ARTICLE

DEVELOPING A COMPREHENSIVE APPROACH TO CLIMATE CHANGE POLICY IN THE UNITED STATES THAT FULLY INTEGRATES LEVELS OF GOVERNMENT AND ECONOMIC SECTORS

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INTRODUCTION

Over the past several years, the issue of global warming has become a national political priority and will likely remain one of the United States' and the world's most pressing and unresolved policy issues. Many factors underlie the current call for action, including the advancement of world science assessments, expansion of public awareness and media coverage, increased severe weather events, noticeable global warming trends, continued recalcitrance on the part of the U.S. federal government, international pressure related to treaty obligations, widespread business success in reducing emissions, business demands for a coherent long range national strategy, mounting national energy policy problems, a tidal wave of state and local leadership actions, and court actions. With the Supreme Court's landmark decision in *Massachusetts v. Environmental Protection Agency*[1] the release of the Fourth Assessment Report of the

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[1] 127 S.Ct. 1438 (2007).

Intergovernmental Panel on Climate Change,[2] the announcement of new state greenhouse gas (GHG) mitigation plans, and the success of Al Gore's documentary, *An Inconvenient Truth*, many believe that a mandatory and comprehensive federal response to climate change is inevitable.

The Supreme Court's decision in *Massachusetts v. EPA* makes possible a national program to address climate change under the Clean Air Act (CAA).[3] Reversing the Administration's denial of a petition to regulate mobile source emissions under section 202 of the CAA,[4] the Court held that (1) the Act gives the U.S. Environmental Protection Agency (EPA) the authority to regulate emissions of carbon dioxide and other GHGs as "pollutants,"[5] and (2) the EPA improperly failed to articulate reasons for its refusal to regulate GHG emissions pursuant to the statutory requirement that the EPA Administrator regulate emissions that "in his judgment, cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."[6] The Court remanded the matter to the EPA to make a finding consistent with the statutory standard.[7]

Given the state of the science and the relevant statutory standard, the EPA cannot reasonably refuse to regulate mobile source emissions of GHGs. Because sections 108 and 111 of the CAA[8] contain language identical to that construed by the Court in *Massachusetts v. EPA*, the establishment of National Ambient Air Quality Standards (NAAQS), state implementation plans (SIPs), new source performance standards, and the full panoply of regulatory mechanisms of the CAA should be applied to GHGs.[9]

Even before the Supreme Court's ruling in *Massachusetts v. EPA*, the recent Congressional shift in power produced a flurry of bills coalescing around the need for strong national goals and mandatory GHG emissions reductions. While many of the new bills before Congress

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[2] Richard Alley et al., *Summary for Policymakers*, *in* CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 1 (Susan Solomon et al. eds., 2007), *available at* http://ipcc-wg1.ucar.edu/wg1/wg1-report.html (last visited Oct. 30, 2007) [hereinafter FOURTH IPCC REPORT, WGI].

[3] 42 U.S.C. §§ 7401 *et seq.* (2000).

[4] *Id.* § 7521(a)(1).

[5] Massachusetts v. EPA, 127 S. Ct. at 1459-63.

[6] *Id*.

[7] *Id.* at 1463.

[8] 42 U.S.C. §§ 7408, 7411 (2000).

[9] *See* Natural Res. Def. Council, Inc. v. Train, 545 F.2d 320, 328 (2d. Cir. 1976) (requiring the EPA to list lead under section 108 of the CAA and to establish a NAAQS).

move toward stronger emissions reduction goals[10] and potentially broader policy approaches, they remain silent on the specific pathways necessary to achieve these climate stabilization goals. For instance, the bills do not describe how to:

- Vertically integrate[11] rapidly expanding state and local climate change programs, as well as international programs, into a comprehensive national program;
- Horizontally integrate[12] a full range of effective measures and programs across economic sectors;
- Address the Bush administration's recalcitrance toward action; and
- Implement a full range of near-term actions without undue delay.

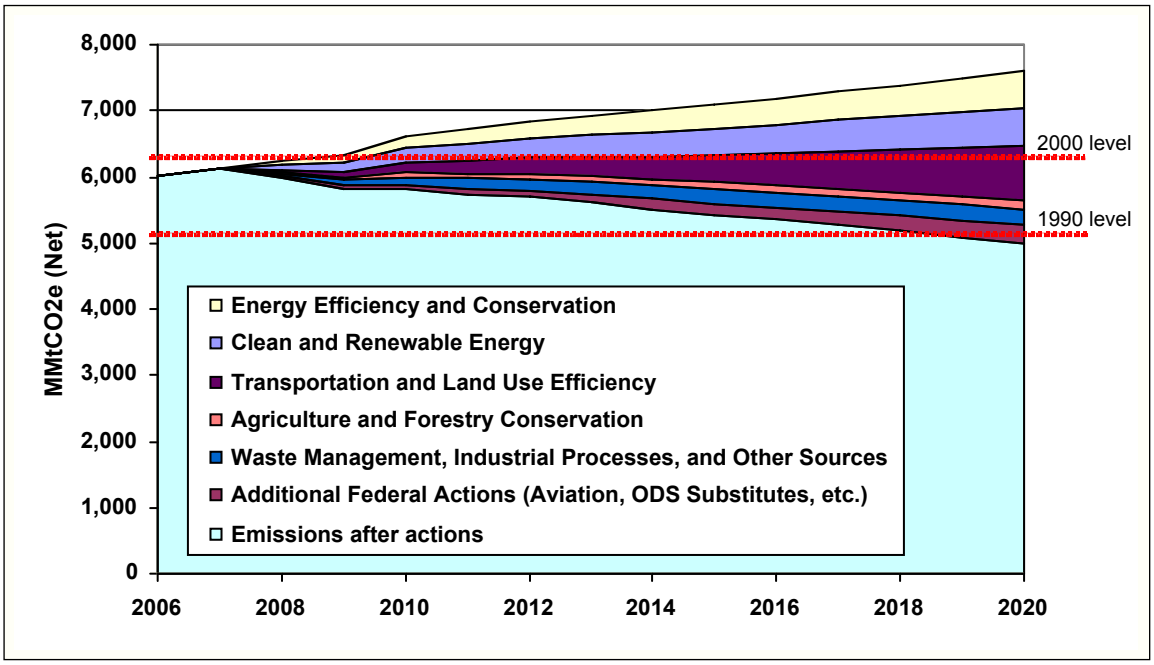
Consequently, federal legislation or rulemaking must significantly clarify and expand the approach to governance if the United States is to make a clear and effective commitment to climate stabilization. If the United States adopts partial or delayed approaches that do not resolve these important governance issues but leave them to be worked out in the courts or through rulemaking, many low cost opportunities for action will evaporate, environmental risks will grow, additional action will be needed, and international pressure will both intensify and spill over into other arenas.

[10] Not all of the bills include meaningful goals. For example, a bill introduced by Senator Bingaman [S. 1115, 110th Cong. (2007)] utilizes the concept of carbon intensity, which seeks to reduce the emissions per unit of gross domestic product. This concept bears no relationship to the emissions reductions necessary to stabilize atmospheric carbon levels. Equally importantly, it gives no reliable guidelines to industry or other planners of a guideline for planning targets and, although intended to mitigate impacts on economic growth, is likely to be a two edged sword that may impede efforts to stimulate growth during times of recession or stagnation. Most growth has resulted in reduced carbon intensity and it is much easier to incorporate measures to achieve both relative (intensity) and absolute carbon dioxide emissions reductions in a growing economy where capital goods are turning over. The carbon intensity measure would require greater absolute emissions reductions when the economy is stagnant or shrinking than when it is growing—precisely at the time these reductions will be most difficult to achieve.

[11] John C. Dernbach, *Achieving Sustainable Development: The Centrality and Multiple Facets of Integrated Decisionmaking*, 10 IND. J. GLOBAL LEGAL STUD. 247, 279-80 (2003) (identifying vertical integration as the integration of all levels of governance—local, state, national, and international—to work together effectively for the same goal).

[12] Horizontal integration occurs when multiple decision-makers on the same or similar level are working together effectively toward the same goal. *Id.* at 280–81.

Growth and Stabilization of United States GHG Emissions[13]



The urgent need for comprehensive action, the opportunities presented by state and local actions, and the difficulties associated with governing such a complex environmental issue all suggest that the conventional approach of federal legislation is unlikely to adequately address the climate issue without substantial augmentation by state learning and example. Many other difficult national and international policy problems in the United States are resolved by combining policy guidance from the states with national government expertise. States develop clear and well-tested programs for climate change mitigation through the use of transparent, stakeholder-driven processes guided by expert facilitators and advanced technical analysts. These lessons learned, combined with expertise related to national governance, are likely to result in a more effective national strategy than conventional

[13] The graphs and charts referenced throughout this Article may be accessed in full color and scale, free of charge, at http://www.velj.org. Unless otherwise noted, the original data for all graphs and charts in this Article were obtained from the Center for Climate Strategies, a non-partisan, independent nonprofit service organization that works directly with public officials and stakeholders to identify, design, and implement policies to address climate mitigation. The calculations provided the data and information embodied in the graphs were provided by employees and consultants for the Center and were cumulated for a meeting of state environmental leaders in 2007. Center for Climate Strategies, http://www.climatestrategies.us (last visited Jan. 3, 2008).

"top-down" federal thinking. Such a process is critical given the salience of the climate change issue today and the realities of governance in the United States.

Fortunately, existing state and federal laws provide a workable template for full integration of governmental and economic needs with respect to climate change. By adapting and enhancing the existing framework of national standards, state programs, and market-based systems found in the CAA, the United States could create a highly tested and widely approved method to address climate change. At the same time, the United States could begin to take swift action on critical near-term policy opportunities while building towards longer-term policy strategies needed to support major shifts in emissions. In the process, the United States could regain global leadership and provide a template for national action by other nations.

Key elements of this approach include the establishment of national and regional standards (including market-based systems) for some sectors and activities, combined with state planning requirements to achieve climate stabilization goals now expressed in comprehensive state climate action plans and many new federal bills. National and state actions within each of the economic sectors could be implemented through the use of a variety of policy mechanisms best suited to specific needs, integrated through national standards and appropriate reporting, using registry systems that ensure national harmonization. States and covered sectors could incorporate flexibility by trading emissions reductions to address overachievement or underachievement of goals and standards.

This Article will begin by discussing the mounting scientific evidence that establishes the urgent need for an integrated and comprehensive approach to reducing GHG emissions, as well as the adverse international implications of the United States' failure to take effective action at the federal level. It will then discuss the models for climate response derived from state responses and present the reductions that could be achieved if these were scaled up to the federal level. The Article will next discuss how the federal legislative proposals to date fail both to build upon state lessons and to provide adequate mechanisms to support the multi-faceted economy-wide approach that can achieve needed reductions in a cost-effective manner. It suggests a mechanism whereby the CAA could be adapted to incorporate state creativity in support of this necessary integrated, economy-wide approach. The Article closes by suggesting that this approach could create the motivation for individual action and international cooperation that is critical to effectively address global

climate change.

I. MOUNTING SCIENTIFIC EVIDENCE UNDERSCORES THE URGENT NEED FOR AN INTEGRATED AND COMPREHENSIVE NATIONAL APPROACH TO REACH CLIMATE STABILIZATION GOALS

Perhaps the greatest single factor in the call for action on climate change is the accumulation of scientific evidence through the Intergovernmental Panel on Climate Change (IPCC) and national scientific bodies such as the National Academy of Sciences (NAS). The IPCC, established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988, conducts comprehensive assessments of atmospheric science and associated impact risks every five years.[14] These assessments have become progressively more accurate and detailed with respect to all aspects of the causes, trends, and potential future implications of global climate change.

In its most recent Assessment, the IPCC concluded that the causes of climate change in the last century are ninety-percent certain to be human-induced.[15] In addition, warming is well underway, with an approximately 1.2 degrees Fahrenheit increase in global average temperatures in the last five decades alone, and projected increases of 3.2 to 7.2 degrees Fahrenheit by 2100 if emissions reduction policies are not successfully implemented.[16] This rate and magnitude of temperature change is unprecedented in human history, matching rates of change previously experienced only over tens or hundreds of thousands of years and associated with natural geologic climate cycles.[17] These changes will be mirrored by equally unprecedented adverse effects. For example, the Fourth Assessment predicts extinction of twenty to thirty percent of the world's animal and plant species if global temperatures rise 2.7 to 4.5 degrees Fahrenheit, as well as increased drying in the southwestern United States and numerous other risks at the regional level.[18]

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[14] *See* Intergovernmental Panel on Climate Change, About IPCC, http://www.ipcc.ch/about/about.htm (last visited Oct. 30, 2007).

