

Pew Center on Global Climate Change Response to:
**"Design Elements of a Mandatory
Market-Based Greenhouse Gas Regulatory System"**
Issued by Sen. Pete V. Domenici and Sen. Jeff Bingaman
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Summary

The Pew Center applauds the Senate Energy Committee for its continued efforts to address the critical issue of climate change. The Center is responding to all four main questions, and submitting additional information on cost containment and recent climate science. Responses draw from an extensive body of analysis, conference and workshop proceedings undertaken by the Center with input from the Center's Business Environmental Leadership Council, scholars, policymakers, and stakeholders; as well as opinions expressed to the Center in discussions with over 30 large corporations. Please note that the Center and most companies surveyed believe that, rather than focusing on any one design element in isolation, any bill must be evaluated as a whole, especially in minimizing the costs to covered entities and the economy.

1. **Point of Regulation:** Ultimately mandatory GHG mitigation measures should cover the economy as a whole, equitably spreading responsibility among large emitters, the transportation sector, and households. For large stationary sources, the submission of allowances would best be required "downstream" at the point of emission, rather than "upstream." For the transportation sector, the Center recommends an approach that would cover vehicle manufacturers through use of tradable vehicle GHG emission standards.
2. **Allowance Allocation:** To assist with the transition to GHG regulation, a high percentage of allowances (e.g., 90% - 95%) should be allocated at no cost, rather than auctioned, at least in the initial years of a cap-and-trade system. A small initial auction can provide funds for transition assistance and technology deployment. Over time, the amount auctioned could increase. In providing federal funding for technology development, a competitive process, such as a "reverse auction," allocating funding on the basis of emission reduction potential, can minimize costs. In the early years of the program, the highest priorities for allocation should be transition assistance and technology development; over time the priorities should shift toward rewarding low-emitting technologies and practices. Offsets are critical for minimizing program costs. Use of offsets to meet allowance submission requirements should not be restricted, as long as the offsets meet reasonable standards for real, verifiable emission reductions. Early action credit is important and could be provided by allowing emitters who document emission reductions earlier than the default baseline year to use an earlier baseline, resulting in a higher allowance allocation.
3. **Linkage:** A U.S. GHG program should be integrated with systems around the world. This is both environmentally and economically important. Linkage will minimize costs while expanding

GHG mitigation and technology transfer opportunities. Use of a low safety valve will greatly complicate such linkage and minimize the incentive for technology transfer and innovation.

4. Encouraging Comparable Action: Different policies are needed to address two distinct but related objectives: (1) achieving adequate action by all major emitting countries, and (2) protecting U.S. firms in energy-intensive industries whose goods are traded internationally against competitiveness impacts. The first is best achieved through multilateral commitments; the second through overall cost containment and targeted support for the vulnerable sectors.

Additional Topics - Cost Containment: A “safety valve” is just one cost containment method. Costs to regulated entities can also be minimized through offsets, allocation, linkage, etc.
Climate Science: The evidence of globally-distributed climate change impacts is mounting.

Question 1. Point of Regulation

Who is regulated and where?

Clarifying Question 1a:

- Is the objective of building a fair, simple, and rational greenhouse gas program best served by an economy-wide approach, or by limiting the program to a few sectors of the economy?

Please begin your response HERE. (no page limit)

Pew Center Response

The Pew Center's responses to these questions draw from two sources:

- An extensive body of analysis, conference and workshop proceedings, and other work undertaken by the Pew Center from 1998 to the present with input from the Center's Business Environmental Leadership Council¹ (BELC), leading scholars, policymakers, and stakeholder groups. This work provides the foundation for the Pew Center's positions on these design questions. Documentation of this work is available at the Pew Center website www.pewclimate.org. Information about the BELC and its 41 member companies can be found at: http://www.pewclimate.org/companies_leading_the_way_belc/.
- Opinions expressed to the Pew Center in dozens of hours of discussion over several years with over 30 large corporations regarding design elements of a greenhouse gas (GHG) cap-and-trade program. The companies include several large utilities as well as companies in other sectors, ranging from primary fuels to manufacturing to retail. Although the Pew Center and the companies with which the Center has discussed design elements agree on the broad outlines of a cap-and-trade program, individual company opinions may or may not agree with the Center's positions on particular issues.

