ARTICLE

Developing a Comprehensive Approach to Climate Change Mitigation Policy in the United States: Integrating Levels of Government and Economic Sectors

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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 for many years. The U.S. Supreme Court's decision in *Massachusetts v. EPA*[1] makes possible a national program to address climate change under the Clean Air Act (CAA).[2] Even before *Massachusetts v. EPA*, the congressional shift in power had produced a flurry of bills coalescing around the need for strong national goals and mandatory GHG emissions reductions. While many of the bills before Congress in past sessions moved toward stronger emissions reduction goals[3] and potentially broader and more inclusive policy approaches, they were relatively silent or short on details for the specific pathways necessary to achieve climate stabilization goals. For example, past bills did not fully describe how to:

1. Vertically integrate rapidly expanding state and local climate change programs, as well as international programs, into a comprehensive national program that addresses unique differences between states and regions as well as unique jurisdictional issues for each level of government;
2. Horizontally integrate a full range of effective sector based policies and measures (including non price instruments) with a cap and trade program (principally using a price instrument) across all economic sectors in order to achieve the lowest cost and highest co-benefit policy outcomes;
3. Implement a full range of near term actions, without undue delay, that capture immediate economic recovery and expansion opportunities.

Consequently, federal legislation and rulemaking has needed to significantly clarify and expand the approach to policy integration and governance issues for the United States to make an effective commitment to climate stabili-

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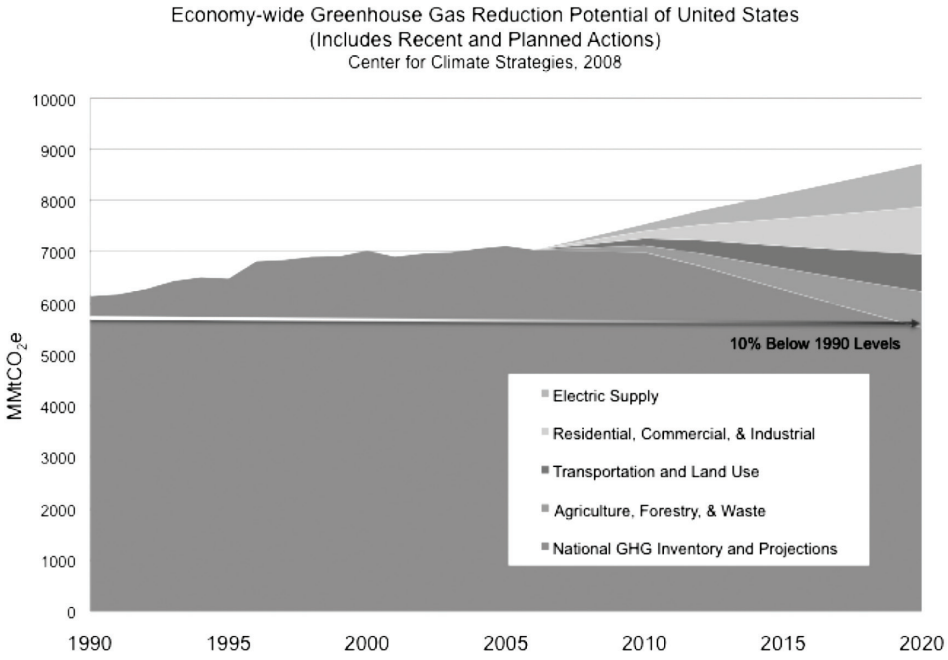
1. 549 U.S. 497, 497, 37 ELR 20075 (2007).
2. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618. Reversing the Administration's denial of a petition to regulate mobile source emissions under section 202 of the CAA, the Court held that (1) the Act provides the U.S. Environmental Protection Agency (EPA) with authority to regulate emissions of carbon dioxide and other GHGs as "pollutants", 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." *Id.* § 7521(a)(1). The Court remanded the matter to EPA to make a finding consistent with the statutory standard.
3. Not all of the bills include meaningful goals. For example, a bill introduced by Senator Bingaman utilizes the concept of carbon intensity, which seeks to reduce the emissions per unit of gross domestic product. S. 1115, 110th Cong. § 402(a)(1) (2007). 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

