse gas emissions in developing countries are still relatively low."[93] Second, developed countries have more money, better technology, and superior capacity to address climate change.[94] As the world's leading greenhouse gas generator, the United States cannot fairly claim international leadership by reducing emissions primarily in other countries.[95]

The three Kyoto Protocol tools for achieving national reduction commitments by reducing emissions in other countries are attractive because they could greatly reduce costs. Yet joint implementation, the Clean Development Mechanism, and emissions trading have significant built-in limitations. Under the Kyoto Protocol, they can only be used by developed countries to supplement their domestic reductions.[96] In May 1999, the European Union's (EU's) Council of Ministers adopted a Community Strategy on Climate Change restating its view that "domestic action should provide the main means" of meeting the Kyoto Protocol commitments, and setting a formula for allocating domestic and international commitments under the Kyoto Protocol. Under that formula, the United States would be able to use international trading to meet only one-third of its Kyoto Protocol commitment.[97] Although the Conference of the Parties has not agreed to this or any other formula for allocating domestic and international reductions, the EU's position and the Kyoto Protocol language suggest that domestic reductions will be the primary pathway to meeting reduction commitments. In addition, these three tools cannot be used until the parties agree to procedures for their use, including procedures for project auditing and verification, and agree to procedures to ensure that rules and decisions are transparent.[98] A pilot phase for joint implementation is underway, but it will be limited until the parties agree on formal procedures for its permanent use.

The need for national agreement on these tools highlights an important distinction between tools that achieve domestic reductions and those that give a country credit for reductions achieved in other countries. The former give the United States much greater control over the basic ground rules, timing, and manner of implementation. The latter require international agreements on a very high level of detail concerning a variety of technically difficult and controversial issues. Even if international rules do go into effect, the United States will have less flexibility and more international oversight in implementing them than it will for tools achieving domestic reductions.[99] Domestic reductions, by domestic tools, can be implemented now.

Finally, substantial domestic reductions by the United States enhance the likelihood that developing countries will make their own reductions. Securing developing country participation may be the greatest challenge of implementing the Framework Convention.[100] The perceived equity of an international agreement contributes to a nation's decision to participate in it.[101] For many reasons, developing countries do not recognize as equitable an international legal system that allows developed countries to secure most of their required reductions abroad.[102]

B. Suite of Legal Instruments

The United States should use a suite of mutually reinforcing laws and policies, not one or two individual instruments, to reduce net greenhouse gas emissions.[103] Such an approach is likely to enhance the benefits and lower the costs of reduc-

91. John C. Dernbach, *Sustainable Development as a Framework for National Governance*, 49 Case W. Res. L. Rev. 1, 47 (1998) (summarizing studies).

92. Framework Convention, *supra* note 1, art. 4.2(a).

93. *Id.* pmbl. (third paragraph).

94. *Id.* arts. 4.2(a) (noting differences in parties' economic structures and resources as well as available technologies and other circumstances) and 4.7 (stating that implementation by developing countries will depend on extent to which developed countries provide developing countries with financial resources and technology).

95. The Byrd-Hagel Resolution's insistence on the participation of developing countries does not alter the need for substantial reductions in net greenhouse gas emissions within U.S. borders.

96. Kyoto Protocol, *supra* note 3, arts. 6.1(d) (acquisition of emission reduction units through joint implementation "shall be supplemental to domestic actions"), 12.3(b) (Clean Development Mechanism project activities "may contribute to compliance with part of their quantified emission limitation and reduction commitments," as determined by Conference of the Parties), and 17 (emissions trading "shall be supplemental to domestic actions").

97. *Annual Energy Outlook 2000: Issues in Focus*, *supra* note 71 (describing formula and explaining its application to the United States).

98. Kyoto Protocol, *supra* note 3, art. 6.2 (calling on parties to "elaborate guidelines" for joint implementation, "including for verification and reporting"), art. 12.7 (calling on parties to "elaborate the modalities and procedures" for Clean Development Mechanism "with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities"), art. 17 (calling on parties to "define the relevant principles, modalities, rules and guidelines, in particular for verification, reporting and accountability for emissions trading"). Some of these issues may be resolved at the meeting of the Conference of the Parties at the Hague, The Netherlands, which is scheduled to run November 13-24, 2000.

99. *See generally* Driesen, *supra* note 9.

100. Wiener, *supra* note 9, at 750.

101. Driesen, *supra* note 9, at 11.

102. *Id.* at 11-14. These include, but are certainly not limited to, concerns about whether the claimed reductions are real and concerns that developed countries will use the least expensive credits or allowances before developing countries have put in place legal systems that will enable them to purchase credits or allowances. *Id.*

103. National Academy of Sciences et al., *supra* note 11, at 467 ("The magnitude of the economic changes at stake, together with the need to pursue a cost-effective approach, implies that a mixed strategy, employing a variety of measures, would be required."). *See also* Marilyn A. Brown et al., *Engineering-Economic Studies of Energy Technologies to Reduce Greenhouse Gas Emissions: Opportunities and Challenges*, 23 Ann. Rev. of Energy & Env't 287, 382 (1998) (concluding that demand- and supply-side strategies for reducing carbon emissions need to be pursued at the same time because they are mutually reinforcing). For example, CO_2 emissions are reduced to a greater degree by energy efficiency and the use of lower carbon fuels than if either approach by itself is applied. *Id. Cf.* Organization for Economic Co-Operation and Development, Handbook of Incentive Measures for Biodiversity: Design and Implementation 74 (1999) (a set of complementary incentive measures, rather than any single measure, should be the norm rather than the exception for biodiversity conservation).

ing greenhouse gas emissions. The major economic models, by contrast, tend to assume the use of one or two legal instruments. While the projected economic costs of using these instruments are modest, costs would likely be even lower if the country relied instead on a broader suite of instruments. If there is an "Olympics of instrument choice" for climate change,[104] it should be a team contest, not a contest among individual instruments.

The wide range of greenhouse gas sources and sinks in the United States[105] means that no national-level response will be effective unless it addresses all sources and sinks of any significance. Even the most sweeping tools (for example, a carbon tax) will not address major greenhouse gases such as nitrous oxide and methane. Moreover, the differing situations of various economic sectors (e.g., electricity generation, forestry, agriculture, transportation) require legal approaches that are, to some degree, particularly tailored for them. Parties to the Framework Convention agreed to integrate climate change considerations into all relevant aspects of environmental, social, and economic decisionmaking.[106] Because these decisions are invariably based on a wide range of legal and policy instruments, it is impossible to carry out this obligation without also employing or modifying those instruments.

It is not enough, moreover, to put new laws in place; existing laws that directly or indirectly encourage greenhouse gas emissions will also need to be modified. The public utilities, corporations, and other entities that will be affected by any national response to climate change are already subject to a wide range of instruments. Many of these instruments now encourage or discourage net greenhouse gas emissions in varying degrees. One example is government subsidies and incentives that encourage activities that increase greenhouse gas emissions.[107] Another is state-approved monopolies and price regulation for electric utilities, which have fostered inefficiency and greenhouse gas emissions in electrical power generation.[108] By harmonizing those instruments so that they encourage or require net reductions, the federal government or a state government could do more to reduce net greenhouse gas emissions than it could by applying any individual tool alone. If, by contrast, a single instrument were imposed without ensuring that other existing instruments gave the same signal to greenhouse gas emitting entities, the resulting law would be more costly and inefficient than necessary and would likely create fewer benefits.

The broadest range of legal instruments should thus be considered for use in reducing greenhouse gas emissions. The dozens of available instruments fall into at least six major categories: planning, regulation, public information, economic instruments, property rules, and formal or classroom education.[109] Each type of tool, in turn, has many variations depending on how they are drafted. As environmental lawyers well know, for example, regulation comes in a great variety of forms, including permitting and standards as well as governmental and even citizen enforcement. Economic instruments include taxes, emissions trading systems, subsidies, and other financial incentives. Voluntary private actions can be in response to regulatory tools because they are prompted by the desire to avoid regulation, but they can also result from economic instruments. Voluntary actions can even be the result of electricity deregulation, so that energy users have choices they previously lacked. Property rules can involve direct changes to property law (allowing a right to sunlight for solar collectors that is not recognized by common law)[110] or indirect changes (tax incentives for carbon sequestration).

In addition, tools can and should be combined in mutually reinforcing ways. An excise tax on the sale of chlorofluorocarbons, coupled with a regulatory phaseout of the production of those chemicals, has probably been more effective than either tool by itself.[111] Even the acid deposition control program under the Clean Air Act (CAA),[112] often celebrated as a market-based system that should be applied to other pollutants, is actually a mixture of traditional regulation and economic incentives.[113]

None of this is particularly remarkable; it simply reflects the reality of law making on a complex subject. But this reality is not apparent in many of the economic studies about the effect of the Kyoto Protocol on the United States. These studies are usually prepared by highly qualified professionals from prestigious institutions, and their conclusions tend to be reported in the press as authoritative. Because future costs and benefits cannot be predicted precisely, however, and because they depend on many variables, the economic models used in these studies inevitably rely on assumptions.

104. Wiener, *supra* note 9, at 680 (describing claims by various writers that particular instruments or types of instruments are preferable to others).

105. Inventory of U.S. Greenhouse Gas Emissions and Sinks, *supra* note 59.

106. Framework Convention, *supra* note 1, art. 4.1(f).

107. *See, e.g.,* Douglas N. Koplow, The Alliance to Save Energy, Federal Energy Subsidies: Energy, Environmental, and Fiscal Impacts (1993).

108. *See* Thomas R. Casten, Turning Off the Heat: Why America Must Double Energy Efficiency to Save Money and Reduce Global Warming 25-69 (1998).

109. Dernbach, *supra* note 91, at 67-82 (explaining the potential use of these tools by national governments to foster sustainable development). Public information includes sustainable development indicators and consumer information. *Id.* at 73-76.

110. *See, e.g.,* John William Gergacz, *Legal Aspects of Solar Energy: Statutory Approaches for Access to Sunlight*, 10 B.C. Envtl. Aff. L. Rev. 1 (1982) (explaining common law concerning access to solar energy as well as four types of statutory approaches to allow solar energy users to acquire a legal right to unobstructed sunlight).

111. J. Andrew Hoerner, *Taxing Pollution, in* Ozone Protection in the United States: Elements of Success 39, 44-49 (Elizabeth Cook ed., 1996). Although chlorofluorocarbons are regulated under a different international regime (Vienna Convention for the Protection of the Ozone Layer, Mar. 22, 1985, UNEP Doc. 1G.53/5/Rev.1, *reprinted in* 26 I.L.M. 1529 (1987)), they also contribute to global warming. Houghton, *supra* note 2, at 35-38.

112. 42 U.S.C. §§7651-7651o, ELR Stat. CAA §§401-416.

113. Daniel H. Cole & Peter Z. Grossman, *When Is Command-and-Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection*, 1999 Wis. L. Rev. 887, 892. The law is regulatory because it imposes a ceiling or cap on overall SO_2 emissions, and because it applies or extends that cap to individual electric-generating facilities. 42 U.S.C. §7651(b), ELR Stat. CAA §403 (capping annual emissions of SO_2 from certain facilities at 8.90 million tons after January 1, 2000, about one-half of their 1990 level), §§7651a(3) & 7651c(e), ELR Stat. CAA §§402 & 404 (allocating allowances, or authorizations to emit one ton of SO_2 in a specific calendar year, to individual coal-fired power plants for Phase I of reduction program), and 40 C.F.R. §73.10-.27 (1999) (allocating allowances for Phase II of program to meet statutory cap). The program is market-based because it authorizes individual facility operators to purchase or sell allowances on the open market. 42 U.S.C. §7651b(b), ELR Stat. CAA §403(b).

Assumptions about instrument choice, and the framework for selecting instruments, are among the most important assumptions in these models.

According to a recent analysis of 14 leading models by Prof. John P. Weyant, an economist at Stanford University, the choice of legal instruments is one of three key factors explaining differences among model results.[114] "In general," he concludes, "the more flexibility permitted in where, when, and which [greenhouse gas] reductions may be used to satisfy a commitment, the smaller the economic impacts."[115] For example, the use of international emissions trading under the Kyoto Protocol "can have a profound effect on the economic impacts of emissions trading."[116] The models tend to assume that CO_2 emissions are limited by revenue-raising instruments (carbon taxes or carbon permit auctions) whose revenues are then returned to the economy (or "recycled") in some fashion. The way in which revenue recycling would occur significantly affects projected costs of reducing greenhouse gases. The elimination of economically inefficient taxes, for instance, could at least partially offset the costs of a carbon tax by fostering better economic returns from labor and capital.[117] It also appears that the costs of a carbon charge "can be significantly reduced by using the revenues to finance cuts in the marginal rates of existing income taxes" rather than returning revenues through "lump-sum" mechanisms such as tax exemptions.[118]

The assumed use of those instruments is far from trivial. Under the type of trading program ordinarily used in the United States, persons emitting a particular pollutant are given permission to continue emitting that pollutant at approximate current levels but are required to reduce their emissions to a lower level by a future date. This legal permission might be in the form of allowances that correspond to its existing emissions level. To meet the lower level, or cap, the permittee could reduce its emissions, or it could purchase or trade for allowances from someone else. Trading rests on two bedrock premises: (1) compliance costs vary from facility to facility, and (2) the operator of the facility knows best the cheapest way to comply, and has every incentive to comply in the cheapest manner possible. Because purchasing or trading allowances from another company may be cheaper than reducing one's own emissions, this type of cap-and-trade program uses the market to reduce costs. The cap-and-trade program for sulfur dioxide (SO_2) under the 1990 CAA Amendments is widely considered a potential model for reducing CO_2 emissions.[119]

If that system were applied to CO_2 emissions, it might work something like this. If Utility X is now emitting 100,000 tons of CO_2 per year, it would be given legal permission to continue emitting 100,000 tons per year. That permission would exist in the form of 100,000 allowances, each worth 1 ton of CO_2 per year. In 2010, however, Utility X's allocation would be reduced automatically to 93,000 allowances, and its emissions would be limited accordingly. Utility X would have to reduce its CO_2 emissions by that date (by using more efficient technology, using different fuels, or reducing demand for its electricity) or purchase additional allowances from companies that have allowances to spare. The operator who sold those allowances would be obliged to emit correspondingly less CO_2.

A key fact in this example is that Utility X gets its initial allocation of allowances for free; it does not pay for them. That is how such trading laws are ordinarily written in the United States.[120] Economists, however, suggest other options for the initial allocation of allowances, including a requirement that companies be required to purchase the initial allocation at an auction. Among other things, an auction would provide greater incentive for reductions in CO_2 emissions and would generate revenue that could be used to offset other taxes.[121] Under such a system, Utility X would have to purchase allowances worth 100,000 tons of CO_2 emissions per year in order to continue its current emissions lawfully. In 2010, when its 100,000 allowances only authorize 93,000 tons of annual emissions, it could purchase additional allowances from another company or reduce emissions itself. The revenue from the auction could be returned (or "recycled") through reductions in taxes on labor and capital. The auction, of course, works much like a carbon tax. The economic logic of a carbon tax is inescapable; higher prices caused by a tax would discourage use of fossil fuels, which would in turn reduce greenhouse gas emissions. Auctioned permits or carbon taxes, with revenue recycling, are 1 set of legal instruments whose use is widely assumed in these 14 models.

The other primary tool whose use tends to be assumed in these models is emissions trading. Emissions trading would allow one country to get credit for emissions reductions that are achieved in another country. Because these reductions may be achieved more cheaply in some countries than in others, it is not surprising that the use of emissions trading would reduce costs.

These legal instruments may be an appropriate part of any U.S. legal response, but this description raises some important questions. One is whether Congress would ever pass, and a president would ever sign, a cap-and-trade program for CO_2 emissions that required the initial allowances to be auctioned. Despite increasing use of emissions trading, the United States has never taken such an approach. Another is raised by the Kyoto Protocol's limitation of emissions trading to developed countries and the absence of any perma-

114. WEYANT, *supra* note 9, at 44. The other key factors are the size of the emissions reduction being considered and the extent to which the benefits of emissions reductions are considered. *Id.*

115. *Id.*

116. *Id.* Weyant identifies at least three other ways in which flexibility provided by the Kyoto Protocol can help reduce costs. One is the possibility of trading among the six different gases covered by the Kyoto Protocol, which would permit countries to help meet their reduction goal by reducing those gases that are least expensive to control. *Id.* at 11; Kyoto Protocol, *supra* note 3, Annex A (identifying six greenhouse gases covered by the Kyoto Protocol) & art. 17 (authorizing parties to develop an emissions trading system that implicitly includes all six gases). A second is carbon sequestration. WEYANT, *supra* note 9, at iii-iv & 11; Kyoto Protocol, *supra* note 3, art. 3.4. The third is the ability of countries to average their emissions over a five-year period (2008-2012). WEYANT, *supra* note 9, at 12; Kyoto Protocol, *supra* note 3, art. 3.1.

117. WEYANT, *supra* note 9, at 12-13.

118. *Id.* at 12. "Thus, to fully analyze the impact of revenue recycling alternatives on the overall cost of carbon taxation, one needs not to analyze the impact of a carbon tax, but also to speculate about how the government would employ the revenues from the tax." *Id.* at 13.

119. *See, e.g.,* ENVIRONMENTAL LAW INST., IMPLEMENTING AN EMISSIONS CAP AND ALLOWANCE TRADING SYSTEM FOR GREENHOUSE GASES: LESSONS FROM THE ACID RAIN PROGRAM (1997).

120. Nathaniel O. Keohane et al., *The Choice of Regulatory Instruments in Environmental Policy*, 22 HARV. ENVTL. L. REV. 313, 316-17 (1998).

121. *Id.* & n.19.

nent ground rules for emissions trading agreed to by the parties. Plainly, the international use of an instrument requires adherence to internationally recognized rules.

Apart from these questions, Professor Weyant's analysis raises a broader point. It appears that these models rely predominantly if not exclusively on carbon charges and legal instruments provided by the Kyoto Protocol. These instruments are a small part of the complete portfolio of legal instruments available to reduce greenhouse gas emissions.[122] If variations in assumptions about this narrow range of instruments are so fundamental, isn't it likely that consideration of a broader range or portfolio of instruments could show pathways to even lower costs and greater benefits? The importance of instrument choice suggests that the debate over climate change should be based to a much greater degree on proposed legislation to reduce greenhouse gases, and to a much lesser degree on assumptions contained in models.

Several recent models and studies, taken together, suggest that a broader range of carefully fashioned legal instruments could result in more technological innovation, greater benefits, and lower costs. The President's Council of Economic Advisors issued a report in 1998 concluding that the cost of meeting the Kyoto Protocol might be $7-12 billion per year in 2008-2012, or 0.1% of projected gross domestic product.[123] This conclusion appears to be based on the use of a cap-and-trade program for CO_2 emissions. The analysis also assumes that mechanisms are in place under the Kyoto Protocol to implement domestic and international trading, joint implementation, and the Clean Development Mechanism.[124] Under the system assumed in this report, CO_2 emissions would evidently be capped in 2008-2012 at a level that corresponds with the required Kyoto Protocol limitations, and permits would be issued that correspond to those limitations. Under one policy design, permits are tradable only within Annex I and key developing countries; under another, they are also tradable in eastern Europe.[125] Companies evidently would be required to pay for permission to emit CO_2. The projected cost of these permits is $23 per ton under the first approach, and $14 per ton under the second.[126] These are the only two legal approaches analyzed in the Council of Economic Advisors' report, but costs vary considerably based on which one is used. The report also acknowledges the importance of instrument choice by noting that it does not account for the effect of proposed federal legislation concerning electric utility restructuring.[127] The proposed legislation includes a renewable energy portfolio standard, system benefits fund, environmental labeling for electricity, and net metering, all of which are discussed in this Article.[128]

A 1998 Energy Information Administration report, *Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity*, or just *Impacts*, draws somewhat different conclusions partly because it relies on different assumptions about the specific legal instruments being employed. This report examines seven different emissions scenarios for 2008-2012, ranging from a reference or "business as usual" case of 33% above 1990 levels to 7% below 1990 levels.[129] For the reference case, *Impacts* is based on the assumption that there are no new federal, state, or local laws after July 1, 1997.[130] The reductions in all other scenarios are assumed to be achieved by a legal instrument that increases the price of carbon.[131] That legal instrument is a system of carbon permits that are sold by the federal government in a competitive auction. Revenues from the auction are returned to consumers through lower taxes.[132] Although its authors recognize the availability of "a number of easy, low-cost options for reducing energy use and emissions," they conclude that "higher levels of reductions will require more expensive investment and changes in patterns of energy demand."[133] *Impacts* does not examine the economic effect of combining these "easy, low-cost options" with a carbon pricing system.

The *Impacts* study reflects the importance of instrument choice because it analyzes two different ways of lowering other taxes to offset the carbon charge—personal income tax rebates or reductions in the social security tax rate for employers and employees[134]—and provides separate estimates for the cost of each. The study concludes that the economic effects of either approach will be slightly negative but that reductions in the social security tax are less costly than reductions in the personal income tax. Not surprisingly, a carbon charge would cause prices to rise in all economic sectors, and higher prices provide "greater incentive to conserve energy, switch to lower-carbon sources, and invest in more energy-efficient technologies."[135] Gross domestic product continues to rise, but at a slightly lower rate. Instead of a projected 2.0% increase in 2010, gross domestic prod-

122. *See supra* note 11.

123. Administration Economic Analysis, *supra* note 10, at iv.

124. *Id.* at iii.

125. *Id.* at 50-53.

126. *Id.* at 52-53 & n.16.

127. *Id.* at 50 & 64. In addition, the Administration's economic analysis does not account for the effects of proposed new federal tax incentives and research and development funding for renewable energy and energy conservation, emissions mitigation through carbon sinks, voluntary industry efforts, and other initiatives. *Id.* at 50-51.

128. *See, e.g.,* S. 1047, 106th Cong. (1999); H.R. 1828, 106th Cong. (1999). For a description and analysis of this proposed legislation, *see* U.S. DOE, *Comprehensive Electricity Competition Act* (updated June 29, 1999) <http://home.doe.gov/policy/ceca.htm>.

129. Impacts of the Kyoto Protocol, *supra* note 9, at 10-11. The other scenarios are 24%, 14%, and 9% above 1990 levels; stabilization at 1990 levels, and 3% below 1990 levels. *Id.*

130. The report was in response to a request from the Committee on Science of the U.S. House of Representatives stating a preference for use of the assumptions contained in Energy Information Admin., Annual Energy Outlook 1998 (1997) <http://www.eia.doe.gov/oiaf/aeo98/homepage.html>. Letter from F. James Sensenbrenner Jr. and George E. Brown Jr. to Jay E. Hakes (Apr. 22, 1998), *in* Impacts of the Kyoto Protocol, *supra* note 9, at 226-27. All of the projections in Annual Energy Outlook 1998 were based on federal, state, and local laws in effect on July 1, 1997, and then-current funding levels. Energy Information Admin., Assumptions to the Annual Energy Outlook 1998, at 7 (1997) <http://www.eia.doe.gov/oiaf/aeo98/homepage.html>. When the Energy Information Administration issued its report, it described the request from the House Science Committee request as specifying that the analysis "use the same methodologies and assumptions employed in [Annual Energy Outlook 1998], with no changes in assumptions about policy, regulatory actions, or funding for energy and environmental programs." Impacts of the Kyoto Protocol, *supra* note 9, at xii.

131. Impacts of the Kyoto Protocol, *supra* note 9, at 10-11.

132. *Id.* at 120 & n.80. If the federal government knows the marginal abatement reduction cost, this system is the same as a carbon tax. *Id.* n.80.

133. *Id.* at 12.

134. *Id.* at 120.

135. *Id.* at 26.

uct would increase 1.6% if revenues are returned through a reduced social security tax, and 1.2% if revenues are returned through personal income tax cuts.[136]

A third government study, issued in 1997 by the Oak Ridge National Laboratory and four other national laboratories, is a comprehensive analysis of the potential impact of energy-efficient and low-carbon technologies on U.S. greenhouse gas emissions.[137] This study differs from many other macroeconomic analyses of the effect of the Kyoto Protocol because it focuses more intensely on the potential and costs of various technologies.[138] The so-called "five labs" study draws three conclusions. First, it shows that a national commitment to develop and deploy these technologies could mean that U.S. CO_2 emissions in 2010 would be at or near 1990 levels. Second, if the right policies are used, national energy savings would approximate the costs of achieving these reductions. Finally, the next generation of these technologies "promises to enable the continuation of an aggressive pace of carbon reductions over the next quarter century."[139] Such reductions are possible, the authors conclude, because of substantial inefficiencies in the generation and use of energy for utilities, industry, buildings, and transportation. "Cost-effective energy efficiency alone can take the nation 30 to 50% of the way to 1990 levels."[140]

The five labs study assumes the use of a combination of instruments. The study looks at two scenarios involving domestic carbon permits, priced at $25 and $50 per ton, that directly or indirectly cap U.S. emissions for 2010 at the Kyoto Protocol level. Under those scenarios, these permits are coupled with environmental regulatory reforms, strengthened state programs, more aggressive and focused federal research and development programs, and voluntary industrial efforts.[141] It acknowledges that the use of additional instruments could achieve "higher penetrations of energy-efficient and low-carbon technologies" at net benefits to the nation.[142] By coupling other instruments with carbon pricing, the study appears to suggest that carbon pricing by itself will not assure the full deployment of potentially available technologies.

Two recent nongovernmental studies consider a broader range of legal instruments. The American Council for an Energy-Efficient Economy's *Approaching the Kyoto Targets: Five Key Strategies for the United States*[143] works from the same reference case as the Energy Information Administration study, but draws strikingly different conclusions. This study concludes that five suites of legal and policy tools could achieve 61% of the emissions reduction required in the United States for the Kyoto Protocol.[144] These five suites of tools would strengthen energy efficiency standards for appliances and equipment, use a small surcharge on electric utility bills to fund energy efficiency measures, improve the fuel economy of cars and light trucks, increase the use of boilers that generate both electricity and heat (not just electricity), and reduce CO_2 emissions from electric power generation. Although the costs of these measures through 2010 are estimated at $181 billion, their energy savings are estimated to total $344 billion, resulting in a net economic benefit by 2010 of $163 billion.[145] *Five Key Strategies* identifies other legal tools whose benefits would exceed their costs, but does not identify increasing carbon prices as one of those tools.[146]

The Tellus Institute and Stockholm Environmental Institute reach even more optimistic conclusions.[147] Their report, *America's Global Warming Solutions*, finds that the United States could not only meet the Kyoto Protocol's 7% reduction by 2010, but could even reduce emissions 14% below 1990 levels with a net savings to households and businesses and an increase in job growth and gross domestic product.[148] They base this conclusion on the use of a "robust mix of complementary approaches" for transportation, industry, electricity generation, and commercial and residential buildings. These approaches include legal standards, trading systems, research and development, tax incentives, government procurement, and market transformation incentives such as manufacturer incentives and consumer education.[149]

These models and studies are not perfectly comparable because they almost certainly use different assumptions about issues other than instrument choice. Still, some broad conclusions seem evident. First, even the most costly models do not find absolute declines in gross domestic product; they find that the rate of growth in gross domestic product will be lower than it would otherwise be.[150] In addition, it appears that a larger suite of carefully crafted legal instruments would achieve the same or similar reductions with lower costs than would a carbon charge and the Kyoto Protocol instruments by themselves. The models also suggest that it is inappropriate to generalize about types of instru-

136. *Id.* at xxiii.

137. Interlaboratory Working Group on Energy-Efficient and Low-Carbon Technologies, Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy-Efficient and Low-Carbon Technologies by 2010 and Beyond (1997) <http://www.ornl.gov/ORNL/Energy_Eff/labweb.htm>.

138. For other technology-based analyses, see, e.g., Jonathan G. Koomey et al., Ernest Orlando Lawrence Berkeley National Laboratory and U.S. EPA, Technology and Greenhouse Gas Emissions: An Integrated Scenario Analysis Using the LBNL-NEMS Model (1998); Brown et al., *supra* note 103.

139. Interlaboratory Working Group, *supra* note 137, at 1.1 <http://www.ornl.gov/ORNL/Energy_Eff/PDF/CON444/Ch1.pdf>.

140. *Id.* at 1.17. "A technology is defined as 'cost-effective' if it delivers a good or service at equal or lower life-cycle costs relative to current practice." *Id.* at 2.4 <http://www.ornl.gov/ORNL/Energy_Eff/PDF/CON444/Ch2.pdf>. This definition of cost effective does not require that external costs be internalized. *Id.*

141. *Id.* at 1.2 <http://www.ornl.gov/ORNL/Energy_Eff/PDF/CON444/Ch1.pdf>.