As reflected in the Center's 15-point "Agenda for Climate Action," the Pew Center believes that mandatory GHG mitigation measures must cover the economy as a whole, equitably spreading responsibility for reducing emissions among large emitters, the transportation sector, and households. The companies surveyed unanimously supported this position.

Because emissions from electricity generation and transportation make up approximately 40% and 30% of U.S. GHG emissions respectively, it is critical to address these sectors sooner rather than later. However, these emissions need not be covered through the same system.

¹ The BELC is the largest U.S. based association of corporations focused on addressing the challenges of climate change, with forty-one members representing \$2 trillion in market capitalization and over 3 million employees.

Large stationary sources should be addressed through a cap-and-trade program.² A cap on emissions would send an economy-wide signal favoring reductions, and emissions trading would ensure that reductions are achieved at the lowest cost possible. Such a program should cover all GHGs in all major emitting sectors and include all measurable, verifiable reductions and offset measures, without restrictions on trading. An absolute cap for the national program should be set to achieve a modest level of emission reductions and announced sufficiently far in advance to allow for planning (e.g., a return to current levels within a five- to ten-year period). Further reductions should be phased in over time as new technologies come online and capital stock turns over. Because individual sectors have different sensitivities to the price of carbon and are growing at different rates, sector-specific emission limits or allowance allocations within the overall cap could be established.

At the end of a year, each emitter would be required to surrender allowances equal to its emissions. Emitters whose cost of abating emissions was lower than the allowance price could sell allowances or “bank” them for future use. Emitters whose cost of reducing emissions was more than the price of an allowance could buy allowances. This flexibility would allow for the most cost-effective emissions reductions.

The transportation sector is difficult to incorporate into a downstream cap-and-trade program, and should be addressed through requirements on vehicle manufacturers, for example by converting the Corporate Average Fuel Economy (CAFE) program into strengthened, tradable corporate average CO₂ (or GHG) standards. Average fuel economy standards under the current CAFE program could be replaced by corporate average CO₂ emission standards for each manufacturer’s combined sales of cars and light trucks. A manufacturer that “overachieves” (whose average emissions are below the standard) in a given year would earn allowances based on the reduction in projected lifetime emissions from vehicles produced in that year. These allowances could be banked, sold to other manufacturers or sold into the broader, economy-wide GHG cap-and-trade program. A manufacturer that does not meet its CO₂ standard would purchase allowances to cover its shortfall.

In order not to penalize any vehicle manufacturer at the start, efforts of those who invested early and exceeded standards would be recognized (for example, through credit allocation) with adequate time provided for other companies to catch up, recognizing the time needed to develop and market new vehicles. Concerns about a lack of price-responsiveness within the transportation sector driving up costs of allowances for stationary sources could be addressed by keeping this program separate from the stationary source cap-and-trade program, or by requiring a certain amount of reductions from within the sector.

² See also: Claussen, E., and R. Fri, co-chairs. 2004. A Climate Policy Framework: Balancing Policy and Politics. Ed. J. Riggs. Report of an Aspen Institute Climate Change Policy Dialogue, November 14-17, 2003. Washington DC: The Aspen Institute. Nordhaus, R., and K. Danish. 2003. Designing a Mandatory Greenhouse Gas Reduction Program for the U.S., Arlington, VA: Pew Center on Global Climate Change.

Since the energy services required by residential, commercial and industrial buildings produce approximately 43% of U.S. CO₂ emissions,³ a comprehensive climate program must address this sector. Measures such as upgraded building codes and appliance efficiency standards are an important complement to a large-source cap-and-trade program. Incentives for technologies such as combined heat and power could move the country toward net zero-energy buildings.

While it is important to cover all major emitters, policies may address some sectors first – for example, by implementing cap-and-trade for the electric power sector before other sectors. Some of the utilities surveyed indicate a willingness to consider such an approach, provided the design of regulations is sensible and fair, in exchange for the regulatory certainty that a program would provide. Similarly, some companies state that, although GHG legislation ultimately needs to cover the economy as a whole, a cap-and-trade program initially needs to be as straightforward and easy to implement as possible. At least two major utilities, however, say they oppose a bill that excludes buildings and transportation. They state that the program otherwise would create a distortion that moves electricity generation away from the sector most able to make low-cost reductions to captive generation by large electricity users. Almost all the utilities note they have extensive experience and internal capacity gained over many years of compliance with other air regulations and, in many cases, are also experienced in emissions trading of other air pollutants, so they are well prepared to work within a GHG cap and trade system.