zation. Legislation introduced in the new (111th) session of congress appears to be moving in these directions. On March 31, 2009, House Energy and Commerce Committee Chair Henry Waxman, and Energy and Environment Subcommittee Chair James Markey, released a draft of the much anticipated "American Clean Energy and Security Act of 2009"[4] with four separate titles that provide a more integrated approach to climate policy than past bills. These include: 1) clean and renewable energy supply policies and measures; 2) energy efficiency policies and measures; 3) a federal cap and trade program and standards for direct control of greenhouse gases; and 4) economic transition programs. The general architecture of the bill is much more aligned with comprehensive policy approaches (including those developed by the states and localities) than any legislation that precedes it.

Growth and Stabilization of United States GHG Emissions[5]



Recent state and existing federal laws provide useful federal guidance by providing a workable template for engineering full integration of governmental and economic needs with respect to climate change. In fact, most state plans were developed in anticipation of federal policy and the need for fully designed and integrated federal programs. By adapting and enhancing the existing framework of national standards, state programs and market-based systems found to a large extent in the CAA (and with adjustment), the United States could create a highly tested and widely approved approach to address climate change. At the same time, the United States could begin taking action quickly on critical near term policy opportunities while also building toward longer term policy strategies needed to support major shifts in emissions. The near term opportunities for use of the existing CAA, however, may not fully address greenhouse gas management needs and the need for targeted legislative enhancements, particularly in the long term.

I. Accumulating Scientific Evidence Underscores the Urgent Need for an Integrated and Comprehensive National Approach to Reach Climate Stabilization Goals

Perhaps the greatest single factor driving changes in the call for action has been the continued ascension of scientific evidence through the Intergovernmental Panel on Climate Change (IPCC), and national science bodies such as the Academies of Science and American Meteorological Society. The most recent Fourth Assessment concludes that the causes of climate change in the last century are 90% certain to be human induced. In addition, warming is well underway, with about 1.5 degrees Fahrenheit increase in global average temperatures in the last four decades alone, and projected increases of 3.5 to 8 degrees Fahrenheit as early as 2050 without mitigation. This rate and magnitude of temperature change is unprecedented in human history. These changes will be mirrored by equally unprecedented adverse effects.

This was succinctly summarized by a group of the world's climate change scientists in an *amicus* brief submitted to provide the Supreme Court with information on the state of climate science in *Massachusetts v. EPA,* as follows:

> 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 (CO_2), but also methane (CH_4), nitrous oxide (N_2O), 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

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.

4. American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §1 (2009).

5. 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 Feb. 15, 2009).

> 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.[6]

Because greenhouse gases are persistent and cumulative once emitted, effects will last over a century and continue unabated without any natural upward limitation on warming. The scientists noted above informed 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.[7]

In order to prevent some of the more dangerous impacts from climate change, scientists predict that we will likely need to reduce worldwide emissions by 75% to 85% by the year 2100, including reductions required for the United States, which currently emits 22% of the world's GHGs with 5% of the population.[8]

II. The U.S. Failure to Seriously Address Climate Change at the National Level Has Adverse International Consequences

The response to this growing challenge has not been symmetrical. Worldwide, virtually all industrialized nations have agreed to adopt mandated targets and timetables for emissions reductions under a protocol (the Kyoto Protocol[9]) to the United Nations Framework Convention on Climate Change (UNFCCC),[10] with the exception of the United States. Developing nations have set out these early commitments under a previous accord (the "Berlin Mandate")[11] that was incorporated into the express terms of the UNFCCC and requires developed nations to move first.[12] The differential has confounded multinational companies with operations in both covered and uncovered nations, including many in the United States, and has lead to a global patchwork of compliance.