142. *Id.* at 2.8.

143. Howard Geller et al., American Council for an Energy-Efficient Economy, Approaching the Kyoto Targets: Five Key Strategies for the United States (1998).

144. *Id.* at ix.

145. *Id.* at 37.

146. *Id.* at 38-39. These additional tools would increase the energy efficiency of buildings, reduce the energy intensity of major industrial processes, increase freight transport energy efficiency, and restrain growth in vehicle use and vehicle-miles traveled. *Id.*

147. Stephen Bernow et al., Tellus Institute and Stockholm Environmental Institute, America's Global Warming Solutions (1999).

148. *Id.* at vii-viii & 21-24.

149. *Id.* at 11-12.

150. Repetto & Austin, *supra* note 9, at 14-16. In general, models based on optimistic assumptions conclude that gross domestic product would be 2.4% higher in 2020 than it would otherwise be; models based on pessimistic assumptions conclude that gross domestic product would be 2.6% lower than it would otherwise be. *Id.*

ments; the cap-and-trade programs assumed in several models are quite different and seem to contribute to different results. The manner in which instruments are drafted, therefore, matters a great deal. Finally, the political feasibility of some of these instruments may compromise their ability to be used at all.

C. Multiple Purpose Instruments

Many analyses of the effect of the Kyoto Protocol on the United States ask what meeting the target would cost. A better question, and one that is increasingly asked, is what policy choices could enhance this country's economic, environmental, social, and national security positions.[151] Legal instruments used in the United States should be capable of furthering these and other goals, in addition to reducing greenhouse gases.[152] Indeed, many of these instruments are capable of achieving multiple purposes but are not recognized as such. In instance after instance, reducing greenhouse gas emissions automatically brings other benefits. In other cases, tools can be designed and drafted to achieve multiple goals if those goals are considered in advance. Many instruments also are more attractive when other benefits are considered. As a practical matter, it is hard to see the United States making progress on climate change mitigation unless laws and policies are employed that can also foster economic growth and social opportunity.

Put another way, the U.S. response should be so attractive that it invites or encourages other countries, particularly developing countries, to reduce their net greenhouse gas emissions. Nations will need to act together to address climate change effectively, but each nation will have to determine for itself whether it should take meaningful action.[153] When a country can show that it can maintain or even enhance its other goals (economic growth, social development, national security) while also reducing its net greenhouse gas emissions, it enhances the likelihood that other nations will act the same way. This is particularly true for the United States, whose historic international leadership on many issues contrasts with its lack of international leadership on environment and sustainable development. If the United States, whose economic and military resources are now unmatched by any other single nation, treats meaningful action on climate change as an act of martyrdom, it is difficult to see how other countries will find it in their interest to reduce their net greenhouse gas emissions.

These points are reinforced by Professor Weyant's recent analysis of models used to assess the likely effects of the Kyoto Protocol on the United States. One of the three key factors in understanding differences in projected benefits and costs under these models, he concludes, is the extent to which models include benefits of emissions reductions. Because many of the models are focused on costs alone, they do not consider any benefits of reducing greenhouse gas emissions, economic or otherwise.[154] Even when benefits are considered, the full range of potential benefits may not be included.[155] While many of these benefits can be quantified in economic terms, many environmental benefits (e.g., human health, ecosystem function) are difficult to quantify. As a result, many analysts describe these benefits without quantifying them.[156] Whether these benefits are quantified in dollar terms or not, it is impossible to fully understand the effect of reducing greenhouse gas emissions without considering them.

1. Economic Benefits

Of the five recent studies discussed above, *America's Global Warming Solutions* is most optimistic about such benefits. A 14% reduction in greenhouse gas emissions by 2010, the authors conclude, would bring other benefits as well. Because of the savings and the economic activity created by a transition to more renewable energy and greater energy conservation, nearly 900,000 new jobs would be created with a net increase in wages and salaries of $27 billion. The authors include a state-by-state breakdown of job increases, projecting significant differences among states but a net gain in all states.[157] In addition, gross domestic product would increase slightly over that projected for 2010.[158]

151. Koomey et al., *supra* note 138, at 1.

152. The simultaneous achievement of these four goals is sustainable development. Dernbach, *supra* note 91, at 9-21. In the international setting where the term "sustainable development" originated, development by itself is a means of fostering human quality of life and freedom. Amartya Sen, Development as Freedom (1999). Development does not simply mean economic growth; it also includes social or human development as well as peace and security. The addition of "sustainable" to development affirms the premise of development that every human being is "entitled to a healthy and productive life," but modifies the term so that development is "in harmony with nature." Rio Declaration on Environment and Development, U.N. Conference on Environment and Development, U.N. Doc. A/CONF.151/5/Rev.1, princ. 1, *reprinted in* 31 I.L.M. 874 (1992). Instead of development *or* the environment, the idea is to achieve development *and* protect the environment at the same time. *See, e.g.,* President's Council on Sustainable Development, Sustainable America iv (1996):

> A sustainable United States will have a growing economy that provides equitable opportunities for satisfying livelihoods and a safe, healthy, high quality of life for current and future generations. Our nation will protect its environment, its natural resource base, and the functions and viability of natural systems on which all life depends.

The United States has agreed in international settings to foster sustainable development. At the 1992 U.N. Conference on Environment and Development in Rio de Janeiro, the United States agreed to an international plan of action and a set of principles for achieving sustainable development. Dernbach, *supra* note 91, at 24-29. The set of principles is the Rio Declaration. The plan is Agenda 21, U.N. Doc. A/CONF.151/26 (1992). While the United States agreed to this framework, it has not been faithful to that commitment. *See* John Dernbach & the Widener University Law School Seminar on Law and Sustainability, *U.S. Adherence to its Agenda 21 Commitments: A Five-Year Review*, 27 ELR 10504 (1997). When it ratified the Framework Convention, however, the United States assented to the principle that "[t]he parties have a right to, and should, promote sustainable development." Framework Convention, *supra* note 1, art. 3.4. *See also* Philippe Sands, *International Law in the Field of Sustainable Development,* 1994 Brit. Y.B. Int'l L. 303, 331 (explaining that the Framework Convention is more accurately described as a sustainable development treaty than an environmental treaty).

153. *Cf.* Wiener, *supra* note 9, at 798 (identifying "participation efficiency"—the extent to which a particular legal tool can induce other nations to join a binding international climate change regime—as "a central attribute of regulatory instrument choice").

154. Weyant, *supra* note 9, at 25.

155. *Id.* at 26-27.

156. *Id.* at 25-26.

157. Bernow et al., *supra* note 147, at 24-26.

158. *Id.* at 21-24. The projected gross domestic product increase of $14 billion is 0.15% of the projected $9.6 trillion 2010 gross domestic product. *Id.* at 21-22.

Another major category of economic benefits are the benefits of avoiding climate change. A narrow focus on the costs of implementing the Kyoto Protocol may suggest, incorrectly, that the United States will experience no costs unless the country acts to implement the Protocol. Yet the costs of not acting are likely to be substantial. Mid-range estimates of the cost to the United States of a doubling of CO_2 concentrations, which is projected to occur in the middle of the next century under a business-as-usual scenario, run from more than 1% to about 2.5% of gross domestic product.[159] Moreover, atmospheric concentration of greenhouse gases will continue to increase after that unless effective action is taken. A tripling of CO_2 concentrations, or more, would result in even greater costs to the United States; mid-range estimates are for annual costs of 6% of gross domestic product.[160] If catastrophic effects occur, of course, the costs would be even higher.[161]

The costs of such effects, and the benefits of avoiding them, are often excluded from studies of the effects on the United States of implementing the Kyoto Protocol.[162] Nor do many of these studies examine the economic productivity that would result from greater energy efficiency or improvements in balance of trade that would result from such policies.[163] Energy conservation could even put downward pressure on energy prices due to reduced demand, another benefit that tends not to be counted.[164] As a result, these studies do not necessarily provide a complete or accurate view of the many economic benefits of reducing greenhouse gases or the potential to reduce emissions in more politically palatable ways. This is not to suggest that there will be no economic costs in reducing greenhouse gases. The point, rather, is that there can also be economic benefits, and that legislation should be drafted to ensure that they occur.

2. Environmental Benefits

Reducing greenhouse gas emissions can have additional environmental benefits. Many studies do not account for reductions in other air pollutants, including SO_2 and fine particulate matter, that would accompany greenhouse gas reductions. Savings from these reductions could offset at least one-quarter of the cost of meeting the Kyoto Protocol target.[165] In late 1999, the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials issued an important and thorough report, *Reducing Greenhouse Gases and Air Pollution: A Menu of Harmonized Options*. While the emission of many pollutants is directly regulated under the federal CAA and state air pollution control laws, CO_2 emissions generally are not regulated directly. The authors look for opportunities to limit both regulated air pollutants and CO_2 at the same time. The study finds that "with few exceptions, strategies that mitigate [greenhouse gases] will also result in reduced emissions of other air pollutants."[166]

After analyzing a wide range of policy and technological options, the study examines how those options might be applied in four places—the state of New Hampshire; the cities of Atlanta, Georgia, and Louisville, Kentucky; and Ventura County, California. Each area chose its own mix of harmonized strategies for this study. If these areas used these strategies, the study found, they would reduce emissions of SO_2 2% to 41%, nitrogen oxides (NO_x) 4% to 17%, particulate matter 1% to 12%, volatile organic compounds 3% to 4%, carbon monoxide 4%, and CO_2, the unregulated greenhouse gas, 7% to 15%, from baseline levels.[167] The study finds that the Kyoto Protocol's 7% reduction target "is well within reach of most states and localities," that these strategies "are generally technically feasible and cost-effective," and that they "also provide additional criteria pollutant reductions required to meet current and future clean air mandates."[168]

3. Social Equity and Job Creation

One major concern about a serious U.S. response to climate change is that the burden of such response might fall with disproportionate weight on the poor. The concern has particular resonance because a major objective of U.S. energy policy has been to keep fuel prices low. Although that policy makes it much harder for the country to mount an effective response to climate change, it has (until recently) prevented greater burdens on persons with low or fixed incomes.[169] Similarly, various energy conservation programs have aimed at reducing home heating cost burdens on the poor. Thus, legal tools to address climate change should have a similar purpose and effect.

The other major concern with a serious American response to climate change is that it would cost American jobs. Because it is not currently possible to capture CO_2 emissions from fossil fuel-fired burning, greenhouse gas reductions will require less use of fossil fuels. As a result, jobs would almost surely be lost in the fossil fuel sector and perhaps others. Indeed, legal instruments will be needed to "cushion the impacts on those few industries, regions, and communities that would be adversely affected."[170] The challenge for these legal tools is also to create more new jobs than the jobs being lost, and to ensure that those jobs pay at least as well as the jobs being lost.

159. D.W. Pearce et al., *The Social Costs of Climate Change: Greenhouse Damage and the Benefits of Control, in* CLIMATE CHANGE 1995: ECONOMIC AND SOCIAL DIMENSIONS OF CLIMATE CHANGE 203-05 (James P. Bruce et al. eds., 1996) (summarizing estimates).

160. *Id.*, at 205-07 (summarizing estimates).

161. *Id.* at 207-09.

162. ADMINISTRATION ECONOMIC ANALYSIS, *supra* note 10, at 69-70 (explaining omission and summarizing studies). Economic models reach more favorable economic conclusions if they account for the benefits of avoiding the economic damage of climate change as well as reducing emissions of other air pollutants. REPETTO & AUSTIN, *supra* note 9, at 7-8.

163. *See, e.g.,* Statement of Mark Chupka, Acting Assistant Secretary for Policy and International Affairs, and Joseph Romm, Acting Assistant Secretary for Energy Efficiency and Renewable Energy, before the Subcommittee on Energy and Environment, Committee on Science, U.S. House of Representatives (Oct. 9, 1997) <http://www.house.gov/science/chupka_10-9.htm> (describing the Energy Information Administration study).

164. GELLER ET AL., *supra* note 143, at 37-38.

165. Prepared Statement of the Honorable Janet Yellen, Chair, Council of Economic Advisors Before the House Commerce Committee, Energy and Power Subcommittee, Federal News Service (Oct. 6, 1998) (describing the Council of Economic Advisors study).

166. REDUCING GREENHOUSE GASES, *supra* note 13, at xiii.

167. *Id. See also* BERNOW ET AL., *supra* note 147, at 19-21 (describing air pollution reductions from use of suggested instruments).

168. REDUCING GREENHOUSE GASES, *supra* note 13, at xiii.

169. Neela Banerjee, *Fuel Bills Empty Poor Pockets, Unfilled by Boom*, N.Y. TIMES, Aug. 9, 2000, at A1.

170. REPETTO & AUSTIN, *supra* note 9, at 37.

4. Technological Innovation

Legal instruments should foster breakthrough technological innovations whose subsequent diffusion will contribute substantially to climate change mitigation.[171] The Kyoto Protocol is only the first step toward stabilizing greenhouse gas emissions at a much lower level than they are at present, and breakthrough innovations could make it much easier to do so. In fact, technology is projected to have as much an impact on future greenhouse gas emissions as economic development and changes in population.[172] As much of the U.S. experience with technology-forcing in environmental law demonstrates, long-term improvements require a conscious and carefully crafted strategy to ensure the continual deployment of more effective technology. Many economic models assume that the most economically attractive approach includes government action to "encourage early development of energy-efficient and low-carbon technologies and to discourage long-lived investments in carbon-intensive energy facilities."[173]

Such an approach also helps move the debate from simply avoiding risks and reducing costs to also seeking opportunities. Among other things, it could engage the private sector in problem solving at a high level of enthusiasm and effort.[174] Legal instruments that reduce net emissions and encourage dynamic technological innovation could put the United States in a stronger international competitive position because of more efficient energy use and the export value of these innovations. On the other hand, the United States and U.S. corporations will likely incur significant opportunity costs in terms of renewable energy and conservation technology development and know-how should the United States act later than other developed countries to mitigate climate change.[175]

5. National Security

National security is a long-term goal of U.S. energy policy,[176] though the extent to which that goal has been realized is open to question. The claim that the United States needs to reduce dependence on foreign oil is particularly resonant when gasoline prices are relatively high. Actions that increase the use of renewable energy and energy conservation should reduce dependence on foreign oil.

Climate change contributes at least two other dimensions to the national security issue. The first is based on the ability of greenhouse gas emissions from other countries to cause adverse affects within the United States. By 2010, developing countries are expected to exceed developed countries in their carbon emissions and energy demand.[177] Moreover, as already noted, temperatures in this country are projected to increase much more than the average global increase, which means that effects may be felt more acutely here than elsewhere. The other dimension of national security is based on the ability of climate change to cause or contribute to problems elsewhere that could affect this country, including conflicts and mass migrations.[178]

D. Cost-Effectiveness

Perhaps the most basic and widely considered criterion for legal instruments is cost-effectiveness. A legal tool is said to be cost effective if it achieves a particular goal at the minimum total cost. This criterion necessarily comes into play after the goal has been chosen.[179] For the United States, there are two goals. The first, stated in the Framework Convention, is the stabilization of greenhouse gases at a level that prevents dangerous human interference with the climate system.[180] The second is the 7% reduction from 1990 levels contained in the Kyoto Protocol. Achieving these goals in a cost-effective manner is particularly important because of the enormous potential costs of reducing net greenhouse gas emissions. A thorough analysis of alternative tools and suites of tools is needed before a particular tool or suite of tools can be considered cost effective.

Many of the studies of the economic impact of the Kyoto Protocol on the United States do not analyze whether particular legal instruments or groups of instruments are cost effective. Instead, they assume that particular instruments are cost effective, and then analyze costs based in part on their assumptions. The Council of Economic Advisors and Energy Information Administration studies, for example, seem to approach the problem in this way. They assume that a particular carbon charge and emissions trading program is cost effective and analyze costs based on that assumption. Such

171. Nicholas A. Ashford, *An Innovation-Based Strategy for the Environment, in* WORST THINGS FIRST? THE DEBATE OVER RISK-BASED NATIONAL ENVIRONMENTAL PRIORITIES (A.M. Finkel & D. Golding eds., 1994); Kurt Strasser, *Cleaner Technology, Pollution Prevention, and Environmental Regulation*, 9 FORDHAM ENVTL. L.J. 1 (1997).

172. WORKING GROUP III, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT ON EMISSION SCENARIOS: SUMMARY FOR POLICYMAKERS 7 (2000) <http://www.ipcc.ch/pub/SPM_SRES.pdf>.

173. REPETTO AND AUSTIN, *supra* note 9, at 22.

174. Ashford, *supra* note 171, at 27.

175. Alan S. Miller, *Energy Policy From Nixon to Clinton: From Grand Provider to Market Facilitator*, 25 ENVTL. L. 715, 731 (1995).

176. *Id.*

177. *International Energy Outlook 2000*, *supra* note 69.

178. CLIMATE CHANGE IMPACTS ON THE UNITED STATES, *supra* note 25, at 6. The United States "cannot, in the end, consider its own vulnerabilities to climate variability and change without also considering the consequences of changes in other parts of the world." *Id.*

179. Stavins, *supra* note 89, at 295. A legal instrument may also be considered cost effective if those who incur costs recoup those costs in the form, say, of money saved by reduced energy consumption. *See supra* note 140.

A benefit-cost analysis, by contrast, weighs the costs and benefits of choosing a particular goal. Stavins, *supra* note 89, at 295.Once a goal has been chosen, a benefit-cost analysis is not appropriate. The framework for instrument choice suggested here is intended, among other things, to ensure separate discussion of benefits (multiple purpose or multiple benefit instruments) and costs (cost-effectiveness). It is not a framework for benefit-cost analysis. *See also* WEYANT, *supra* note 9, at 43:

> Above all, it is essential to keep the benefits of climate change policies transparent and separate from the costs, both in doing the analysis and in communicating the results. It would be unfortunate if cost estimates from a cost-effectiveness study that did not take into account climate change benefits were misinterpreted to include such benefits. And it would be equally unfortunate if a cost estimate that did not account for climate change benefits was misinterpreted as excluding them.

As used in this Article, benefits and costs are described separately, with one exception. If a legal instrument causes the person incurring costs to save money, the economic benefit to that person is counted against his or her costs as part of a cost-effectiveness analysis. All other benefits are considered separately.

180. Framework Convention, *supra* note 1, art. 2.

assumptions make it difficult to know whether these studies are drawing conclusions about costs based on the most cost-effective approach. Differences in their legal assumptions make one suspect otherwise. The "five labs" study and the nongovernmental studies reinforce that suspicion, recognizing that additional instruments, including those fostering technological innovation, would be more cost effective.[181]

III. State Actions to Reduce Net Greenhouse Gas Emissions

A. Why State Actions Matter

In a federal system like that in the United States, where laws can be adopted at the national, state, or even local level, the question of instrument choice is coupled with a separate but related issue concerning the level of government employing those instruments. Because of the division of governance responsibility between states and the federal government, states do not ordinarily play a major role in the implementation of international agreements. Historically and constitutionally, the federal government is responsible for relations with other nations. Indeed, states can obstruct rather than facilitate foreign relations and the implementation of international agreements.[182]

States can nonetheless play a significant role in reducing net greenhouse gas emissions.[183] Because the United States has already ratified the Framework Convention, state actions that reduce net greenhouse gas emissions help fulfill the country's responsibilities under international law.[184] State actions to address global warming are also important in their own right because many states emit greenhouse gases at levels that exceed those of most countries.[185] Greenhouse gas reduction plans developed by a handful of states could reduce U.S. greenhouse gas emissions by 2% from projected 2010 levels if they are implemented.[186] Moreover, it has been recognized for some time that states would necessarily be part of any comprehensive U.S. response to climate change.[187] In 1990, for instance, EPA established a State and Local Climate Change Program to help states respond to the risks of global warming.[188] States thus provide a forum for moving forward on climate change mitigation that is now largely unavailable at the national level because of policy gridlock in Washington, D.C.

State actions are likely to fit within the framework described above for considering legal tools or instruments for reducing net greenhouse gas emissions. They are likely to achieve their reductions domestically, and these reductions may be significant. States can employ, and have employed, dozens and perhaps hundreds of different legal instruments that have the effect of reducing net greenhouse gas emissions.[189] Moreover, states may and do employ combinations

181. *See, e.g.,* BERNOW ET AL., *supra* note 147, at 15-16 (suggesting that more efficient use of money would yield a net savings of $368 per household).

182. In a prominent recent case, Breard, a citizen of Paraguay, alleged that his conviction for rape and murder and his death sentence should be overturned because the Virginia prosecutor violated international law. Breard argued that the state did not tell him he had the right to contact the Paraguayan Consulate, as required by a treaty on consular relations. When his claim was brought to the International Court of Justice (ICJ), the court issued a preliminary order that "[t]he United States should take all measures at its disposal to ensure that Angel Francisco Breard is not executed pending the final decision in these proceedings . . . ." Case concerning the Vienna Convention on Consular Relations (Para. v. U.S.), Provisional Measures, para. 41 (Order of Apr. 9, 1998) <http://www.icj-cij.org>. The U.S. Supreme Court refused a petition for a writ of habeas corpus based on the treaty violation. Breard v. Greene, 118 S. Ct. 1352 (1998). The Secretary of State asked Virginia's governor to stay Breard's scheduled death sentence, but the governor refused and Breard was executed. *See* Jonathan I. Charney & W. Michael Reisman, *Agrora: Breard*, 92 AM. J. INT'L L. 666 (1998). For many, the case exemplified the ability of states to interfere with treaty commitments. *See, e.g.,* Louis Henkin, *Provisional Measures, U.S. Treaty Obligations, and the States*, 92 AM. J. INT'L L. 679 (1998) (arguing that states are bound by international agreements), and Carlos Manuel Vazquez, *Breard and the Federal Power to Require Compliance With ICJ Orders of Provisional Measures*, 92 AM. J. INT'L L. 683 (1998) (arguing that the federal government had the power to prevent Virginia from executing Breard and should have exercised that authority in response to the ICJ order). *See also* Crosby v. Nat'l Foreign Trade Council, 68 U.S.L.W. 4545 (2000) (invalidating Massachusetts statute restricting authority of its agencies to purchase goods or services from companies doing business with Burma (Myanmar) because it frustrates the objectives of a federal statute imposing mandatory and conditional sanctions on the same country).

183. Local governments can also play a significant role. EPA's State and Local Climate Change Program assists municipalities as well as states. *See* STATE AND LOCAL CLIMATE CHANGE PROGRAM, U.S. EPA, MAPPING A CLEANER FUTURE (1998). The International Council for Local Environmental Initiatives also has a program for communities that want to reduce greenhouse gas emissions. Many major U.S. cities (e.g., Chicago, Minneapolis/St. Paul, Pittsburgh) participate in that program. *See* International Council for Local Environmental Initiatives, U.S. Office, *What Is the Cities for Climate Protection Campaign (CCP)?* (visited July 18, 2000) <http://www.iclei.org/us/US_ccp.html>.

184. H.R. EXEC. DOC. NO. 102-55, *supra* note 57, at 13 (recognizing that state actions would be part of the U.S. implementation of the Framework Convention).

185. Barry G. Rabe, The Politics of Global Climate Change: Implementing a "Law of the Atmosphere" in American States and Canadian Provinces (unpublished paper, July 1999), at 6 (on file with author) ("[I]f the fifty American states and ten Canadian provinces were somehow to secede and become independent nations, approximately half of them would rank among the top 60 national emitters of greenhouse gases around the globe.").

186. MAPPING A CLEANER FUTURE, *supra* note 183, at 2.

187. *See, e.g.,* OFFICE OF TECH. ASSESSMENT, *supra* note 11, at 142, 327-31 (describing state actions that address climate change). *See also* DANIEL A. LASHOF & ERIC L. WASHBURN, NATURAL RESOURCES DEFENSE COUNCIL, THE STATEHOUSE EFFECT: STATE POLICIES TO COOL THE GREENHOUSE (1990) *and* CENTER FOR GLOBAL CHANGE, UNIVERSITY OF MARYLAND AT COLLEGE PARK, COOL TOOLS: STATE AND LOCAL POLICY OPTIONS TO CONFRONT A CHANGING CLIMATE (Pamela Wexler ed., 1992).

188. MAPPING A CLEANER FUTURE, *supra* note 183, at 4.

189. Harrison Institute for Public Law, Georgetown University Law Center, The States and Global Climate Change: Adopted and Proposed Initiatives (n.d.) (unpublished paper on file with author made available by Prof. Robert Stumberg) (identifying dozens of adopted and proposed state laws). In the residential sector, adopted legal and policy instruments include state energy efficiency standards, home efficiency loan discounts, promotion of efficient residential lighting, and funding for low-income energy insulation. *Id* (app.). Commercial sector instruments include state energy efficiency standards and measures concerning commercial lighting. Industrial sector instruments include emission taxes from factories, limits on the sale of ozone-depleting chemicals, training for users of such chemicals, and various industry-specific measures. *Id.* Transportation-related instruments include tax credits for alternative fuel vehicles, heightened emissions inspections, required sale of low- and zero-emissions vehicles, land use regulation, car pooling measures, business fleet efficiency standards, trip reduction ordinances, and alternative fuel demonstration projects. *Id.* In the electricity generation sector, adopted instruments include demand-side management, planning for renewable energy, tax credits for the use of alternative fuels, use of solar or wind driven technologies, collection of methane from coal mining, and expanded use of biomass. *Id.* For forestry, instruments include tree planting initiatives, incentives to not cut trees, and tradable property allowances for forested lands. *Id.* For the gov-

of these methods to reduce net greenhouse gas emissions. Many of these laws also have been in place long enough so that we know a fair amount about their effectiveness in meeting environmental, economic, and social goals. In addition, they are likely to be low cost and economically, socially, and environmentally beneficial; otherwise they would not likely still be in place. These instruments are likely justified by multiple benefits even when their effect on climate change is not counted.[190] These benefits include reductions in other air pollutants as well as energy and cost savings. State experience strongly suggests that it is inappropriate to consider only the climate change effects of proposed laws. The range of projected impacts from climate change also fall well within traditional state police power responsibilities to protect human health, safety, and welfare. "For state agencies," EPA has concluded, "climate change will make protection of public health, the environment, and the economy more difficult."[191] Potential impacts include an increase in heat-related deaths, difficulty in meeting water quality standards, new diseases, loss of or shifts in forest range, loss of fish habitat, changes in agricultural yield, and rising sea levels.[192] These are all areas where states have traditionally exercised legal authority, and where they still exercise authority today.[193]

State experience provides a source for learning what works and what does not work. State actions provide insight into what actually happens when specific tools are employed, alone or in combination with others. Factual information about the effect of state laws or programs already in place is also more accurate and useful than projections based on assumptions about how the world works, particularly assumptions based on the choice of legal instruments. Because we have actual information about how these instruments work, we can consider applying them in other states or at the national level with some confidence about their likely effect and effectiveness. The use of tested and effective legal instruments provides a promising starting point for meeting the Kyoto Protocol. It may also be more politically feasible to apply more broadly tools with which we already have some experience than it is to apply tools that are less well understood.[194] State successes thus make it easier for other states and the federal government to act.

State actions regarding climate change also provide a specific context within which to examine the Earth Summit maxim that national governments should delegate responsibility for sustainable development actions to the lowest effective level.[195] This is particularly true because states are likely to be affected in different ways by climate change. For example, states that have ocean coast lines or are heavily dependent on agriculture will need to respond differently than other states. State experience may help us understand the extent to which the state level actions, as opposed to national or local actions, are effective in addressing climate change. The choice of legal instruments may even lead to positive synergies between state and federal actions.

This is not to suggest that state policy innovation regarding climate change is widespread or aggressive. Nor is this to suggest that state action regarding climate change is preferable to federal actions. In fact, measured against conventional wisdom about the value of shifting responsibility for environmental law and policy toward the states, the level of state action regarding climate change may fairly be characterized as disappointing.[196] At least five states have legislation prohibiting the adoption of regulations intended in whole or in part to reduce greenhouse gas emissions under the Kyoto Protocol unless such reductions are authorized by existing law.[197] States may believe that climate change is an international matter for which they are not suited, or they may believe that action taken to reduce net greenhouse gas emissions would put them at a competitive disadvantage with other states.[198] The question, however, is what we can learn from those states that have taken action.