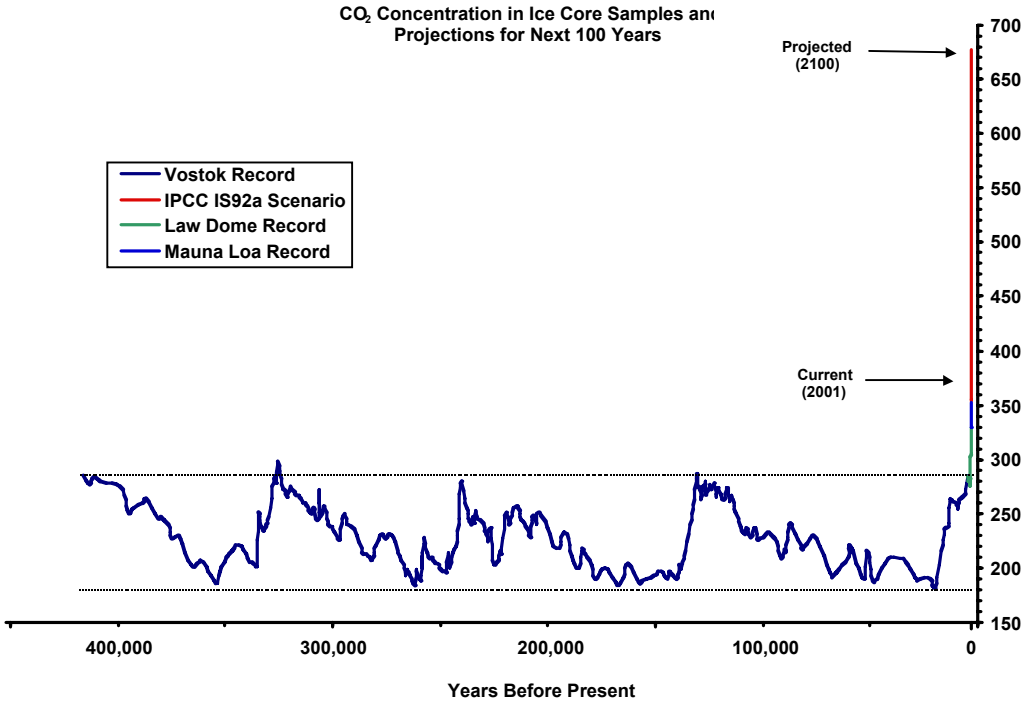
[15] FOURTH IPCC REPORT, WGI, *supra* note 2, at 3.

[16] *Id.* at 5, 13.

[17] *Id*. at 3.

[18] Neil Adger et al., *Summary for Policymakers*, *in* CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 7, 11 (Martin L. Parry et al. eds., 2007), *available at* http://www.ipcc.ch/SPM13apr07.pdf. *See also,* Richard Seager, *Model Projection of an Imminent Transition to a More Arid Climate in Southwestern North America*, SCIENCE ONLINE, April 5, 2007,

Historical & Projected Growth in Global GHG Concentrations[19]



The impacts of these changes are uncertain and involve a multiplicity of risks to human health and the environment, including sea level rise, increased storms, intensified droughts and floods, water balance changes, expansion of vector borne disease, heat waves, and rapid shifts in growing zones and ecosystems. Impacts are not likely to be even over time—some regions will experience disproportionate effects. While no single risk factor is fully predictable, the interplay between such factors and their acceleration over time presents difficult scenarios to forecast. NAS drew similar conclusions in 2001.[20]

While some uncertainty regarding impacts remains, there is a significant likelihood that such uncertainty will resolve itself for the worse rather than the better. A group of the world's top climate change scientists summarized this proposition in an amicus brief submitted to

http://www.sciencemag.org/cgi/rapidpdf/316/5828/1181.pdf?ijkey=CAlzmuA008O0.&keytype=ref&siteid=sci.

[19] Jonathan Overpeck, Dir., University of Arizona Institute for the Study of Planet Earth, Presentation to the New Mexico Climate Change Advisory Group: Climate Change—What's Ahead for the Southwest (July 27, 2005).

[20] COMM. ON THE SCI. OF CLIMATE CHANGE, NAT'L RESEARCH COUNCIL, CLIMATE CHANGE SCIENCE: AN ANALYSIS OF SOME KEY QUESTIONS 3-5 (2001).

the Supreme Court in *Massachusetts v. EPA*:

> As practicing scientists who study the earth's climate system, we and many in our profession have long understood that continued human-caused emission of greenhouse gases—primarily carbon dioxide (CO2), but also methane (CH4), nitrous oxide (N2O), and fluorocarbons—would eventually warm the earth's surface. Most were skeptical that we would see strong signs of human-induced climate change in our lifetimes. But by the beginning of this decade, we observed that global temperatures are rising, plant and animal ranges are shifting, glaciers are in retreat globally, and arctic sea ice is retreating. Sea levels are rising and the oceans are becoming more acidic. To the extent that these changes result from human alteration of the atmosphere, we know that they are just the first small increment of climate change yet to come if human societies do not curb emissions of greenhouse gases.[21]

Because GHGs are persistent and cumulative once emitted, effects will last over a century and continue unabated without any natural ceiling on warming. The scientists noted above warned the Court that:

> [D]elaying action to reduce greenhouse gas emissions will certainly result in greater buildup of greenhouse gases in the atmosphere, and thus we commit the earth to long-lasting climate change and associated damages decades before these damages can be measured. Reversing the impacts of climate change becomes vastly harder, or impossible, and more expensive as we allow greenhouse gas pollutants to accumulate in the atmosphere.[22]

In order to stabilize the global mean temperature near current levels and prevent some of the more dangerous impacts from climate change, scientists predict that worldwide emissions must be reduced fifty to eighty-five percent from 2000 levels by the year 2050. Such a measure would require even greater percentage reductions by the United States, which currently emits roughly twenty-two percent of the world's GHGs but contains only five percent of the world's population.[23]

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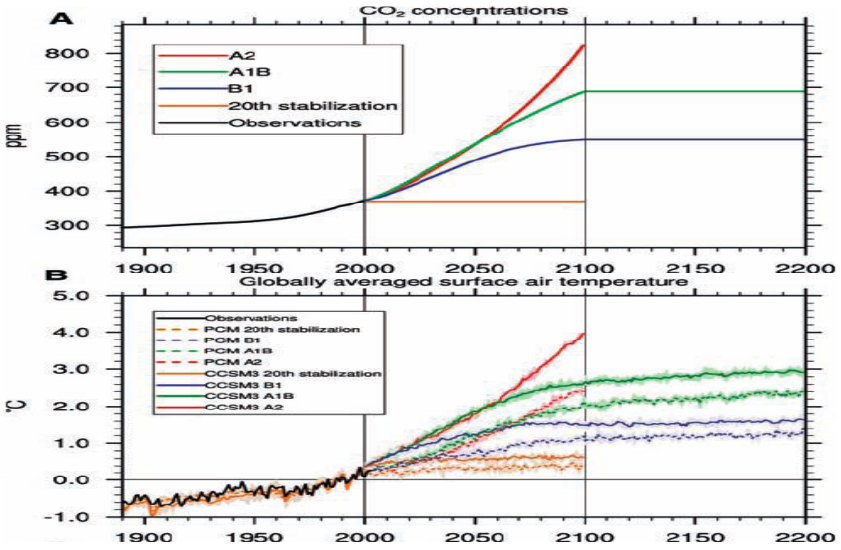
[21] Brief for David Battisti et al. as Amici Curiae Supporting Petitioners at 2-3, Massachusetts v. EPA, 127 S. Ct. 1438 (2007) (No. 05-1120). This group of climate scientists included two Nobel Prize winners and the majority of the NAS/NRC panel that advised President Bush on the state of climate science.

[22] *Id*. at 29-30.

[23] Terry Barker et al., *Technical Summary*, *in* CLIMATE CHANGE 2007: MITIGATION OF CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP IIII TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 25, 30 (Bert Metz et al. eds., 2007), *available at* http://www.mnp.nl/ipcc/pages_media/AR4-chapters.html [hereinafter

Climate Stabilization Scenarios: GHG Concentrations v. Global Temperatures[24]



II. THE UNITED STATES' FAILURE TO SERIOUSLY ADDRESS CLIMATE CHANGE AT THE NATIONAL LEVEL HAS ADVERSE INTERNATIONAL CONSEQUENCES

Virtually all industrialized nations worldwide, with the exception of the United States, mandate targets and timetables for emissions reductions under the Kyoto Protocol[25] to the United Nations Framework Convention on Climate Change (UNFCCC).[26] Developing nations sat out these early commitments under the Berlin Mandate,[27] a previous accord incorporated into the express terms of the UNFCCC that requires developed nations to act first to reduce GHG emissions.[28] This

FOURTH IPCC REPORT, WGIII].

[24] Overpeck, *supra* note 19.

[25] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22, *available at* http://unfccc.int/resource/docs/convkp/kpeng.pdf [hereinafter Kyoto Protocol].

[26] United Nations Framework Convention on Climate Change, May 9, 1992, 1771 U.N.T.S. 107, *available at* http://unfccc.int/resource/docs/convkp/conveng.pdf [hereinafter UNFCCC].

[27] The Berlin Mandate was a decision reached by the Third Conference of Parties of the UNFCCC to require actions by developed nations to precede those by developing nations. This support of this decision by the United States State Department did not involve consultation with the United States Senate, and was cited by Senate members as a key barrier to approval of U.S. participation in the Kyoto Protocol.

[28] UNFCCC, *supra* note 26, art. 4, para. 2 ("(a) Each of these Parties. . .*with the aim of*

discrepancy between developed and developing nations confounds multinational companies and gives rise to a global patchwork of compliance.

The decision by the United States not to participate in the Kyoto Protocol creates international tension and lends support to claims that developing nations should not yet be held to equivalent mandates. Emissions from the United States, already the highest in the world, as well as emissions from major developing nations India and China, are increasing. As a result, the emissions problem grows worse, and greater action will be needed in the future to compensate for the lack of early action by major emitting nations. The lack of significant and effective near term action by the United States and the rapidly-developing developing industrialized nations leads to many long-term decisions with respect to infrastructure, energy technology, natural resources, and economic growth that lock in high emissions growth scenarios.

III. STATE RESPONSES TO CLIMATE CHANGE PROVIDE IMPORTANT EXAMPLES OF HOW TO ATTAIN CLIMATE STABILIZATION GOALS AT A NATIONAL LEVEL

In the midst of this stalemate, state governments are attempting to help close the United States' emissions reduction gap through an array of climate change mitigation actions. Since 2000, twenty-six states have developed and implemented a variety of comprehensive climate action plans covering all emitting sources and sectors.[29] These states recently established, or will establish, statewide emissions reduction targets.

Numerical goals and targets for emissions reductions are typically developed through consensus-based planning processes and in-depth technical and economic feasibility analyses. The goals and targets vary by state, but all are moving toward climate stabilization levels through a range of highly specific methods. U.S. GHG emissions, for instance, are projected to grow roughly fifty percent above 1990 levels by 2020.[30] Growth rates of individual states vary widely during the same period, with Pennsylvania emissions growth estimated at thirteen percent, and Arizona emissions growth at 149 percent.[31] The increases projected for

returning individually or jointly to their 1990 levels these anthropogenic emissions of carbon dioxide and other greenhouse gases. . .") (emphasis added).