III. State Responses to Climate Change Show How to Attain Climate Stabilization Goals at a National Level, and Are an Essential Source of Learning on How to Address This Issue

Since 2000, 31 states have developed and implemented a variety of comprehensive climate action plans.[13] These states, with dramatically different emissions growth rates, have 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 economic feasibility analyses. The goals and targets vary, but all are moving toward climate stabilization levels using a range of tools.

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 by 2050 to achieve stabilization of atmospheric levels of GHGs.[14] State plans have been remarkably consistent in the level of achievable emissions reductions, at about 50% below projected emissions levels by 2020.[15]

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

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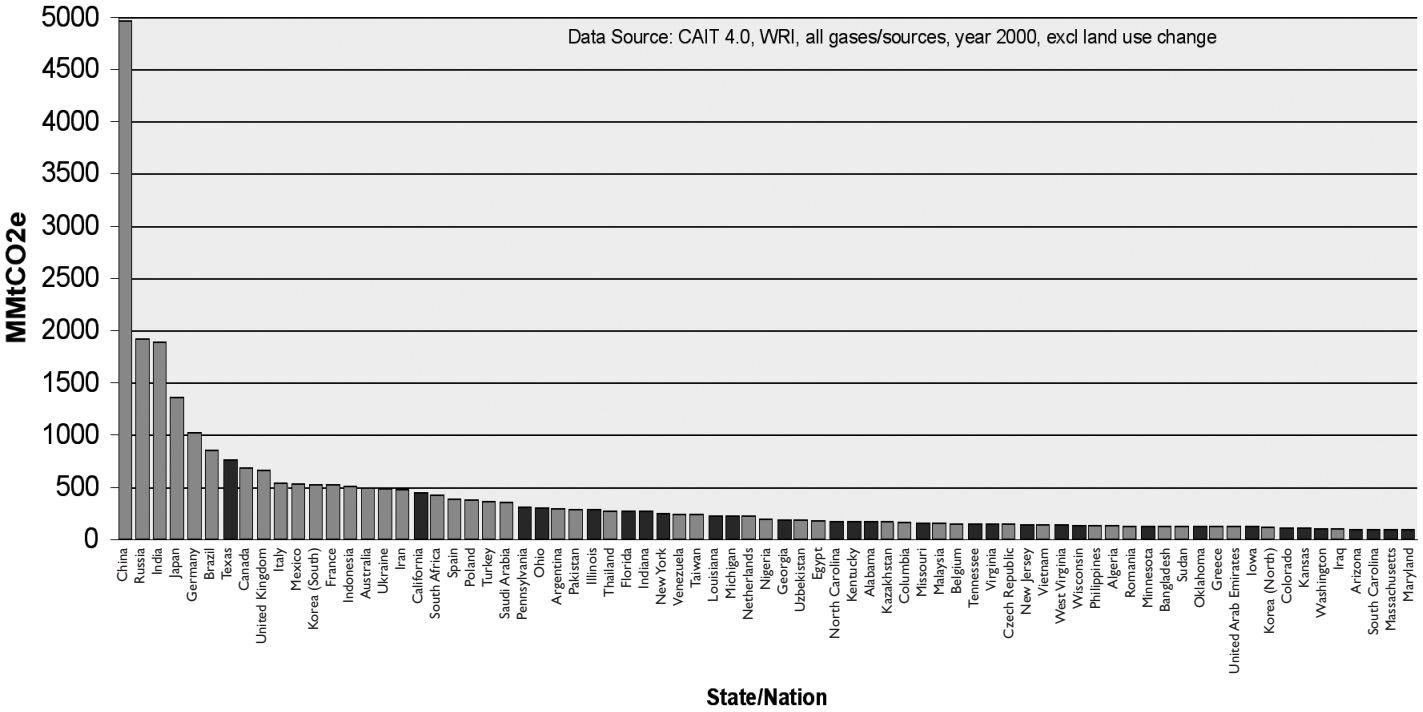
6. Brief for David Battisti et al. as Amici Curiae Supporting Petitioners at 2-3, Massachusetts v. EPA, 549 U.S. 497 (2007) (No. 05-1120), 2006 WL 1491307. This group included two Nobel prizewinners and the majority of the NAS/NRC panel that advised President Bush on the state of climate science.
7. *Id.* at 29-30.
8. Terry Barker et. al., *Technical Summary*, *in* Climate Change 2007: Mitigation of Climate Change, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 25, 30 (Bert Metz et al. eds., Intergovernmental Panel on Climate Change 2007), *available at* http://www.mnp.nl/ipcc/pages_media/FAR-4docs/final_pdfs_ar4/TS.pdf [hereinafter Fourth IPCC Report, WGIII].
9. United Nations Framework Convention on Climate Change, Kyoto, Japan, Dec. 1-10, 1997, *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, U.N. Doc. FCCC/CP/1997/L.7/Add. 1 (Dec. 10, 1997), *available at* http://unfccc.int/resource/docs/convkp/kpeng.pdf [hereinafter Kyoto Protocol].
10. United Nations Framework Convention on Climate Change, May 29, 1992, U.N. Doc. A/AC.237/18 (1992), *reprinted in* 31 I.L.M. 849 (1992), *available at* http://unfccc.int/resource/docs/convkp/conveng.pdf [hereinafter UNFCC].
11. 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 United States participation in the Kyoto Protocol.
12. UNFCCC, *supra* note 10, art. 4, para. 2 ("(a) Each of these Parties shall adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs. These policies and measures will demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of the Convention . . . ; (b) In order to promote progress to this end, each of these Parties shall communicate, within six months of the entry into force of the Convention for it and periodically thereafter, and in accordance with Article 12, detailed information on its policies and measures referred to in subparagraph (a) above, as well as on its resulting projected anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol for the period referred to in subparagraph (a), *with the aim of returning individually or jointly to their 1990 levels these anthropogenic missions of carbon dioxide and other greenhouse gases* . . . .") (emphasis added).
13. A number of plans were developed before that date. However, these plans were far from comprehensive, did not involve stakeholder input, and were largely formulaic with no significant implementation.
14. Most of the long-term goals have been based upon the reductions ultimately needed to stabilize atmospheric levels.
15. This translates into reductions ranging from 10% below 1990 levels to a return to 2000 levels. The differences are due to the fact that growth rates from state to state vary.