B. Inventories, Plans, and Reduction Goals

States can best begin an effort to reduce greenhouse gas emissions by conducting an inventory of the sources and quantities of such emissions, developing and implementing a strategy to reduce these emissions, and setting a numerical reduction goal. Most states have begun or completed inventories of sources of greenhouse gas emissions.[199] Because sources vary in type and significance from state to state de-

ernment sector, instruments include improvement in energy efficiency in state buildings, requirements that state vehicles meet efficiency standards, and state employee discounts for public transport. In the waste management sector, instruments include laws requiring or encouraging the collection of materials for recycling and landfill methane gas recovery. *Id.* Most of these instruments are not included in this study. *See also* MICHAEL TOTTEN & NITA SETTINA, CENTER FOR POLICY ALTERNATIVES, ENERGY WISE OPTIONS FOR STATE AND LOCAL GOVERNMENTS (2d ed. 1993) <http://www.crest.org/efficiency/energywise_options/>. *See also* LASHOF & WASHBURN, *supra* note 187, *and* CENTER FOR GLOBAL CHANGE, *supra* note 187.

190. MAPPING A CLEANER FUTURE, *supra* note 183, at 6 (outlining state climate mitigation actions that protect public health, improve productivity, reduce costs, improve transportation, and improve forestry and agriculture that "make good economic and environmental sense even if climate change is not an issue of concern").

191. *Id.* at 5.

192. *Id.*

193. "It is important that the federal government recognize that states take on a leadership role [on climate change] given their authority over utilities, land use, transportation, taxation, and other policy areas affecting the environment," according to the Natural Resources Committee of the National Governors' Association. Julie Cohen, *Water Pollution: Governors Seek Legislative Changes to Address Concerns With TMDL Program*, Nat'l Env't Daily (BNA), July 12, 2000, (quoting statement).

194. *See, e.g.,* Cole & Grossman, *supra* note 113, at 915 (the 1970 CAA "intended to improve and build upon pre-existing models, rather than elaborate an entirely novel approach to regulation").

195. Agenda 21, *supra* note 152, at 8.5(g); Rabe, *supra* note 185, at 7. *See also* Donald A. Brown, *Thinking Globally and Acting Locally: The Emergence of Global Environmental Problems and the Critical Need to Develop Sustainable Development Programs at State and Local Levels in the United States*, 5 DICK. J. ENVTL. L. & POL'Y 175 (1996).

196. Rabe, *supra* note 185, at 11, 26. *See also* Barry G. Rabe, *Toward the Sustainable State: Environmental Policy Innovation in Minnesota*, 2 TOLEDO J. GREAT LAKES LAW, SCI. & POL'Y 191, 208 ("[V]irtually all state and provincial environmental agencies and stakeholders talk the language of sustainability but most give little indication of translating these rhetorical flourishes into concrete policy.").

197. ALA. CODE §22-28A-2 (1998); 415 ILL. COMP. STAT. ANN. §140/5 (West 1999); KY. REV. STAT. §224.20-125 (Michie 1998); W. VA. CODE §22-23-1 (1999); WYO. STAT. ANN §35-11-213 (Michie 1999). These prohibitions will not apply when the Kyoto Protocol is ratified and federal implementing legislation is in place.

198. David L. Feldman & Catherine A. Wilt, *States' Roles in Reducing Global Warming: Achieving International Goals*, 6 WORLD RESOURCE REV. 570, 582 (1994).

199. MAPPING A CLEANER FUTURE, *supra* note 183, at 2.

pending on the fuel used to create electricity and many other factors, such inventories give states an understanding of what their priorities should be. Because such inventories ordinarily show the existence of many sources of greenhouse gases and different types of greenhouse gases, inventories can also encourage states to use a portfolio of legal and policy tools specific to individual sources or groups of sources rather than focus on a handful of tools that address only certain sources or types of gases.

About one-half of the states have developed or are developing strategies or action plans to reduce net greenhouse gas emissions.[200] The planning process mobilizes and focuses the state's resources and formally engages the state in an effort to reduce emissions if the state is committed to implementing its plan. The process also tends to identify the types of laws needed to carry out the plan. Because of the many different types of greenhouse gas sources and the varying economic sectors that emit them, such plans ordinarily suggest the use of a suite of legal instruments. A consistent theme of these state plans is that reducing greenhouse gas emissions can create jobs, save money, and protect the environment.[201]

Some states have taken a third step—numerical reduction goals that are analogous to, but not necessarily the same as, the numerical reduction goal in the Kyoto Protocol. New Jersey's plan, for example, is directed toward a 3.5% reduction in its greenhouse gas emissions below 1990 levels by 2005.[202] Numerical goals focus a planning effort, provide a measurable target against which success or failure can be determined, and give the public a straightforward way of understanding the purpose of the effort. When state decisionmakers are willing to be held accountable in this manner for the plan's effectiveness, they give it greater legitimacy.

C. Selected Legal Tools

Each state plan contains a mix of proposed legal and policy measures, only a few of which are discussed here.[203] The following are examples of tools that foster customer choice of renewable energy sources, encourage conservation, provide financial incentives for energy conservation and renewable energy, and encourage or require the use of renewable or low-carbon energy supplies. The tools analyzed here were selected from among dozens and perhaps hundreds of legal tools that are applied at the state level. A great many legal tools for reducing net greenhouse gases are based on the application of existing air pollution, waste management, and transportation laws. For the most part, the greenhouse gas mitigation tools discussed here are not; rather, they are based on state and federal experience with energy regulation, though they also borrow ideas from environmental law. As a result, they illustrate the ways in which environmental law and energy law must mesh together if states and the national government are to reduce net greenhouse gas emissions effectively. In addition, the tools are directed primarily toward stationary emission sources rather than motor vehicles, and CO_2 rather than other greenhouse gases. They also address CO_2 sinks as well as sources. Taken together, they illustrate the complexity of the legal landscape and the many opportunities that are available to reduce net greenhouse gas emissions.

1. Tools Fostering Customer Choice of Renewable Energy or Conservation

For most of this century, electric utilities have been considered natural monopolies because it has been cheaper to generate and distribute electricity from central plants. As a result, electric utilities were given an exclusive legal franchise to provide electric service in specific areas. Under this system, a customer located within the service territory of Utility X must generally purchase electricity from Utility X. To protect customers from price gouging in the absence of competition, and to give utilities a reasonable rate of return on their investments, state utility commissions set the rates that utilities charge residential and industrial customers.[204] This system has also had a simple but profound effect on the ability of utility customers to choose the manner in which their electricity is generated. In general, they have no choice. If Utility X generates electricity with coal-fired power plants, then its customers must use that electricity, even if they prefer electricity generated by solar or wind energy. Electric utility deregulation may provide retail consumers with choices over the cost and manner in which their electricity is produced. If conducted properly, it thus has the potential to help reduce net greenhouse gas emissions.

The traditional system of electric utility regulation is based on both federal and state law. The federal Public Utility Holding Company Act of 1935 establishes financial and corporate governance requirements for electric utilities that have retail monopolies.[205] In addition, the Federal Power Act established a structure under which the federal government, now in the form of the Federal Energy Regulatory Commission (FERC), regulates interstate electricity prices, and the states, usually in the form of state utility commissions, regulate intrastate electricity prices.[206] State utility commissions regulate the prices that electric utilities can charge within their own borders and also control the activities for which utilities can be compensated.

200. *Id.* at 12.

201. *Id.* at 13 ("Wisconsin's climate change action plan is built around the theme that reducing greenhouse gas emissions is good for the state's economy."). *See also* Vermont Dep't of Public Serv., Fueling Vermont's Future: Comprehensive Energy Plan and Greenhouse Action Plan 2-1 (1998) (identifying economic, environmental, and social goals of plan).

202. New Jersey Dep't of Envtl. Protection, New Jersey Sustainability Greenhouse Act Plan at E2 (1999).

203. Mapping a Cleaner Future, *supra* note 183, at 12 (identifying most commonly cited measures in such plans as home energy rating systems, energy-efficiency mortgage programs, model energy codes, tax incentives for industrial fuel switching, emissions trading, methane reclamation, statewide recycling, state alternative fuel fleets, truck-to-train cargo mode shifts, incentives for purchasing fuel-efficient cars, and planting trees on unforested land).

204. Approved rates are designed to provide a specified rate of return on invested capital. Bernard S. Black & Richard J. Pierce Jr., *The Choice Between Markets and Central Planning in Regulating the U.S. Electricity Industry*, 93 Colum. L. Rev. 1339, 1344 (1993). *See also* Thomas R. Casten, Turning Off the Heat: Why America Must Double Energy Efficiency to Save Money and Reduce Global Warming 32-42 (1998) (brief history of electric utility regulation).

205. 15 U.S.C. §79. *See id.* §§79(a)-(c) for statements regarding the nature of holding companies, the protection of investers and consumer interests, and policies regarding abusive holding company practices.

206. 16 U.S.C. §§813 & 2721(b).

Until recently, electric utilities built and operated their own generating stations and only sometimes purchased power from other utilities. That has changed for several reasons. First, utility overinvestment in nuclear power in the late 1960s and 1970s was so costly that state commissions prevented utilities from charging customers for one-fifth of utility nuclear investments.[207] To prevent future similar actions, many utilities began to purchase power from other parties rather than build their own facilities, an action made possible by technical advances that permit electricity to be transmitted longer distances.[208] Second, in 1996, FERC made the purchase of electricity from other utilities much easier when it required public utilities that own, control, or operate electric transmission facilities in interstate commerce to permit the use of those transmission facilities by other utilities on a nondiscriminatory basis. This decision allows the "wheeling" of electricity generated by one utility to another utility on a third utility's transmission lines.[209] Third, from 1930 to 1980, economies of scale favored the construction and operation of larger and larger power plants (up to 1,000 megawatts in generating capacity) that required a 10-year lead time for design, approval, and construction. That tendency plainly favored the natural monopoly approach to utility regulation. By the mid-1980s, however, 50 to 150 megawatt natural gas power plants became available that were cheaper than the larger plants on a dollars-per-megawatt basis, and that required only a one-year lead time.[210] Fourth, the Public Utility Regulatory Policies Act (PURPA) became law in 1978.[211] The Act was intended to reduce demand for fossil fuels and foster energy conservation and the use of renewable energy.[212] It did so by creating two new classes of power producers. Small power production facilities generate electricity from certain renewable sources and have a power production capacity of 80 megawatts or less.[213] Cogeneration facilities, on the other hand, are facilities that produce and market electricity as well as steam or other forms of useful energy, but are not subject to the 80-megawatt limit.[214] Regulations adopted under PURPA require utilities to purchase electricity from these facilities at the utilities' avoided cost if they are not owned by utilities and meet other requirements.[215] The Act also exempts these power producers from a variety of state and federal laws pertaining to electric utilities.[216] In effect, PURPA offers qualifying facilities "a guaranteed market for their electricity, at a fair price, and without the burden of regulatory constraints."[217] Not surprisingly, PURPA has led to the rapid growth of independent power producers that operate small power production and cogeneration facilities.[218] These are companies that build and operate power plants, and then sell their electricity to utilities.

Competition to supply electricity to utilities has also created pressure to authorize retail competition. The average electric bill in the early 1990s varied from as low as 3.7 cents per kilowatt hour (kwh) in Washington to as high as 10.8 cents per kwh in New Hampshire and New York. Such differences made it apparent that utility price regulation did not keep customer's bills as low as they could be.[219]

a. Customer Choice of Electricity Providers

More than 20 states have thus far authorized retail competition in the provision of electricity.[220] Retail competition means that utility customers get to choose their electricity provider. A homeowner, business, or industry located within the service territory of Utility X is no longer obliged to purchase electricity from Utility X. Instead, it may purchase electricity from any other company that offers to sell electricity within that service territory.

Customer choice of electricity providers could play a significant role in reducing net emissions of greenhouse gases *if* individuals and firms choose providers that generate electricity from wind, solar, and other non-fossil fuel sources, or providers that also make energy conservation services available to customers. Current state experience suggests that customer choice will work that way only if, among other things, customers understand how their choice will affect their electric bill, the system actually fa-

207. Black & Pierce, *supra* note 204, at 1345-47.

208. *Id.*

209. Federal Energy Regulatory Comm'n, Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, Order No. 888, 61 Fed. Reg. 21540 (1996). *See also* Transmission Access Policy Study Group v. Federal Energy Regulatory Comm'n, No. 97-1715 and consolidated cases, 2000 U.S. App. LEXIS 15362 (D.C. Cir. June 30, 2000) (substantially upholding decision).

210. Casten, *supra* note 204, at 42-43.

211. 92 Stat. 3144 (1978) (contained in scattered sections of 16 U.S.C.).

212. Federal Energy Regulatory Comm'n v. Mississippi, 456 U.S. 742, 750-51, 12 ELR 20896 (1982) (describing legislative history).

213. 16 U.S.C. §796(17)(A) (defining "small power production facility").

214. *Id.* §796(18)(A).

215. 18 C.F.R. §§292.101(B)(6) & 292.304(b)(2). *See also* American Paper Inst. v. American Elec. Power Serv. Corp., 461 U.S. 402 (1983) (upholding regulations). Small power producers and cogenerators do not have the right to supply power to utilities unless they are owned by a person other than an electric utility. 16 U.S.C. §§796(17)(C) & 824a-3(a).

216. 16 U.S.C. §824a-3(e).

217. Thomas A. Starrs, *Solar, Wind, and Geothermal Energy, in* Environmental Law From Resources to Recovery §11.2(B)(2) (Celia Campbell-Mohn et al. eds., 1993 & Supp. 1997).

218. Jeffrey D. Watkiss & Douglas W. Smith, *The Energy Policy Act of 1992—A Watershed for Competition in the Wholesale Power Market*, 10 Yale J. on Reg. 447, 452-53 (1993).

219. Amy W. Ando & Karlen L. Palmer, *On the Way to Retail Competition*, Resources (Resources for the Future, Washington, D.C.), Summer 1998, at 11. A kwh, the amount of electricity used or expended in one hour by one kw of energy, is a standard measure of energy consumption.

220. For a continually updated state-by-state analysis, *see* Energy Information Admin., U.S. DOE, *Status of State Electric Industry Restructuring Activity as of July 2000* (last updated July 11, 2000) <http://www.eia.doe.gov/cneaf/electricity/chg_str/tab5rev.html>. *See, e.g.,* Ariz. Rev. Stat. Ann. §30-803 (West 1998); Ark. Code Ann. §23-19-103, -107 (Michie 1999); Cal. Pub. Util. Code §§330-398.5 (Deering 1997) & §§9600-9606 (Deering 2000); Conn. Gen. Stat. §§16-244, 245u (1999); Del. Code Ann. tit. 26, §§1001-1017 (1999); 220 Ill. Comp. Stat. 5/16-101 to 5/16-130 (West 1998); Me. Rev. Stat. Ann. tit. 35-A, §§3201-3217 (1999); Md. Code Ann. Pub. Util. §§7-501 to 7-511 (1999); Mass. Ann. Laws ch. 164, §1 (1998); Mich. Stat. Ann. §22.13(6n) (West 1999); Mont. Code Ann. §§69-8-101 to -604 (1999); N.H. Rev. Stat. Ann. §§374-F:1 to -F:7 (1999); N.M. Stat. Ann. §62-3A-1 to -23 (1999); Ohio Rev. Code Ann. §§4928.01-.67 (Anderson 1999); Okla. Stat. tit. 17, §§190.1-190.9 (1999); 66 Pa. Cons. Stat. Ann. §§2801-2812 (1999); R.I. Gen. Laws §39-1-43 (1998); Tex. Util. Code §§39.001 to 41.104 (1999); Va. Code Ann. §§56-576 to -595 (Michie 1999); In re Competitive Opportunities Regarding Elec. Serv., 168 P.U.R. 4th 515 (N.Y. Pub. Serv. Comm'n 1996).

cilitates customer choice (rather than merely appearing to provide choices), and state laws authorizing customer choice are part of a broader effort to reduce net greenhouse gas emissions.

The Pennsylvania, California, and Massachusetts statutes have been in effect as long, or longer, than any of the others. The Pennsylvania statute authorized a pilot program for retail customers beginning April 1, 1997, and the California and Massachusetts laws went into effect in early 1998.[221] While their experience is relatively brief, it provides at least some indication of how retail customer choice may work to reduce net greenhouse gas emissions.

These state laws only affect part of a customer's bill. Prior to restructuring, a customer's bill contains a single charge for the number of kwhs of electricity used during the billing period. The bill for someone who used 700 kwhs in a month looks something like this:

700 kwh	x	8.0 cents/kwh	=	$56.00

This type of bill varies from month to month based on the number of kwhs used, but it is straightforward. It also conveys a simple but important message related to global warming: energy conservation and reduced energy use save money. In reality, however, the customer's bill is comprised of four parts—a generation charge for the electricity produced by the power plant, a transmission charge for use of interstate electric wires that brought the electricity from the power plant, a distribution charge for the use of intrastate wires that brought the electricity to the customer's home or business, and a competition transition charge (about which more is explained later). All four of these charges are based on the number of kwhs of electricity used by the customer. State restructuring laws generally require utilities to "unbundle" the single charge and show the customer all four charges.[222] Thus, the same bill after restructuring should look something like this:

700 kwh	x	2.3 cents/kwh (distribution)	=	$16.10
700 kwh	x	0.5 cents/kwh (transmission)	=	$3.50
700 kwh	x	4.0 cents/kwh (generation)	=	$28.00
700 kwh	x	1.2 cents/kwh (transition)	=	$8.40
TOTAL				$56.00

Not only are there now at least four separate charges,[223] but customer choice affects only one of these. The transmission and distribution charges are regulated by FERC and state utility commissions, respectively, as natural monopolies. No one wants or expects competing electricity generators to put up their own separate set of wires. Customers thus do not get to choose who transmits and distributes their electricity. In addition, as discussed below, the transition charge is fixed by the state and is unavoidable. Thus, state restructuring laws only authorize competition for the generation charge.

☐ *Customer Information*. These added complexities may make it difficult for customers to even understand their bill, much less consider alternative electrical sources. For instance, Utility Y, a competitor to Utility X in the example above, may offer electricity at 6 cents per kwh. A customer may believe that Utility Y is offering a better deal than Utility X because his or her bill is now 8 cents per kwh. But Utility Y can only compete for generation, not transmission or distribution. Thus, the proper price to compare on the current Utility X bill is the generation charge of 4 cents per kwh, not the total charge. A customer who does not understand that, and chooses Utility Y to obtain a lower electrical bill, will be frustrated and unhappy when his or her bill actually increases.

To address such issues, the National Association of Regulatory Utility Commissioners adopted at its 1996 annual meeting a resolution supporting customer "right-to-know" laws for retail marketing of electricity.[224] The National Council on Competition and the Electric Industry, a joint effort of state utility regulators and state legislators, then sponsored research and drafted model legislation.[225] Information disclosure lets customers make the decisions they seek to make, enhances consumer protection by allowing direct comparison of information about competitors, and makes the market more efficient by rewarding those who provide what customers want.[226] The Council's research shows that customers want and need all electricity suppliers to provide standard information, including information that will allow effective price comparisons.[227] Among other things, the model legislation requires each electricity product sold at retail to show the average price, length of the contract period, and the type of rate (fixed or variable) "in a succinct and easily understood format."[228] Because a customer who chooses another electrical supplier will ordinarily be asked to sign a terms-of-service agreement or contract with the new supplier, the length of that contract is important. Many (but not all) state restructuring laws require suppliers to provide such information.[229]

These state laws vary in the extent to which they require disclosure of this information. The model act requires that

221. Cal. Pub. Util. Code §365(b)(1) (West Supp. 2000); Mass. Ann. Laws ch. 164, §1A(a) (West Supp. 2000); 66 Pa. Cons. Stat. Ann. §2804(12) (West 1999).

222. *See, e.g.,* 66 Pa. Cons. Stat. Ann. §2807(c)(1) (West 1999); Cal. Pub. Util. Code §392(a)(1) (Deering 1997); Mass. Regs. Code tit. 220, §11.06 (2000).

223. A variety of other charges may also be included, depending on the state law. The transition charge should not increase customer bills from their level prior to retail competition. As explained below, the charge is a way of allowing utilities to recover costs that they are already allowed to recover. In fact, California prohibited utilities from using the transition charge to increase customer rates. Cal. Pub. Util. Code §330(v).

224. The Regulatory Assistance Project, *The National Council on Competition and the Electric Industry Synthesis Report: A Summary of Research on Information Disclosure* (April 1998) (draft) at 2 (visited Apr. 19, 2000) <http://www.rapmaine.org/synthesis/SNY2.html> [hereinafter *Synthesis Report*].

225. *Id.*

226. *Id.* at 2-3.

227. *Id.* at 3-4. For more information on this research, see Edward A. Holt, *Information Consumers Want in Electricity Choice: Summary of Focus Group Research* (1997) (visited Apr. 19, 2000) <http://www.rapmaine.org/focsum.html>.

228. *Synthesis Report*, *supra* note 224, app. A, §III.

229. E.g., Mass. Regs. Code tit. 220, §11.06(3) (2000).

the labels appear on all written retail marketing and advertising materials as well as the terms-of-service agreement with the electricity supplier.[230] California requires the disclosure labels to be included in all product-specific written marketing materials but excludes advertisements in the general media.[231] The state also requires quarterly disclosure by a supplier to its customers.[232] In Massachusetts, suppliers must provide disclosure labels before the initiation of service, with the customer's first bill, and quarterly thereafter. Written advertisements do not need to contain the label, but they need to say that it will be provided on request.[233]

State restructuring laws also require utilities to implement customer education programs to enable customers to make informed decisions.[234] These programs surely make customers more aware of their ability to make choices. But labeling and education programs, without more, do not provide any information about the energy sources relied on by particular electricity generators or the environmental effects of those sources, including their greenhouse gas emissions. In fact, they may suggest that the only issue that matters in customer choice is cheaper costs.

☐ *Actual Competition and the Transition Charge*. While these customer choice laws authorize retail competition for electrical generation, that authorization comes with a catch. The catch is a transition system for electric utilities. Because of significant differences in the price of electricity within and between states, some utilities would be unable to compete effectively in this new market. Retail customers would migrate to lower cost utilities, and leave the higher cost utilities with significant investments in plant and equipment that they could not recover. These unrecoverable investments are known as stranded costs. Every state restructuring law has allowed utilities to recover the bulk of their claimed stranded costs.[235] State legislatures have evidently been persuaded by the notion that states have a "regulatory compact" with utilities because their state regulatory commissions previously approved these investments under a pricing structure that was designed to let utilities recover their costs.[236]

Thus, each state law allows electric utilities to recover their stranded costs in the form of a competitive transition charge or competition transition charge. The charge is non-bypassable, which means that every customer within the service territory of Utility X must pay it, even if the customer is purchasing electricity from another source. This result is consistent with the "regulatory compact" because it means that the utility can recover its stranded costs from persons who would otherwise be its customers. But it has a profound effect on the willingness of individuals and firms to choose other providers of electricity. The transition charge means that a customer may not obtain electricity from another provider at that provider's market rate; the customer must also pay the transition charge. The transition charge increases the cost of electricity from all other electrical providers, including providers that rely on renewable energy for much or all of their energy. Because electricity from wind and solar power is often still more expensive per kwh than electricity from fossil fuels,[237] the transition charge makes it more unlikely that providers of such electricity will be selected. To be sure, some people will choose renewable energy even if it is more expensive, and electricity will be so expensive in some utility service areas that renewable energy providers will be able to offer cheaper electricity. Others will be persuaded that the energy conservation services made available by a different provider will make that provider less expensive, either right away or over several years. But the general effect of the competitive transition charge is to favor existing utilities.

In addition to reducing the likelihood that utility customers will choose other electricity providers, stranded cost recovery through the transition charge has another adverse effect on competition—it operates as a barrier to market entry by potential competitors. Even if these potential competitors can offer better prices and little or no greenhouse gas emissions, they must still bear the weight of the transition charge for the electric utility with which they intend to compete.

There are two ways of responding to the adverse effects of stranded cost recovery. One is to wait until these costs have been recovered. Pennsylvania's law, for example, generally requires that stranded costs be recovered by January 1, 2006 (nine years from its effective date).[238] In other cases, utilities have recovered their costs earlier than projected by, for example, selling their electric-generating facilities to other companies. Where this has occurred, competition, including competition by renewable energy providers, is likely to be more vigorous. The second and more immediate way of responding is for states to ensure that the competitive transition charge is no higher than necessary. Because a basic purpose—probably *the* basic purpose—of these laws is to reduce electrical costs for customers, it follows that these laws should not increase prices. In fact, the Massachusetts and California laws involve up-front rate reductions of 10% or more.[239] Essentially, as long as overall rates are capped,[240] the higher the transition charge, the less room there is for price competition. The distribution and transmission charges are based on the natural monopoly of electric lines and are set without reference to generator competition. The only two other charges are the generation charge and the transition charge. Because the overall rate cannot ordinarily

230. *Synthesis Report*, *supra* note 224, at app. A, §III(B). Electronic or telephone solicitations must inform the customer that they can obtain a copy of the label if they ask for it. *Id.*

231. CAL. PUB. UTIL. CODE §398.4(b) (Deering 1997).

232. *Id.* §398.4(c).

233. MASS. REGS. CODE tit. 220, §§11.06(4)(c) & (6)(c) (2000).

234. *See, e.g.,* 66 PA. CONS. STAT. ANN. §2807(d)(3) (West 1999); CAL. PUB. UTIL. CODE §392(2)(b) (Deering 1997).

235. Ajay Gupta, *Tracking Stranded Costs*, 21 ENERGY L.J. 113, 114 (2000). *See, e.g.,* DEL. CODE ANN. tit. 26, §1006 (1999); CAL. PUB. UTIL. CODE §383.5 (Deering 2000).

236. Gupta, *supra* note 235, at 113. Opponents of stranded cost recovery have argued that it harms customers because they have to pay higher rates, and that it undermines a utility's incentive to control costs. *Id.*

237. Energy Information Admin., U.S. DOE, *Annual Energy Outlook 2000: Market Trends—Electricity* (visited June 2, 2000) <http://www.eia.doe.gov/oiaf/aeo/electricity.html#elesale>.

238. 66 PA. CONS. STAT. ANN. §2808(b) (1999).

239. CAL. PUB. UTIL. CODE §330(w) (Deering 1997); MASS. REGS. CODE tit. 220, §11.04(9)(b)(3)(a) (2000). *See also* John Rohrbach, *Made in the Keystone State: Pennsylvania's Approach to Retail Electric Competition*, ELECTRICITY J., Jan./Feb. 1999, at 26, 27.

240. Because overall rates were not capped, retail customers in San Diego and part of Orange County, California, experienced significant price increases in the summer of 2000, apparently because of increased costs of wholesale electricity. *See, e.g., California Senate Clears Bill Curbing Power Costs*, WALL ST. J., Aug. 11, 2000, at A4.

exceed the rate before retail price competition, higher transition charges mean a lower generation charge. The lower the generation charge, the more competition is inhibited.

Consider these examples, which are intended only to illustrate two differences between the actions of the Pennsylvania and California utility commissions in response to their restructuring laws:

Example A	Example B
2.5 cents/kwh (distribution)	2.5 cents/kwh (distribution)
0.5 cents/kwh (transmission)	0.5 cents/kwh (transmission)
4.0 cents/kwh (generation)	1.2 cents/kwh (generation)
1.0 cents/kwh (transition)	3.0 cents/kwh (transition)
8.0 cents/kwh (TOTAL)	7.2 cents/kwh (TOTAL)

The controlling charge in both examples is the total charge. The total in Example B is 10% lower than Example A to reflect the up-front rate reduction provided in California. The distribution and transmission costs, which total 3.0 cents per kwh, are the same in both examples to enhance comparability. In Example A, where 5.0 cents per kwh are left for the remaining two charges, the relatively low transition charge allows a relatively high generation charge. In Example B, the rate reduction leaves only 4.2 cents per kwh for the other two charges. The relatively high transition charge allows only a relatively small generation charge.

The 4.0 cents per kwh generation charge in Example A provides the customer with a price to compare with those of competing electrical generators.[241] Because it is a significant fraction of the overall bill, the generation charge (or "shopping charge," so called because it is the price not paid to the former utility when the customer is no longer getting electricity from it, and is thus the price against which a customer shops for a better deal) provides a significant opportunity for price competition. Thus, while the electric bill in Example A is higher than the bill in Example B, 4.0 of the 8.0 cents per kwh charge is subject to price competition. By contrast, the 1.2 cents per kwh charge in Example B leaves relatively little room for price competition. Even though the bill is lower at the outset, it is much less likely that a customer's choice of another electrical provider will reduce the bill.