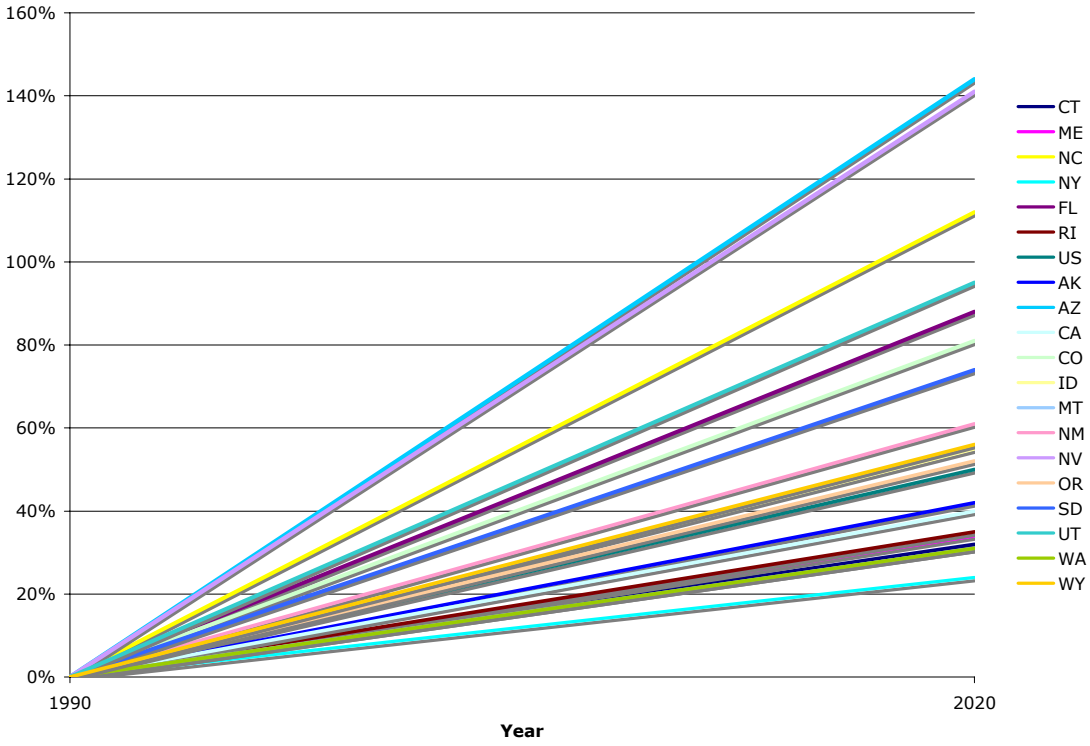
[29] A number of plans were developed before 2000. However, these plans were far from comprehensive, did not involve stakeholder input, and were largely formulaic with no significant implementation.

[30] Center for Climate Strategies, *supra* note 13.

[31] *Id*.

coastal northeast and west coast states are lower than the national average (averaging in the thirtieth percentile), while the projected range of rates for interior and southern states are higher (ranging from sixty to 150 percent).

State GHG Growth Rates 1990-2020[32]



State planning targets are consistent with long-term climate stabilization pathways recommended by the scientific community for the short-term (through 2020). The targets provide a platform for the steeper reductions needed by 2050 to achieve stabilization of atmospheric levels of GHGs.[33] State plans are remarkably consistent in the level of achievable emissions reductions, averaging about thirty to fifty percent below projected emissions levels by 2020.[34]

[32] *Id.*

[33] Most of the long-term goals are based upon reductions ultimately needed to stabilize atmospheric levels.

[34] This translates into reductions ranging from ten percent below 1990 levels to a return to 2000 levels. The differences are due to the fact that growth rates vary from state to state.

State GHG Forecasts, Reduction Goals, Plan Results[35]

State	**GHG Forecast**	State Goals	**Climate Plan Coverage**
AZ	149%	2000 levels by 2020; 50% below by 2040	106%
CA	41%	E.O.: 2000 level by 2010; 10% below by 2020; 80% by 2050 AB-32: 1990 levels by 2020	100%
CT	32%	1990 level by 2010; 10% below by 2020; 75% below 1990 levels by 2050	100%
ME	34%	1990 level by 2010; 10% below by 2020; 75% below 1990 levels by 2050	100%
NJ	TBD	1990 levels by 2020; 80% below 2006 levels by 2050	100%
NM	64%	2000 level by 2012; 10% below by 2020; 75% by 2050	137%
OR	38%	1990 level by 2010; 10% below by 2020; 75% by 2050	85%
WA	37%	1990 level by 2010; 25% below by 2035; 50% below 1990 levels by 2050	TBD
RI	35%	1990 level by 2010; 10% below by 2020; 75% below 1990 levels by 2050	100%
VT	TBD	25% below 1990 levels by 2012; 50% below 1990 by 2028; 75% below 1990 levels by 2050	TBD

The magnitude of existing state actions that reduce GHGs is underappreciated. In combination, states undertake or plan well over 250 different actions across all sectors to reduce GHG emissions.[36] Some of these actions arose because of related policy objectives, while others were designed expressly for GHG abatement. In addition, a majority of states now have comprehensive inventories and forecasts of emissions and reporting systems to support implementation of policies and plans. Regional areas now aggregate and expand upon individual

[35] Center for Climate Strategies, *supra* note 13.

[36] *See* N.C. CLIMATE ACTION PLAN ADVISORY GROUP, CATALOG OF STATE CLIMATE MITIGATION OPTIONS (2006), *available at* http://www.ncclimatechange.us/ewebeditpro/items/O120F8216.pdf (cataloguing 230 different climate change mitigation options undertaken or considered by U.S. states); Robert B. McKinstry, Jr. & Thomas D. Peterson, *The Implications of the New "Old" Federalism in Climate-Change Legislation: How to Function in a Global Marketplace When States Take the Lead*, 20 PAC. GLOBAL BUS. & DEV. L.J. 61, 72-87 (2007) (listing over 260 options for GHG reduction by states).

state actions, particularly in sectors where markets transcend state boundaries, such as electricity generation and sales. A majority of states currently have state GHG plans or state GHG plans in progress.[37]

State experience identifies the following six key action areas that are critical to achieving national GHG emissions reductions targets:

- Energy efficiency and conservation
- Clean and renewable energy
- Transportation and land use efficiency
- Agriculture and forestry conservation
- Waste management and recycling
- Industrial process improvements.[38]

States consistently find that meaningful progress in these critical action areas requires the combination of implementation mechanisms, particularly if high levels of public consensus and economic performance are desired. These mechanisms typically include a range of traditional approaches, as well as innovative means by which market forces can be mobilized, including:

- Codes and standards
- Voluntary and negotiated agreements
- Targeted spending
- Financial incentives
- Market based systems
- Technical assistance
- Pilots and demonstration projects
- Education and awareness
- Reporting and disclosure
- Public recognition and reward[39]

The combination of different actions and mechanisms across all of the relevant sectors is critical to meeting strong new emissions targets. It also provides overall low costs of implementation by allowing the government to balance the costs and savings of individual actions. Finally, this comprehensive "portfolio" approach—characterized by ten to twenty policy choices from each of six sectoral columns—is crucial

[37] McKinstry & Peterson, *supra* note 36, at 72-87; Center for Climate Strategies, *supra* note 13 (documenting completed state GHG plans in nineteen states, and twelve state GHG plans in progress). States with completed GHG plans include California, Oregon, Washington, Minnesota, Wisconsin, Illinois, Arizona, New York, North Carolina, Vermont, Maine, New Mexico, and Montana, among others. For a complete color-coded map of these states, visit http://www.velj.org.

[38] Center for Climate Strategies, *supra* note 13.

[39] *Id.*

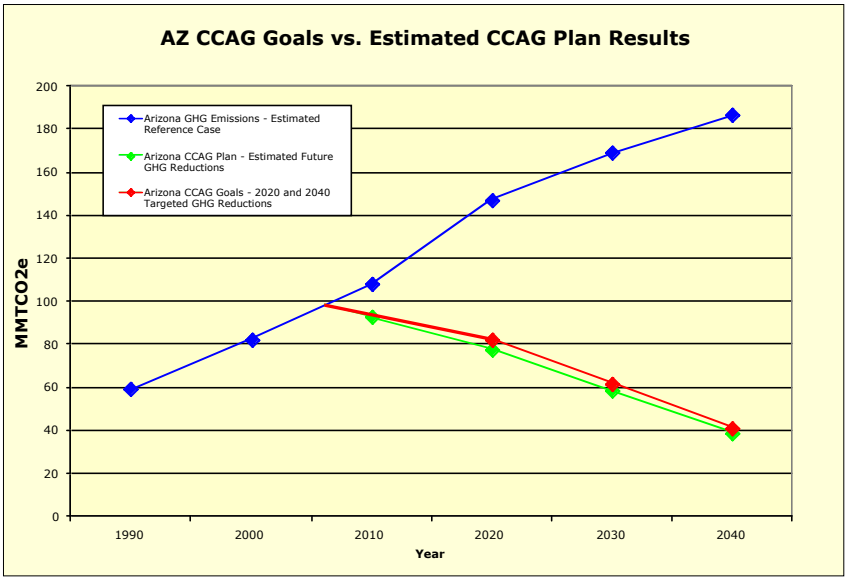
to gaining political support for any climate-related action, as it provides an enormously flexible range of choices by which potential conflicts may be resolved.

One recent example of the state approach is the Arizona Climate Action Plan, which was completed in 2006.[40] Following an intensive consensus-building process through joint fact-finding and policy development, the state developed a plan with forty-nine separate actions across all sectors, using a variety of implementation approaches. The plan achieved high levels of emissions reductions and net economic savings (estimated at $5.5 billion by 2020) by focusing on actions to reconfigure new economic growth to become cleaner and more efficient, rather than costly actions requiring retrofitting of existing infrastructure.[41] Despite the fact that Arizona has the highest estimated growth rate of GHG emissions in the United States, it was able to set reduction targets consistent with climate stabilization needs without negatively impacting its economic growth.

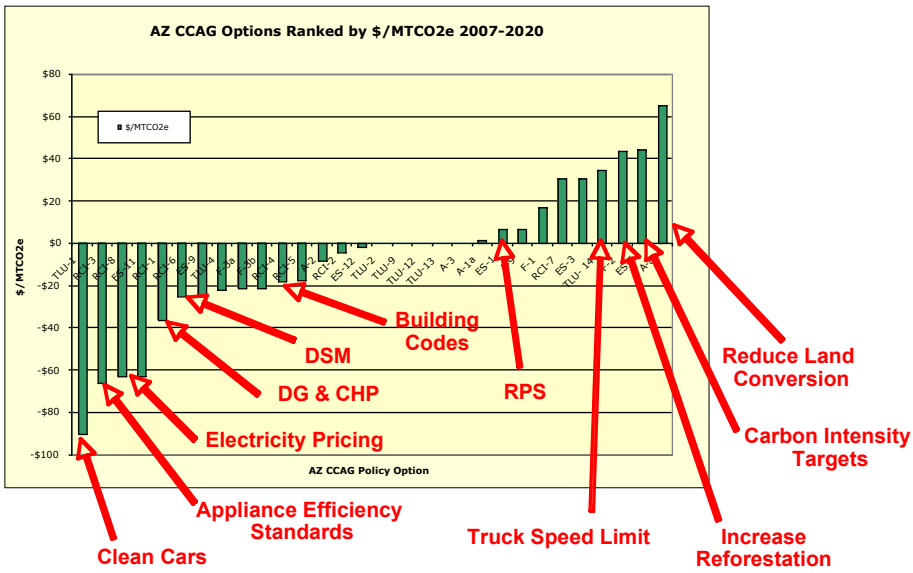
[40] ARIZ. CLIMATE CHANGE ADVISORY GROUP, CLIMATE CHANGE ACTION PLAN (2006), *available at* http://www.azclimatechange.gov/download/O40F9347.pdf.

[41] *Id.* at 8.

Arizona Climate Action Plan Recommendations 2006[42]



Arizona Climate Mitigation Cost Curve[43]



[42] *Id.* at 40.

If the state climate action targets recently established by sixteen leadership states through completed action plans were emulated nationally, they would reduce U.S. GHG emissions by one third of total projected emissions by 2020, the equivalent of 1990 levels. Preliminary estimates also suggest that national emulation of state efforts could provide the United States with net economic *savings* of about one hundred billion dollars by 2020 (or about thirty-one billion dollars in savings during 2020 alone), based on an extrapolation to the national level from a series of extensive and openly-reviewed expert studies by the states conducted through public stakeholder processes and advanced economic analysis.[44]

Estimated Scale Up of State Climate Plan Actions[45]

Potential US 2020	**Percent National GHG Plan**	**MMTCO2e**	**Cost/Cost Savings**	Estimated Total Savings
Energy Efficiency and Conservation	~24%	555	-$10 to -$30	-$11 Billion
Clean and Renewable Energy	~24%	565	$7 to $21	$8 Billion
Transportation and Land Use Efficiency	~36%	831	-$32 to -$36	-$28 Billion
Agriculture and Forestry Conservation	~6%	132	-$1 to -$5	-$0.4 Billion
Waste Management, Industrial Processes, and Other	~11%	246	TBD	TBD
Additional Federal Actions	~6-18%	264	TBD	TBD
Total				-$31 Billion +

[43] *Id*. at 18.

[44] Center for Climate Strategies, *supra* note 13 (compiling scale-up analysis of state leadership actions).

[45] *Id*. (using results of state climate action plans completed since year 2000, as of April 2007).