State and National GHG Levels, 2000[16]



- Energy efficiency and conservation
- Clean and renewable energy
- Transportation and land use efficiency
- Agriculture and forestry conservation
- Waste management and recycling
- Industrial process improvements.[17]

States consistently find that meaningful progress in these critical action areas requires a 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:

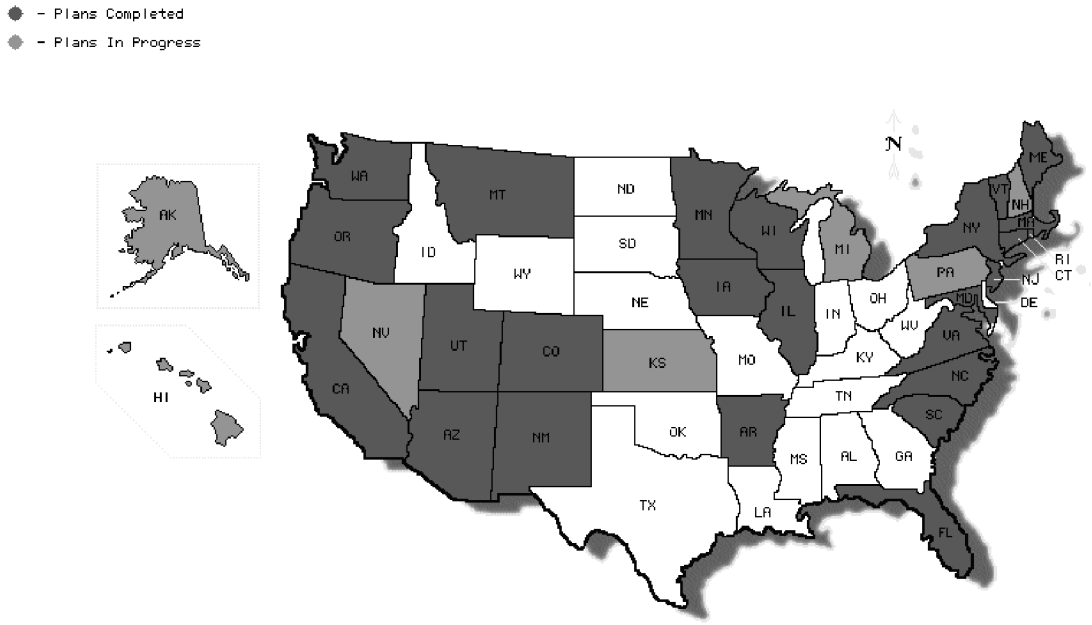
- Codes and standards
- Voluntary and negotiated agreements
- Targeted spending
- Financial incentives
- Market based systems
- Technical assistance
- Pilots and demonstration projects
- Education and awareness