These differences in generation charges have significant effects on participation in each of the two state programs. More than 500,000 of Pennsylvania's five million electric customers already have chosen another electrical generator under that state's program. By contrast, only 200,000 of California's 12 million electric customers have done so.[242] All of California's electric customers received an up-front reduction in their electric rates, and in that respect receive an immediate benefit from retail competition. On the other hand, Pennsylvania rate payers have greater potential for rate reductions through customer choice. Thus, the size of the generation charge has a major effect on the ability of customer choice to reduce greenhouse gas emissions. At the same time, the relatively small fraction (10%) of Pennsylvania customers who have chosen another electrical provider suggests that the generation charge is not the only reason customers are sticking with their existing utility.

□ *Incorporating Customer Choice Into a Broader Strategy for Reducing Emissions*. Customer choice is provided primarily to let customers reduce their costs. But it is not about cost alone, for these laws also are designed to protect other values, such as the reliability of electrical generation, transmission, and distribution. The challenge is to use electrical restructuring for yet another value—reducing net greenhouse gas emissions.

If the price of electricity reflected all of the social and environmental costs of producing it, including greenhouse gas emissions, then price competition by itself would reduce greenhouse gas emissions. That is, unfortunately, not the way that prices now work. The nation's extensive air pollution control laws do not prevent significant emissions from power plants. EPA has concluded that "in terms of the volume and variety of pollutants emitted into our nation's air, no other single category of stationary sources comes close to matching the contribution of electricity generation."[243] Although many of these pollutants are directly regulated, but not completely eliminated, by air pollution laws, CO_2 is not even directly regulated. Power plant emissions of CO_2 thus enhance the risks and costs of climate change. These costs have not been internalized or incorporated into the price of electricity.

Retail competition by itself can have both positive and negative effects on net greenhouse gas emissions. On one hand, price competition favors cogeneration plants over power plants that produce only electricity. Electric-generating plants heat water to high pressure steam, and then run the steam through a turbine to produce electricity. Even the best turbines, however, can only convert 38% of the plant's energy into electricity.[244] At stand-alone nuclear and

241. Rohrbach, *supra* note 239, at 34-36.

242. John Hanger, President, Citizens for Pennsylvania's Future, Presentation to seminar (Mar. 22, 2000). Less than 10,000 customers participate in the Massachusetts program. *Id. See also* Pennsylvania Office of Consumer Advocate, PA Electric Shopping Statistics (last updated July 3, 2000) <http://www.state.pa.us/PA_Exec/Attorney_General/Consumer_Advocate/cinfo/stat.htm>.

The effectiveness of these programs from a cost-savings perspective should not be judged solely by the number of persons who choose a different electricity provider, however. Among other things, competition should exert downward pressure on prices, which would lower costs for all customers.

243. In re Southern Nev. Water Auth., No. 95-9022, 1996 WL 394357, at *3 (Nev. Pub. Serv. Comm'n May 20, 1996) (quoting EPA comments in a FERC proceeding). Electric-generating facilities were responsible for 36% of all human-caused CO_2 emissions, 72% of all SO_2 emissions, 33% of all NO_x emissions, 32% of all particulate emissions, and 23% of all mercury emissions in 1993. *Id. See generally* OFFICE OF TECH. ASSESSMENT, STUDIES OF THE ENVIRONMENTAL COSTS OF ELECTRICITY (1994) (analyzing and evaluating eight different studies).

Despite an ambitious national program to reduce SO_2 and NO_x emissions from coal-fired power plants, emissions from these facilities are still causing significant environmental damage. *See, e.g.*, U.S. GAO, ACID RAIN: EMISSIONS TRENDS AND EFFECTS IN THE EASTERN UNITED STATES (2000) (finding a decrease in sulfates in 92% of lakes sampled in Adirondack Mountains, but an increase in nitrates in 48% of these lakes, and suggesting that NO_x emissions from coal-fired power plants received insufficient attention in design of that program). Electric utility power plants also emit significant concentrations of mercury and other toxic pollutants. About 1.1 billion of the 7.3 billion pounds of toxic pollutants released into air, water, and land in 1998 were released by electric utilities. U.S. EPA, *Summary of 1998 Toxics Release Inventory (TRI) Data* (2000) (visited July 31, 2000) <http://www.epa.gov/tri/tri98/data/1998datasumm.pdf>.

244. CASTEN, *supra* note 204, at 45-46.

coal-fired power plants, the rest of the plant's heat energy is dissipated in the form of steam from cooling towers or the release of warm water into streams and rivers. Combined heat and power plants, by contrast, use at least 70% to 80% of their energy because, in addition to electricity, they supply heat to factories, office buildings in city centers, and others.[245] Because such plants have more energy to market, and waste less energy, they are more economically competitive and produce fewer greenhouse gases for the energy they generate than stand-alone plants. In addition, technological improvements for gas turbines at natural gas power plants allow these turbines to recover 42% to 45% of their energy in the form of electricity, and as much as 90% if the heat is also marketed.[246] Natural gas plants also produce far less conventional air pollution and greenhouse gases than coal-fired power plants, and are thus becoming the energy source of choice for the overwhelming majority of new plants.[247] On the other hand, price competition has driven many utilities to make greater use of cheaper coal-fired power plants that are also older and less well regulated.[248] Moreover, because higher electric rates tend to encourage energy conservation more than lower electric rates, competition could undermine energy conservation and lead to even greater energy use.

The issue is thus not whether customer choice is likely to affect net greenhouse gas emissions. The issue, rather, is whether we will structure competition to reduce net greenhouse gas emissions—a result that is consistent with the U.S. obligation under the Framework Convention to take climate change considerations into account in formulating economic, social, and environmental policies.[249] That cannot be done by focusing on price and competition alone. In Pennsylvania, for instance, only 80,000 customers have chosen an electric provider that sells greener energy products.[250] While electrical restructuring is an important tool for reducing net greenhouse gas emissions, it cannot do that job without the aid of other tools.

b. Environmental Labeling Requirements for Electricity Sources

Economic competition is more likely to lead to reduced greenhouse gas emissions if customers can make informed choices about the environmental effects of the power supplies used by electricity providers. Many, but not all, states that have authorized customer choice also require energy generators to provide such information to potential and actual customers.[251] When required, such information is distributed in the same manner as price information—in written promotional materials, in customer bills, and elsewhere.[252]

Although price appears to be the most important consideration in choosing an electricity supplier, 82% of the customers surveyed by the National Council on Competition and the Electric Industry believed environmental factors to be very important. In fact, customers tend to believe their utility provides cleaner and greener power than it really does.[253] For nearly two decades, Americans have responded to polls by saying that they prefer renewable energy as an energy source; they have even stated a willingness to pay slightly more for renewable energy.[254]

The National Council's model legislation requires each electricity product sold at retail to show fuel mix and air emissions (for NO_x, SO_2, and CO_2) in the same succinct and easily understood format as price information.[255] Such information enables customers to choose suppliers based on the extent to which they use cleaner electricity. It also enables companies to seek a competitive advantage based on their ability to offer such electricity. Because this information is subject to state truth-in-advertising and other laws, it also helps protect customers from fraudulent or misleading claims concerning the environmental characteristics of a supplier's product.

In general, these labels display the different sources of a customer's electricity. At present, the overwhelming majority of the nation's electricity is supplied by fossil fuels, principally coal and natural gas. These two fuels are sources of greenhouse gas emissions, although, as previously noted, coal produces more of such emissions per kwh of electricity generated than natural gas. Another significant fraction of the nation's electricity comes from nuclear power, which does not create greenhouse gas emissions. Nuclear power, however, has been relatively expensive and generates radioactive waste whose disposal raises significant public concerns.[256] About 12% of the nation's electricity comes from renewable energy sources. Ten percent comes from hydroelectric power, and the rest comes from other renewable sources such as solar energy, wind energy, geothermal en-

245. *Id.* at 47-48.

246. *Id.* at 65-66.

247. The Energy Information Administration forecasts that 92% of the 780 new power plants expected to be constructed in the United States by 2015 will be fired by natural gas. A new 300 megawatt coal-fired power plant would cost $330 million and would have a thermal efficiency of about 36%. By contrast, a new 300 megawatt combined-cycle gas plant would cost only $173 million and would have a thermal efficiency of about 50%. Colin Sullivan, *Murkowski, Bingaman Hope to Overcome Dereg Differences by June 7*, ENERGY & ENV'T DAILY, May 29, 2000 <http://www.eenews.net/subscriber/search/search.cgi?op'pdf&file'eew.htm> (subscription-based news service, article on file with author).

248. *See, e.g.,* Sandra Fleishman, *Environmentalists, Industry Air Differences on Pollution*, WASH. POST, Oct. 17, 1999, at H7; Edward A. Smeloff, *Utility Deregulation and Global Warming: The Coming Collission*, 12 NAT. RESOURCES & ENV'T 280 (1998); Alan Miller & Adam Serchuk, *The Promise and Peril in a Restructured Electric System*, 12 NAT. RESOURCES & ENV'T 118 (1997).

249. Framework Convention, *supra* note 1, art. 4.1(f).

250. Hanger, *supra* note 242.

251. *See, e.g.,* CAL. PUB. UTIL. CODE §398.4 (West 1997); 220 ILL. COMP. STAT. 5/16-127 (West 1999); N.J. STAT. ANN. §48:3-87(a) (West 1999); MASS. REGS. CODE tit. 220, §11.06(d) (1999). Pennsylvania, however, does not require the disclosure of such information.

States are highly unlikely to require labeling if they do not provide competition. In Colorado, the state utility commission refused to require labeling because the state does not allow customers to choose their own electrical supplier. In re Rules Regulating the Serv. of Elec. Utils., Docket No. 98R-536E, Decision No. C99-151 (Colo. P.U.C. 1999). The commission found that such information would be of little help to customers who had no choice. *Id.*

252. *See supra* text accompanying notes 230 through 233.

253. *Synthesis Report*, *supra* note 224.

254. Barbara C. Farhar, *Energy and the Environment: The Public View* (1996) (available at <http://www.repp.org/> under "Publications" icon) (conclusion based on synthesis of data from more than 700 polls conducted between 1973 and 1996). The analysis showed a similar preference for energy conservation.

255. *Synthesis Report*, *supra* note 224, at app. A, §III.

256. *But see* Richard Rhodes & Denis Beller, *The Need for Nuclear Power*, FOREIGN AFF., Jan./Feb. 2000, at 30.

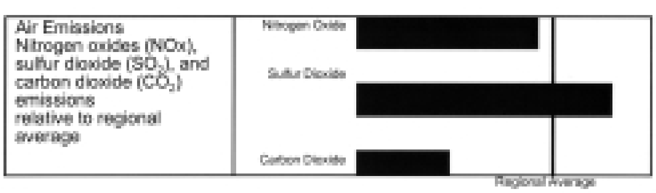
ergy, and biomass.[257] Except for biomass, renewable energy sources do not generate greenhouse gas emissions. Biomass is plant material in the form of forestry and agriculture residues, or methane from landfills, that is burned to produce electricity. Although burning releases CO_2 to the atmosphere, this CO_2 was in the atmosphere relatively recently (as opposed to CO_2 from fossil fuels). Biomass-produced electricity is thus considered a means of mitigating greenhouse gas emissions.

Despite their current minor use in electricity generation, renewable energy resources have enormous potential. Renewable energy resources comprise 93% of the nation's energy resources; solar, wind, and geothermal resources are especially abundant.[258] The use of renewable electricity sources other than hydroelectric power is expected to grow.[259] Many areas of the country have the kind of steady high winds needed for wind power, others have abundant sunlight, and still others (e.g., California, Hawaii) have substantial geothermal resources. Information about electricity sources could prompt customers to demand, and suppliers to provide, increasing amounts of electricity from renewable sources.

Two examples suggest some of the different ways in which environmental information can be displayed in advertising and for other purposes. The National Council recommended an electricity facts label that shows the supply mix and air emissions as follows[260]:

Electricity Facts

Supply Mix We used these sources of electricity to supply this product from 6/96 to 5/97	Coal	30%
	Natural Gas	20%
	Nuclear	15%
	Hydro	10%
	Solar, Wind, Biomass	20%
	Waste Incineration	5%
	Total	100%



The supply mix reflects the reality that most utilities and electrical suppliers use electricity from a variety of different sources. In this example, a customer gets to consider whether she likes a supply mix that is predominantly made up of nuclear and fossil fuel sources but that still contains a significant fraction of renewable sources.[261] The air emissions graph shows air emissions for three different pollutants, two of which are regulated as criteria air pollutants under the federal CAA (NO_x and SO_2), and one of which is not (CO_2).[262] By including CO_2 with its electricity facts, the utility has identified it as an important pollutant. Moreover, utility actions that reduce NO_x and SO_2 emissions can also reduce CO_2 emissions.[263] Thus, while the label is not exclusively about greenhouse gas emissions, such emissions are plainly an important part of the label.

California has taken a somewhat different approach to labeling energy sources. The label looks like this[264]:

POWER CONTENT LABEL

ENERGY RESOURCES	PRODUCT A* (projected)	1999 CA POWER MDC** (for comparison)
Eligible Renewable	56%	12%
-Biomass & waste	-	2%
-Geothermal	-	5%
-Small hydroelectric	-	3%
-Solar	-	<1%
-Wind	-	2%
Coal	10%	20%
Large Hydroelectric	10%	20%
Natural Gas	16%	31%
Nuclear	8%	16%
Other	<1%	<1%
TOTAL	100%	100%

* 50% of **Product A** is specifically purchased from individual suppliers.

** Percentages are estimated annually by the California Energy Commission based on the electricity sold to California consumers during the previous year.

For specific information about this electricity product, contact **Company Name**. For general information about the Power Content Label, contact the California Energy Commission at 1-800-555-7794 or www.energy.ca.gov/consumer.

257. Energy Information Admin., U.S. DOE, Renewable Resources in the U.S. Electricity Supply ix (1993). The report is available at <ftp://ftp.eia.doe.gov/pub/electricity/renewmas.pdf>.

258. *Id.* at 3-4.

259. *Id.* at x-xi. Hydroelectric power is not expected to grow because most major rivers already have dams. *Id.* at x.

260. *Id.* at 5. The generation price and contract parts of the label are omitted here.

261. Illinois requires that information about electricity sources be provided in percentage terms and in a pie chart showing these percentages. 220 Ill. Comp. Stat. Ann. §5/16-127(a) (West 1999).

262. Environmental Defense (formerly the Environmental Defense Fund) suggests another way of showing annual emissions data—by number of pounds (not a bar graph). Environmental Defense, *Sample Electricity Label* (visited Jan. 27, 2000) <http://www.edf.org/programs/energy/green_power_label.html>.

263. Reducing Greenhouse Gases, *supra* note 13, at 25.

264. California Energy Comm'n, *The Power Content Label* (last updated June 9, 2000) <http://www.energy.ca.gov/consumer/power_content_label.html>.

The California label allows a customer to compare her electric service supplier's fuel mix with the statewide average, and it differs from the National Council label in that respect. In this instance, Product A is offering a supply mix with almost five times more renewable energy than the 1999 California electricity mix or portfolio (identified as 1999 CA POWER MDC).[265] That is likely to be an important consideration for many electrical customers. It is even conceivable that many electrical suppliers will want to show that they exceed the California power mix and will increase their percentage of electricity from renewable sources. If enough suppliers do, the California power mix itself will show an increase in the percentage of renewable electricity. Unlike the National Council's label, though, the California label does not show air emissions.[266]

There appears to be little if any empirical information to date about the effectiveness of such informational requirements. Customers who have never thought about their electricity bill beyond the amount are now, in many states, being provided with information about environmental impacts and choices of electrical suppliers. So it is probably fair to say that electrical customers are at the beginning of a significant learning curve. But environmental information requirements build on similar labeling laws elsewhere that have had a significant educational effect on customers. Perhaps the most prominent example is the "nutrition facts" label on food packages, which states the calories, fat, cholesterol, sodium, carbohydrates, and protein in the product.[267] Because food packages are offered for sale, the nutrition label is similar to the environmental information label required in written energy supplier promotional materials and advertising. Both provide product quality information in a format that allows easy comparison with other products. On the other hand, customers receive direct and personal benefits from eating and drinking more healthy food products. Except for the personal satisfaction of using renewable energy, however, the benefits of choosing renewable energy are shared with the public generally.[268] As a result, the personal incentive present in nutrition labeling may be weaker for electricity labeling.

In time, if customers prefer certain renewable energy sources to others, the labels could also affect the type of renewable energy sources being developed. The labels suggest, but do not make explicit, significant controversy over the environmental effects of some types of renewable energy sources. They do so by the way in which they divide or group renewable energy sources. The California label distinguishes between small hydroelectric and large hydroelectric sources, or essentially between small dams and large dams. Although small dams may or may not have adverse environmental effects, large dams have few environmental defenders. The National Council's label, by contrast, has a single line for all hydroelectric power. The definition of biomass raises another issue. The incineration of municipal waste to produce electricity or steam heat is arguably another form of biomass combustion. The California label puts biomass and waste on the same line. From an environmental perspective, however, it is probably better to recycle the paper and cardboard being burned and to compost the organic materials. Thus, the National Council label groups biomass with solar and wind energy and contains a separate line for waste incineration.

Beyond their effect on customer choice, environmental labels educate the public about the extent to which their electricity choices cause the emission of greenhouse gases and other pollutants. A more informed public is likely to support—and seek—public and private decisions that reduce net greenhouse gas emissions.

2. Tools Fostering the Use of Renewable or Low-Carbon Energy

States encourage the development of renewable or low-carbon energy by, among other things, allowing retail customers who generate energy to sell their excess electricity to the utility (net metering), by adopting planning and siting preferences for renewable energy and CO_2 limits for new power plants, and by using renewable energy portfolio standards to require a steady increase in the overall percentage of electricity provided by renewables.

a. Net Metering

The amount of electricity used in a customer's residence or business is normally measured by a meter that provides the basis for the customer's bill. A growing number of customers are also generators because, for example, they have solar photovoltaic panels on their roofs. At least 18 states now authorize persons with their own energy generation systems to sell electricity they don't use to their local electric utility.[269]

265. The specific percentages of eligible renewable resources is not shown because the supplier may not know the precise mix of renewable resources at that time; the supplier of Product A is required to report that information to customers after year's end when it becomes available. *Id.*

266. A third approach to environmental labeling, albeit a nongovernmental one, is the Green-e seal developed by the nonprofit Center for Resource Solutions. The Green-e seal is a voluntary certification and verification program for electricity suppliers. A company can use the Green-e seal if it uses at least 50% renewable sources to generate its electricity, has nonrenewable sources with lower emissions than nonrenewable sources ordinarily have, and agrees to disclose its electricity sources to customers. It also is obliged to add 5% to its renewable energy mix in the first year following deregulation, and perhaps keep adding to its renewable energy mix over time. Green-e Renewable Electricity Program, Center for Resource Solutions, *What Is Green-e?* (visited May 26, 2000) <www.green-e.org/what/index.html>. Although voluntary, the Green-e seal program is national in scope.

A virtue of the Green-e seal is its simplicity, particularly in comparison to the other two. The logo, a flower with an "e" at its center and lines projecting outwards and upwards from the "e" like the sun's rays, stands by itself. It contains no other information about the electricity product being advertised. There is no need to understand pollutants or types of renewable energy.

267. 21 C.F.R. §101.9.

268. Kirsten H. Engel, *The Dormant Commerce Clause Threat to Market-Based Environmental Regulation: The Case of Electricity Deregulation*, 26 ECOLOGY L.Q. 243, 317-18 (1999).

269. California: CAL. PUB. UTIL. CODE §2827 (Deering 1999); Connecticut: 1998 CONN. PUB. ACTS 98-28, §43, 45; Idaho: In re Idaho Power Co., No. 26750,1997 WL 56691 (Idaho Pub. Util. Comm'n Jan. 21, 1997) and In re Rulemaking Proceeding for Consideration of Cogeneration & Small Power Prod., 40 P.U.R.4th 563 (Idaho Pub. Util. Comm'n 1980); Indiana: IND. ADMIN. CODE tit. 170, 4-4.1-1 to -9 (1999); Iowa: IOWA ADMIN. CODE 199-15.11(476) (2000); ME. REV. STAT. ANN. tit. 35-A, §3210 (West 1999) and In re Customer Net Energy Billing (Chapter 313), P.U.R.4th (Dec. 1998); Maryland: MD. PUB. UTIL. CO. CODE ANN. §7-511 (1999); Massachusetts: MASS. ANN. LAWS ch. 164, §1G (Law. Co-op. 1999); Minnesota: MINN. STAT. §216B.164 (1999); Montana: MONT. CODE ANN. §§69-8-601 to -604 (1999); Nevada: NEV. REV. STAT.

Under these laws, a metering system measures electricity going in and out. If the customer's net use of electricity is greater than what it generates, the customer pays a bill based on the difference. If the utility receives more electricity than it provides, it generally pays the customer based on the difference. Net metering laws eliminate a barrier to market participation by enabling customers to sell electricity. Residential customers with their own energy generating technologies pay a reduced bill to the utility, if they pay any bill at all. Net metering thus provides an additional incentive to use small-scale renewable technologies. A study by the Maryland Energy Administration suggests that net metering nearly doubles the monthly cost savings a customer can expect from installing a solar photovoltaic system.[270]

PURPA provides the basic framework for state net metering laws. Under PURPA, utilities are obliged to purchase electricity from qualifying electric-generating facilities of 80 megawatts or less that are powered by renewable resources, geothermal energy, waste, or biomass (or any combination of these sources).[271] A rooftop residential solar photovoltaic system is plainly such a facility. The kind of electricity generation systems amenable to net metering, in fact, are tiny compared to many of the other renewable power sources (such as wind farms and biomass burning facilities) that are defined as small power producers under the Act.

Net metering laws generally require utilities to treat customer-generators differently from independent power producers. Ordinarily, for independent power producers, a utility will sign a net purchase and sale agreement and will install a second meter to measure electricity generation.[272] Net metering programs can simplify this process. Net metering programs generally use one meter, not two; the single meter moves forward to measure consumption and backward to measure generation.[273] Net metering should be easy for customers to use and understand because there is ordinarily no complicated power purchase agreement with the utility.[274] Billing can be much simpler and less expensive because it can be done on an annual basis. A monthly bill makes less sense because it would likely have the customer paying the utility some months, and the utility paying the customer in others.

Net metering programs also offset electric costs or provide revenue for customer-generators. PURPA regulations require a utility to pay for electricity from such facilities based on the utility's full avoided cost.[275] Under PURPA, a utility's full avoided cost is "the cost to the electric utility of the electric energy which, but for the purchase from such cogenerator or small power producer, such utility would generate or purchase from another source."[276] Utilities are thus required to purchase electricity from these producers at the same price they would obtain it otherwise. Full avoided cost, however, is typically less than the retail price. Most states require the utility to purchase net excess generation at the utility's avoided cost. A few require the utility to pay the customer at retail prices.[277]

Because utilities are concerned about the loss of customers and the effect of that loss on their rate base, state laws typically limit the amount of energy that utilities are required to purchase through net metering. The California limit, for instance, is 0.1% of a utility's combined peak load demand.[278] As tiny as that percentage appears, it provides ample opportunity for growth in the use of small-scale renewable energy technologies. Whatever quantity of energy most utilities obtain from renewable sources, most do not now purchase much electricity from the small-scale sources that rely on net metering. As use of net metering increases, lawmakers can decide whether increasing these caps is appropriate.[279]

In addition to directly reducing greenhouse gas emissions by using renewable energy, net metering can foster technological innovation in, and market penetration by, small-scale renewable technologies. Moreover, net metering does not require public funding.[280] Although net metering can directly reduce utility revenues, these losses may be offset by reduced billing and other costs.[281] Utility costs are also reduced by usage caps such as that employed by Cali-

ANN. §§704.766-.774 (Michie 1999); New Jersey: N.J. STAT. ANN. §48:3-87 (Bender 1999); Ohio: OHIO REV. CODE ANN. §§4928.01, 4928.67 (Anderson 1999); Pennsylvania: 52 PA. CODE §57.253 (2000); Vermont: VT. STAT. ANN. tit. 30, §219(a) (2000); Virginia: VA. CODE ANN. §56-594 (Michie 1999); Washington: WASH. REV. CODE §§80.60.005-.040 (2000). For state-by-state summaries, see The Green Power Network, *Net Metering* (visited Mar. 2, 2000) <http://www.eren.doe.gov/greenpower/netmetering/>.

270. Christopher Cook & Jonathan Cross, Maryland Energy Administration, *A Case Study: The Economic Cost of Net-Metering in Maryland: Who Bears the Economic Burden?* (visited Mar. 2, 2000) <http://www.energy.state.md.us/netmtrg.htm>.

271. 16 U.S.C. §796(17).

272. Yih-huei Wan & H. James Green, National Renewable Energy Laboratory, Current Experience With Net Metering Programs 1, Paper presented at Windpower '98, Bakersfield, California, April 27-May 1, 1998 (on file with author).

273. Thomas Starrs, *Net Metering: New Opportunities for Home Power* 4 (visited June 13, 2000) (available at <http://www.repp.org/> under "Publications" icon) [hereinafter Starrs, *Net Metering*]. Because conventional meters are capable of moving in both directions, special metering technology is not necessarily required. Wan & Green, *supra* note 272, at 5-6.

274. THOMAS J. STARRS & HOWARD J. WENGER, POLICIES TO SUPPORT A DISTRIBUTED ENERGY SYSTEM 4-5 (1998) <http://www.repp.org/articles/pv/3/3.html>. In many cases, though, utilities seek to impose on customer-generators the same kind of complex power purchase agreements as they negotiate with independent power producers. *Id.* at 11-12.

275. 18 C.F.R. §292.304(b)(2). In adopting the full avoided cost rule, FERC rejected suggestions that the rate paid to independent producers be a fraction of the avoided cost, stating that payment of full avoided costs would encourage renewable energy and cogeneration. American Paper Inst. v. American Elec. Power Service Corp., 461 U.S. 402, 406-7 (1983) (summarizing regulatory history).

276. 16 U.S.C. §824a-3(d). *See also* 18 C.F.R. §292.101(b).

277. *See, e.g.,* MINN. STAT. ANN. §216B.164(3) (West Supp. 1999-2000) (but limiting retail rate to facilities with less than a 40 kw capacity). Some utilities have challenged this approach, arguing that PURPA prohibits the states from requiring utilities to pay the retail rate. These challenges have thus far been unsuccessful. *See* Wan & Green, *supra* note 272, at 4-5 (summarizing decisions). In programs that use two meters, one meter measures customer consumption and the other measures customer generation. In dual metering programs, the customer-generator typically pays the retail price for electricity but produces electricity at the avoided cost rate. Starrs, *Net Metering*, *supra* note 273, at 2-3. Dual-meter programs obviously provide less of an incentive to produce renewable energy than single-meter programs.

278. CAL. PUB. UTIL. CODE §2827(c)(3) (Deering 1999).

279. Starrs, *Net Metering*, *supra* note 273, at 7-8.

280. Wan & Green, *supra* note 272, at 2.

281. Starrs, *Net Metering*, *supra* note 273, at 8. Utilities that purchase power generated a long distance from their customers lose a fraction of that electricity in transmission. Locally generated electricity thus may be economically advantageous. *Id.* at 8-9.

fornia.[282] When reductions in environmental externalities and other savings are factored in, net metering may even benefit the utility and its customers.[283]

Little hard data exists concerning the effectiveness of net metering programs, but anecdotal evidence suggests that relatively few customers have participated in them.[284] The great distance between low electricity prices and the high cost of small renewable energy systems evidently has not been overcome by the financial returns from net metering.[285] Lack of public awareness and burdensome utility interconnection requirements are also obstacles.[286] Utility electric distribution systems are designed to provide power to customers, not to receive it. As a result, interconnection with customer-generators in net metering programs raises safety and reliability concerns.[287] Utilities have sometimes reacted by imposing unnecessarily burdensome requirements (such as significant liability insurance) and various interconnection charges.[288]

These obstacles, however, are being overcome by several factors. The costs of small-scale photovoltaic and wind systems have declined to the point where net metering can make them cost effective.[289] In addition, grass-roots groups are advocating net metering as a simple way of increasing the use of renewable energy, and many national renewable energy trade groups are supporting them.[290] Nevertheless, a continuing challenge is identifying and responding to legitimate concerns from utilities and simultaneously keeping these programs relatively simple and free of unnecessary burdens.

b. Planning and Siting Preferences for Renewable Energy

Some states have also established preferences for electrical generating facilities that use renewable energy for new power supplies. Because electrical demand is expected to grow, such preferences should in theory enhance the likelihood that renewable generating facilities will be used to meet that demand. Several different types of preferences exist, and they can be employed in both the planning and facility siting processes.