The same portfolio-based policy architecture developed by individual states is mirrored in the climate plans of virtually all nations in compliance with UNFCCC treaty obligations.[46] Key structural elements include:

- Comprehensive emissions inventories and forecasts;
- A common but differentiated system of targets and timetables for GHG reductions;
- Comprehensive GHG reduction actions in all economic sectors and levels of government;
- A variety of matching implementation mechanisms, tailored to underlying sector-based actions that reduce GHGs; and
- Reporting and measurement systems to support implementation.

Jurisdictions typically regulate major stationary source emissions (which usually constitute a minority of overall GHG emissions) under a central policy instrument such as a tax, levy, cap and trade system, or some combination thereof. The remaining portion of emissions reductions are aimed at, *inter alia*, transportation, commercial, and residential sources. These reductions are achieved through a set of more decentralized policies and measures, including regional standards and state-specific actions. In these diverse sectors, emissions reduction measures are often directed to areas where market imperfections make the application of a tax or cap and trade program less likely to be effective—for instance, where price mechanisms are highly distorted or confounded by other decisional attributes of policy, or where transaction costs for small sources are high. Ultimately, these two approaches are merged in a comprehensive plan or portfolio of actions tailored to the specific jurisdiction.[47]

Through this common framework, jurisdictions may engage in joint or reciprocal actions that capture geographic efficiencies. Due to the wide scope of policy actions within the plans, this approach requires an effective governance structure across sectors as well as horizontal and vertical levels of government.

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[46] *See* FOURTH IPCC REPORT, WGIII, *supra* note 23, at 31-33 (providing details on international GHG plans).

[47] For example, the United Kingdom relies upon a "climate levy" imposing a tax on GHG emissions while allowing industry to opt into a cap in return for reduced tax rates. This is supplemented by policies covering transportation, residential and commercial activities. *See* FOURTH IPCC REPORT, WGIII, *supra* note 23, at 28–29.

IV. CURRENT FEDERAL LEGISLATIVE PROPOSALS DO NOT ADEQUATELY INTEGRATE ELEMENTS OF STATE CLIMATE INITIATIVES OR EXISTING MECHANISMS AVAILABLE UNDER THE CAA

Remarkably, none of the proposed federal bills now before Congress adopt the comprehensive portfolio approach described above, a shortcoming illustrated by the five economy-wide bills introduced as of April 1, 2007.[48] All of these bills authorize a cap-and-trade component, although the details differ widely—including whether the implementation of a cap and trade program is required, as opposed to merely an option to be considered.

Two of the bills rely almost completely on cap and trade programs to achieve emissions reductions goals.[49] The other three focus primarily on measures other than cap and trade. These measures, which are in one or more of the three bills, include emission limits for motor vehicles,[50] emission limits for electric generating plants,[51] energy efficiency standards for electric providers,[52] required increases in the percentage of electricity that must be generated by renewable energy,[53] and required increases in the percentage of gasoline service stations that dispense ethanol fuel.[54] One of the other three bills authorizes, but does not require, the establishment of a cap and trade program.[55]

Even the broadest of these bills does not authorize or require the full range of necessary options to reach climate stabilization goals by 2020 and beyond. To begin with, the bills fail to take advantage of the

[48] S. 280, 110th Cong. (2007); S. 309, 110th Cong. (2007); S. 485, 110th Cong. (2007); H.R. 620, 110th Cong. (2007); H.R. 1590, 110th Cong. (2007). These bills are directed at all major sectors, as well as each of the six major GHGs covered by the Kyoto Protocol.

[49] S. 280, 110th Cong. tits. I and II (2007); H.R. 620, 110th Cong. tits. I and II (2007). The Senate bill also contains a separate Title that is intended to create an innovation infrastructure and encourage the deployment of advanced technologies and practices. S. 280, 110th Cong. tit. III (2007).

[50] S. 309, 110th Cong. § 2 (2007) (adding § 707 to the CAA); H.R. 1590, 110th Cong. § 3 (2007) (adding § 706 to the CAA).

[51] S. 309, 110th Cong. § 2 (2007) (adding § 708 to the CAA).

[52] S. 309, 110th Cong. § 2 (2007) (adding § 712 to the CAA); S. 485, 110th Cong. tit. I, § 101 (2007) (adding § 706 to the CAA); H.R. 1590, 110th Cong. § 5 (2007) (adding § 611 to the Public Utility Regulatory Policies Act).

[53] S. 309, 110th Cong. § 2 (2007) (adding § 713 to the CAA); S. 485, 110th Cong. tit. I, § 101 (2007) (adding § 707 to the CAA); H.R. 1590, 110th Cong. § 4 (2007) (adding § 610 to the Public Utility Regulatory Policies Act).

[54] S. 485, 110th Cong. § 102 (2007) (amending § 211(o)(2) of the CAA).

[55] *Compare* S. 309, 110th Cong. § 2 (2007) (adding § 704(f) to the CAA, which authorizes but does not require the EPA to establish "1 or more market-based programs") *with* S. 485, 110th Cong. tit. I, § 101 (2007) (adding § 703(a) to the CAA, which requires the EPA to establish a cap-and-trade program) *and* H.R. 1590, 110th Cong. § 3 (2007) (adding § 704(a) to the CAA, which requires the EPA to promulgate cap-and-trade regulations).

breadth of legal tools made available by the CAA. Whatever the wisdom of that position prior to *Massachusetts v. EPA,* it is no longer viable. Because the Court held that carbon dioxide is a pollutant under the CAA, it is subject to the all relevant provisions of that statute.[56] The CAA utilizes a combination of SIPs,[57] national technology based standards,[58] permits,[59] monitoring requirements,[60] reporting requirements,[61] preconstruction review,[62] and a national cap and trade program that limits sulfur dioxide emissions from power plants to reduce acid deposition.[63] None of the pending bills shows how carbon dioxide and other GHGs will be integrated into that existing framework. This may be due to the EPA's position (now repudiated) that GHGs are not pollutants under the CAA. Whatever the reason, this lack of integration should be remedied.

[56] Massachusetts v. Envtl. Prot. Agency, 127 S. Ct. 1438, 1462 (2007).

[57] 42 U.S.C. § 7410 (2000).

[58] *Id*. §§ 7411 (technology-based standards of performance for new and modified stationary sources), 7412 (technology-based standards for hazardous air pollutants), 7521 (technology-based standards for emissions from mobile sources).

[59] *Id*. §§ 7429 (permits required for solid waste combustion facilities), 7475 (preconstruction permits required under the prevention of significant deterioration program), 7503 (permits required in non-attainment areas), 7561g (permits required under acid deposition program), 7661-7661f (general provisions regarding permit program under the CAA).

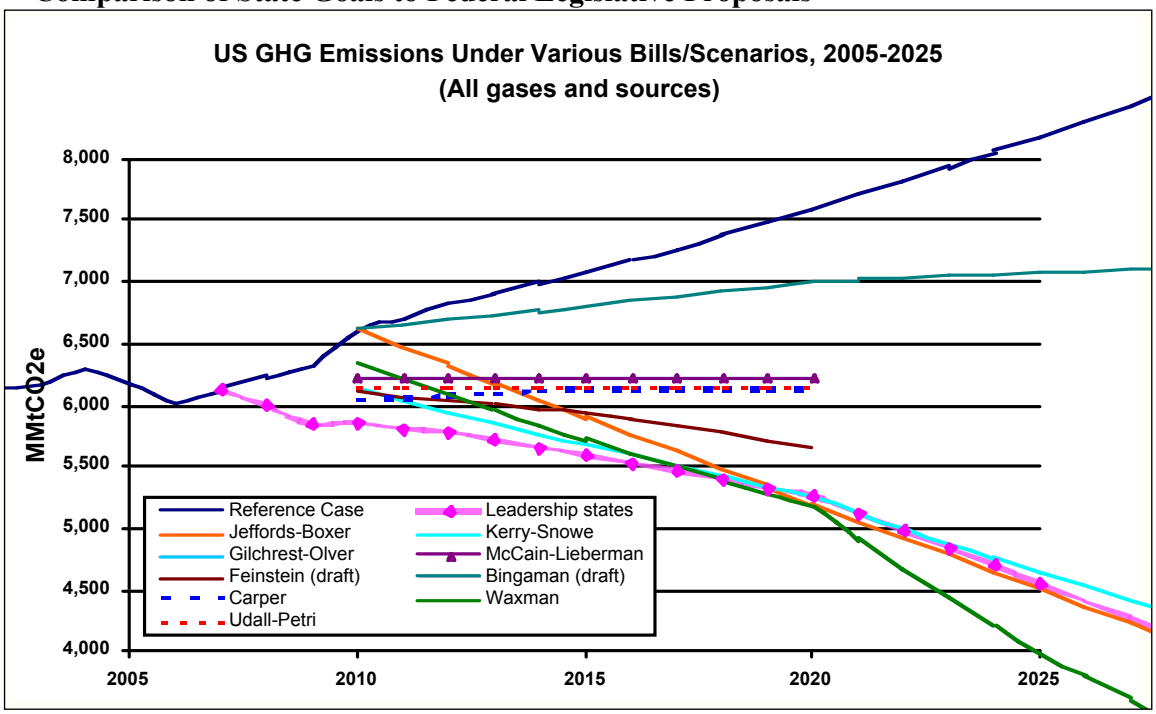
[60] *E.g.*, *id*. §§ 7429(c), 7475(e), 7661c(b).

[61] *E.g.*, *id*. §§ 7429(c), 7475(e), 7661c(c).

[62] *See, e.g.*, 42 U.S.C. § 7475 (2007) (prevention of significant deterioration program); 42 U.S.C. § 7503 (2007) (non-attainment program).

[63] 42 U.S.C. § 7651 (2007).

Comparison of State Goals to Federal Legislative Proposals[64]



Furthermore, the bills' almost exclusive focus on emissions trading is driven by a number of assumptions that are founded upon the successful record of the acid deposition program in achieving reductions at minimal cost. This success has contributed to a popular belief that command and control regulation found in the major environmental laws enacted between 1969 and 1990 does not work, and it assumes that the next generation of pollution controls should be managed via cap and trade. This conclusion is based on assumptions that (1) the measures employed in environmental laws before cap and trade do not achieve success in a cost-effective manner, (2) the acid rain cap and trade program applicable to a single, highly regulated sector can readily be applied to emissions of GHGs across the whole economy, and (3) the cap-and-trade program was successful as a "stand alone" venture. The strategy of relying wholly or largely on cap and trade may also be based on the additional assumption that future economic growth is closely tied to historically low energy prices, and that energy prices will rise due to

[64] Center for Climate Strategies, *supra* note 13.

climate policy, creating irreconcilable conflicts.

None of these assumptions ultimately hold up under scrutiny. Most notably, while the acid deposition cap-and-trade program established by Subchapter IV-A of the CAA[65] succeeded in achieving very significant reductions of acid rain precursors at a minimal cost,[66] its success was due to a number of unique circumstances. While a number of the characteristics of GHG emissions suggest that a trading system may be an effective tool to address climate change, there are important limitations that militate towards limiting the use of such a system to particular circumstances.[67] An effective trading program requires design constraints as well as careful consideration of where such a program can be effective.[68] These design constraints will inform where the trading mechanism fits in a larger portfolio approach—in other words, where a trading mechanism will work most effectively, where other measures will be required to make the trading mechanism work effectively, and where other tools will work more effectively. In particular, the acid deposition cap and trade system's success is the result of the following specific factors:

- The program built upon and complemented an array of regulatory tools already incorporated into the CAA to control sulfur dioxide and nitrogen oxide emissions (the principal acid rain precursors). The program built upon requirements for permits, monitoring, and enforcement already required by the CAA.[69] More importantly, for controls of acid deposition precursors emitted from sources not subject to the cap and trade program, it relied upon controls established pursuant to other sections of the CAA related to SIPs and technology-based standards for automobile emissions and new and modified stationary sources.[70]
- The acid deposition program was limited to the utility sector,

[65] 42 U.S.C. § 7651.

[66] *See* Joseph Goffman, *Title IV of the Clean Air Act: Lessons for Success of the Acid Rain Emissions Trading Program*, 14 PENN ST. ENVTL. L. REV. 177, 180-81 (2006).

[67] *See* David M. Driesen, *Trading and Its Limits,* 14 PENN ST. ENVTL L. REV. 169, 170-72 (2006); Robert B. McKinstry, Jr., *Putting the Market to Work for Conservation: The Evolving Use of Market-Based Mechanisms to Achieve Environmental Improvement In and Across Multiple Media*, 14 PENN ST. ENVTL L. REV. 151, 158-60 (2006) (discussing limitations on use of trading programs).

[68] *See* Tom Tietenberg, *Tradable Permits in Principle and Practice,* 14 PENN ST. ENVTL L. REV. 251, 276-77 (2006).