State GHG Forecasts, Reduction Goals, Plan Results[18]

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% "ultimately"	85%
WA	37%	1990 level by 2010; 25% below by 2035; 50% below 1990 levels by 2100	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

16. Year 2000 data from WRI CAIT with analysis performed by the Center for Climate Strategies. Center for Climate Strategies, *supra* note 5.
17. Center for Climate Strategies, *supra* note 5.
18. *Id.*

Comprehensive State Climate Mitigation Action Plans Since 2000[19]



- Reporting and disclosure
- Public recognition and reward[20]

The combination of different actions and mechanisms across all relevant sectors is critical to meeting strong new targets. It also provides overall low costs of implementation by allowing the government to balance the costs and savings of individual actions to achieve an overall negative cost for achieving GHG emissions reduction. This comprehensive "portfolio" approach—characterized by 10 to 20 policy choices from each of six sectoral columns—is crucial 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.[21]

If 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 to the equivalent of 1990 levels. Preliminary estimates also suggest that national emulation of state efforts could provide the United States net economic *savings* of about 100 billion dollars (or about 31 billion dollars in savings during 2020 alone), based on an extrapolation to the national level from a series of extensive and openly-reviewed studies by the states conducted through public stakeholder processes and advanced economic analysis.[22]

The portfolio based policy architecture developed by individual states is mirrored in the climate plans of virtually all nations in compliance with UNFCCC treaty obligations.[23] Key structural elements include:

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

Typically each jurisdiction covers major stationary source actions (usually a minority of total emissions) under a central policy instrument such as a tax, levy, cap and trade system, or combination. The remaining portion of emissions reductions (often the majority) from other emitting sources such as transportation, commercial and residential actions are covered through a set of decentralized policies and measures. Emissions reduction measures in these other sectors are often directed to areas where market imperfections make application of a cap and trade or tax less likely to be effective. The

19. *Id.*
20. *Id.*
21. *See* Ariz. Climate Change Advisory Group, Climate Change Action Plan 1 (2006), *available at* http://www.azclimatechange.gov/download/O40F9347.pdf. The Arizona Climate Action Plan was completed in 2006. Following an intensive consensus building process through joint fact-finding and policy development, the state developed a plan with 49 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. *Id.* at 8. Despite the fact that Arizona has the highest estimated growth rate in GHG emissions in the United States, it was able to set reduction targets consistent with climate stabilization needs without negative impacts on economic growth. Results of the Arizona Climate Action Plan are available at www.climatestrategies.us.
22. Center for Climate Strategies, *supra* note 5 (compiling scale-up analysis of state leadership actions).
23. *See* Fourth IPCC Report, WGIII, *supra* note 8, at 31-33 (providing details on international GHG plans).