☐ *Planning Preference*. Probably the most common type of planning preference requires utilities to consider the external environmental costs of electrical generation, including CO_2 emissions, in choosing new generating facilities. The federal Energy Policy Act of 1992 required states to consider using integrated resource planning.[291] Integrated resource planning is a process for determining the extent of future demand for more electricity and the means utilities use to meet it. It requires consideration of all alternatives, including construction of new facilities, purchase of power from another source, energy conservation and efficiency, and renewable energy.[292] Minnesota requires utilities to file periodically with the Public Utility Commission a resource plan identifying various options for meeting customer demand.[293] The utility commission is required to "quantify and establish a range of environmental costs associated with each method of electricity generation." These costs are to be used by utilities to evaluate and select options for meeting customer needs in resource plans.[294] At least 24 other states require the consideration of such externalities in the planning process.[295] Inclusion of these additional environmental costs, or "adders," in the planning process gives a preference to renewable energy.

The Minnesota Public Utility Commission has established cost ranges for each of five different air pollutants, including CO_2.[296] It has estimated the cost of CO_2 emissions at $0.30 to $3.10 per ton.[297] In their resource plans, utilities need to calculate the costs of CO_2 and other pollutants that would be generated from any proposed power plant, using both the high-range and low-range estimates.[298] This cost calculation gives renewable energy sources other than biomass a preference over fossil fuel plants, and also gives natural gas plants a preference over coal plants.

Adders have modest value in reducing net greenhouse gas emissions, but may backfire. By quantifying the external environmental costs of electric production—costs that exist despite state and federal environmental laws—utility commissions have made an important contribution to the national debate. It is true that these additional external costs are not contained in the bills customers pay and, thus, are at best a substitute for fully internalized costs,[299] but that criticism is an implicit endorsement for internalizing those costs. In addition, these external costs are not necessarily

282. Cook & Cross, *supra* note 270.
283. *Id.*
284. Wan & Green, *supra* note 272, at 6-7.
285. *Id.* at 7.
286. *Id.* Starrs & Wenger, *supra* note 274, at 13-16.
287. Wan & Green, *supra* note 272, at 5.
288. *Id.* at 5-6. Utilities do not impose all of these requirements. Some derive from private codes and covenants. Starrs & Wenger, *supra* note 274, at 16-18.
289. Starrs & Wenger, *supra* note 274, at 9.
290. *Id.*
291. 16 U.S.C. §2621(d)(7).
292. *Id.* §2602(19).
293. Minn. Stat. Ann. §216B.2422(1)(d) & (2) (West Supp. 1999-2000). As part of the planning process, utilities also are required to prepare "the least cost plan for meeting 50 and 75% of all new and refurbished capacity needs through a combination of conservation and renewable energy resources." *Id.* §216B.2422(2). However, the statute does not categorically require commission approval or utility implementation of such plans.

See also Pacific Northwest Electric Power Planning and Conservation Act of 1980, 16 U.S.C. §839b(e)(1) (energy planning strategy used by Pacific Northwest Electric Power and Conservation Planning Council, which includes Idaho, Montana, Oregon, and Washington, gives first priority to energy conservation (demand-side management) and second priority to renewable energy resources and cogeneration facilities); Nev. Rev. Stat. Ann. §704.746(3)(c) & (4) (Michie 1998) (authorizing utility commission in utility planning process to give preference to renewable energy and energy efficiency).
294. Minn. Stat. Ann. §216B.2422(3)(a) (West Supp. 1999-2000).
295. U.S. GAO, Electricity Supply: Consideration of Environmental Cost in Selecting Fuel Sources (1995). *See also* In re Renewable Resource Dev., 152 P.U.R.4th 84 (Or. Pub. Util. Comm'n 1994) (agreeing to allow utilities short-term recovery of costs for renewable energy in excess of avoided costs to gain experience with renewable sources).
296. In re Quantification of Envtl. Costs, 174 P.U.R.4th 516 (Minn. Pub. Util. Comm'n 1996), *aff'd*, 578 N.W.2d 794 (Minn. Ct. App. 1998), *petition for review denied*, 1998 Minn. LEXIS 546 (Minn.). Cost figures were also determined for SO_2, particulate matter, lead, carbon monoxide, and NO_x. *Id.*
297. *Id.*
298. *Id.* Utilities are also obligated to present cost estimates that do not show these costs at all.
299. Black & Pierce, *supra* note 204, at 1399.

determinative in a resource plan or certificate-of-need proceeding; they are simply one data source that is considered. If their use would push actual electricity costs higher than a utility commission deemed reasonable, for example, they would likely be ignored. While they apply only to new facilities, they may help tip the planning process toward new facilities with lower external environmental costs than would otherwise be the case. On the other hand, they may contribute to pollution by making electricity from older facilities appear less expensive.[300]

☐ *Siting Preference*. Minnesota also requires that the added environmental costs identified in the planning process be used in the approval process for individual facilities. The state prohibits the siting or construction of large energy facilities unless the utility commission has issued a certificate of need.[301] The certificate of need cannot be issued unless, among other things, the applicant demonstrates that "the alternative selected is less expensive (including environmental costs) than power generated by a renewable energy source."[302] In addition, the commission may not issue a certificate of need or authorize cost recovery for any nonrenewable energy facility "unless the utility has demonstrated that a renewable energy facility is not in the public interest."[303] In one recent case, the commission approved a certificate of need for a natural gas plant because, among other things, the utility showed that "the project is less expensive, including environmental costs, than power generated by renewable energy sources."[304] The statute may have pushed new power production toward lower emissions, but apparently did not tip the balance toward renewable energy.

c. CO_2 Limits for New Power Plants

Oregon has taken a unique approach for new electric-generating facilities—a direct limitation on their net CO_2 emissions. Since 1975, no person generally has been allowed to construct a new or expanded electric-generating facility of 25 megawatts or more without first obtaining a site certificate from the Energy Facility Siting Council.[305] Under legislation adopted in 1997, the Council cannot issue the site certificate for a base load natural gas plant unless, among other things, its net CO_2 emissions do not exceed 0.70 pounds per kwh of electricity generated.[306] Thus, the state imposes a direct limitation on CO_2 emissions as a prerequisite to the operation of new electric-generating facilities. Oregon is evidently the first state to impose such a limit.[307]

The limitation is also stringent and designed to become more stringent as technology improves. In essence, if the Council finds that the most efficient natural gas plant operating and demonstrated in the United States emits less CO_2 per kwh of electricity than authorized by this limitation, the Council is authorized to adopt a regulation reducing the CO_2 emissions limit 17% below those of this plant.[308] The Council acted on this authorization in 1999, issuing a regulation reducing the 0.70 pounds limit to 0.675 pounds of CO_2 per kwh.[309] The catalyst for this change is a natural gas facility located in Vancouver, Washington.[310]

If the Council determines from the design of the facility and its likely emissions that the standard is met, it can issue a site certificate with conditions ensuring compliance with the standard.[311] An applicant can meet the CO_2 emissions limit in one or more of three basic ways. First, the applicant can show that the proposed facility will produce both electricity and heat, and that the heat will displace another CO_2 source that would otherwise have continued.[312] Second, the applicant can offset the additional emissions by sequestering carbon or by having a third party do so.[313] Third, the applicant or a third party can fund sequestration activities by paying $0.57 for each ton of CO_2 emissions.[314] By giving applicants these choices, the statute enables them to comply in a more cost-effective manner than if the statute limited their compliance options.

If the applicant chooses the third approach, funding carbon sequestration, it must identify an appropriate nonprofit organization to carry out the sequestration activities and post a performance bond to ensure that the activities are both funded and carried out.[315] Like the Kyoto Protocol, the Oregon legislation requires that carbon sequestration activities result in new and genuine reductions. The Council is to determine the amount of the likely reduction based on the level of certainty that the predicted reduction will occur, the ability of the Council to quantify the reduction, and the extent to which the sequestration would occur anyway.[316] In 1997,

300. Engel, *supra* note 268, at 284-85. For a broader and more critical assessment of adders, *see* Black & Pierce, *supra* note 204, at 1398-1430.

301. MINN. STAT. ANN. §§216B.2421(2) & 216B.243(2) (West Supp. 1999-2000).

302. *Id.* §216B.243(3a).

303. *Id.* §216B.2422(4).

304. In re Application of Lakefield Junction LLP, 194 P.U.R.4th 248 (Minn. Pub. Util. Comm'n 1999). Because the plant would be used to supply power during peak load times and would replace older and less efficient plants, the commission found it likely that the plant would result in a net reduction in emissions. *Id.*

305. OR. REV. STAT. §§469.300(9), 469.320, & 469.503 (1997).

306. *Id.* §469.503(2). Similar limits are imposed by regulation for other types of facilities. *See* OR. ADMIN. R. §§345-024-0590 & 345-024-062 (2000). (A base load plant produces electricity continuously, not just during times of peak demand.)

307. Oregon Office of Energy, *Proposed Power Plant Is First in State to Meet Carbon Dioxide Standard* (visited June 8, 2000) <http://www.energy.state.or.us/office/relrel98a.htm>.

308. OR. REV. STAT. §469.503(2)(a) (1997).

309. OR. ADMIN. R. §345-024-0550 (2000). For a more detailed explanation of the standard-setting process, see Oregon Office of Energy, *Oregon Carbon Dioxide Emission Standards for New Energy Facilities* (visited June 8, 2000) <http://www.energy.state.or.us/climate/ccnewst.pdf>.

310. Electronic mail message from Laura H. Kosloff, vice president of Trexler and Associates, Inc., to Jennifer Cole (Apr. 4, 2000) (on file with Ms. Cole).

311. OR. REV. STAT. §468.503(c).

312. *Id.* §469.503(c)(A).

313. *Id.* §469.504(c)(B).

314. *Id.* §469.503(c)(C). The Council is authorized to issue regulations increasing or decreasing this charge based on empirical evidence of the cost of CO_2 offsets. *Id.* In addition to these three ways of offsetting the additional emissions, the Council may adopt regulations specifying other ways of complying with the standard. *Id.* §469.503(c)(D).

315. *Id.* §469.503(d). In general, the holder of a site certificate must contract to carry out the required offsets within 18 months after beginning construction of the facility. *Id.* §469.503(d)(B).

316. *Id.* §469.503(d).

the Oregon Climate Trust was set up to contract for carbon sequestration projects under this legislation.[317]

The first two site certificates under this legislation were issued to natural gas plants.[318] The first, in Klamath Falls, is a 500 megawatt natural gas cogeneration facility that will produce both electricity and industrial steam.[319] The plant will offset its CO_2 emissions by at least 30% by reforesting 6,250 acres in Oregon, providing funds to the Oregon Climate Trust to develop alternate energy, providing solar energy in developing countries, and helping to develop geothermal energy in Klamath Falls.[320] The second certificate went to a 536 megawatt natural gas plant in Hermiston that will achieve the emissions standard by improving efficiency and paying an estimated $3.6 million to the Oregon Climate Trust.[321]

The Oregon statute shows that states can directly reduce CO_2 emissions from new facilities. While the statute does not require complete offsets for CO_2 emissions, the partial offset requirement provides additional domestic experience quantifying and verifying carbon sequestration projects. The CO_2 limit for new facilities also provides a potential opportunity for carbon trading—not emissions for emissions, but CO_2 emissions for carbon sequestration. The statute's requirement for lower net emissions than the most efficient U.S. plant also provides a means to force either continual improvements in technology or continual reductions in net emissions.

d. Renewable Energy Portfolio Standards

Instead of relying only on procedural options and choices, states using a renewable energy portfolio standard specify the percentage or amount of renewable energy generation they want operating by a specific date. Each state has a particular mix, or portfolio, of types of energy sources. Renewable energy portfolio standards set a standard or target for renewable energy in these portfolios that is ordinarily greater than the current percentage of renewable energy.[322] Thus, a state with 2% renewables in its existing portfolio might set a standard of 5% that must be met by a specified date several years in the future. The standard is usually accompanied by a legal mechanism for achieving it. States typically require every power provider to have renewable energy credits equal to some percentage of its annual sales.[323] Providers can have their own renewable energy sources or purchase credits from other generators. The standard, in sum, comes with a trading system for meeting it.[324] The state certifies these credits, monitors for compliance, and imposes penalties when necessary.[325] At least eight states have renewable energy portfolio standards.[326]

From the standpoint of fostering renewable energy and reducing greenhouse emissions, the most significant question is the extent to which the standard raises the level of renewable energy use in the state. Maine's 30% standard[327] appears to be much higher than that in any other state, but 45% of Maine's electricity already comes from renewable energy sources (mostly hydroelectric dams and wood-fired generating facilities).[328] Many states chose an initial level that seems to be slightly above its current level of renewable energy, and then require that level to be increased over time.[329] By gradually scaling renewable production upward, these states will likely be able to keep electricity prices from increasing and take advantage of projected reductions in renewable energy costs as the use of renewable energy expands. Eventually, higher standards may displace existing fossil fuel sources that are less efficient and more costly.

317. Oregon Climate Trust, *About Us* (visited Apr. 3, 2000) <http://www.climatetrust.org/aboutus.html>. In addition, the trust is to conduct a public outreach and education program concerning climate change and opportunities for action. *Id.*

318. The second was approved under the 1997 law, but the site certificate for the first facility was issued under a predecessor to the 1997 legislation that allowed a limited exemption from the requirement that an applicant show the need for the facility. 1995 Or. Laws. ch. 505, §20 (codified at OR. REV. STAT. §469.501(L)) (modified by 1997 Or. Laws ch. 428). Using a competitive process, the Council awarded a site certificate to the proposed facility that would have the least effect on the environment, including climate change. Oregon Office of Energy, *EFSC Awards Need Exemption Based on Carbon Dioxide Mitigation Efforts* (visited Mar. 28, 2000) <http://www.energy.state.or.us/office/rel/rel14.htm>. The effect of this process was to achieve essentially what the 1997 law required.

319. City of Klamath Falls, Oregon, and PacifiCorp, *Klamath Cogeneration Project—Overview* (visited Mar. 30, 2000) <http://www.sobusi.com/cogen/overview.html>. The plant's fuel efficiency will be about 62%, much higher than that of a coal-fired plant. *Id.*

320. *Id.*; Hal Bernton, *Power Plant Tackles Global Warming*, OREGONIAN, June 11, 1999. The Bernton article is available at <http://oregonlive.com/news/99/06/st061112.html>.

321. Oregon Office of Energy, *Proposed Power Plant*, *supra* note 307.

322. For a state-by-state summary, see Union of Concerned Scientists, *State Minimum Renewable Energy Requirements (as of February 2000)* (visited June 20, 2000) <http://www.ucsusa.org/>.

Two similar approaches are conservation portfolio standards and emissions portfolio standards. For conservation portfolio standards, a state could require every retail energy provider to hold energy conservation credits equal to some percentage of its annual energy sales. Each credit would likely be denominated in terms of a specific number of kwhs of electricity saved or avoided. These credits would also be tradable, allowing energy conservation for the least cost. Emissions portfolio standards might be more difficult to implement, but would be based on the same structure. In re Southern Nev. Water Auth., No. 95-9022, 1996 WL 394357, at *15-*16 (Nev. Pub. Service Comm'n May 20, 1996) (explaining concepts).

323. *See, e.g.,* In re Renewable Portfolio Standard, 201 P.U.R.4th 386 (Ariz. Corp. Comm'n 2000); NEV. REV. STAT. §704.989(3) (1999).

324. For a more detailed explanation of how the standard can work, see American Wind Energy Ass'n, *The Mechanics of a Renewables Portfolio Standard Applied at the State Level (1997)* (visited Feb. 9, 2000) <http://www.awea.org/policy/rpsmechste.html>.

325. Nancy A. Rader & Richard B. Norgaard, *Efficiency and Sustainability in Restructured Electricity Markets: The Renewables Portfolio Standard*, ELECTRICITY J., July 1996, at 43-44.

326. Ryan Wiser et al., *Emerging Markets for Renewable Energy: The Role of State Policies During Restructuring*, ELECTRICITY J., Jan. 2000, at 13, 15.

327. ME. REV. STAT. ANN. tit. 35-A, §3210 (West 1999) (requiring that competitive electricity suppliers obtain 30% of their energy from cogeneration or renewable energy).

328. Steven Clemmer, *A Powerful Opportunity: Making Renewable Electricity the Standard*, NUCLEUS, Spring 1999 <http://www.ncusa.org/Nucleus/99sp.opportunity.html>.

329. *See, e.g.,* CONN. GEN. STAT. ANN. §16-245a(a) (West 1999) (requiring electric suppliers to provide 6% of their output from renewable energy sources now, and 13% by July 1, 2009); MASS. ANN. LAWS ch. 25A, §11F(a) (Law. Co-op. 2000) (requiring retail electric suppliers to increase by 1% the fraction of their sales from new renewable sources by December 31, 2003, to increase that fraction by 0.5% each year until December 31, 2009, and to increase that fraction by 1.0% annually thereafter, until a date determined by the division of energy resources); NEV. REV. STAT. §704.989 (1999) (requiring that solar and renewable energy be 0.2% of the electricity consumed in the state by January 1, 2001, and increase biannually thereafter by 0.2% until it reaches a total of 1.0%); N.J. STAT. ANN. §48:3-87(d) (West 1999) (requiring that 0.5% of each supplier's and provider's electricity be from renewable energy by January 1, 2001, and increase 2% to 4% by January 1, 2012).

Another issue is the type of renewable energy that qualifies for the standard. Arizona, which had limited its portfolio standard to new solar energy, has recently modified its portfolio standard to include other sources of renewable energy.[330] Others recommend the exclusion of certain sources (such as municipal waste incineration) in order to promote the development of new renewable energy technologies.[331]

Renewable energy portfolio standards are attractive for many reasons. They set a legally binding statewide target for the use of renewable energy. The other tools that can foster renewable or low-carbon energy—net metering, planning and siting preferences, and CO_2 limits for new facilities—do not set such a standard. The standards also apply to both new and existing power production; the other three tools apply only to new production. In addition, they provide a market mechanism for achieving that target, allowing buyers and sellers in the marketplace to find the least expensive way of complying with the standard.[332] They also serve as a kind of "market-friendly proxy" for integrated resources planning,[333] a legal tool that will likely require reformulation after retail price competition. Finally, and perhaps most fundamentally, portfolio standards create a growing long-term market for renewable energy, which is likely to reduce renewable energy costs substantially over time.[334] Portfolio standards may even lead to reduced electric prices.[335] Because the standards set only a floor, electricity providers can still market a greener product to customers who want to exceed the standard.[336]

Other states require that a specific amount of new generating capacity, rather than a percentage of the total portfolio, be based on renewable energy. Texas is using that approach to plan what appears to be more new renewable energy than any other state, including those with portfolio standards—2,000 megawatts of new renewable energy by 2009.[337] Texas will use a trading/credit system to implement this requirement.[338]

Minnesota also is requiring a specific amount of new renewable capacity. Instead of trading, it plans to allow competition to work in a different way. The state has required utilities operating nuclear power plants within its boundaries to put in place wind power systems capable of producing 225 megawatts of electricity by the end of 1998, and an additional 200 megawatts by the end of 2002.[339] The state also required utilities operating nuclear plants within the state to put in place 50 megawatts of biomass electric-generating facilities by the end of 2001, and 75 more megawatts by the end of 2002.[340] Because of winds and agriculture in Minnesota, both required forms of renewable electricity production are suited to the state.[341]

Minnesota also has created a rebuttable statutory presumption in favor of additional renewable energy. Utilities operating nuclear plants in Minnesota are obliged to operate or obtain the use of 400 megawatts of wind power generating facilities in addition to the wind power described above. This obligation for an additional 400 megawatts, however, is explicitly subject to statutory least cost and resource planning requirements.[342] In seeking approval for its resource plan for 1998-2012, Northern States Power Company opposed the additional 400 megawatts, arguing that the cost of wind power would exceed the cost of natural gas. The Minnesota Public Utilities Commission disagreed and ordered the 400 megawatts of wind energy to be added during the utility's planning period.[343] The commission found that the utility's projected cost difference between wind and natural gas was only 0.2% to 1.0% of annual costs and concluded that this difference was too small to outweigh the statutory presumption for additional wind energy.[344]

The remedy portion of the commission's order allows wind energy to compete for a broader market. Northern States Power had planned to obtain new electricity through competitive bidding, not construction of its own facilities. Instead of requiring the company to bid competitively for 400 megawatts of wind energy, though, the commission took a different and more far-sighted approach. It ordered Northern States Power to develop an

330. In re Renewable Portfolio Standard, 201 P.U.R.4th 386 (Ariz. Corp. Comm'n 2000).

331. Steven L. Clemmer et al., Union of Concerned Scientists, A Powerful Opportunity: Making Clean Electricity the Standard xii (1999). An executive summary is available at <http://www.ucsusa.org/energy/an.POexec.html>.

332. "If policy makers are interested in relying, to the maximum extent possible, on competitive markets to deliver electric services, but want to ensure that those markets deliver a cleaner, more diverse resource base, then portfolio standards may be the most promising mechanism for achieving policy goals." In re Southern Nev. Water Auth., No. 95-9022, 1996 WL 394357, at *19. The commission then added: "However, a combination of strategies may also be appropriate." *Id. See also* Rader & Norgaard, *supra* note 325, (arguing that a portfolio standard is more efficient than green marketing or a public goods charge in moving the market toward renewable energy). This mechanism can facilitate the development of a healthy renewable energy industry in the United States, which could then more effectively compete for a large export market. *Id.* at 44-45.

333. Rader & Norgaard, *supra* note 325, at 42-43. They can also limit greater use of older and more polluting power plants under electricity deregulation. Engel, *supra* note 268, at 287-88.

334. Rader & Norgaard, *supra* note 325, at 43-45.

335. Price is a function of cost and risk. While renewable energy may cost more in terms of kwhs per hour in the short term, it also involves less risk. Risk involves annual fluctuations in operating costs driven primarily by changes in fossil fuel prices. This type of risk does not exist for renewable energy. The other significant risk, equipment failure or breakdown, can be minimized by a diverse portfolio of renewable sources. Because of this greatly reduced risk, the price charged for renewable electricity in a long-term contract may be lower than that for fossil fuels. *See* Shimon Awerbuch, *Getting It Right: The Real Cost Impacts of a Renewables Portfolio Standard*, Pub. Util. Fortnightly, Feb. 15, 2000, at 44.

336. Rader & Norgaard, *supra* note 325, at 45.

337. Tex. Util. Code Ann. §39.904 (West 1999) (stating legislative intent to have 2,000 additional megawatts of generating capacity from renewable energy technologies installed by January 1, 2009, and requiring the utility commission to establish necessary rules to implement this goal). *See also* Wiser et al., *supra* note 326, at 18-19 (estimating that more than one-half of the new renewable energy resulting from all state renewable energy portfolio standards would come from Texas).

338. *See, e.g.,* Tex. Util. Code Ann. §39.904(b).

339. Minn. Stat. Ann. §§216B.2423(1) & 216C.06(12) (1992 & West Supp. 1999-2000). Only one utility operates nuclear facilities in Minnesota—Northern States Power Company.

340. *Id.* §216B.2424(5). Among other things, these biomass facilities must burn trees or grasses that are intentionally cultivated for fuel for electrical generation, and they must be located within 400 miles of the cultivation site. *Id.* §216B.2424(1) & (5).

341. It is also possible to prohibit the construction of specific types of new facilities; Minnesota has prohibited new nuclear power plants. *Id.* §216B.243(3b).

342. *Id.* §216.2423(2).

343. In re Application of Northern States Power Co. for Approval of Its 1998 Resource Plan, 1999 Minn. PUC LEXIS 12 (Minn. Pub. Util. Comm'n 1999), *amended*, 1999 Minn. PUC LEXIS (1999).

344. *Id.* at 20-21.

all-source competitive bidding process that is unbiased in its treatment of renewable energy and that is not limited to the additional 400 megawatts.[345]

For a variety of reasons, wind contracts and fossil fuel contracts historically have been written differently. As a result, the decision whether to use renewable energy or fossil fuels for new power is often made when the bidding process is designed. If a proposed fossil fuel contract is the basis for the bidding process, for example, wind producers cannot even bid. The commission's challenge to the utility and other parties was to write a contract and bidding process that would apply to both. Such a contract would mean that wind will have to compete successfully with natural gas to get any additional megawatts, but it also means that fossil fuels must compete with renewable energy. The commission believed wind should compete on its own, rather than having its own specialized track, if it is to be mainstreamed into the utility's energy portfolio.[346] The commission was encouraged to take that view because the cost of wind power is declining, there is a now a relatively small cost difference between wind and natural gas, and the utility can implement this decision on an ongoing basis over the next decade or so.[347] The commission, in sum, is attempting to use competition to foster the use of renewable energy.

3. Energy Conservation Tools

The cost savings inherent in using less energy provide an obvious but underutilized incentive for energy conservation. Spurred by Congress, states have had some success using energy conservation in building codes. State utility commissions also have had limited success in encouraging utilities to control demand for the electricity they sell, but demand-side management will not likely survive the end of retail price regulation.

a. Building Codes Requiring Energy Efficiency

More than one-third of the energy used in the United States heats, cools, lights, and otherwise provides energy to buildings.[348] Energy efficiency in buildings thus provides a large opportunity to reduce greenhouse gas emissions. Energy efficiency standards in building codes can also foster sustainable development by reducing energy costs and greenhouse gas emissions simultaneously. Improving energy efficiency in buildings makes economic sense much more often than not; the cost of installation is often offset in five years or less by reduced energy bills.[349] Cost-effectiveness studies for residential building codes indicate that increases in monthly mortgage payments are offset by monthly energy savings and that homeowners receive a good return on their investment.[350] States have been relatively active in adopting and implementing such provisions. In fact, energy efficiency provisions in state building codes have been described as "[o]ne of the most successful energy-efficiency policies at the state and local level."[351] Much of the impetus for such provisions, though, comes from Congress, and there is abundant evidence that more can be done.

Building codes typically divide buildings into a low-rise residential category and a commercial category that includes high-rise residential buildings. These codes generally allow compliance by either a prescriptive method or a performance-based method. In the former, a person follows highly detailed standards for insulation, windows, heating and cooling equipment, and other things. Under the performance-based method, a person can demonstrate compliance by showing that a particular structure consumes an amount of energy that is less than or equal to the amount of energy consumed by a comparable building that uses the prescriptive standards.[352]

The Energy Policy Act of 1992 required each state to review the energy efficiency provisions of its residential building codes. Each state was also obliged to determine within two years whether it should adopt the 1992 Model Energy Code published by the Council of American Building Officials.[353] The Model Energy Code, the most widely used energy efficiency code for residential buildings in the United States, sets minimum insulation standards as well as standards for heating, cooling, lighting, and ventilation.[354] Each state was to make this determination in writing after providing public notice and a hearing. If a state decided not to revise its building code, it was to provide the U.S. Department of Energy (DOE) a written explanation.[355] The Model Energy Code is revised annually through a privately run process that is open to interested and affected persons.[356] Thus, whenever this code (or any successor to this code) is revised, the Act requires the Secretary of Energy to determine whether it "would improve energy efficiency in buildings." If so, the Secretary is to publish a notice of that determination in the *Federal Register*.[357] States are then obliged to determine, using the same process as their original determination, whether to revise their codes to conform to the new version.[358] The 1995 Model Energy Code is the most recent code for which the Secretary has made that determination for low-rise residential buildings.[359]

345. *Id.* Order & 9, *as amended*, 1999 Minn. PUC LEXIS 140.

346. *Id.* 1999 Minn. PUC LEXIS 12 at 23.

347. *Id.* at 18-23.

348. Kate McQueen, *Promoting Energy Efficiency Through Building Codes*, 12 NAT. RESOURCES & ENV'T 122, 122 (1997).

349. REDUCING GREENHOUSE GASES, *supra* note 13, at 163.

350. McQueen, *supra* note 348, at 124-25.

351. *Id.* at 182.

352. REDUCING GREENHOUSE GASES, *supra* note 13, at 182. In many of the most effective states, builders generally comply with energy efficiency provisions in building codes based on performance-based methods, not prescriptive methods. *Id.*

353. 42 U.S.C. §§6832(15) & 6833(a)(1).