[69] *See* Driesen, *supra* note 67, at 169-72 (discussing need for monitoring).

[70] *See* David M. Driesen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289, 335 (1998).

which was already highly regulated in 1990. Allowances could be allocated to the utility sector with minimal concerns about equity and impacts on competition, since costs and benefits could be apportioned equitably among the shareholders and the users of electricity, who were protected by rate regulation. Other sources of acid rain precursor emissions were permitted to opt-in voluntarily.

- The acid deposition cap-and-trade program also worked well because market imperfections were minimized. Market allocations work best where costs are imposed upon those who have the requisite knowledge and control to minimize costs.[71] Limitations on acid rain emissions required choices about types of generation technology, air pollution control technology and fuels that could best be made by the utilities which controlled emissions.
- The program was limited to two pollutants, sulfur dioxide and nitrogen oxides, which are controlled through installation of pollution control equipment, fuels, and generation technology switching.[72]
- There was no concern about "hot spots"—areas where high concentrations can cause local adverse impacts on health or the environment. Local concentrations were limited under the existing provisions of the CAA.

Applying the above considerations, trading can undoubtedly be a powerful tool for control of GHG emissions. GHG hotspots are not of concern because there is sufficient mixing of carbon dioxide, the

[71] *See* GUIDO CALABRESI, THE COSTS OF ACCIDENTS: A LEGAL AND ECONOMIC ANALYSIS 135-97 (1970); Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, And Inalienability: One View Of The Cathedral*, 85 HARV. L. REV. 1089, 1096-97 (1972):

[I]t is enough to say here: (1) that economic efficiency standing alone would dictate that set of entitlements which favors knowledgeable choices between social benefits and the social costs of obtaining them, and between social costs and the social costs of avoiding them; (2) that this implies, in the absence of certainty as to whether a benefit is worth its costs to society, that the cost should be put on the party or activity best located to make such a cost-benefit analysis; (3) that in particular contexts like accidents or pollution this suggests putting costs on the party or activity which can most cheaply avoid them; (4) that in the absence of certainty as to who that party or activity is, the costs should be put on the party or activity which can with the lowest transaction costs act in the market to correct an error in entitlements by inducing the party who can avoid social costs most cheaply to do so; and (5) that since we are in an area where by hypothesis markets do not work perfectly - there are transaction costs - a decision will often have to be made on whether market transactions or collective fiat is most likely to bring us closer to the Pareto optimal result the "perfect" market would reach.

[72] However, the failure to provide for adequate interpollutant trading and control of nitrogen oxides represents one of the major failures of the acid deposition cap and trade program.

principal GHG constituent.[73] The various GHGs can be traded at ratios that can be readily established. A trading program involving GHGs can build upon the tools already incorporated in the CAA, which can readily be applied to GHG emissions.[74] But many of the other conditions that made the acid deposition cap and trade program so successful do not apply to GHG emissions. For example:

> While acid deposition could be regulated through controls on the utility sector, control of GHG emissions will require significant reductions across the economy. Reductions will be required in unregulated markets with many participants, such as the markets for transportation fuels, representing thirty-three percent of emissions in the United States,[75] and residential and commercial heating and power, representing thirty-eight percent of GHG emissions in the United States.[76]

In the case of acid deposition control, the utility market was highly regulated, which provided assurance that allocations of emissions rights would not cause unjust enrichment. But many of the markets involved in potential GHG regulation are not regulated, so distributional considerations come into play.[77] Moreover, since the creation of the acid deposition program, even the electric generation sector of the utility industry has been deregulated.

The distribution and initial allocation of GHG emissions allowances raises significant ethical issues that were of less significance with respect to the acid deposition program. An allocation of allowances for GHG emissions involves an allocation of a global commons that has

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[73] Carbon dioxide emissions represent just a small portion of the total amount of carbon dioxide in the biosphere: human activities produce only a four percent or less increase in the *rate* of carbon dioxide emissions from natural sources. But human carbon-emitting activities are still of concern because of the cumulative impacts of *adding* this small amount to the already huge fluxes each year. Carbon dioxide mixes readily and is taken up by photosynthesis or dissolution in water. *See* State of California, Climate Change Policy & Programs, http://www.climatechange.ca.gov/policies/1990s_calif_in_context/page1.html (last visited Jan. 3, 2008); U.S. Global Change Research Info. Office, Frequently Asked Questions, http://www.gcrio.org/ipcc/ar4/wg1/faq/ar4wg1faq-7-1.pdf (last visited Jan. 3, 2008).

[74] McKinstry & Peterson, *supra* note 36, at 101; Robert R. Nordhaus, *The New Power Generation: Environmental Law and Electricity Innovation: Colloquium Article: New Wine into Old Bottles: The Feasibility of Greenhouse Gas Regulation Under the Clean Air Act*, 15 N.Y.U. ENVTL. L.J. 53, 61 (2007).

[75] U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2005, at 3-7, 3-25, 3-30 (2007) [hereinafter EPA INVENTORY].

[76] *Id*.

[77] *See generally* Adam Rose & Gbadebo Oladosu, *Greenhouse Gas Reduction Policy in the United States: Identifying Winners and Losers in an Expanded Permit Trading System*, 23 ENERGY J. 1 (2002) (surveying the impact of GHG caps on different income groups in the United States).

significant distributional considerations.[78]

Market imperfections will make the use of market mechanisms more problematic for reduction of GHG emissions in many sectors. While the trading provisions in the 1990 CAA amendments aimed to encourage energy conservation,[79] there is little evidence that they had that effect. GHG emissions reductions require decreases in energy demand through mechanisms such as green buildings and smart growth. Unlike the utility sector, those making the decisions in these sectors are not the same entities that will incur the costs.[80] For example, housing location and character will often be determined by builders rather than the homeowners. Those buying homes will be more motivated by the price of the home and may not have the knowledge or sophistication to make comparisons based on the present value of future energy consumption arising from the home's heating system and insulation or its location. Additionally, the persisting state regulation of the utility industry may limit utilities' ability to pass through the costs of emissions controls in a way that matches market incentives to demand.

These concerns suggest that a broader and somewhat different approach will be required for control of GHG emissions. To be effective, a tax or cap-and-trade mechanism, or both, should be a part of the mix, but other measures will be also required and must be integrated with the cap-and-trade program and with each other. Most importantly, careful thought must be given to the question of which tool to use where. Such thinking is not fully evident in current legislation.

A second group of assumptions that underlie other federal proposals, such as those putting a cap on costs of emissions control or those basing their approach on the questionable concept of GHG intensity, are also flawed. Specifically, the assumptions that economic growth is closely tied to energy prices and that energy prices will rise due to climate policy are incorrect. State actions provide substantial evidence on the economic benefits of climate change mitigation. Recent state plans show net economic savings from the combined effects of specific, proven actions at the state level when combined with long-term

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[78] *See* DONALD A. BROWN, AMERICAN HEAT: ETHICAL PROBLEMS WITH THE UNITED STATES' RESPONSE TO GLOBAL WARMING 193-200 (2002) [hereinafter BROWN, AMERICAN HEAT] (discussing international allocation issues); DONALD BROWN ET. AL., WHITE PAPER ON THE ETHICAL DIMENSIONS OF CLIMATE CHANGE 19-23 (2006), *available at* http://rockethics.psu.edu/climate/edcc-whitepaper.pdf [hereinafter BROWN, WHITE PAPER] (discussing issues for allocation among nations); Adam Rose, *Global Warming Policy: Who Decides What is Fair?*, 26 ENERGY POL'Y 1, 2-3 (1998); Adam Rose et. al., *International Equity and Differentiation in Global Warming Policy,* 12 ENVTL & RES. ECON. 25, 29-33 (1998).

[79] 42 U.S.C. § 7651(b) (2007).

[80] *See* CALABRESI, *supra* note 71, at 135; Calabresi & Melamud, *supra* note 71, at 1096.

transitions toward new technologies, systems, and practices. The economic performance of these plans is driven both by the new energy economy and by opportunities to save energy and diversify supply through a host of reform actions. Today, energy prices are significantly higher than a decade ago when international treaty negotiations peaked, and they are widely expected to increase for the indefinite future.

V. THE CLEAN AIR ACT PROVIDES A POSSIBLE APPROACH TO GOVERNANCE AND FULL POLICY COVERAGE

Given the record of accomplishment among the states, it appears that successful climate change mitigation requires strong goals and diverse solutions that involve all sectors and levels of government. The United States must construct a new approach based on a model that effectively incorporates the successful models used by the states but also provides federal consistency. The following matrix illustrates the need to integrate economic sectors, policy instruments, and levels of government into one holistic system.

Climate Policy Integration Matrix

Economic Sector	**Level of government**			
	Local	State	Regional	National
Energy Supply				
Residential, Commercial, Industrial				
Transportation and Land Use				
Agriculture and Forestry				
Waste Management				

With the Supreme Court's holding in *Massachusetts v. EPA*, there is little doubt that the regulatory construct for addressing climate change at the federal level will build upon the CAA. Because it is very unlikely that Congress will amend the law to remove environmental protections,[81] the focus has necessarily shifted from the question of

[81] Since the 1990s, legislators have objected to efforts to implement climate change controls without ratification of the Kyoto Protocol. These legislators were unable to amend the CAA to

whether there will be a federal response under the CAA to the question of *how* that response should best be managed and what amendments will be required to make the federal response appropriately integrated with international, state, and local efforts.

The authors previously wrote on how the provisions of the CAA could provide a template to be used to address climate change and effectively integrate state programs.[82] The Act provides a structure whereby state climate change plans and actions can be integrated into a coherent federal system while allowing long term evolution toward new approaches without sacrificing strong near term action. Under the existing provisions of the CAA, a willing and flexible EPA could implement an effective governance structure for GHGs. Such an approach, however, depends upon a willing EPA and the development of new regulations, an already time-consuming process that could face further delays incident to legal challenges.

To avoid these delays and uncertainties, Congress could require the EPA to implement a national climate change program through amendments to the CAA. Alternatively, the states could voluntarily coordinate their efforts to allow continued progress in emissions reduction while providing a model that Congress or the EPA could copy in ways that support a full range of emissions reduction actions proven effective and politically acceptable at the state and local level. This approach would consist of the following elements:

- The establishment of NAAQS at a level sufficient to prevent dangerous anthropogenic climate change;[83]
- The establishment of short, intermediate and long term emissions reduction goals necessary to maintain the NAAQS with corresponding sectoral and state elements;
- National and regional performance or technology-based limits and cap and trade programs for some sectors;
- SIPs designating additional measures necessary to achieve emissions reduction goals;

remove existing authority and, instead, enacted a budget resolution preventing money to be spent to implement the Kyoto Protocol. S. Con. Res. 86, 105th Cong. § 317(b) (1998) ("It is the sense of Congress that funds should not be provided to put in effect the Kyoto Protocol prior to the Senate ratification in compliance with the requirements of the Byrd-Hagel Resolution and consistent with Administration assurances to Congress.").

[82] McKinstry & Peterson, *supra* note 36.

[83] UNFCCC, *supra* note 26, at art. 2 ("The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.").

- Provisions to effectively engage individuals in implementation; and
- Establishment of United States as a serious actor in the international community.

Equally importantly, provisions are needed to integrate these measures and require specific EPA action. The CAA provides adequate authority for the EPA to implement most of the measures described below, [84] and the EPA could promulgate regulations that would provide for such implementation and the integration suggested below.[85] However, there are a number of factors that suggest that reliance upon EPA discretion will not result in reasonably expeditious action. In *Massachusetts v. EPA*, the Supreme Court suggested that the EPA would retain significant discretion with regard to the timing of regulations.[86] Immediately following the decision, the Administration announced its view that its current efforts to address climate change were sufficient and shortly thereafter issued an Executive Order outlining the actions over which the Administrator still retained discretion.[87] Without some mandate, swift action is unlikely under the Bush administration.

Even if the EPA were inclined to take rapid action, numerous barriers are present. The EPA would be required to gather information, formulate several series of draft regulations, and provide an opportunity for public notice and comment.[88] Even after the rulemaking process ends, regulations are subject to judicial review.[89] This could result in remand and additional delays.

Because delay will increase the ultimate cost of achieving necessary reductions and make achieving climate stabilization more difficult, some mechanism to reduce delays is desirable. Amending the CAA to incorporate specific directives and deadlines with the specificity normally found in regulations would be one mechanism to minimize

[84] *See* McKinstry & Peterson, *supra* note 36, at 72-87.