Estimated Scale Up of State Climate Plan Actions[24]

Potential US 2020	% National GHG Plan Reductions	MMTCO2e	Cost/ Cost Savings Per Ton GHG Removed	Estimated Total Savings Below BAU 2020
Energy Efficiency and Conservation* [RCI]	29%	1035	-$13/ton	12%
Clean and Renewable Energy** [ES]	29%	1020	$6/ton	12%
Transportation and Land Use Efficiency	16%	575	$13/ton	6%
Agriculture and Forestry Conservation, Waste Management & Recycling	26%	933	$8/ton	11%
Total	100%	3563	$3/ton	41%

* Includes efficiency in residential, commercial and industrial buildings as well as industrial process improvements.
** Includes energy supply (improved conventional sources, renewables such as wind and solar) and demand management (e.g., reducing peak demand through pricing, etc.) programs.

two approaches are merged in a comprehensive plan or portfolio of actions, tailored to the jurisdiction.[25] 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.

IV. Past Federal Legislative Proposals Have Not Adequately Integrated State Climate Initiatives or Existing Mechanisms Available Under the CAA

As recently as 2008, none of the proposed federal bills introduced adopted the comprehensive portfolio approach.[26] The bills failed to take advantage of the breadth of legal tools made available by the CAA or even to address how carbon dioxide and other GHGs will be integrated into that existing framework. New draft legislation is raising these issues more directly, but has not yet fully resolved them.

Past bills' almost exclusive focus on emissions trading was driven by a number of assumptions that are founded upon the successful record of the acid deposition program, and other experiences, suggesting a cap and trade program may be able to achieve reductions at minimal cost. These successes contributed to the popular belief that "command and control" regulation found in the major environmental laws enacted between 1969 and 1990 does not work as well in terms of cost containment, and assumes the next generation of pollution controls need to be managed via cap and trade instead. This conclusion is based on the assumptions that (1) the measures employed in environmental laws before cap and trade do not achieve success in a cost-effective manner because they do not rely solely upon price based instruments, (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.

None of these assumptions ultimately hold up fully under scrutiny. Most notably, while the acid deposition cap and trade program established by Subchapter IV-A of the CAA[27] succeeded in achieving very significant reductions of acid rain precursors at a minimal cost,[28] 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 its use to particular circumstances.[29] An effective trading program requires careful consideration of where such a program can be effective.[30] Many of the conditions that made the acid deposition cap and trade program so successful do not apply to GHG emissions.[31]

Secondly, the assumptions that economic growth is primarily tied to energy prices, and that energy prices will necessarily rise due to climate policy, are incorrect. State actions provide substantial evidence on the economic benefits of climate 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 transitions

24. Center for Climate Strategies, *supra* note 5 . (using results of state climate action plans completed since year 2000, as of April 2007).
25. 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 8, at 28-29.
26. 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.
27. 42 U.S.C. §7651, ELR Stat. CAA §401.
28. *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).
29. For example, the facts that carbon dioxide mixes rapidly throughout the atmosphere, there is no concern about hot spots, and there is significant fungibility allowing trading between various types of GHGs at fixed scientific ratios makes use of trading particularly useful as a tool in addressing climate change. *See* 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,* 4 Penn St. Envtl. L. Rev. 151, 158-160 (2006) (discussing limitations on use of trading programs); David M. Driesen, *Trading and Its Limits,* 14 Penn St. Envtl. L. Rev. 169, 170-72 (2006).
30. *See* Tom Tietenberg, *Tradable Permits in Principle and Practice,* 14 Penn St. Envtl. L. Rev. 251 (2006).
31. 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. 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 GHG regulation are not regulated, so distributional considerations come into play. *See generally* Adam Rose & Gbadebo Oladosu, *Greenhouse Gas Re-*

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 Existing CAA 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 must 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 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 determination 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, the focus has necessarily shifted from question of *whether* there will be a federal response under the CAA to the question of *how* that response should best be managed and what amendments would be required to make the federal response appropriately integrated it with international, state and local efforts.