354. Notice of Proposed Rulemaking, Energy Efficiency Code for New Federal Residential Buildings, 62 Fed. Reg. 24164, 24164-65 (May 2, 1997). The provisions of the 1992 Model Energy Code regulate the design of building envelopes for adequate thermal resistance and low air leakage, and the design and selection of mechanical, electrical, service water-heating, and illumination systems and equipment that will enable effective use of energy in new building construction. The Model Energy Code provides flexibility to permit the use of innovative approaches and techniques to achieve efficient utilization of energy. *Id.*

355. 42 U.S.C. §6833(a)(2)-(4).

356. McQueen, *supra* note 348, at 123.

357. 42 U.S.C. §6833(a)(5)(A).

358. *Id.* §6833(a)(5)(B).

359. Building Energy Standards Program: Determination Regarding Energy Efficiency Improvements in the 1995 CABO Model Energy Code for Low-Rise Residential Buildings, 61 Fed. Reg. 64727 (Dec. 6, 1996). The 1995 code requires more wall and ceiling insulation in southern locations than the 1992 code, requires recessed-lighting fixtures to reduce heat loss, and makes other changes. Department of

The Energy Policy Act contains a more stringent procedure for energy conservation in commercial building codes. It requires each state to certify to the Secretary of Energy within two years that the energy efficiency provisions in its commercial building code "meet or exceed the requirements of ASHRAE Standard 90.1-1989," which was published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).[360] Unlike residential building codes, states were not given a choice whether to conform their commercial building codes to this standard. The Secretary is also required to determine whether any revision to ASHRAE 90.1-1989 (or any successor to this code) "will improve energy efficiency in commercial buildings." If so, the Secretary must publish a notice in the *Federal Register*. States then have two years to certify that they have upgraded their codes accordingly.[361] ASHRAE recently published a new standard, ASHRAE 90.1-1999, which revises the 1989 code,[362] but the Secretary of Energy has made no determination concerning this revision.

The Energy Policy Act authorizes DOE to provide financial and technical assistance to states to upgrade their codes.[363] In Fiscal Year 1999, for example, DOE awarded $4 million in grants on a competitive basis to 20 states and territories to establish or upgrade the energy efficiency section of their building codes.[364] Such federal assistance has helped states that are interested. California and Minnesota are among the states with the most advanced energy-efficient building codes. California's standards for residential and nonresidential buildings are probably the most advanced in the world.[365] Savings from reduced energy costs under California's standards are estimated at $15.8 billion and are projected to grow to $43 billion by 2011.[366] The state adopted these standards to save money, reduce emissions of regulated pollutants, and reduce the state's dependence on foreign oil, but they also are responsible for significant reductions of CO_2 emissions.[367] Minnesota's code is generally more stringent than the Model Energy Code and ASHRAE 90.1-1989.[368] It is based on state legislation requiring the state's energy code to equal or exceed the codes of other states and requiring energy savings to exceed costs of installation amortized over the life of the building.[369]

The Energy Policy Act's different approaches to residential and commercial buildings do not appear to have had much overall effect on state efforts. About one-half of the states have adopted residential standards that meet or exceed the Model Energy Code, and about one-half of the states have commercial codes that meet or exceed ASHRAE Standard 90.1-1989.[370] The Energy Policy Act does not appear to have motivated other states, however. There does not appear to be political opposition at the state level to commercial energy efficiency codes; legislators simply have not focused on it.[371] There is political opposition to residential energy efficiency codes, however, and Michigan even repealed its code.[372] Homebuilder associations claim a preference for voluntary codes, but relatively few homes are built according to such codes.[373]

Unlike many federal environmental laws, the Energy Policy Act does not require a state to choose between implementing its code to meet a national standard or having the federal government implement the standard within that state's boundaries, does not provide federal grants to implement the standard once it is adopted, and does not seem to require rigorous state enforcement of the standard. This latter point is particularly important because code enforcement requires significant time and personnel commitments.[374] In addition, although home purchasers believe energy efficiency is an important factor in the house they buy, they assume (often wrongly) that new homes are energy efficient.[375] The absence of an across-the-board public information or labeling requirement about energy conservation in residential and commercial buildings hinders informed customer choices. While energy efficiency provisions in building codes provide a relatively successful example of state effort that has the effect of reducing greenhouse gas emissions, such codes have much greater potential.

Housing and Urban Development, *Assessment of the 1995 Model Energy Code for Adoption* (visited Apr. 26, 2000) <http://www.huduser.org/publications/destech/mec.html> (summarizing assessment).

360. 42 U.S.C. §§6832(16) & 6833(b)(1). The standard provides minimum requirements for the energy-efficient design of new buildings except low-rise residential buildings, new portions of buildings, and new systems and equipment in existing buildings. It applies to the envelope of buildings (i.e., foundation, walls, roof, windows, doors) as well as heating, lighting, ventilation, air conditioning, and other systems and equipment. ASHRAE, *ASHRAE Standard 62 Through 109 Purposes and Scopes* (visited May 2, 2000) <http://www.ashrae.org/STANDARDS/s62-s109.htm>.

361. 42 U.S.C. §6833(b)(2).

362. Building Code Assistance Project, *ASHRAE Publishes Revised Standard 90.1-1999* (visited Apr. 26, 2000) <http://solstice.crest.org/efficiency/bcap/ashrae 1999.html>.

363. 42 U.S.C. §6833(d)-(e). *See also* 10 C.F.R. pt. 420 (regulations governing grants to states). The Energy Information Administration also publishes electricity profiles of each state, including information about primary electricity sources, regulatory policies, and trends. Energy Information Admin., U.S. DOE, *State Electricity Profiles* (visited June 2, 2000) <http://www.eia.doe.gov/cneaf/electricity/st_profiles/toc.html> (index to individual state profiles).

364. U.S. DOE, Building Standards and Guidelines Program, 1999 State Grant Summaries iv (1999). This report is available at <http://www.energycodes.org/news/99grant.pdf>. In 1998, DOE awarded a similar amount to 22 states and territories. U.S. DOE, Building Standards and Guidelines Program, 1998 State Grant Summaries v (1998). This report is available at <http://www.energycodes.org/news/98grant3.pdf>.

365. Lawrence Berkely Laboratory, University of California, From the Lab to the Marketplace: Making America's Buildings More Energy Efficient 17 (1995).

366. California Energy Comm'n, *Title 24 Part 6 California's Energy Efficiency Standards for Residential and Nonresidential Buildings* (visited June 5, 2000) <http://www.energy.ca.gov/title24/index.html>. The estimates include savings from standards for energy-efficient appliances not covered under federal law. *Id.*

367. Reducing Greenhouse Gases, *supra* note 13, at 183.

368. *Id.*

369. *See* Minn. Stat. Ann. §§216C.19(8) & 216C.27(1) (West Supp. 1999-2000).

370. McQueen, *supra* note 348, at 124. For a summary of individual state efforts, see Building Codes Assistance Project, *Status of State Energy Codes* (visited Apr. 26, 2000) <http://solstice.crest.org/efficiency/bcap/update.html>. The summary is updated bimonthly.

371. McQueen, *supra* note 348, at 124.

372. *Id. See* Mich. Stat. Ann. §5.2949(4)(6) (LEXIS 1999) (which also repealed the energy efficiency code for commercial buildings).

373. *Id.*

374. Reducing Greenhouse Gases, *supra* note 13, at 182-83. States also must provide manufacturers with significant lead times before these codes go into effect. *Id.* at 183.

375. McQueen, *supra* note 348, at 124.

b. Electric Utility Demand-Side Management

The traditional state energy conservation tool for electric utilities is demand-side management. In a system where utilities have no competitors and receive a fixed rate of return for every kwh of electricity they sell, the regulatory structure tends to encourage utilities to sell more and more electricity. To counteract this, Congress and state regulators have put into place a set of restrictions that essentially oblige electric utilities to control demand for electricity. These laws have worked to some degree, particularly where the economic interest of utilities coincides with these restrictions. It is not clear how well these laws will work after the advent of retail price competition.

In 1978, as part of PURPA, Congress required state regulatory authorities to consider requiring electric utilities to offer load management techniques to their customers.[376] Load management techniques are methods other than time-of-day or seasonal rates that reduce the peak demand load for electricity.[377] From day to day and season to season, customer demand for electricity varies. Demand is greatest, or peaks, during the work day when electricity is used for business and on hot summer days when air conditioners are used. Load management techniques move at least some peak demand to off-peak times by, for example, energy storage devices, interruptible electric service, and even energy conservation.[378] The Act does not require the use of these load management techniques, but it does require states to consider techniques they determine to be cost effective. That is, these techniques are to reduce a utility's maximum demand and have long-run benefits to the utility that exceed their long-run costs.[379] Load management can reduce a utility's costs when it is cheaper for a utility to reduce peak-load demand than to build and operate a new power plant for peak load alone. In 1996, energy efficiency programs were responsible for almost half (47.6%) of actual peak load reductions achieved by electric utilities.[380] The remainder of the peak load reductions were achieved by means other than energy conservation.

While demand-side management includes load management, it also includes a variety of energy conservation measures that utilities and other power generators can use to reduce all demand, not just peak-load demand. In 1992, as part of the Energy Policy Act, Congress required state utility regulatory authorities to consider energy conservation more directly in the ratemaking process. Essentially, states were required to consider incorporating utility investments for "energy conservation, energy efficiency resources, and other demand-side management measures" into their utility rates.[381] The measures considered by states are to be at least as profitable as lost income from reduced sales of electricity.[382] These measures have greater potential to reduce greenhouse gas emissions than load management alone, and they are often referred to as "negawatt [negative megawatt] acquisition programs" to distinguish them from load management.[383] The 1992 legislation coupled energy conservation with a requirement that the states consider integrated resource planning. Integrated resource planning thus includes planning for demand-side management. More than 40 states require utilities to use integrated resource planning.[384] Load management and negawatt acquisition programs, therefore, are formally incorporated into state utility laws.

Essentially, negawatt acquisition programs oblige the utility to pay some or all of the price of electricity-demanding equipment (e.g., light bulbs, motors) or energy conservation equipment (e.g., attic insulation, double-pane windows).[385] The utility does so by paying the customer to purchase the equipment, buying the equipment and giving it to the customer or selling it at a discounted price, or paying an independent company to purchase and install the equipment for a customer for free or a reduced price.[386] States then allow utilities to recover the costs of these programs in the rate base. States also tend to require that utilities earn at least as great a rate of return on these programs as they would have earned if these programs had not been implemented.[387] When these programs work, customers pay lower bills because they are consuming less energy, even though their electric rates are somewhat higher to account for the cost of the programs.[388]

Demand-side management has had a real but modest effect on demand. In 1998, these programs saved an amount of energy equal to 1.74% of electricity sales.[389] By contrast,

376. 16 U.S.C. §§2621(a) & (d)(6)(A). Like the duty to consider residential building codes, this duty to "consider" is not trivial. The state's obligation to consider these techniques is backed by requirements to consider them after public notice and a hearing, and to make a determination in writing based on evidence produced at the hearing. *Id.* §2621(b). Any person who participated in the state proceeding is authorized to seek judicial review of the state's determination in an appropriate state court. *Id.* §2633(c)(1). In Federal Energy Regulatory Comm'n v. Mississippi, 456 U.S. 743, 761-72, 12 ELR 20896 (1982), the Supreme Court upheld these and related portions of the statute against a challenge that they compel the exercise of sovereign state power in violation of the Tenth Amendment. The states, the Court reasoned, can simply refuse to adopt the standard after considering it. *Id.*

377. 16 U.S.C. §2602(8).

378. *Id.*

379. *Id.* §§2621(d)(6) & 2625(c). In addition, the load management techniques must be reliable and help utilities manage their energy and capacity. *Id.* §§2621(d)(6)(B) & (C).

380. Energy Information Admin., U.S. DOE, U.S. Electric Utility Demand-Side Management 1996 31 (1997) [hereinafter Demand-Side Management 1996].

381. 16 U.S.C. §§2621(d)(8) & 2622(b).

382. *Id.* §2621(d)(8).

383. Black & Pierce, *supra* note 204, at 1354.

384. In re Southern Nev. Water Auth., No. 95-9022, 1996 WL 394357, at *1 (Nev. Pub. Serv. Comm'n May 20, 1996). *See, e.g.,* 66 Pa. Cons. Stat. Ann. §524 (West 2000); S.C. Code Ann. §§58-37-10(2) & 58-37-40 (West Supp. 1999).

385. Black & Pierce, *supra* note 204, at 1354.

386. *Id.* at 1355.

387. *See, e.g.,* 66 Pa. Cons. Stat. §§523 & 1319 (1999); Pennsylvania Indus. Energy Coalition v. Pennsylvania Pub. Util. Comm'n, 653 A.2d 1336, 1350-52 (Pa. Commw. Ct. 1995), *aff'd per curiam*, 670 A.2d 1152 (Pa. 1996) (upholding Public Utility Commission orders requiring utility implementation of demand-side management programs containing financial incentives). *See also* S.C. Code Ann. §58-37-20 (if adopted, demand-side management programs "must be at least as financially attractive as construction of new generating facilities"). *See also* Black & Pierce, *supra* note 204, at 1355-56 & 1357-58 n.61 (stating that allowed rate of return on such investments typically exceeds rate of return on other investments, and providing numerous examples of state utility commission decisions).

388. Black & Pierce, *supra* note 204, at 1354. In 1996, most utilities with demand-side management programs spent between 0.1% and 1.0% of their sales revenue to retail customers on those programs. Demand-Side Management 1996, *supra* note 380, at 61.

389. Steven Nadel et al., American Council for an Energy-Efficient Economy, State Scorecard on Utility Energy Efficiency Programs 7 (2000).

electricity demand in the United States is expected to continue growing between now and 2020 by more than 1% per year.[390] Thus, demand-side management reduces electrical demand only slightly and is not preventing significant growth in demand.

The varying effort and effectiveness of state programs appear to be part of the reason. In 1998, the state of Washington saved an amount of energy equal to 9.2% of electric sales, while Kansas saved almost no electricity.[391] If all states achieved the same level of energy savings as the top five states, national energy savings would have been four times greater.[392] Another and perhaps more fundamental reason is an outgrowth of traditional utility regulation. Here, the state, in effect, requires or encourages a utility whose primary business is power production and sale to compete with itself. Every kwh of electricity conserved is a kwh that the utility does not sell. Even when state utility commissions structure rates so that utilities earn a better return on energy conservation than on the sale of electricity, one part of a utility's business is cutting into another—and from its perspective, more fundamental—part. Demand-side management is thus an inherently limited legal tool for achieving energy conservation.[393]

As a practical matter, the transition to competitive electricity markets is undermining demand-side management. The integrated resource planning model on which demand-side management is based may make it difficult for utilities to compete in a retail electricity market with independent power producers whose long-term plans are not subject to this type of public review.[394] In addition, retail price competition removes the state price-control authority on which these programs also have been based. Pressure to reduce costs within utilities is leading to cutbacks in demand-side management programs. Utility spending on such programs dropped from $2.74 billion in 1993 to $1.57 billion in 1998.[395] That leaves two questions: how can states protect the energy conservation gains they have already made, and how can states use the newly developing market for electricity to foster even greater gains in energy efficiency and conservation?

4. Tools Providing Financial Incentives

Many legal instruments provide financial incentives for energy conservation, the use of renewable energy, and carbon sequestration. Three such instruments are public funding programs, cap-and-trade programs, and tax credits.

a. Public Funding Programs

At least two kinds of state public funding programs can reduce net greenhouse gas emissions. One is based on electricity surcharges, and the other builds on historic public support for forestry programs.

□ *System Benefit Charges*. System benefit charges, public goods charges, and similarly named charges provide a way of collecting revenue from electric utility customers to support various programs. These programs can include renewable energy, energy conservation, low-income assistance, and research and development.[396] Such programs, particularly rate assistance and weatherization for low-income persons, existed before restructuring. For other purposes, though, they did not exist as such. System benefits charges provide an obvious potential vehicle for replacing demand-side management because money collected from the surcharge can directly support the same kind of energy conservation and energy efficiency programs that have been supported by utilities through demand-side management programs. More broadly, funds from the surcharge can overcome market barriers to renewable energy and energy conservation and can help commercialize new technologies. Because the surcharges are relatively small, however, they do not likely have any direct effect on energy usage. In that respect, they are different from carbon taxes.[397]

At least 17 states have authorized or put in place system benefits for energy efficiency, research and development, renewable energy, rate assistance, and weatherization.[398] Many state restructuring laws establish the surcharge as a separate nonbypassable component of a customer's electric bill.[399] Like the transition charge, the customer cannot avoid the public goods charge by his or her choice of an electricity provider. Under these laws, state utility commissions determine the amount of the charge. In states that have already determined funding levels, the charge is quite small, ranging from 0.004 cents per kwh (Illinois) to 0.089 cents per kwh (Connecticut).[400] In states with a public goods charge, the customer might be billed like this:

390. *Market Trends—Electricity*, *supra* note 237. Projected annual increases in demand are 1.5% (residential), 1.2% (commercial), and 1.3% (industrial). *Id.*

391. Nadel et al., *supra* note 389, at 7. Five other states—Minnesota, Oregon, Rhode Island, Vermont, and Wisconsin—reported savings of at least 4% of sales. *Id.*

392. *Id.* at vii.

393. These programs also are open to another set of market-based criticisms. In essence, these critics argue that governmental efforts to create a market for energy conservation cost too much, generally produce little environmental or energy conservation benefit, and distort utility and customer behavior in unproductive ways. *See, e.g.,* Black & Pierce, *supra* note 204.

394. In re Southern Nev. Water Auth., No. 95-9022, 1996 WL 394357, at *11 (Nev. Pub. Serv. Comm'n May 20, 1996).

395. *Id.*; Nadel et al., *supra* note 389, at 2.

396. *In re Southern Nev. Water Auth.*, 1996 WL 394357, at *16. *See also* Engel, *supra* note 268, at 295-6.

397. *See* Frank Muller & J. Andrew Hoerner, *Greening State Energy Taxes: Carbon Taxes for Revenue and the Environment*, 12 Pace Envtl. L. Rev. 5 (1994) (advocating that states adopt carbon taxes in conjunction with other state tools to address climate change). *See also* Engel, *supra* note 268, at 305-07 (describing and explaining the difference between facility emission taxes and consumption taxes at the state level).

398. Energy Programs Consortium, National Energy Assistance Directors' Ass'n et al., *The Role of System Benefit Charges in Supporting Public Benefit Programs in Electric Utility Restructuring* (last updated Sept. 9, 1999) <http://www.naseo.org/energy_sectors/power/system_benefit.htm>.

399. *See, e.g.,* Cal. Pub. Util. Code §381(a) (Deering 1999); Conn. Gen. Stat. Ann. §16-2451(1)(a) (West 1999); Mont. Code Ann. §69-8-402(1) & (2)(a) (1999); N.J. Stat. Ann. §48:3-60(a) (West 2000); N.M. Stat. Ann. §§62-3A-3(BB) & 62-3A-6(A)(10) (Michie 1999). *See also* N.H. Rev. Stat. Ann. §374-F:3(VI) (1999) (authorizing but not requiring non-bypassable system benefit charge).

400. Steven Clemmer et al., Union of Concerned Scientists, Clean Power Surge: Ranking the States 17 (2000) (available at <http://www.ucsusa.org/> under "Publications" icon) [hereinafter Clean Power Surge].

2.5 cents/kwh (distribution)
0.5 cents/kwh (transmission)
1.9 cents/kwh (generation)
2.4 cents/kwh (transition)
0.03 cents/kwh (system benefit)
7.33 cents/kwh (TOTAL)

In general, these state laws are intended to ensure that funding for energy programs, at least initially, is not reduced below the level that was available with demand-side management.[401] In practice, states seem to be increasing funding for energy conservation, renewable energy, and related purposes.[402] A major reason appears to be the cost-effectiveness of existing programs. Utility energy conservation programs in California in the mid- to late-1990s, for example, returned more than two dollars for every dollar spent.[403] Despite the state's aggressive energy conservation program, large opportunities for cost-effective energy conservation remain.[404] Total annual funding in states that have determined funding levels ranges from nearly $9 million in Maine to $415 million in California.[405] According to one estimate, these programs could lead to the development of 1,000 megawatts of new renewable energy generation by 2010.[406]

The challenge for such programs is to precisely determine market limitations and to correct those limitations. If particular activities do not require government financial support, or cannot be helped by it, there is no point in funding them. The effectiveness of these programs thus depends on the manner in which funds are allocated and distributed.[407] California requires the state's Energy Commission to allocate the funds for "cost-effective" energy conservation, "research and development not adequately provided by competitive and regulated markets," and "new and emerging" renewable energy technologies, not established technologies.[408] The Energy Commission has identified the small commercial market as deserving of financial assistance, for example, because it "has been chronically under-served by previous utility [demand-side management] programs."[409] Such funds could also play an important role in supporting renewable energy technologies for which there is long-term promise.

☐ *Public Funding for Forestry*. Many states provide financial and other support for tree planting and reforestation and have done so for decades.[410] While carbon sequestration to mitigate climate change is not one of their stated purposes, they can and do have that effect. Where financial incentives are offered, of course, it is important that they stimulate activity that would not have occurred in their absence; otherwise, the money is wasted.[411] Some newer programs directly link tree planting with reductions in atmospheric carbon. Minnesota provides matching grants to nonprofit organizations and communities to plant trees and protect forest health.[412] Oregon allows utilities to incorporate the costs of small-scale tree planting programs into their rate base and thus recover those costs.[413] More ambitiously, a 1991 Arkansas statute is intended to result in the planting of 10 million trees each year until 2001 and to enlarge the state's forested area by 1 million acres.[414] The challenge for states here is to enhance already existing programs and to combine the purposes of those programs with carbon sequestration. The evidence to date is that states are beginning to recognize the potential of this approach, but have not aggressively pursued this opportunity.

b. Cap-and-Trade Programs

Few legal tools to address climate change have received more attention than emissions or carbon trading. Trading is specifically mentioned in the Kyoto Protocol, and two other Kyoto Protocol mechanisms—joint implementation and the Clean Development Mechanism—are based at least in part

401. *See, e.g.,* N.J. STAT. ANN. §48:3-60(a)(3).

402. Memorandum to Interested Legislators from David L. Lovell, Senior Analyst, Wisconsin Legislative Council 5 (June 23, 1999) (on file with author). Much of the Lovell memorandum is based on Energy Programs Consortium, *supra* note 398. The only exception is Maine, which adopted a renewable energy portfolio standard. The state appears to have reduced public funding for renewable energy as a consequence. *Id.*

Although much of this money is spent for renewable energy and energy conservation, public goods funds can also be allocated for other purposes. These include, for example, decommissioning costs for nuclear power plants. *See, e.g.,* N.J. STAT. ANN. §48:3-60(a)(2).

403. CALIFORNIA ENERGY COMM'N, THE ENERGY EFFICIENCY PUBLIC GOODS CHARGE REPORT: A PROPOSAL FOR A NEW MILLENNIUM 17 (1999). The report is available at <http://www.energy.ca.gov/reports/1999-12_400-99-020.PDF>.

404. *Id.* at app. A.

405. Lovell memorandum, *supra* note 402, at 3. Other annual funding levels are Connecticut ($109 million), Massachusetts ($200 million), Montana ($12.5 million), New York ($67.4 million), and Rhode Island ($17 million). *Id.*

406. Wiser et al., *supra* note 326, at 15-16

407. *Id.*

408. CAL. PUB. UTIL. CODE §381(b) (Deering 1997).

409. THE ENERGY EFFICIENCY PUBLIC GOODS CHARGE REPORT, *supra* note 403, at 17.

410. *See, e.g.,* LA. REV. STAT. ANN. §§3:4410-4412 (West 2000) (authorizing a portion of state funds received from timber severance tax to be used for forestry productivity program that includes grants and assistance to landowners); VA. CODE ANN. §10.1-1173 (Michie 2000) (authorizing state forester to provide tree seedlings and other materials to landowners without charge, and authorizing payment to landowners of part of their costs for reforestation projects). On the other hand, some states require reforestation after logging. *See, e.g.,* WASH. REV. CODE §76.09.070 (2000).

411. R.A. Kluender et al., *The Use of Forestry Incentives by Nonindustrial Forest Landowner Groups: Is it Time for a Reassessment of Where We Spend Our Tax Dollars?*, 39 NAT. RESOURCES J. 799 (1999) (survey and analysis of nonindustrial private forest landowners in Arkansas shows that reforestation incentives—tax investment credits, early credits, early amortization of reforestation costs, and cost-share programs—produce no additional timber for sale).

412. MINN. STAT. ANN. §88.82 (West 1999) (establishing Minnesota releaf program "to reduce atmospheric carbon dioxide levels and promote energy conservation"); Minnesota Department of Natural Resources, *Minnesota ReLeaf: New Grant $$ Available to Help Your Trees* (visited June 16, 2000) <http://www.dnr.state.mn.us/forestry/releaf/>.

413. OR. REV. STAT. §757.266 (1997) (authorizing recovery to allow utility to gain experience in offsetting CO_2 emissions).

414. Arkansas Reforestation Act of 1991, 1991 Ark. Acts 375 & 384, *reprinted immediately following* ARK. CODE ANN. §15-31-101 (Michie 1999) (identifying atmospheric CO_2 removal as one of its purposes); Arkansas Forestry Comm'n, *AFC Seedling Program* (visited June 16, 2000) <http://www.forestry.state.ar.us/seedling.html> (stating intent to plant 10 million pine seedlings and 6 million hardwood seedlings in the 1999-2000 planting season).

on forms of trading. Cap-and-trade programs have two basic forms. One is limited to emissions and appears to be the instrument often assumed (with a carbon charge) in economic models of the impact of the Kyoto Protocol. The other, called carbon trading, includes emissions trading as well as trades of CO_2 emissions for sequestered carbon.

Most of the academic and public conversation about trading, however, has focused on international trading. Although often overlooked, trading within the United States offers significant opportunities for cost-effective reduction of greenhouse gases. Some states have taken highly visible actions—authorizing a registry for early reductions such as those based on trading, and initiating a trading process with another country. They also have experience trading other pollutants. Still, state registries do not appear to add significantly to what already exists at the federal level, and there is little legislation authorizing emissions or carbon trading. The voluntary trading that is already occurring would likely increase and be more credible if there were legislative ground rules.

☐ *Registry for Early Reductions*. Trading systems do not work particularly well unless an operator has some incentive to trade. That incentive is ordinarily provided by a cap on its emissions. Because it is most politically feasible to set caps based on existing emissions, the prospect of a cap-and-trade program for CO_2 creates a problem for many industries that want to reduce their greenhouse gas emissions now. If they do so, they do the right thing but risk the possibility that their baseline emissions in a future cap-and-trade program will be set at the reduced level, which will force them to make still more reductions. Because these additional reductions are likely to be more expensive than the reductions required at a comparable facility that did not make any reductions, the company that reduced its emissions early might be at a competitive disadvantage.

To help counteract that possibility, Congress and at least one state have provided companies with an opportunity to voluntarily report early reductions in greenhouse gas emissions. The Energy Policy Act of 1992 requires DOE to establish guidelines and voluntary reporting procedures for persons who reduce, sequester, or avoid greenhouse gas emissions, and to establish a database comprised of such information.[415] This information, which has been reported since 1993, may include reductions based on trades, and recording a claim under this program provides some evidence of its validity. In 1998, 187 U.S. companies claimed that they had taken part in 1,507 projects that reduced or sequestered an amount of CO_2 equivalent to 3.2% of U.S. emissions for the year.[416] The program has taught staff at many companies how to estimate greenhouse gas reductions, has educated companies about what other companies are doing, and has fostered learning in accounting for emissions reductions that will be useful in a future trading program.[417] On the other hand, recording a claim does not mean that the claim will eventually be recognized in law, does not mean that the person claiming the reduction actually "owns" it, and does not factually validate the claim.[418]

At least one state, New Hampshire, has authorized the creation of a voluntary greenhouse gas reductions registry to provide state recognition of early reductions and a baseline against which federal reduction requirements may apply.[419] The state's legislation, adopted in the fall of 1999, appears to provide additional encouragement to New Hampshire businesses to voluntarily report their reductions, and it appears to help strengthen claims for such reductions. The existence of the federal registry, however, means that state programs such as that in New Hampshire play at best a supporting role.

☐ *Emissions Trading*. States are developing considerable experience with emissions trading for volatile organic compounds, NO_x, and other pollutants under the nonattainment provisions of the CAA. Although these trades do not ordinarily include CO_2 because it is not a regulated pollutant under that Act, state experience with trading of other emissions will likely be extremely useful in any future trading program.