[85] 42 U.S.C. § 7601(a) (2000) ("The Administrator is authorized to prescribe such regulations as are necessary to carry out his functions under this chapter."). For example, the original non-attainment provisions of the Clean Air Act, 42 U.S.C. §§ 7501-7515, were first promulgated by the EPA as an interpretive rule, 41 Fed. Reg. 55524 (Dec. 21, 1976), and then incorporated into the statute by the 1977 Amendments to the Clean Air Act. *See* Pub. L. 95-95, § 129(a), as amended Pub. L. 95-190, § 14(b)(2)(3) (Nov. 16, 1977), 91 Stat. 1404.

[86] Massachusetts v. Envtl. Prot. Agency, 127 S.Ct. 1438, 1462 ("EPA no doubt has significant latitude as to the manner, timing, content, and coordination of its regulations with those of other agencies.").

[87] Exec. Order No. 13,432, 72 Fed. Reg. 27,717 (May 14, 2007).

[88] 42 U.S.C. § 7607(d), (h) (2006).

[89] 42 U.S.C. § 7607(b) (2006). No stay may be granted during judicial review of regulations. *Id.* § 7607(g).

delays and uncertainty. That approach was adopted by Congress in the mid-1980s when it was faced with an EPA unwilling to respond to environmental issues under more general statutory authority.[90] States could also contribute by adopting consistent deadlines and plans that could serve as SIPs if and when a federal system is in place. Cooperative ventures, already underway by several states, could also provide Congress with a model for action.

A. National Ambient Air Quality Standards for GHGs

The first step towards a coordinated federal approach under the CAA would be the establishment of NAAQS. After listing an air pollutant under section 108,[91] the EPA Administrator is required by section 109 of the CAA to establish primary NAAQS which, "allowing an adequate margin of safety, are requisite to protect the public health," as well as secondary NAAQS "requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air."[92] The requirements applicable to these standards mesh neatly with the requirements of the UNFCCC, which establishes the goal of preventing "dangerous anthropogenic" climate change[93] and directs that the parties adopt a "precautionary" approach that aims to anticipate and to prevent harm.[94] In light of these requirements, it would appear appropriate to set the primary and

[90] This approach was taken in both the Hazardous and Solid Waste Amendments of 1984, Pub. L. No. 98-616, 98 Stat. 3221 (1984) and the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1615 (1986). In response to very specific statutory directions, the EPA could quickly issue an interpretive regulation that simply restated the statutory requirements. *See* Hazardous Waste Management System, 50 Fed. Reg. 28702, 28703 (July 15, 1985) (final rule).

[91] 42 U.S.C. § 7408 (2006).

[92] 42 U.S.C. § 7409(b) (2006).

[93] UNFCCC, *supra* note 26, art. 2:

> The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

[94] *Id.* at art. 3, § 3:

> 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 such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.

secondary NAAQS for GHGs at an atmospheric level equal to that needed to prevent "dangerous anthropogenic" climate change."

Although significant scientific uncertainties make the establishment of NAAQS for GHGs difficult,[95] scientists are currently addressing the issue by determining what level of GHGs will prevent "dangerous anthropogenic" climate change. Information currently suggests that the threshold should be established at a level that would seek to keep atmospheric concentrations of carbon dioxide below 450 ppmv and concentrations of total GHGs below 500 ppmv in carbon dioxide equivalents.[96] Because there are a variety of GHGs with different warming potentials, both emissions and concentrations are typically established in terms of carbon dioxide equivalents. Consequently, NAAQS will likewise need to be established for total GHGs in terms of carbon dioxide equivalents at the 500 ppmv level.

There are uncertainties concerning the establishment of NAAQS for GHGs that may be resolved with better scientific information. Similar uncertainties arise with respect to most NAAQS, however, and the standards for existing criteria pollutants are often modified as better information becomes available. Indeed, the CAA specifically contemplates this process by requiring that the EPA review air quality criteria and standards every five years and make revisions as warranted.[97]

Leaving it to the EPA to establish NAAQS administratively will entail substantial delays, even assuming that the Agency would take action initially.[98] Progress is better assured if Congress specifies a 500

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[95] Nordhaus, *supra* note 74, at 61-62 (suggesting that establishing NAAQS presents "substantial legal and practical obstacles," focusing on the fact that emissions come from around the world and mix throughout the atmosphere).

[96] *See*, *e.g.*, James E. Hansen, *Scientific Reticence and Sea Level Rise*, ATMOSPHERIC & OCEANIC PHYSICS (forthcoming May 2008), *available at* http://arxiv.org/ftp/physics/papers/0703/0703220.pdf. The actual level is a function both of GHG concentrations and the impacts of aerosols that reflect radiance and have a cooling impact. We are currently at a level above 380 ppmv carbon dioxide, while the total GHG levels, in carbon dioxide equivalents are about 50 ppmv higher, or 430 ppmv, but the aerosols create a negative (cooling) effect that roughly cancels out the effect of the non-carbon dioxide GHGs. Scientists do not expect that aerosols will increase and assuming they remain roughly the same a total GHG level of 500 ppmv would have the equivalent warming potential of the 450 ppmv level believed to protect against "dangerous" anthropogenic climate change. Interview with Gavin A. Schmidt, Goddard Institute for Space Studies, and Michael Mann, Pennsylvania State University (May 1, 2007).

[97] 42 U.S.C. § 7409(d) (2006).

[98] In the case of lead, where the EPA voluntarily initiated action to regulate the lead content of gasoline, litigation was brought to compel the Agency to establish a broader listing, which would then require a NAAQS. Natural Res. Def. Council, Inc. v. Train, 545 F.2d 320, 324-25 (2d Cir. 1976). The timeline for the adoption of lead regulations is instructive. The EPA began evaluating

ppmv GHG NAAQS, allowing this figure to be reevaluated and revised consistent with evolving science and international accords, as already provided for in the CAA. This approach is already taken by the many states that establish ambitious long term reduction goals.[99]

B. Short, Intermediate, and Long-Term Emissions Reduction Goals

The CAA requires the adoption and implementation of SIPs to achieve and maintain the NAAQS. The statute gives states considerable flexibility in the choice of regulated sources as well as legal and policy tools, so long as the SIP is capable of achieving and maintaining the NAAQS.[100]

Some suggest that SIPs are not an appropriate legal tool for regulating GHGs.[101] The reasoning underlying this distinction is flawed

controls on leaded gasoline shortly after the 1970 enactment of the Clean Air Act. *See* Regulation of Fuel Additives, 36 Fed. Reg. 1486 (proposed Jan. 30, 1971) (to be codified at 42 C.F.R. pt. 479). It then twice proposed a schedule to reduce the maximum amount of lead allowed in gasoline pursuant to its "endangerment" authority in section 211(c)(1)(A) over the objections of industry. Regulation of Fuels and Fuel Additives, 37 Fed. Reg. 3882 (proposed Feb. 23, 1972) (to be codified at 40 C.F.R. pt. 80); Regulation of Fuels and Fuel Additives, 38 Fed. Reg. 1258 (proposed Jan. 10, 1973) (to be codified at 40 C.F.R. pt. 80). It finally adopted lead phase down regulations almost three years after voluntarily initiating this process. Control of Lead Additives in Gasoline, 38 Fed. Reg. 33,734 (final rule Dec. 6, 1973) (to be codified at 40 C.F.R. pt. 80). Three years later, the Court of Appeals affirmed a district court decision requiring the EPA to adopt an NAAQS, *NRDC v. Train*, 545 F.2d at 328. Finally, four years after that, the Court of Appeals for the District of Columbia affirmed the EPA's establishment of a NAAQS for lead, the culmination of a decade-long process. Lead Indus. Ass'n v. Envtl. Prot. Agency, 647 F.2d 1130, 1184 (D.C. Cir. 1980). Assuming a similar administrative process for GHGs would project a 2017 date before a NAAQS for GHGs would be settled—three years before the initial 2020 goals for most state climate change action plans. Although states that have already taken action will continue to pursue these goals and more can be expected to join them, many of the largest emitters of GHGs, including Texas, the second highest emitter, and many mid-western coal states, have not yet taken action and if their emissions continue to grow under a "business as usual" scenario, it will be very difficult to achieve the economy-wide reductions necessary to prevent "dangerous anthropogenic" climate change.

99 *See* Cal. Exec. Order No. S-3-05 (June 1, 2005) (stating a goal to reduce emissions to eighty percent below 1990 levels by 2050); COMM. ON THE ENV'T AND THE NE. INT'L COMM. ON ENERGY OF THE CONFERENCE OF NEW ENGLAND GOVERNORS AND EASTERN CANADIAN PREMIERS, NEW ENGLAND GOVERNORS/EASTERN CANADIAN PREMIERS CLIMATE CHANGE ACTION PLAN 2001, at 6-7 (Aug. 28, 2001) [hereinafter NEG/ECP CLIMATE CHANGE ACTION PLAN] (providing the long term goals of the New England Governors and Eastern Canadian Premiers). Both of these reports are based upon the goal of stabilizing and then reducing emissions to prevent dangerous anthropogenic climate change.

100 42 U.S.C. § 7410(a) (2006).

101 In denying the petition to regulate GHG emissions at issue in *Massachusetts v EPA*, the EPA suggested that the CAA was an inappropriate mechanism to regulate GHG emissions. Control of Emissions From New Highway Vehicles and Engines, 68 Fed. Reg. 52,922, 52,924 (Sept. 8, 2003) (stating that the NAAQS regime is ill-suited to address GHGs in relation to global climate change); Nordhaus, *supra* note 74, at 61 ("It is difficult to see how the SIP mechanism could be used to control global concentrations. It appears to be fundamentally ill-suited to the

insofar as it is based on the nature of pollutants regulated under the SIP mechanism in the past, all of which tend to have localized effects. Other criteria pollutants do not mix uniformly, they vary in their concentrations from airshed-to-airshed, they have a relatively short residence time in the atmosphere, and their local concentrations can be affected relatively quickly by changes in control strategy. For that reason, SIPs have focused on regulation aimed at achieving or maintaining local air pollutant concentrations. This focus requires extensive modeling and monitoring of local air movements and concentrations to bring out-of-compliance areas into compliance with the NAAQS, and to maintain those local areas that are already in compliance with the NAAQS.[102] GHGs, by contrast, have a relatively uniform concentration throughout the atmosphere. Most areas will be in compliance with the NAAQS for GHGs when and if they are promulgated. GHGs mix rapidly in the atmosphere, and their health and welfare impacts arise from average concentrations. GHGs reside in the atmosphere for long periods of time.[103] Consequently, in order to maintain levels below the NAAQS, emissions levels will need to be dramatically reduced well before they even approach the NAAQS.

Consequently, establishment of NAAQS for GHGs will require somewhat different SIP implementation mechanisms than those used for other criteria pollutants. NAAQS could be implemented either under the existing CAA through the promulgation of regulations calling for regulation of GHGs, or through a statutory amendment mandating such an approach. Because of the nature of GHG emissions, it would be appropriate for the EPA to establish specific numeric emissions reduction goals on a national basis that are phased in over time and that are horizontally and vertically differentiated among states, sectors, and policy implementation mechanisms.

task.").

[102] *See*, *e.g.*, 42 U.S.C. §§ 7407 (focusing on air quality control regions), 7410(a)(2)(K) (modeling) (2006). Although these provisions will not be applicable to regulation of GHG emissions, as the Supreme Court noted, the CAA's provisions are written with significant breadth and flexibility. Massachusetts v. Envtl. Prot. Agency, 127 S.Ct 1438, 1467-68 ("While the Congresses that drafted §202(a)(1) might not have appreciated the possibility that burning fossil fuels could lead to global warming, they did understand that without regulatory flexibility, changing circumstances and scientific developments would soon render the Clean Air Act obsolete. The broad language of §202(a)(1) reflects an intentional effort to confer the flexibility necessary to forestall such obsolescence.").

[103] NASA Goddard Inst. for Space Studies, Earth's Temperature Tracker, http://www.giss.nasa.gov/research/features/temptracker/page2.html (last visited Jan. 3, 2008) ("Because greenhouse gases reside in the atmosphere for decades, while aerosols usually wash out over a span of days to weeks, the warming influence of greenhouse gases gradually won out.").

Maintenance of the NAAQS would therefore require the establishment of total emissions reduction goals with corresponding emissions caps. Such an emissions-based approach to SIPs could be accommodated within the current structure of the CAA. The Act calls for the establishment of air quality control criteria simultaneously with the promulgation of a new NAAQS[104] and calls for promulgation of regulations defining criteria for SIPs.[105] Such criteria and regulations could establish a cap-based approach aimed at emissions reductions.