Under the existing provisions of the CAA, EPA can implement an effective governance structure for GHGs. Such an approach depends both upon a willing EPA and the development of new regulations, an already time-consuming process that could face further delays incident to legal challenges.

An effective approach could, potentially, consist of the following elements:

1. The establishment of an NAAQS at a level sufficient to prevent "dangerous anthropogenic climate change;"[32]
2. The establishment of short, intermediate and long term emissions reduction goals necessary to maintain the NAAQS with corresponding sectoral and state elements;
3. National and regional performance or technology-based limits and cap and trade programs for some sectors;
4. SIPs designating additional measures necessary to achieve the emissions reduction goals;
5. Provisions to effectively engage individuals in implementation; and
6. Establishment of United States as a serious actor in the international community.

Equally importantly, provisions may be needed to integrate these measures and require specific EPA action and 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 delays and uncertainty.[33] 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,[34] 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."[35] Although significant scientific uncertainties make the establishment of NAAQS for GHGs difficult,[36] scientists

duction 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). Additionally, market imperfections will make use of market mechanisms more problematic for reduction of GHG emissions in many sectors. GHG emissions reduction requires reduction of energy demand through mechanisms such as green buildings and smart growth. Unlike the utility sector, those making the decisions in this sector are not the same as those who will incur costs. *See* Guido Calabresi, The Costs of Accidents: A Legal and Economic Analysis, 135 (1970); Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 Harv. L.R. 1089, 1096 (1972).

32. UNFCCC, art. 2, *supra* note 10.
33. This approach was taken in the Hazardous and Solid Waste Amendments of 1984, Pub. L. No. 98-616, 98 Stat. 3221, and the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1615. 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).
34. 42 U.S.C. §7408, ELR Stat. CAA §108.
35. 42 U.S.C. §7409(b), ELR Stat. CAA §109(b).
36. Robert R. Nordhaus, *The New Power Generation: Environmental Law and Electricity Innovation: Colloquium Article: New Wine in Old Bottles: The Feasibility*

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.[37] 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.[38]

Leaving it to the EPA to establish NAAQS administratively may entail substantial delays. Progress is better assured if Congress specifies a 500 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.[39]

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.[40]

Some suggest that SIPs are not an appropriate legal tool for regulating GHGs.[41] The reasoning underlying this distinction is flawed 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. 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.[42] 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.

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. 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 50 to 85% by 2050,[43] and many states set long term emissions goals based on that number.[44] The United States, which only contains 5% of the world's population, emits 22% of the world's emissions.[45] 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 94% to 96%.

Neither the 75% nor the 96% emissions reduction goal can be achieved without realistic intermediate benchmarks

of Greenhouse Gas Regulation Under the Clean Air Act, 15 N.Y.U. Envtl. L.J. 53, 61-62 (2007) (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).

37. *See*, *e.g.*, James E. Hansen, *Scientific Reticence and Sea Level Rise*, 2 Envtl. Res. Letters 1, 6 (2007), *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).
38. 42 U.S.C. §7409(d), ELR Stat. CAA §109(d).
39. *See* Cal. Exec. Order No. S-3-05 (June 1, 2005) (stating a goal to reduce emissions to 80% 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.
40. 42 U.S.C. §7410(a), ELR Stat. CAA §110(a).
41. 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 37, 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 task.").
42. 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.").
43. *See generally* Fourth IPCC Report, WGIII, *supra* note 8.
44. NEG/ECP Climate Change Action Plan, *supra* note 40, at 7.
45. U.S. Envtl. Prot. Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005, at 104 (2007).

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[46] and adopt intermediate goals appropriate for any of the most significant national reduction goals.[47] 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.