In areas of the country where concentrations of criteria pollutants such as ozone and NO_x exceed federal air quality standards, states may not issue permits for new or modified major sources of those air pollutants unless the facility's operator obtains reductions at sources within the region to sufficiently offset the added pollutants from that facility.[420] Because a company can offset its new emissions by retiring its own equipment or obtaining reductions from other sources, the offset program relies to a significant extent on emissions trading.[421] The nonattainment program is run primarily by states. Thus, states with significant nonattainment problems are also likely to have developed considerable experience and expertise with emissions trading that could be employed in CO_2 trading.

At least one state, New Jersey, is preparing to conduct international trading to support its goal of reducing greenhouse gas emissions. In late 1999, the state signed an agreement with the government of the Netherlands to, among other things, identify possible greenhouse gas emission trading projects "in both directions."[422] The two governments agreed to evaluate two types of pilot projects—pri-

415. 42 U.S.C. §13385(b).

416. Energy Information Admin., U.S. DOE, *Voluntary Reporting of Greenhouse Gases 1998: Executive Summary* (visited May 28, 2000) <http://www.eia.doe.gov/oiaf/1605/vrrpt/index.html>. The annual reductions may be based on actions such as "fuel switching, forest management practices, tree planting, use of renewable energy, manufacture or use of vehicles with reduced greenhouse gas emissions, appliance efficiency, methane recovery, cogeneration, chlorofluorocarbon capture and replacement, and power plant heat rate improvement." 42 U.S.C. §13385(b)(1)(B).

417. Energy Information Admin., U.S. DOE, *Voluntary Reporting of Greenhouse Gases 1998: An Overview* (visited May 28, 2000) <http://www.eia.doe.gov/oiaf/1605/vrrpt/chapter1.html>.

418. Energy Information Admin., U.S. DOE, *Recording Transfers and Retirement of Greenhouse Gas Reductions in the Voluntary Reporting Program* (visited Jan. 5, 2000) <http://www.eia.doe.gov/oiaf/1605/trade.html>.

419. N.H. Rev. Stat. Ann. §§125-L:1 to L:3 (Bender 1999).

420. 42 U.S.C. §§7503(a)(1)(A) & 7503(c), ELR Stat. CAA §173(a)(1)(A) & 173(c).

421. One of the most sophisticated and well-known programs is the Regional Clean Air Incentives Market (RECLAIM) program operated by the South Coast Air Quality Management District in the Los Angeles basin. *See* Hoong N. Young, *An Analysis of a Global CO_2 Emissions Trading Program*, 14 J. Land Use & Envtl. L. 125, 133-35, 139-41 (1998) (describing that program).

422. Aide Memoire, New Jersey Department of Environmental Protection and Netherlands Ministry of Housing, Spatial Planning and the Environment (Dec. 7, 1999) (on file with author).

vate-sector-to-private-sector trades facilitated by the two governments, and private-sector-to-government trades.[423] In taking this step, both governments intend to obtain "early experience" in emissions trading that will likely be of great value to them.[424]

□ *Carbon Trading*. State laws do not yet authorize carbon trading, but at least one state—Oregon—allows carbon sequestration to partially offset CO_2 emissions. Carbon trading is more complex than emissions trading. Emissions trading involves credit for a ton of CO_2 emission reductions in one place based on a ton of CO_2 emission reductions elsewhere. By contrast, carbon trading involves credit for emissions reductions based on carbon (not CO_2) that is removed from the atmosphere and then stored or sequestered. Carbon trading requires the comparison of atmospheric CO_2, a molecule made of one carbon and two oxygen atoms, with elemental carbon, the material that is actually sequestered. For this purpose, one ton of CO_2 is equivalent to 0.273 tons of carbon, and one ton of carbon is equivalent to 3.67 tons of CO_2.[425] Carbon trading is also more complex because carbon sequestration is difficult to measure and implement effectively. The amount of carbon sequestered by trees varies by species, local climate, and other factors; reliable quantification methods are not widely available. In addition, the permanence of carbon sequestration is a potential problem. A tree might remove a ton of carbon from the atmosphere over its lifetime, but what happens when the tree dies or is harvested? How long will it take before the carbon contained in the tree is released to the atmosphere through burning or decay?

A recent report by the IPCC concluded that carbon sequestration is likely to make only a limited contribution to reducing net greenhouse gas emissions under the Kyoto Protocol and that current experience with carbon sequestration is limited to a small number of projects.[426] Carbon sequestration is also constrained by the reality that trees absorb CO_2 most readily while they are young and much less readily when they are mature.[427] As a result, the ability of specific forested areas to absorb CO_2 is effectively limited in time. In addition, basic definitional and operating rules under the Kyoto Protocol for carbon sequestration have yet to be formulated.[428]

As already explained, Oregon has taken a step toward carbon trading with a law that limits CO_2 emissions from new power plants and that allows facility operators to meet that limit in part through carbon sequestration.[429] Because the statute authorizes third parties to conduct carbon sequestration to offset emissions, it provides experience that will likely be useful in any subsequent trading system.

Despite the lack of broad legislative effort, many voluntary carbon sequestration projects are being undertaken. More than 100 forestation, reforestation, or forest preservation programs were reported in 1998 to DOE's registry for early reductions.[430] These programs tend to involve financial assistance to private landowners to replant and manage forest lands. The landowners, in turn, sign and record a conservation easement preventing the harvesting of trees for a specified period. Power companies then use the carbon sequestered under these agreements to offset their CO_2 emissions.[431] Such agreements provide environmental benefits for forestry and climate; they also provide economic benefits to landowners.

Similar approaches are being considered for agriculture, particularly carbon storage in soil. This form of sequestration places carbon in the soil itself, not in trees. Scientific studies suggest that carbon sequestration in soil could reduce net greenhouse gas emissions in the United States by up to 8.5% annually.[432] Although a great deal of carbon is stored in soil, much of that carbon has been released because of cultivation. It is estimated that 13 tons of carbon per acre could be returned to U.S. cropland with proper management.[433] Significantly, practices that sequester carbon also "are practices that build soil quality and reduce soil erosion."[434] These practices include conservation tillage, which involves planting and weed control without use of a plow. Planting is done by cutting a slit into the soil, placing the seed in the slit, and then replacing the ground as it was. Conservation tillage also reduces soil erosion and operating costs.[435] Another time-honored means of ensuring and restoring soil health—placement of organic matter into soil—simultaneously moves carbon into the soil. Such practices coincide nicely with a variety of state and federal environmental laws directed toward these same goals.[436] Soil-based carbon sequestration could thus supplement forest-based sequestration.[437] If carbon credits were available to farmers, they could also provide an additional financial

423. *Id.*

424. Letter of Intent Between The Ministry of Housing, Spatial Planning and the Environment, the Netherlands, and The Department of Environmental Protection, the State of New Jersey (June 5, 1998) (on file with author).

425. *Land Use, Land Use Change, and Forestry*, *supra* note 73, at 18.

426. *Id.*

427. *Id.* at 4. The effect of carbon sequestration forestry projects also can be reversed in a variety of ways, including disease, fire, premature cutting, and even climate change. *Id.* at 9.

428. *Id.* at 11.

429. *See supra* notes 306-22 and accompanying text.

430. Energy Information Admin., U.S. DOE, *Voluntary Reporting of Greenhouse Gases 1998: Agriculture and Forestry*, tbl. 11(visited June 19, 2000) <http://www.eia.doe.gov/oiaf/1605/vrrpt/table_11.html>.

431. Montana Carbon Offset Coalition, Montana Carbon Offset Coalition Program Summary 3-5 (Jan. 15, 1999) (on file with author).

432. R. Lal et al., The Potential of U.S. Cropland to Sequester Carbon and Mitigate the Greenhouse Effect 83 (1998) (U.S. cropland has the potential to annually sequester carbon in an amount equal to 8.5% of annual CO_2 emissions); L.E. Drinkwater et al., *Legume-Based Cropping Systems Have Reduced Carbon and Nitrogen Losses*, 396 Nature 282 (1998) (describing specific practices that, if applied in the major maize/soybean growing region in the United States, would increase soil carbon sequestration by an amount equal to 1% to 2% of U.S. CO_2 emissions).

433. Reducing Greenhouse Gas Emissions, *supra* note 13, at 239.

434. *Id.* at 240.

435. *Id.* at 240-42.

436. *See generally* K. Jack Haugrud, *Agriculture, in* Environmental Law From Resources to Recovery (Celia Campbell-Mohn et al. eds., 1993 and 1997 Supp.).

437. In the first 10 years of a new forest's life, agricultural practices that sequester carbon in soil will remove more atmospheric carbon than the forest. For the next 70 years, the forest will sequester more carbon than the soil. After 80 years, as the amount of carbon sequestration by trees declines, agricultural practices remove more CO_2 than the forest. Interview by Matthew Williams with Gerald F. Talbert, consultant for National Ass'n of Conservation Districts, in Relay, Md. (Feb. 10, 2000).

incentive for activities that benefit the environment in many ways.[438] Perhaps not surprisingly, the Iowa State Association of Conservation Districts is exploring the idea of combining conservation tillage with carbon credits.[439]

c. Tax credits

Tax law, including state tax law, has a significant yet mostly unrealized potential to protect and restore the environment.[440] About one-half of U.S. states have tax provisions that encourage the use of renewable energy, but only a handful have energy efficiency provisions.[441] Among the many state tax tools available to address climate change,[442] tax credits can and do encourage energy conservation, the use of renewable energy, and carbon sequestration. To be effective, tax credits must be used in conjunction with legal tools other than tax law and they must be written and administered to achieve actual reductions in net greenhouse gas emissions.

A tax credit is an allowance against (or reduction of) the tax that would otherwise be paid. Unlike deductions, which reduce the amount of income subject to the tax, credits "directly reduce tax liability."[443] As a practical matter, they are a type of government subsidy. If a person uses a $2,000 tax credit, the credit offsets that person's tax liability by $2,000. If a person whose income would otherwise be taxed at 29% uses a $2,000 tax deduction, though, the reduction reduces that person's tax liability by only $580. Thus, tax credits offer stronger incentives to taxpayers than deductions, but also reduce government revenue by a greater amount.[444]

Two types of tax credits are generally considered. Investment tax credits help offset the cost of financing projects and provide up-front benefits. If they lack performance standards and effective enforcement, though, they do not ensure that the project will actually operate effectively.[445] Production credits are available for part or all of the facility's life. While they help ensure that the facility will operate as intended, they do not provide investors with immediate benefits.[446] Investment credits help promote the development of riskier and less mature technologies, while production credits can help more developed technologies that still face competitive obstacles.[447]

Significant federal tax credits for energy conservation and renewable energy were enacted by Congress in 1978 and 1980 during the Carter Administration, but most of these credits, including the most generous, ended in the mid-1980s.[448] There is still a 10% investment tax credit for solar energy equipment that is used to generate electricity, to heat or cool the structure, and for other purposes, as well as for certain geothermal energy equipment.[449] Although the federal income tax system is generally separate from state tax systems, state tax credits can target the same technology or equipment as the federal tax laws, and thus provide taxpayers who purchase or use such technology or equipment with greater cost reductions than the Internal Revenue Code alone. Of course, states may also provide tax credits for energy conservation and renewable energy that are different from those authorized under federal law.

States have adopted a variety of tax credits to foster energy conservation and renewable energy.[450] For instance, states have provided tax credits of 25% of the cost of installing solar energy equipment (up to $3,750).[451] They have authorized tax credits to landlords of low-income persons to offset part of the cost of insulation and other energy conservation projects.[452] States have even authorized tax credits

438. *See, e.g.,* Gregg Hillyer, *Cash for Carbon*, PROGRESSIVE FARMER, Oct. 1999, at 25.

439. Talbert interview, *supra* note 437.

440. J. Andrew Hoerner, *Harnessing the Tax Code for Environmental Protection: A Survey of State Initiatives*, 14 STATE TAX NOTES 1197 (1998).

441. *Id.* at 1220-21.

442. Tax deductions, lower tax rates, and property tax exemptions are among the other tax tools that states can use to reduce net greenhouse gas emissions. Although tax credits are discussed here, these other tools may also be effective. For examples relating to carbon sequestration, see MD. NAT. RES. CODE ANN. §5-219 (1999) (authorizing income tax reduction for landowners participating in reforestation program); MINN. STAT. ANN. §§270.33(14) & 270.36(2)(1) (West 1999) (taxing land being reforested at same rate as land that cannot be used for growing commercial timber because of rock outcrops, marshes, and similar natural features); N.Y. REAL PROP. TAX LAW §480 (McKinney 1999) (authorizing property tax exemption for certain private forested land). *See generally* Thomas Lundmark, *Methods of Forest Law-Making*, 22 B.C. ENVTL. AFF. L. REV. 783, 797-802 (1995) (describing tax incentives for forestry on private lands).

443. ROBERT S. SMITH, WEST'S TAX LAW DICTIONARY 195 (1999).

444. Tax credits also are easier to use than deductions because taxpayers ordinarily can use deductions only if they itemize their expenses. Peter A. Friedmann & David G. Mayer, *Energy Tax Credits in the Energy Tax Act of 1978 and the Crude Oil Windfall Profits Tax Act of 1980*, 17 HARV. J. ON LEGIS. 465, 469 (1980). But tax credits (and deductions) tend to favor upper and middle income taxpayers because lower income taxpayers tend to lack the income necessary to pay for qualifying improvements and the income necessary to take full advantage of the credits. *Id.*

Another alternative to tax credits is direct governmental payments to qualifying persons. *See, e.g.,* 42 U.S.C. §13317 (authorizing DOE to pay 1.5 cents/kWh of electricity generated to the owner or operator of certain renewable energy-generation facilities during the 10-year period after the facilities are put in service). For a comparative assessment of tax credits and direct governmental payments in the context of President Clinton's Climate Change Technology Initiative, see Dylan Golden, *The Politics of Carbon Dioxide Emissions Reduction: The Role of Pluralism in Shaping the Climate Change Technology Initiative*, 17 UCLA J. ENVTL. L & POL'Y 171 (1998-1999).

445. Frank Muller, *Tax Credits and the Development of Renewable Energy in California*, *in* GREEN BUDGET REFORM: AN INTERNATIONAL CASEBOOK OF LEADING PRACTICES 30, 43 (Robert Gale et al. eds., 1995).

446. *Id.*

447. *Id.* at 52.

448. Starrs, *supra* note 217, §11.2(B)(1)(c); *see also* Friedmann & Mayer, *supra* note 444 (summarizing and explaining 1978 and 1980 legislation).

449. *See* I.R.C. §§38(b)(1), 46, & 48(a).

450. In the late 1970s, at least 25 states provided tax credits, tax deductions, or property tax exemptions for solar energy equipment. John Minan & William Lawrence, *State Tax Incentives to Promote the Use of Solar Energy*, 56 TEX. L. REV. 835 (1978). Many states allowed their tax credits to expire in the 1980s, but state interest is increasing again. Starrs, *supra* note 217, §11.2(B)(2)(c)(iii).

451. N.Y. TAX LAW §606(g-1) (LEXIS Supp. 2000). *See also* HAW. REV. STAT. §235-12(b) (1998) (tax credits to offset part of cost of solar and wind energy systems as well as heat pumps and ice storage systems); MASS. GEN. LAWS ANN. ch. 62, §6(d) (West 2000) (tax credit to offset part of cost of solar, wind, or other renewable energy costs).

452. *See, e.g.,* CONN. GEN. STAT. §12-635 (West 1999). *See also* OKLA. STAT. tit. 63, §§2357.6 & 2901 (1999) (authorizing tax credit of 50% of amount contributed to Energy Conservation Assistance Fund, which is used to assist low-income homeowners with energy conservation). *See also* OR. REV. STAT. §469.207 (1997) (authorizing tax credit up to $5,000 of actual installed costs of energy conservation measures in certain rental housing units).

for 50% of the additional cost of an alternative fuel car (up to $5,000).[453] Some allow tax credits for part of the cost of certain reforestation projects.[454] Oregon has used an investment tax credit since 1979 to offset part of the cost of facilities that generate renewable energy or conserve substantial amounts of energy.[455] The tax credit is generally available only if the state has certified that the project was constructed and is operating in accordance with state requirements.[456] The state has approved credits for about $500 million in investments since the law went into effect. About one-half of these projects would not have gone forward or would have involved less energy conservation had the tax credit not existed.[457]

California's experience with tax credits for wind energy illustrates both the strengths and weaknesses of this tool. The state adopted investment tax credits for residences in 1976, expanded them to commercial applications one year later, but then allowed these tax credits to expire at the end of 1986.[458] In response, many wind turbines were erected in the early 1980s, often on windy mountain passes visible from major highways. Wind technologies were still at a relatively early stage of development, and some of these projects would have failed regardless of investor intentions. Because these projects were funded by investors who were simply seeking tax benefits, however, many had no hope of succeeding. The highly visible failure of these wind turbines led to the end of the tax credit.[459] Still, wind energy generation in California increased dramatically during that period. Both wind energy companies and a California Energy Commission study conclude that federal and state tax credits made much of the difference.[460] With the demise of tax credits for wind and similar credits for solar energy, renewable energy generation by primary energy source declined by an average of 7.3% annually between 1988 and 1998.[461] Even so, California produced more electricity by solar and wind energy than any other state in 1997.[462]

As such experiences suggest, tax credits for renewable energy and energy conservation can be justified on several grounds. They can stimulate the development of new technology by stimulating sales and attracting private capital. Such technology, in turn, can reduce the cost of basic services (e.g., electricity) and stimulate productivity improvements. Tax credits can also lead to reductions in emissions of greenhouse gases and other pollutants.[463]

To be effective, though, tax credits must stimulate activity that would not have occurred in their absence.[464] States can do so by writing tax credit legislation narrowly to fit certain types of projects that would not otherwise be undertaken. States can also require taxpayers to demonstrate that they qualify for the credit (as opposed to simply claiming it), and draft legislation to ensure that subsidized projects are effectively carried out. California's experience has helped move tax credits in that direction.

Finally, tax credits are most effective when used in conjunction with other legal instruments.[465] Tax credits do not ordinarily offset the full cost of renewable energy or energy conservation; they only offset part of the cost. Even in those cases where a tax credit by itself makes purchase of the energy product or service attractive,[466] tax credits will likely produce greater public benefits if they are coupled with other tools that are directed toward the same goal. Thus, while state tax credits are a useful part of any state strategy to reduce net greenhouse gas emissions, they need to be employed carefully and used in combination with other tools. In California, for instance, the renewable energy industry in the state benefitted not from one or two instruments, but from a "particularly comprehensive set of policies."[467] These included tax credits, electric utility restructuring, and the aggressive manner in which the state Public Utilities Commission implemented PURPA, which was intended to foster the development of renewable energy and cogeneration from independent power producers. Its role in implementing PURPA included rate decisions and standard contracts that facilitated market entry by these producers.[468]

IV. Lessons From State Experience

A. Consistency With Instrument Choice Framework

In general, the legal instruments discussed here can produce significant reductions of greenhouse gases, are best employed in portfolios or suites, can generate significant benefits in addition to climate change reduction, and are either cost effective or involve negligible costs. The continuing vitality of several instruments, particularly demand-side management and adders, is questionable. But most fit this framework, or can be drafted to meet this framework. These instruments, moreover, are only a fraction of the legal instruments available to reduce greenhouse gas emissions. This is obviously a different picture than that painted by those opposing action to address climate change. It is available by

453. N.Y. Tax Law §606(p)(2).

454. Or. Rev. Stat. §315.104.

455. *E.g.*, *id.* §§469.185-225.

456. *Id.* §469.215

457. Hoerner, *supra* note 440, at 1212 (describing survey by Oregon State University).

458. Muller, *supra* note 445, at 41 (summarizing history of California tax credits for renewable energy).

459. *Id.* at 47.

460. *Id.* at 47-48. Electricity generation from wind rose from 52 million kwhs in 1983 to 2,707 million kwhs in 1992, or 1.1% of the state's electricity. *Id.* at 47. *See also* Peter Gray & Erica Rosenberg, *Turning on Wind Power*, Envtl. F., Sept./Oct. 1991, at 16, 21 ("[T]he California experience has established wind as a reliable and low-cost form of energy.").

461. Energy Information Admin., U.S. DOE, *State Electricity Profiles: California* (visited July 11, 2000) <http://www.eia.doe.gov/cneaf/electricity/st_profiles/california.pdf>. In the same period, hydroelectric generation grew by an average of 8.4% annually. *Id.*

462. Energy Information Admin., U.S. DOE, Renewable Energy Annual 1998 With Data for 1997 (1998) <http://www.eia.doe.gov/cneaf/solar.renewables/rea_data/html/front-1.html#chapter1a>.

463. J. Andrew Hoerner & Avery P. Gilbert, Assessing Tax Incentives for Clean Energy Technologies: A Survey of Experts Approach 3 (rev. 2000); Starrs, *supra* note 217, §11.8.

464. Richard A. Westin, *Understanding Environmental Taxes*, 46 Tax Law. 327, 346-47 (1993) (explaining that 12 GAO studies indicate tax credits must be relatively high to be effective).

465. Hoerner & Gilbert, *supra* note 463, at 1.

466. Westin, *supra* note 464, at 346-47 (federal tax credit to homeowners of 40% of the purchase price of renewable energy devices for heating and cooling water had significant effect on consumer behavior; elimination of that credit sharply reduced demand for solar hot water devices).

467. Muller, *supra* note 445, at 52.

468. *Id*. at 38, 52.

looking at the laws themselves and experience with those laws rather than assumptions about the laws that might be employed.

1. Significant Domestic Reductions

This analysis indicates that states can accomplish domestic reductions with these and other tools. On the other hand, this analysis also shows that the effect of state tools in reducing net greenhouse gas emissions so far is modest. Every state (including California) could do much more to reduce net greenhouse gas emissions.

The best evidence of what can be done is provided by the most active states. California's experience comes up over and over in this analysis because it has sought to foster renewable energy and energy conservation for several decades through a variety of legal instruments, including customer choice of electricity providers, environmental labeling for electricity advertising, energy efficient building codes, system benefit charges, and tax credits. But California is by no means the only state that has addressed these issues aggressively. For each of these instruments, and for other instruments not discussed here, there are state leaders. Pennsylvania and California are considered to have the most competitive markets; California, Massachusetts, and Connecticut provide the most total funding for renewable energy; Minnesota has made the biggest commitment to new wind and biomass energy.[469] If all state did as much as these states, greenhouse gas emission reductions would be impressive. As explained earlier, for example, national energy savings from demand-side management would be four times greater if all states did as much as the top five states.

States are more likely to achieve significant reductions if they inventory their greenhouse gas emissions, develop a plan for addressing them, and set numerical goals for emissions reductions. As already noted, state greenhouse gas action plans would reduce emissions by 2% over otherwise projected 2010 levels. This figure would likely be higher if all states had such plans, rather than half of them. If New Jersey succeeds in reducing its emissions by 3.5% below 1990 levels by 2005, it will provide further evidence of what states can achieve.

To the extent reductions are projected from current state use of the tools discussed in this Article, however, the reductions are relatively small. Indeed, relatively few states use the legal tools described here. Many of these tools are being used by roughly a dozen states, and some are used by only a handful or less. Perhaps the most widely used tools discussed in this Article are energy conservation provisions in building codes and demand-side management. The latter, of course, may not survive electric utility restructuring.

Another reason for modest reductions is that some of these tools have not been in effect long enough to show significant effects. This is particularly true of tools that are based on electric utility restructuring. Customer choice of electric providers and environmental labeling requirements for retail advertising, for example, are only recently under way. As customers gain experience with retail competition, and as the transition charges end, these tools may play a much greater role in facilitating the use of renewable energy. Others, like cap-and-trade programs for CO_2 or carbon, have very limited statutory authorization at present and are being employed on a voluntary basis, mostly to offset CO_2 emissions.

Tools that have been around longer have shown better results. Building codes with energy efficiency provisions have been in effect in some states for several decades. Across the country, demand-side management programs reduce demand to retail customers by about 2%. If system benefit charges effectively replace demand-side management programs, they should be able to protect and perhaps improve on that achievement. The higher level of funding shown in many state system benefit programs suggests that they may be able to reduce energy use even more. Public funding for forestry has probably made a significant contribution to carbon sequestration, even if it was not intended for that purpose.

2. Suite of Legal Instruments

This analysis indicates that greenhouse gas reductions can best be achieved by using a suite of legal and policy tools that are specifically tailored to various greenhouse gas sources and economic sectors. Energy efficiency standards in buildings, for example, focus on an important source of greenhouse gas emissions and achieve results that would be difficult to achieve as directly with other legal instruments. Other instruments affect only electricity generation and are specifically tailored to that industry—including customer choice of electricity providers, environmental labeling requirements for electricity, net metering, and renewable energy portfolio standards. Cap-and-trade programs, moreover, must be specifically tailored to the particular economic sectors they are intended to cover. A domestic cap-and-trade program limited to large sources of CO_2 emissions, for example, will be quite different from a program that includes smaller CO_2 sources. Carbon trading through carbon sequestration will require laws with specific provisions for forestry, agriculture, and other economic sectors.

This approach to instrument choice is also pragmatic. Instead of narrowing legal options to specific types of instruments (such as economic instruments or regulatory instruments), it looks at whatever instruments might be effective in particular situations. Many of these instruments, moreover, have both regulatory and market-based elements. Some tools, like net metering, remove a barrier to market entry. The most market-oriented tools (cap-and-trade programs) limit CO_2 emissions even as they authorize trading for carbon or CO_2. Some of these tools grow out of reduced regulation of the electric utility industry (customer choice, environmental labeling, system benefit charges). Many of the regulatory tools, particularly demand-side management and energy-efficient building codes, return more dollars in savings than they cost. Other regulatory tools, such as renewable energy portfolio standards, can be implemented through market mechanisms. Still others, particularly those directed at new electric-generating facilities, are intended to reduce external environmental costs.

Combinations of instruments may achieve specific goals better than individual tools. The combination of tax credits for renewable energy and net metering, for instance, is more likely to increase the use of certain renewable energy technologies than the use of either tool alone. Tax credits can

469. CLEAN POWER SURGE, *supra* note 400, at 6.

also make other renewable energy technologies more competitive with fossil fuels and enhance the likelihood that energy conservation will be used. The combination of renewable energy portfolio standards, net metering, and siting and planning preferences for renewable energy facilities, moreover, would likely have a greater effect than any one tool alone. In fact, much state leadership on renewable energy comes from combining instruments. Only three states (Connecticut, Massachusetts, and New Jersey) have renewable energy portfolio standards, system benefit charges for renewable electricity, net metering, and environmental labeling requirements for electricity sources.[470] If air pollution control laws are written or enforced to internalize more of the negative environmental costs of electricity, retail price competition will more likely favor renewable or perhaps natural gas providers.

On the other hand, achieving these synergies requires care in design and drafting. Renewable energy portfolio standards will foster the use of readily available renewable technologies that are relatively inexpensive. System benefit charges used to fund the same renewable energy technologies, however, are unlikely to provide additional benefits. System benefit charges are more likely to provide added benefits for renewable energy if they are used to fund promising renewable energy technologies that are not yet ready for the market.[471] Laws should also lead to new renewable energy capacity, for example, and not support activities that would occur anyway. They should also be written to enable renewable energy to compete effectively over the long run, even after these laws have been repealed.[472]

Even the legal form of state-level decisions is relevant to their ability to reduce net emissions. State energy laws, like state environmental laws, are contained in statutes, regulations, and cases. State utility commission decisions, though, might apply to one utility service area within a state but not in another utility's service area. Moreover, utility commission decisions of statewide scope only apply to utilities, not independent power producers or rural electric cooperatives. A public utility commission decision requiring net metering, for example, will likely not apply to many rural customers even though it is probably easier to install wind turbines in rural areas.[473] Legislation and regulations are thus likely to be broader in scope than utility commission decisions.