While an emissions cap approach appears appropriate for GHGs, what the reduction goals and caps will look like raises a number of questions. These relate to what the ultimate goals and caps should be, how a cap for the United States relates to international emissions, whether and how the reductions should be phased in, and how reduction goals and caps should be allocated among the states. Again, the experience of the states is instructive.

Any approach to determining an emissions reduction goal must start with what is necessary to stabilize worldwide emissions to maintain the NAAQS. Most sources concur that worldwide emissions must be reduced fifty to eighty-five percent by 2050,[106] and many states set long term emissions goals based on that number.[107] The United States, which only contains five percent of the world's population, emits twenty-two percent of the world's emissions.[108] Consequently, the emissions reductions goal, if based upon the assumption that each person in the world is entitled to emit an equal increment of GHGs, would be in the range of ninety-four to ninety-six percent.

Neither the seventy-five percent nor the ninety-six percent emissions reduction goal can be achieved without realistic intermediate benchmarks and immediate reduction incentives to guide the market. Intermediate reduction goals are particularly important. Because carbon dioxide accumulates, less radical reductions will be required later on if there are earlier reductions. For this reason, many states are facing the difficult question of what degree of reduction will ultimately be required for the United States[109] and adopt intermediate goals

104 42 U.S.C. § 7409(a)(2) (2006).

105 42 U.S.C. § 7410(k)(1)(A) (2006). This provision called for the promulgation of regulations within nine months of the 1990 Amendments to the Clean Air Act. Where an entirely new criteria pollutant is regulated, new criteria are required under section 108 of the Act, 42 U.S.C. § 7408(a)(2) (2006), and, by implication, new standards for SIPs should be required.

106 *See generally* Barker et al., *supra* note 23, at 30.

107 NEG/ECP CLIMATE CHANGE ACTION PLAN, *supra* note 99, at 7.

108 EPA INVENTORY, supra note 75, at 104.

109 The question of the ultimate emissions allocations among nations has bedeviled international negotiations and this issue is responsible, at least in part, for the United States

appropriate for any of the most significant national reduction goals. This approach is taken by California, which sets the goal of eighty percent reductions from 1990 levels by 2050.[110] Intermediate national goals could also be based upon those set forth in the NEG/ECP Climate Action Plan. Alternatively, goals could be derived by scaling up the various intermediate goals originating from the state planning processes. This latter approach would make it possible for states to coordinate their actions by specifying common goals, even before Congress acts.

The comprehensive climate change bills before Congress in early 2007 would establish short term, intermediate, and long-term goals, although each set of goals is stated in different ways. Two bills are explicitly intended to ensure that U.S. GHG emissions in 2050 are eighty percent below 1990 levels.[111] This long-term objective would be met through a series of intermediate goals. The EPA would be obliged to adopt regulations capping 2020 emissions at 1990 levels. For each of the three decades between 2020 and 2050, the EPA would be required to establish regulations achieving one-third of the eighty percent reduction.[112] Another bill would reduce U.S. GHG emissions sixty-five percent from 2000 levels by 2050, require the EPA to adopt regulations capping 2020 emissions at 1990 levels, and require annual reductions of 2.5% (between 2021 and 2030) or 3.5% (between 2031 and 2050) to meet the long-term goal.[113] Two other bills express their goals in terms of millions of metric tons of GHGs. Under these bills, the number is reduced each decade between 2010 and 2050 until it reaches a number that is one-quarter or one-third of 2010 emissions by 2050.[114] While

failure to participate. The United States has taken the position that it is entitled to its existing "baseline" while developing nations contend that emissions should be allocated per capita or even that developing nations should have a greater share of future emissions, due to the fact that past emissions by the developed world have caused a significant part of the current problem. *See* BROWN, AMERICAN HEAT, *supra* note 78, at 203-221; BROWN, WHITE PAPER, *supra* note 78, at 19-23.

110 Cal. Exec. Order No. S-3-05 (June 1, 2005). The legislature endorsed this order in the California Global Warming Solutions Act of 2006, which set the goal of achieving 1990 emission levels by 2020, and which maintained and continued emission reductions beyond 2020. Cal. Health & Safety §§ 38550, 38551(b). This goal is endorsed by a growing number of college and university presidents. *See* Julian Dautremont, Nancy Gamble, Robert M. Perkowitz & David Rosenfeld, A CALL FOR CLIMATE LEADERSHIP: PROGRESS AND OPPORTUNITIES IN ADDRESSING THE DEFINING CHALLENGE OF OUR TIME (2007), *available at* www.presidentsclimatecommitment.org/pdf/climate_leadership.pdf.

111 S. 309, 110th Cong. § 2 (2007) (adding § 702(2) to CAA); H.R. 1590, 110th Cong. § 3 (2007) (adding § 701(3) to CAA).

112 S. 309, 110th Cong. § 2 (2007) (adding § 704(b)). The House bill establishes a similar approach. H.R. 1590, 110th Cong. § 3 (2007) (adding § 701 to CAA).

113 S. 485, 110th Cong. § 101 (2007) (adding § 702 to CAA).

114 S. 280, 110th Cong. § 124(a) (2007); H.R. 620, 110th Cong. § 124(a) (2007).

each of these choices will put the nation on a path toward the reductions necessary to prevent dangerous anthropogenic climate change, the choice of approach would be best informed by scaling up the state experiences to date.

There is sufficient flexibility built into the CAA to allow long-term and intermediate emissions reduction goals to be established administratively by regulation. While this is possible from a legal prospective, it is likely not desirable from a policy perspective. Decisions of this importance will carry added political legitimacy if they are made by Congress. Specific targets and timetables will provide the framework around which U.S. actions to address climate change will be undertaken, and on which all sectors in the U.S. economy may rely.[115] Perhaps more importantly, EPA action in this arena would likely be slow or non-existent, and could be delayed further by litigation challenging its authority and its choices of limitations. The goals could be similar to those stated in the proposed bills. Even if goals are established by Congress, however, the EPA must still be authorized to reassess and modify these goals based on actual progress, new scientific developments, and new international agreements.

Long term goals and planning are not only necessary to achieve the emissions reductions required, but also to assist industry. Many capital investment decisions require a long term horizon. Many capital goods and buildings have minimum life spans of twenty years, and some have life spans ranging up to fifty years. Capital investment decisions also require long lead times. The establishment of long term goals, with opportunities to adjust in light of emerging science and actual experience, will enable capital investment decisions to be based on a long term horizon.

After long-term and intermediate national emissions reductions goals are established, it is necessary to allocate those emissions reductions among states and sectors of the economy. This requires consideration of (1) the emissions reductions that will be achieved through national technology-based standards under the CAA, (2) emissions reductions that will be required under sectoral cap-and-trade systems, and (3) characteristics of the states that will govern the establishment of emissions reduction goals for state implementation plans. Finally, mechanisms must be established to modify these goals in light of actual

[115] *See* John C. Dernbach, *Targets, Timetables and Effective Implementing Mechanisms: Necessary Building Blocks for Sustainable Development*, 27 WM. & MARY ENVTL. L. & POL'Y REV. 79, 96-102 (2002) (explaining that targets and timetables demonstrate commitment, help to give real-world meaning to often vague goals, and help focus debate on concrete objectives).

experience. These mechanisms will be described below.

C. National Technology-Based Limits and Cap-and-Trade Programs for Some Sectors

Under the CAA, uniform national or multi-state performance or technology-based limitations or sectoral cap-and-trade programs will be established as primary tools for emissions reductions in industrial and mobile source sectors, where feasible and appropriate. Factors to consider in establishing uniform national or multi-state performance or technology-based limits include the economic importance of national or multi-state standards, the potential emissions reductions to be achieved through uniform performance or technology-based standards, the extent to which the creation of such standards would augment or disrupt existing state efforts to control emissions from the same class of sources, and the extent to which there are already performance or technology-based standards for other pollutants from the same sources under the CAA.The last factor would include technology-based standards for mobile sources and some stationary sources under sections 202 and 111 of the CAA and electric power sector cap and trade programs. Some of the bills before Congress would force the adoption of such standards for GHGs.

Massachusetts v. EPA makes the promulgation of mobile source emissions standards under section 202 of the CAA appear likely at some point. Technology-based standards are particularly appropriate for mobile sources, for which cap and trade programs are difficult to administer.[116] California already has emissions standards, and at least twelve states have adopted the California standards.[117] But on December 21, 2007, the EPA announced its intention to deny California's application for an exemption from preemption under the CAA; this was the first time that the EPA ever denied such a request.[118] In light of the EPA's intransigence, amendments to the CAA could

[116] A cap-and-trade system for mobile sources would necessarily require regulation "upstream" with allowances provided for the sale of gasoline. Robert B. McKinstry, Jr., Adam Rose & Coreen Ripp, *Incentive-Based Approaches to Greenhouse Gas Mitigation in Pennsylvania: Protection the Environment and Promoting Fiscal Reform*, 14 WIDENER L. J. 205 (2004).

[117] Clean Cars Campaign, State Action, http://www.cleancarscampaign.org/web-content/stateaction/stateaction.html (last visited Jan. 3, 2008). One federal district court recently upheld Vermont's adoption of the California GHG emissions standards, subject to the EPA granting a waiver from federal CAA preemption under 42 U.S.C. § 7543(b). *Green Mountain Chrysler Plymouth Dodge Jeep v. Crombie,* 508 F. Supp. 2d 295 (D. Vt. 2007).

[118] Caroline Wetzel & Steven D. Cook, *EPA Rejects Waiver Request to Regulated Vehicle-Related Emissions*, ENV'T REP., Dec. 2007, at 2696.

require the adoption of standards at least as stringent as California's, or require that the EPA adopt new federal standards on par with other major industrialized nations every five years.[119] Two of the comprehensive bills before Congress in early 2007 would require immediate adoption of the California standards and the adoption of more stringent motor vehicle regulations every five years.[120] Congress could also consider repealing preemption of state mobile source standards, or broadening the California exemption from preemption to allow any state or group of states to establish more stringent mobile source standards if they exceed a certain population threshold.[121]

In lieu of technology-based standards, sectoral cap-and-trade programs similar to the acid deposition cap-and-trade program could be established for the utility sector and most major industrial sectors. By enacting the Clean Air Interstate Rule (CAIR), the EPA has already found the authority to impose a cap and trade program that will control emissions from both new and existing sources more effectively than reliance on technology-based standards under the new source review program (NSR).[122] For GHG emissions, it makes most sense for caps to be established representing the emissions reductions needed to achieve climate stability through 2100, dropping in predictable amounts consistent with nationwide emissions reductions. Although the caps could initially be specified through 2100, provisions would need to be included for reassessment in light of new science and actual experience. The caps could also provide for adjustments that will be warranted because of emissions reductions and reductions in demand for electricity through SIP implementation, as described below. [123] In the

[119] Federal corporate average fuel economy standards are significantly weaker than GHG emissions standards applicable in most major foreign automobile markets. *See* FENG AN & AMANDA SAUER, PEW CTR. ON GLOBAL CLIMATE CHANGE, COMPARISON OF PASSENGER VEHICLE FUEL ECONOMY AND GREENHOUSE GAS EMISSION STANDARDS AROUND THE WORLD 25 (2004), *available at* http://pewclimate.org/global-warming-in-depth/all_reports/fuel_economy.

[120] S. 485, 110th Cong. § 101 (2007) (adding § 704 to CAA); H.R. 1590, 110th Cong. § 3 (2007) (adding § 706 to CAA).

[121] Mobile sources represent an exception to the general rule against federal preemption of more protective state standards under the CAA. 42 U.S.C. § 7416 (2006).

[122] Using its authority under section 110(a)(2)(D) of the CAA, 42 U.S.C. § 7410(a)(2)(D) (2006), the EPA has promulgated regulations establishing a trading mechanism in lieu of technology-based standards for the utility industry for a variety of pollutants in its CAIR. *See* 70 Fed. Reg. 25162 (May 12, 2005). Section 110(a)(2)(D) requires that each SIP "contain adequate provisions— (i) prohibiting . . . any source or other type of emissions activity within the State from emitting any air pollutant in amounts which will— (I) contribute significantly to nonattainment in, or interfere with maintenance by, any other State with respect to any such national primary or secondary ambient air quality standard . . . ." 42 U.S.C.A. § 7410(a)(2)(D) (2006).

[123] Two of the comprehensive bills in Congress do something similar to this. These bills

establishment of caps and the allocation of credits, it would be important to include assurances that early reducers be given full credit for their reductions. This could be accomplished by treating their early reductions as "banked."