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 may not be desirable from a policy perspective. Decisions of this importance arguably carry added political legitimacy if 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.[48] Perhaps more importantly, EPA action could be delayed 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 20 years, and some have life spans ranging up to 50 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 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.[49] *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.[50] While California already has emissions standards, EPA recently denied California's application for an exemption from preemption.[51] Although the new Administration has ordered reconsideration of this decision, to prevent its recurrence, amendments to the CAA could 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.[52]

46. 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 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* Donald A. Brown, American Heat: Ethical Problems With the United States' Response to Global Warming 203-221(2002) (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 (discussing issues for allocation among nations).
47. This approach is taken by California, which sets the goal of 80% reductions from 1990 levels by 2050. 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 et al., 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.
48. *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).
49. 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.
50. 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. et al., *Incentive-Based Approaches to Greenhouse Gas Mitigation in Pennsylvania: Protection the Environment and Promoting Fiscal Reform*, 14 Widener L.J. 205 (2004).
51. Caroline Wetzel & Steven D. Cook, *EPA Rejects Waiver Request to Regulated Vehicle-Related Emissions*, Env't Rep., Dec. 2007, at 2696.
52. 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,

Two of the comprehensive bills before Congress in early 2007 would have required immediate adoption of the California standards and the adoption of more stringent motor vehicle regulations every five years.[53] 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.[54]

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.[55] 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. In the 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 existing authority in the Clean Air act, amendments to the CAA specifying caps and their reductions may 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.[56] 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,[57] a different model establishing standards applicable to new and existing sources, similar to that employed in some cases by the Clean Water Act, may[58] be more appropriate. While this approach might be employed by the EPA under section 110 of the CAA, as in the case of the CAIR,[59] statutory amendments requiring such an approach and requiring periodic adjustments of these limitations could be included in CAA amendments.

Finally, 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. 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.[60]

D. State Implementation Plans and Measures for Integration and Adjustment

All remaining emissions reductions could, potentially, be achieved through a reinvented version of state implementation plans (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.[61] 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

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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.

53. S. 485, 110th Cong. §101 (2007) (adding §704 to CAA); H.R. 1590, 110th Cong. §3 (2007) (adding §706 to CAA).
54. 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, ELR Stat. CAA §116.
55. Section 110(a)(2)(D) of the CAA, 42 U.S.C. §7410(a)(2)(D), authorizes states to include cap and trade programs in their state implementation plans. The EPA promulgated regulations establishing a trading mechanism in lieu of technology-based standards for the utility industry for a variety of pollutants in the Clean Air Interstate Rule (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. §7410(a)(2)(D), ELR Stat. CAA §110(a)(2)(D).
56. *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).
57. 42 U.S.C. §7411, ELR Stat. CAA §111.
58. *See, e.g.*, 33 U.S.C. §§1311, 1317, ELR Stat. FWPCA §§301, 307.
59. 42 U.S.C. §7410(a)(2)(D), ELR Stat. CAA §110(a)(2)(D).
60. 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.
61. 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 §112 of the CAA. 42 U.S.C. §7412(k), ELR Stat. CAA §112(k).

states.[62] Some of these calculations will follow from the measures employed and others will best be informed from state experience. 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.[63] 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.

Integration of demand reduction requirements into SIPs and integration of utility emissions reductions requirements with demand requirements could be accomplished through the promulgation of regulations under existing authority provided by the CAA. Statutory amendments specifying these procedures would 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 or incentives such as providing the states with revenues from cap-and-trade auctions would provide more effective means to achieve compliance.

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.[64]

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.[65] Allocations must consider factors such as population and projected growth rates. The results of the state planning efforts 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. Finally, 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.[66]

62. A more detailed list of categories, as well as legal and policy tools, is contained in 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, 72-80 (2007) (listing over 260 options for GHG reduction by states).
63. 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.
64. For example, if the initial goal requires a 10% 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 5% reduction.
65. 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.
66. 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.

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.[67] Beyond the availability of these mechanisms, the precision with which Congress directs agency and nongovernmental 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 85% 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.[68] 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.[69]

VI. 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 likely 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 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 v. 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.

67. 42 U.S.C. §7604, ELR Stat. CAA §304.
68. UNFCCC, *supra* note 10.
69. 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.