3. Multiple-Purpose Instruments

In addition to reducing greenhouse gases, states are using these tools to save money, foster economic growth, reduce negative environmental externalities from electricity generation, keep energy prices manageable for the poor, create new jobs, and foster technological innovation. In fact, it can be argued that their primary purpose and effect is to provide such benefits because the climate change benefit to individual states of reducing their emissions is minor.

a. Economic Benefits

States using these tools also foster economic growth for companies that manufacture, construct, install, sell, and maintain renewable energy technologies and more energy-efficient or energy-conserving equipment. These tools can also provide additional economic benefits to farmers, foresters, and others who sequester carbon. As know-how, technological expertise, and product quality improve, the potential for international sales of products and services increases. Indeed, every one of the tools discussed in this Article provides, or can provide, such economic benefits. These tools can also help avert the costs of climate change if they are used aggressively enough.

b. Additional Environmental Benefits

All of the tools discussed here reduce the negative external costs of energy generation, not only for CO_2 emissions but also for other air pollutants such as SO_2 and NO_x. The reduction of these external air pollution costs would bring a myriad of public health and ecological benefits that are separate from climate change. The use of renewable energy and energy conservation is also likely to have fewer adverse environmental effects than other energy generation facilities.

c. Social Equity and Job Creation

States that use these tools can help control and even reduce energy costs for the poor and people on fixed incomes. They can also help create jobs and foster economic development.

Energy conservation tends to keep fuel bills lower for the poor and people on fixed incomes. It also helps protect them from fuel price increases. Thus, energy efficient building codes can limit the burdens such persons may experience.[474] More broadly, tools that foster the development of new renewable technology keep open the possibility of much lower energy bills in the long term if the price of such technology continues to decline. It is possible that adding significant amounts of new renewable energy to a state's electricity portfolio could lead to a present increase in current electricity prices because renewable energy tends to be more expensive now than fossil fuels. Because utility prices are expected to decrease with retail competition, though, renewable energy is likely only to reduce the amount of the price decrease. Expected reductions in the cost of renewable energy, coupled with a program to phase renewable energy in over time, should also help keep prices relatively low.

States using these tools to enhance the growth of renewable energy and energy conservation also create jobs. Renewable energy sources tend to create more employment than comparably sized fossil fuel sources.[475] Building codes requiring energy efficiency can also generate additional employment for manufacturers and installers of efficient equipment. Demand-side management, system benefit

470. Clean Power Surge, *supra* note 400.

471. Wiser et al., *supra* note 326, at 21.

472. *Id.*

473. Wan & Green, *supra* note 272, at 3 (explaining that rural customers are "less constrained by issues such as zoning, noise, lack of space, visual impact, and safety").

474. The poor, on the other hand, likely have insufficient income to make use of tax credits.

475. Bенntham Paulos et al., Union of Concerned Scientists, Powerful Solutions for Illinois: Seven Ways to Switch to Renewable Energy 4 (explaining that "renewable energy investments produce over three times more jobs, income and economic activity than the same amount of electricity generated from coal and natural gas power plants"). The document is available by accessing the Illinois link at <www.ucusa.org/energy/an.PSexec.html>.

charges, and tax credits can help create the same type of jobs. Net metering, system benefit charges, and tax credits can also help create jobs for makers and installers of renewable energy products. Because the type of renewable energy chosen will often depend on local conditions (for example, geothermal energy in Hawaii), renewable energy particularly lends itself to the creation of local industries and local jobs. For other tools, significant job creation and retention potential exists. Carbon sequestration could protect and create jobs for farmers, foresters, and others if states developed legal systems that allowed carbon trading or the use of carbon credits.

Modest use of these tools is not likely to have much effect on employment in fossil fuel industries because of the expected continued growth in energy demand. More ambitious use of these tools, however—the kind of use required to significantly reduce net greenhouse gas emissions—would likely cost jobs in those industries.

d. Technological Innovation

These tools directly and indirectly foster technological innovations that have short-term and long-term potential to significantly reduce net greenhouse gas emissions. Many of these tools directly foster the development and diffusion of new renewable energy and energy conservation technologies. System benefit charges for such purposes can help bring these technologies to market. Properly tailored tax credits can have a similar effect. Perhaps of greater importance are renewable energy portfolio standards, net metering, and planning and siting preferences for renewable energy. States that adopt renewable portfolio standards with progressively greater required percentages of renewable energy over time are particularly likely to facilitate technological innovation because of the market commitment they provide and because of the competitive manner in which renewable energy will be introduced. This type of innovation has additional benefits to states because of the large potential domestic and international markets for renewable energy and energy conservation technologies.

States using these tools also appear to be facilitating innovations in energy conservation in other ways. Periodic revisions of the model building codes appear to encourage the development of new conservation methods and technologies because these new approaches may then be incorporated into the model codes. Although states generally do not write these codes, they can and often do require compliance with them. Demand-side management supports a market for more efficient motors and other energy-using technologies, as well as energy conservation technologies and methods, that probably would not have otherwise existed. If substitute programs are established through system benefit charges, these markets and the technological innovation they support will likely continue.

Many of these tools provide greater opportunities for the development and use of renewable energy technology than has previously existed. By allowing customers to choose electricity providers with "greener" portfolios than their existing utility, and by requiring electricity providers to provide environmental information in their advertising, many states have opened a door for renewable energy. While the technologies being employed may have been ready for market, the growing sale of renewable energy technology allows companies to invest more money in research and development of better and less expensive renewable technologies.

States also use these tools to foster other innovation and learning. Oregon's law for new power plants may encourage the development of new natural gas power plants that emit lower amounts of CO_2. Early registry programs for net greenhouse gas emissions do not necessarily foster technological innovation, but they do encourage institutional and professional learning as well as sharing of that information with others. Oregon's CO_2 limits for new power plants also facilitates learning about carbon sequestration.

e. National Security

Because these tools have the potential to reduce net greenhouse gas emissions in the United States, they can also help protect national security. Reductions of greenhouse gas emissions in this country will likely reduce the effect of climate change in the United States, and will encourage other countries to reduce their emissions. As a result, there will be less risk of severe disruptions from climate change. Because climate change has national security implications, however, it is inappropriate for the United States to rely on state-by-state decisions to reduce greenhouse gas emissions.

Dependence on foreign energy supplies is another national security concern, but it is not raised in significant ways by the legal instruments discussed in this Article. Most of them are related to the use of coal and natural gas for which this country has ample domestic supplies. Except for energy efficiency in buildings that are heated with oil and utility electric generation based on oil, these particular tools are not likely to significantly reduce dependence on foreign oil.

4. Cost-Effectiveness

These tools, taken as a whole, appear to be capable of reducing greenhouse gases and achieving other goals at a negligible cost. Indeed, a continuing theme in analyses of many tools is their cost-effectiveness.

Many tools, particularly those related to energy conservation, tend to return more in benefits than they cost. Every dollar spent in California's demand-side management program in recent years has saved more than two dollars. Building codes requiring energy efficiency have been shown to be cost effective by paying for themselves in five years or less. Many building codes even allow builders a performance-based alternative to specified means if they can meet a certain level of energy efficiency by using another means. Because building codes raise the initial cost of a new structure, however, their ability to pay for themselves in five years and generate a cost savings thereafter is not always recognized or rewarded. For energy efficiency, regulatory instruments appear to be needed to ensure actions that are cost effective in their own right.[476]

476. *See* Stephen J. DeCanio, *The Efficiency Paradox: Bureaucratic and Organizational Barriers to Profitable Energy-Saving Investments*, 26 Energy Pol'y 441, 453 (1998) (data from EPA's Green Lights energy efficiency program "reinforce the view that there is a large potential for profitable energy-saving investments that is not being realized because of [non-economic] impediments that are internal to private and public-sector organizations").

Drafted properly, electricity restructuring laws could be more cost effective than existing utility regulation and permit or encourage choices that will result in lower CO_2 emissions. Alternatively, some customers may choose wind and solar power sources that are currently more expensive than conventional sources. When customers make such choices, it is difficult to conclude that the underlying law is therefore not cost effective.

Market-based tools will play a substantial role in reducing costs. Renewable energy portfolio standards and cap-and-trade systems, for example, have enormous potential to reduce the cost of any state climate change effort because of their credit or trading systems. By allowing competition between wind and natural gas for new power production, Minnesota may facilitate cheaper wind energy. Net metering programs allow residential electric customers to sell the electricity they generate and help offset the costs of acquiring and installing renewable energy systems. The Oregon siting law allows prospective facility operators to choose from at least three different means of compliance, enabling the most cost effective choice. Tax credits can help make wind, solar, and geothermal technologies more cost effective by reducing their costs. Net metering gives a boost to cost-effective technologies, and may help other technologies become cost effective.

On the other hand, demand-side management uses government-developed price supports, essentially the only means available to foster conservation under traditional utility regulation. While it made more sense under the traditional utility system, demand-side management is not likely to survive the demise of utility regulation. Similarly, "adders" may not survive in the emerging new era of retail price competition.

Other laws are or should be drafted to enhance market-based customer decisionmaking by providing relevant information to customers. Many state utility restructuring laws ensure that prospective customers get energy source and emissions information, for instance. On the other hand, customer information about energy conservation in residential and commercial buildings does not appear to be required or provided on a widespread basis.

These and other tools can have a profound effect on the potential cost-effectiveness of legal instruments chosen to reduce net greenhouse gases in the United States. These tools indicate that macroeconomic studies on the costs of the Kyoto Protocol to this country likely project higher costs than necessary or appropriate. Thus, it appears that a carefully drafted combination of such instruments could achieve a significant part of the Kyoto Protocol emissions reduction more cost-effectively than a carbon tax and international emissions trading. The size of the potential reduction would depend in large measure on how the legislation is drafted.

This analysis also points to a second conclusion: Combinations of these tools with a carbon tax could be more cost effective in meeting the Kyoto Protocol than a carbon tax alone. Assume that a national carbon tax is put in place, as the models suggest. Unlike emissions limitations or caps, carbon taxes and other economic charges do not directly reduce CO_2 emissions. Rather, they encourage firms and households to use less-carbon-intensive fossil fuels, renewable energy, and energy conservation. The easier it is to make these changes, the more likely they will occur.[477] A significant source of uncertainty about such a tax in the economic models is the extent to which individuals and firms will respond by substituting energy sources and technologies that create lower greenhouse gas emissions or none at all. Another source of uncertainty is the extent to which substitution possibilities will improve over time.[478] In general, the "more flexibility the model includes in the choice of technologies, retirement of old equipment, and introduction of new technologies, the lower the economic impacts of emissions reductions."[479] On the other hand, it is generally recognized that subsidies encouraging the use of fossil fuels will inhibit the effectiveness of a carbon tax because they discourage substitution.[480]

The existence of other laws can also enhance or inhibit the responsiveness of individuals and firms to a carbon tax. When the carbon tax becomes effective, for instance, State A has a well-drafted law that allows customers to choose their electricity providers, but State B has no such program. Instead, customers in State B are obligated to continue using electricity generated primarily by fossil fuels, the dominant fuel burned by State B's utilities. The carbon tax is likely to encourage greater greenhouse gas emission reductions, at a lower cost, in State A than in State B. This is so because the choices of individuals and firms in State A are market driven and based on individualized calculations of costs. By contrast State B's utilities are likely to be less responsive to the carbon tax because it will have less effect on their market. The absence of individualized choices in State B will also make the carbon tax less cost effective in State B than it is in State A. Many other examples could be used to illustrate the ability of other laws to affect the responsiveness of firms and individuals to a carbon tax.[481]

B. Role of Federal Government

1. Current Federal Involvement

Although this Article began as an effort to understand what states can do to reduce net greenhouse gas emissions, virtually every tool studied is based on federal law, uses federal law as a framework, or requires the assistance of federal agencies or federal law. To be sure, considerable state innovation has occurred. Yet the federal government's current involvement in state-level energy conservation, renewable energy, and climate change activities is already considerable.

Federal energy law is ubiquitous. The Public Utility Holding Company Act and the Federal Power Act provide much of the legal structure in which public utilities operate. PURPA played a major role in introducing competition for wholesale electricity, which in turn has put pressure on

477. REPETTO & AUSTIN, *supra* note 9, at 18.

478. WEYANT, *supra* note 9, at 44-45.

479. *Id.* at 45.

480. *See, e.g.,* WEYANT, *supra* note 9, at 13.

481. To use just one more, assume that State C has a net metering statute when a national carbon tax goes into effect, and State D has no such statute. All other things being equal, State C is likely to see greater reductions in greenhouse gas emissions than State D. Electricity customers in State C will be more likely to install renewable energy technologies in their homes or firms than customers in State D because State C customers can recoup their costs through sale of extra electricity. The carbon tax will prompt customers in both states to seek alternatives, but customers in State C will be more responsive because they will receive a greater economic benefit.

states to open their retail markets to price competition. That Act also makes net metering possible. The Energy Policy Act directed states to consider energy conservation in their building codes. The same Act also required states to consider using integrated resource management in utility planning and to consider using demand-side management to conserve energy. State "adders" are a modification of the integrated resource planning process. System benefit charges are, in part, an effort to protect and enhance the gains of demand-side management. State tax credits are, to some degree, supportive of federal tax credits. Moreover, DOE funds some state efforts to develop and upgrade their building codes.

Federal environmental law also plays a role in shaping potential tools. Cap-and-trade programs for carbon and CO_2 would borrow directly from the experience with SO_2 and other pollutants under the CAA. Renewable energy portfolio standards also borrow from that experience. To some extent, carbon sequestration would build on existing federal environmental programs related to agriculture. EPA funds state efforts to inventory their greenhouse gases and develop action plans. More generally and perhaps more importantly, negative environmental externalities from electricity generation reflect limitations in federal environmental law, particularly air pollution control law.

Admittedly, some legal tools appear to be relatively independent of federal law. These include renewable energy portfolio standards and carbon limits for new power plants. While others may have been prompted or affected by federal law, they also appear to be predominantly state creations. These include net metering, tax credits, environmental labeling requirements for electricity advertising, and system benefit charges. While these innovations do not change the considerable influence that the federal government has on the states in this area, they do identify areas of state creativity that should be considered at the national level.

2. The Argument for Greater Federal Involvement

Perhaps the greatest weakness of state efforts to date is their limited effectiveness in reducing net greenhouse gas emissions. Broader and more intense state activity could result in greater reductions, of course. An alternative is national legislation that uses these and other state tools. When successful state laws are adopted nationally, the resulting national legislation is often broader and more ambitious than the state law on which it was based.[482] National legislation would be consistent with the country's obligation to implement the Framework Convention in good faith. In international law, a national effort to meet a treaty commitment should presumably be just that—a national effort. Because climate change has significant national security dimensions, a national response seems particularly appropriate. There are compelling reasons for this alternative.

National legislation would have a much greater impact on greenhouse gas emissions than state laws. Because it would include individuals and businesses in all states, a national effort would more likely reduce net greenhouse gas emissions, and reduce them to a greater degree, than would a collection of state efforts. Unless states can somehow each adopt uniform laws on greenhouse gases or create an interstate agreement or compact to address climate change,[483] the scope of any state's law will be limited by its own borders.

Some of the major achievements of U.S. energy policy have occurred because of national legislation concerning a national market. Familiar regulatory laws that have long been part of this landscape include the corporate average fuel efficiency (CAFE) standards established under the Energy Policy and Conservation Act of 1975, which now require that passenger automobiles achieve an average fuel efficiency of 27.5 miles per gallon.[484] Another important statute is the National Appliance Energy Conservation Act of 1987, which requires DOE to set energy efficiency standards for refrigerators, washing machines, clothes dryers, and other household appliances.[485] Although these laws were not enacted to reduce greenhouse gas emissions, they have had that effect. For example, residential appliance efficiency standards are projected to reduce annual carbon emissions between 1990 and 2010 by an amount equal to 4% of 1990 U.S. carbon emissions at a net savings to the U.S. economy.[486] More generally, energy consumption per dollar of gross domestic product declined from 20,500 BTUs in 1950 to 13,100 BTUs in 1997, an efficiency improvement of 36%.[487] This improvement would not likely have occurred in the absence of national legislation.

The potential impact of a domestic CO_2 and carbon trading market helps illustrate this point. Any state trading effort would be handicapped by its own boundaries, questions about the extent to which other states would recognize actions performed under that law in another state, and differences among state laws. A domestic trading program at the national level, by contrast, would have one set of rules for the entire country. Such a system would foster technological innovation within the United States, would provide a rich source of experience and expertise in addressing the numerous accounting problems that a trading program entails, and would more likely produce genuine reductions than an initial program that allowed U.S. energy producers and users to

482. *See, e.g.,* John C. Dernbach, *Pennsylvania's Implementation of the Surface Mining Control and Reclamation Act: An Assessment of How "Cooperative Federalism" Can Make State Regulatory Programs More Effective*, 19 U. Mich. J. L. Ref. 903 (1986) (explaining major changes required in Pennsylvania law by federal legislation that was ostensibly based on Pennsylvania's program).

483. Rick Valliere, *Air Pollution: OTC Targets Six Ozone Sources for Action, Endorses EPA Diesel Engine, Fuel Proposal,* Nat'l Env't Daily (BNA), June 2, 2000 (describing proposed interstate cooperative agreement on greenhouse gas emissions by New Jersey Environmental Protection Commissioner Robert C. Shinn).

484. 49 U.S.C. §32902. *See also* Robert Bamberger, *Congressional Research Service, Automobile and Light Truck Fuel Economy: Is CAFE Up to Standards?*, (visited Jan. 5, 2000) <http://www.cnie.org/nle/air-10.html> (explaining history of CAFE standards and policy options for further improving fuel economy).

485. Pub. L. No. 100-12, 101 Stat. 103, codified at 42 U.S.C. §§6291-97, 6299, 6302, 6303, 6305, 6306, 6308, & 6309. The Act was amended in 1988. Pub. L. No. 100-357, 102 Stat. 671. For a supportive assessment of these standards, see David B. Goldstein, *Appliance Efficiency Standards: A Success Story of Economically Beneficial Environmental Protection*, July 25, 1996 (visited Jan. 5, 2000) <http://www.nrdc.org.nrdcpro/testim/dg072696.html>.

486. Jonathan G. Koomey et al., *Projected Regional Impacts of Appliance Efficiency Standards for the U.S. Residential Sector* (Feb. 1998) (visited Jan. 5, 2000) <http://enduse.lbl.gov/Info/39511-abstract.html>.

487. U.S. Council on Environmental Quality, *supra* note 64, at 169.

trade in other countries.[488] More basically, a domestic trading program would demonstrate that the United States recognizes its responsibility under international law for the effects of private-sector actors operating within its borders.[489]

The H. John Heinz III Center for Science, Economics, and the Environment has developed four different options for a domestic trading system in collaboration with representatives from industry, environmental groups, government, and universities.[490] These options provide a sense of what a domestic program could look like. Option I would include cap-and-trade programs on large fossil fuel plants and apply efficiency standards for smaller energy consumers. The Option I cap would apply to about one-half of the nation's greenhouse gas emissions. An advantage of Option I would be its application to facilities that are already covered under the SO_2 limits in the acid rain program and who presumably already have significant expertise with cap-and-trade programs. Option II would cap fossil fuels that can enter the economy from coal producers, oil refineries, and natural gas pipelines, and would require them to purchase permits for the carbon they produce or transport.[491] The other two options are more complex variations of the first two.[492] Whatever option might eventually be applied, states will have considerable expertise to draw upon in helping administer such a program. But state trading efforts are not likely to have a significant effect without federal leadership.

National legislation that includes a domestic carbon trading scheme and is not limited to CO_2 emissions could have significant environmental and economic benefits. For both agriculture and forestry, national experience with carbon offsets and carbon trading could be a useful contribution to international knowledge and expertise concerning carbon sequestration. This is particularly important for sequestration methods other than forestry, which are not recognized by the Kyoto Protocol, and which are not likely to be recognized until there is significantly more experience. National legislation would also provide professional expertise to U.S. citizens and corporations that would be invaluable in any international carbon trading system.

In addition, the uniformity provided by federal legislation would create or enhance a national market for many energy conservation and energy efficiency technologies and methods. For example, net metering interconnection standards for small-scale renewable energy systems vary from state to state and even within states. The lack of nationally recognized uniform standards reduces market penetration of these technologies and increases costs.[493] Indeed, adoption of the National Appliance Energy Conservation Act of 1987 was prompted by differing state appliance standards. When the Reagan Administration refused to promulgate appliance efficiency standards required under the Energy Policy and Conservation Act of 1978,[494] states began to adopt their own appliance efficiency standards. Because different state standards made it difficult to market appliances nationally, manufacturers helped convince Congress to adopt the1987 legislation.

In addition to the national market, federal legislation provides an opportunity to draft state tools in a way that addresses net greenhouse emissions more aggressively. State system benefit charges and renewable energy portfolio standards, for example, may increase new renewable energy resources by 4,800 megawatts, but electric capacity nationwide is projected to increase 80,000 megawatts by 2010.[495] By contrast, the Clinton Administration has proposed a national renewable energy portfolio standard that would lead to more than 50,000 megawatts of renewable electricity.[496] Sen. Jim Jeffords (R-Vt.) has proposed legislation that would move the national renewable energy portfolio standard from 2.5% in 2000 to 20% in 2020.[497]

National legislation does not raise the dormant U.S. Commerce Clause concerns that may endanger state laws.[498] Under a long series of U.S. Supreme Court decisions, the constitutional power of Congress to regulate interstate commerce contains an implicit limitation on the power of states to discriminate against commerce originating in another state, or to unduly burden interstate commerce.[499] Many tools that states can use to reduce greenhouse gases require states to create markets for things that did not previously exist, such as credits for carbon sequestration or renewable energy portfolio standards. For perfectly understandable reasons, states may seek to limit those markets to their own boundaries to obtain the benefits of emissions reductions. While the benefits of greenhouse gas reductions are not merely local, they are partly local. This is particularly true because, as already noted, CO_2 reductions can also yield reductions in other air pollutants whose effects are more likely to be experienced locally. Yet such limits may run afoul of the dormant Commerce Clause.[500] It has been argued that such market-based state environmental actions should be permissible if they retain the benefits of a market the state has created, prevent the loss of state-created environmental benefits to other states, or reduce the flow of conventional economic benefits of state actions to other jurisdictions.[501] Whether that view of the dormant Commerce Clause is ultimately adopted or not, this issue creates two kinds of problems for states. It may make actions to reduce net greenhouse gas emissions less attractive because states are less likely to capture the benefits of their actions. It may

488. David M. Driesen, *Free Lunch or Cheap Fix?: The Emissions Trading Idea and the Climate Change Convention*, 26 B.C. Envtl. Aff. L. Rev. 1, 35-55 (1998).

489. *Id.* at 68-70.

490. *Designs for Domestic Carbon Emissions Trading* (visited Feb. 11, 2000) <http://www.heinzctr.org/Programs/gcexec.html>.

491. *Id.*

492. Like Option II, Option III limits the carbon entering the economy. In addition to allocating emission permits to producers (like Option II), Option III also allocates emission permits to companies operating large coal-fired power plants and certain other fossil fuel consumers. Option IV expands the Option I emissions cap, which applies to large fossil fuel combusters, to auto manufacturers. *Id.*

493. Starrs & Wenger, *supra* note 274, at 9-11.

494. *See* Natural Resources Defense Council v. Herrington, 768 F.2d 1355, 15 ELR 20781 (D.C. Cir. 1985) (invalidating DOE decision refusing to adopt new appliance energy efficiency standards).

495. Wiser et al., *supra* note 326, at 20.

496. *Id.*; *see supra* note 128.

497. S. 1369, 106th Cong. (1999).

498. *See* Engel, *supra* note 268; Margaret Tortorella, *Will the Commerce Clause "Pull the Plug" on Minnesota's Quantification of the Environmental Externalities of Electricity Production*, 79 Minn. L. Rev. 1547 (1995).

499. *See, e.g.,* Philadelphia v. New Jersey, 437 U.S. 617, 8 ELR 20540 (1978).

500. This issue is explored in detail in Engel, *supra* note 268.

501. *Id.* at 250.

also mean that Commerce Clause issues complicate state efforts to adopt and implement tools to reduce net greenhouse gas emissions. National legislation, of course, does not face these problems.

The national benefits provided by these tools provide a final argument for national legislation. These national benefits include significant reductions in net greenhouse gas emissions, greater protection of national security, support for development of American technology, and greater overall employment. More particularly, and as an example, renewable energy portfolio standards would reduce CO_2 emissions at a low cost, diversify the nation's electricity portfolio, foster renewable energy across the country, and have little effect on electricity prices.[502] National benefits, one state official has observed, need national support. "We must not rely on a handful of states or on volunteers to provide these national benefits."[503]

These and other tools could be employed at the federal level in one or more ways. They could be used to ease the transition from the current system to a more energy-efficient and renewables-dependent system. Among other ways, they could do so by fostering technological improvements and by ramping up the use of renewable energy and energy conservation technologies. At some future point, moreover, tools such as tax credits and system benefit fees for renewable energy and energy conservation might no longer be needed. If a carbon tax is part of a permanent system, the use of these tools as a transition to a system based more on a carbon tax would be less disruptive.[504] The use of these tools could even permit a longer period of time for phasing in a carbon tax.

Some of these tools could also be used as part of a permanent long-term program to reduce greenhouse gas emissions. It is difficult to imagine a long-term program without net metering, building codes for energy efficiency, environmental labeling for electricity sources, and domestic cap-and-trade programs, among others. It is even possible that such tools could move the country to the Kyoto Protocol target, and some studies have concluded as much. If that is not possible, use of these tools may also reduce the level of any carbon tax needed to achieve a particular level of emissions reduction.

Whether these or other tools are part of a transition program, a permanent program, or both, the federal government could make use of the states in different ways. Congress could use the model it has used in environmental law—imposing national standards, requiring the states to implement them, and funding a substantial part of state efforts to do so. Alternatively, it could use the model it has used in much energy law—requiring the states to consider employing these standards, and using competitively awarded grants to encourage use and improvement of the standards. It could also try other approaches, encouraging and rewarding the kind of creativity that is already evident in many states.[505] The critical point, however, would be to enlist the states in a national effort to reduce net greenhouse gases. States should not be allowed to simply volunteer, but neither should they be turned into mere agents of federal authority. The ability of states to respond to their differing environmental, economic, and social situations would make significant state participation both appropriate and necessary.

V. Conclusion

Proposed legislation needs to play a central role in the national debate over climate change. When the United States finally decides to address global warming seriously, it will do so through laws, not economic models or scientific studies. This is true whether action ultimately occurs at the national or state levels or, as is more likely to be the case, both. Because it is increasingly evident that something needs to be done, the merits of proposed legislation need to be part of the debate now.[506] This is not an argument against science or economics, or an argument for law alone. Rather, each needs to play a role that corresponds to its ability to make a contribution. When economic models include assumptions about laws that will be used based on the perspective of professional economists, for instance, significant options are ignored.

Most but probably not all of the legal tools described in this Article, and other instruments as well, can be used in a state or federal package that would substantially reduce net greenhouse gas emissions. They are already being used to reduce greenhouse emissions and achieve other economic, social, environmental, and even national security benefits, and they could be employed in a broader and more systematic manner. The sheer complexity of the problem, coupled with its differing effects on various economic sectors, means that a suite of laws is more likely to address the problem effectively and comprehensively than one or two instruments. Because suites of laws can be drafted precisely to avoid particular problems and solve others, they are more likely to achieve multiple benefits and reduce the costs of responding to climate change than the narrow laws assumed in economic models.[507] In addition, they do not require international agreement.

During the seminar, students—soon to begin careers as lawyers—identified another value of laws. For climate change, they said, laws do not merely confirm the existence of serious risks; they also take steps to reduce those risks. In so doing, well-drafted laws provide a realistic basis for a more hopeful future.

It takes time to prepare, debate, adopt, and implement such laws. What are we waiting for?

---

502. Clemmer et al., Union of Concerned Scientists, *supra* note 331.

503. Alan J. Nogee, Union of Concerned Scientists, *Prepared Testimony Before the Senate Comm. on Energy and Natural Resources*, Federal News Serv. (Apr. 13, 2000) (quoting Richard Cowart, former Chairman of the Vermont Public Service Board).

504. This insight came from a telephone interview with J. Andrew Hoerner (July 12, 2000).

505. In appropriate cases, federal legislation could expressly authorize state use of specific legal tools in a manner that would shield state laws from challenge under the dormant Commerce Clause.

506. Leadership, said the late Elliot Richardson:

> [s]hould not be confused with posturing or rhetoric. It will require resourcefulness, ingenuity, persuasion, pressure, and flexibility. It also demands a clear sense of the interests at stake and a willingness to listen, to emphasize, and to communicate. It calls, in short, for the very qualities and skills that we public-spirited lawyers are so well and so uniquely equipped to provide.

Richardson, *supra* note 16.

507. This kind of attention to legal detail may be characteristic of the legislation required for sustainable development in other contexts as well, because it takes care in drafting to achieve several substantive goals simultaneously.