Although a cap-and-trade program could be established under the same rationale as that supporting the CAIR rule, amendments to the CAA specifying caps and their reductions would be desirable. Changes in the law would remove any question regarding authority and could more precisely guide the EPA in implementation. Designation of long-term goals might be more readily achieved through statutory amendment. California and the states participating in the Regional Greenhouse Gas Initiative (RGGI) already initiated efforts to establish similar sectoral programs.[124] Although state cap-and-trade programs deal solely with initial caps and do not include long term reduction requirements, the existing model could be employed to establish long term caps.

For some industrial sources, a cap-and-trade program may not be desirable. Such a program may be cumbersome for industries with many small emissions sources because of its needs for effective monitoring and reporting. For these sources, performance or technology-based standards could be established. While such standards might be established for new or modified sources under section 111 of the CAA,[125] a different model establishing standards applicable to new and existing sources, similar to that employed in some cases by the Clean Water Act,[126] may be more appropriate. While this approach might be employed by the EPA under section 110 of the CAA,[127] as in the case of the CAIR, statutory amendments requiring such an approach and requiring periodic adjustments of these limitations could be

apply a cap and trade program to "covered entities," a term covering stationary sources in the electric, commercial, or industrial sectors of the economy that emits from any facility more than 10,000 metric tons of GHGs per year. The term also applies to any refiner or importer of petroleum products used in transportation that, when combusted, will emit more than 10,000 metric tons of greenhouse gases per year. *See* S. 280, 110th Cong. § 3 (2007) (definition of covered entity); H.R. 620, 110th Cong. §3 (2007) (definition of covered entity). The allowances available to such entities are reduced every decade at a level that comports with the targets and timetables in the legislation. S. 280, 110th Cong. § 124 (2007); H.R. 620, 110th Cong. §124 (2007).

124 *See* California Global Warming Solutions Act, CAL. HEALTH & SAFETY CODE §§ 38500-38597 (2007); *see also* Regional Greenhouse Gas Initiative, Regional Gas Initiative Model Rule (August 15, 2005), *available at* http://www.rggi.org/docs/model__rule_8_15_06.pdf (providing a model rule for the utility sector).

125 42 U.S.C. § 7411 (2006).

126 *See, e.g.*, 33 U.S.C. §§ 1311, 1317 (2006).

127 42 U.S.C.A. § 7410(a)(2)(D) (2006).

included in CAA amendments.

Any amendments to the CAA should necessarily address the problems created by NSR requirements and the need to integrate GHG emissions reductions with those for other pollutants. By abandoning its original "four-pollutant strategy" and focusing on conventional pollutants without consideration of GHGs, for example, the Bush Administration might be encouraging industries to develop control technology that increases GHG emissions rather than promoting a switch to inherently low emissions technologies. Delaying the requirements for conventional pollutants or otherwise authorizing states and the EPA to relax the requirements of NSR for projects replacing high emission technologies with low emission technologies would enhance efficiency and pollution reduction.[128]

D. State Implementation Plans and Measures for Integration and Adjustment

All remaining emissions reductions could be achieved through SIPs. Much as state climate plans do today, SIPs could address crucial demand reduction measures for utilities, other stationary sources, and mobile sources. SIPs could also independently address other sectors not directly addressed by the cap-and-trade and technology-based standards, such as commercial and residential heating, cooling, and hot water.[129] The use of SIPs provides a higher level of certainty that legal and policy measures would be vertically integrated at federal, state, and local levels in an effective manner.

Establishment of the emissions reductions goals for SIPs requires calculations of (1) demand reductions for the utility sector, (2) reductions required to achieve the necessary national emissions reductions after consideration of reductions that will be achieved after application of technology-based standards and sectoral cap and trade programs, and (3) allocation of emissions reductions among the various states.[130] Some of these calculations will follow from the measures employed and others will best be informed from state experience.

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[128] For example, coal-fired utilities may spend hundreds of millions of dollars installing scrubbers to remove sulfur dioxide and nitrogen oxides, while increasing energy consumption and thus increasing GHG emissions. Abandoning a conventional coal-fired plant to a combined cycle coal gasification plant would increase efficiency while reducing emissions of all pollutants.

[129] It may be possible to create federal technology standards for some of these sectors, but a statutory amendment would likely be required, similar to the "area source" mechanism for hazardous air pollutants under section 112 of the CAA. 42 U.S.C. § 7412(k) (2006).

[130] A more detailed list of categories, as well as legal and policy tools, is contained in McKinstry & Peterson, *supra* note 36, at 72-80.

Current state climate action plans provide an excellent starting point for these allocation decisions by providing estimates of emissions reductions from specific, sector based actions agreed upon through rigorous stakeholder negotiation.

It would be useful for Congress to require that GHG SIPs draw, at least initially, from the same menu of legal and policy tools. State actions to date tend to be based on energy efficiency and conservation, clean and renewable energy, transportation and land use efficiency, agriculture and forestry conservation, waste management, and industrial processes. Within each category is a standard set of legal and policy tools. Many of these tools, in turn, are specific to particular economic sectors like electricity generation and transportation. For example, two tools within the category of "clean and renewable energy" for the electricity generation sector are renewable energy portfolio standards and tax credits. This menu would put in front of any state the most comprehensive list of available choices that is available anywhere. It would thus help states choose the most appropriate and cost-effective options needed to meet emissions reductions targets. The "other" category is intended to include legal and policy choices that are not specifically identified on the menu but can nonetheless contribute to reduction of the state's GHG emissions. The menu should, in turn, be periodically revised to specifically identify new legal and policy tools and otherwise reflect new experience and learning.

The "efficiency and conservation" category will necessarily include the calculation of electricity demand reduction measures. The electric utility sector will not achieve the proportional reductions required to stabilize carbon dioxide levels without reduction in demand, which continues to grow. Many of the measures that can be employed to reduce demand from the electric utility industry are best employed at the state and local level. These include measures such as green building, replacement of traffic lights and indoor lighting with LED bulbs and compact fluorescents, and other measures traditionally managed by state and local governments. Scaling up the demand reduction measures developed by state plans could be used to calculate emissions reductions in the utility sector that can be achieved through demand reduction. This scaling up could then be used to generate both the demand reduction goals for SIPs and the percentage of the emissions reductions necessary to meet utility caps.

The relationship between state and local demand reduction measures and attempts to eliminate barriers to emissions reductions to utility caps is one of the most notable issues not well addressed by various legislative proposals. Utilities require long term planning to meet

demand and emissions reduction requirements. The two are interrelated, and the applicable requirements of the two must be integrated. If, for example, a state does not formulate an adequate demand reduction program as part of its SIP, it would not be fair to punish the utility for emissions associated with furnishing necessary electricity service to that state. Accordingly, if states do not meet their emissions reduction goals, the caps of utilities serving the state will need to be adjusted upwards and appropriate sanctions placed on the offending states. Similarly, if states exceed their demand reduction goals, caps will need to be reduced downward. Thus, provisions will need to be made for reassessment of progress towards demand reduction and adjustment of caps at regular intervals. If the cap for the power industry were initially established for 2015 at ninety percent of 2000 levels and SIPs called for demand management techniques (such as appliance and building codes) to reduce demand by two percent by 2015, the cap needed to achieve the same ten percent reduction for that sector would be eighty-eight percent. Credits would need to be provided if the demand adjustment were not actually achieved.

Integration of demand reduction requirements into SIPs and integration of utility emissions reductions requirements with demand requirements could theoretically be accomplished through the promulgation of regulations under existing authority provided by the CAA. But statutory amendments specifying these procedures would better facilitate implementation. Amendments would also be required to provide a more appropriate sanctioning mechanism for states failing to meet their demand reduction requirements. The elimination of transportation funding or the promulgation of a federal implementation plan as provided by the current version of the CAA are not appropriately targeted sanctions. A measure such as a standby federal tax on the sale of electricity sold within non-complying states would be a more effective sanction and would help to remedy non-complying states' failures.

Before establishing emissions reductions goals for SIPs, it is necessary to calculate the emissions reductions that will be required. This will require calculation of the emissions reductions that will be achieved through emissions caps and technology-based standards, and then subtracting that number from the overall emissions reductions required across the United States. For example, if the initial goal requires a ten percent reduction and half of those reductions can be achieved through the application of uniform federal standards, the SIPs will need to develop measures that account for the remaining half or five percent reduction.

The final calculation would involve allocation of the nationwide emissions reduction goals among the states. This will undoubtedly become the subject of much negotiation. Here, state experience can also provide instruction. The states with completed plans have varying economic growth rates. The business-as-usual extrapolation of emissions growth and the emissions reductions identified for 2020 and 2040 provide realistic individual goals for other states. Allocations must consider factors such as population and projected growth rates. The results of the state planning efforts described above, however, suggest that very similar results can be achieved in states with dramatically different growth rates, so that this task will be less difficult than it might seem, whether the allocation is made via rulemaking or by Congressional action.

The phasing of reductions will also be necessary. Overall reductions and appropriate caps should be phased to achieve reductions needed through 2100. These reductions could be paralleled by reductions in caps, with demand reduction measures allocated pro rata. It will likely be feasible to project technology-based emissions through 2020, so that the SIPs would be required to plan for necessary reductions to meet a 2020 goal with a roadmap to achieve the ultimate 2100 goal. Plan revisions and reallocation of goals by the EPA could be required periodically (five or ten years), so that a plan required in 2010 would need to achieve the reductions for 2025, one required in 2020 would need to achieve the reductions for 2035, and so forth.

Regardless of whether Congress mandates these changes or the EPA acts independently to create the system described above, additional measures would be desirable to assure that some of the problems with existing SIP implementation do not arise. For example, a measure for approval by third party certifiers might be provided.[131]

E. Provisions to Effectively Engage Individuals in Implementation

Any comprehensive effort must fully engage citizens and consumers in its implementation. The CAA contains a variety of provisions for citizen participation in its enforcement and implementation, including citizen suits.[132] Beyond the availability of these mechanisms, the precision with which Congress directs agency and nongovernmental

[131] These SIPs may be simpler to implement than existing SIPs because they will be based on emissions reductions rather than local air quality and would consequently not require considerations such as air dispersion modeling. Although consideration of demand changes from other states would be necessary, interference resulting from GHG emissions from other states would not create the same difficulties present under the current SIP process.

[132] 42 U.S.C. § 7604 (2006).

activities will have considerable bearing on the speed with which any legislation is implemented, and on the effectiveness of citizens in influencing its implementation. Fully engaging individuals also means fully engaging consumers by providing them with information, incentives, and the means necessary to make energy conservation and renewable energy both attractive and available.

F. Relation to International Actions

Unilateral action by the United States will not suffice to prevent "dangerous anthropogenic climate change." Reductions by the rest of the developed and developing world are required to achieve the eighty-five percent reduction in emissions required. But proactive and unilateral action by the United States is a necessary prerequisite to international re-engagement, just as unilateral action by individual states has been necessary to induce federal action. In the UNFCCC, the United States and the rest of the developed nations of the world agreed to take the lead in reducing emissions.[133] By failing to ratify the Kyoto Protocol, the United States undercut its ability to negotiate reductions required by the developing world. Without a significant unilateral commitment to meet this obligation, the United States will be unable to establish the *bona fides* necessary to induce others to achieve the obligations required.[134]

CONCLUSION

The task facing the United States in reducing GHG emissions to levels necessary to avoid dangerous interference with the climate is significant. The challenge is so great and so complex that no single tool will be able to do the job by itself, not even cap and trade or GHG emissions taxes. Still, there are a portfolio of legal and policy tools that, taken together, could result in the necessary emissions reductions even as GDP grows, new technology is developed, and the United States is freed from foreign energy dependence. The approach suggested here builds on those tools, but expands their range and purpose. Although this specific approach may not ultimately be adopted, something very

[133] UNFCCC, *supra* note 26.

[134] This is the implication of the "tit for tat" strategy in the Prisoners' Dilemma game in game theory. According to game theory, parties will cooperate in most instances, but if one fails to cooperate or reneges on a deal, as the United States did, the other party will retaliate and withdraw cooperation. However, if the first party reinitiates cooperation, the other will quickly forgive. *See* ROBERT AXELROD, THE EVOLUTION OF COOPERATION *vii-ix* (1984). U.S. action is, under this scenario, a necessary prerequisite for resumption of cooperation.

similar is needed to craft an effective strategy for reducing GHG emissions. Harnessing the creativity and local knowledge of state governments is a crucial part of any effective approach. With the Supreme Court's decision in *Massachusetts vs. EPA*, it is clear that the CAA should be the vehicle for a federal approach. And by following the states, the United States can overcome the international impasse, lead by example, and regain its status as an international environmental leader.