Finally, while the objective is to build “a fair, simple, and rational” program, it is important to recognize possible tensions between “fair” and “simple.” The Pew Center and all of the companies with which we have discussed design elements agree that fairness calls for all sectors to bear a fair share of the emissions reduction burden. However, implementing a cap and trade bill for large emitters could be a simpler first step than covering other sectors in the same bill. Establishing a large emitter cap and a U.S. GHG trading market could provide a simple, effective platform for integrating transportation, buildings, and other sectors into a GHG regime over time, rather than undertake measures for all sectors simultaneously.

³ Brown, M., Southworth, F., Stovall, T. 2005. Towards a Climate-Friendly Built Environment, Arlington, VA: Pew Center on Global Climate Change.

Clarifying Question 1b:

- What is the most effective place in the chain of activities to regulate greenhouse gas emissions, both from the perspective of administrative simplicity and program effectiveness?

Pew Center Response

The Pew Center and most of the companies surveyed believe that allowance submission should be required “downstream” at the point of emission from large stationary sources, rather than “upstream” (e.g., on producers of coal, oil, and natural gas). To many, a program that applies a cap and trade to upstream producers functions for all practical purposes like a carbon tax, rather than a robust market. Moreover, some research suggests that carbon taxes must be very high and continuous to motivate a significant market response. It is more useful to apply regulation to those in a position to alter the behavior that results in emissions, rather than to apply a tax on firms that have no technology or process options to reduce emissions.

Regarding the special case of transportation emissions, the Pew Center recommends a focus on vehicles – changing the CAFE standard to a tradable emissions approach, as discussed in response to the Question 1a.

Question 2. Allocation

Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

Pew Center Response

The Pew Center believes that the costs of regulation can be mitigated through the free allocation of many allowances, as well as through other measures, as discussed in the section on “Cost Containment” in the Additional Topics.

The responses to the following questions draw from two sources:

- An extensive body of analysis, conference and workshop proceedings, and other work undertaken by the Pew Center from 1998 to the present with input from the Center’s Business Environmental Leadership Council (BELC), leading scholars, policymakers, and stakeholder groups. This work provides the foundation for the Pew Center’s positions on these design questions. Documentation of this work is available at the Pew center website www.pewclimate.org. Information about the BELC and its 41 member companies can be found at http://www.pewclimate.org/companies_leading_the_way_belc/.
- Opinions expressed to the Pew Center in dozens of hours of discussion over several years with over 30 large corporations regarding design elements of a greenhouse gas (GHG) cap-and-trade program. The companies include several large utilities as well as companies in other sectors, ranging from primary fuels to manufacturing to retail. Although the Pew Center and the companies with which the Center has discussed design elements agree on the broad outlines of a cap-and-trade program, individual company opinions may or may not agree with the Center’s positions on particular issues.

Resolving the question of how to allocate emission allowances will be fundamentally an issue of political acceptability. As observed in the successful acid rain trading program and noted in the Pew Center’s previous analytical work (see, e.g., Ellerman et al), there is no appreciable difference in environmental effectiveness in using a free distribution, rather than an auction, to start a program. The environmental benefits accrue from the timing and quantity of reductions – recognizing that a program that starts sooner would require less drastic reductions. In other words, the allocation vs. auction debate is more relevant to political feasibility than environmental outcome. However, there are a number of key considerations and tradeoffs among the various approaches to allocation. The Pew Center does not have a position on the method of allocation, but has led workshops and discussions addressing these many considerations in developing an allocation method. The following response lays out these areas of consideration, and in some cases makes recommendations. It also describes the views of the

surveyed corporations on these issues. More detail on the implications of various allocation options can be found in the attached documents (along with a lengthier discussion on the pros and cons of free allocation).

Pew Center Analysis

Covered entities, especially those with significant compliance obligations and those in energy-intensive industries, will bear costs associated with transitioning into a market-based system for emissions allowances. To assist with this transition, a high percentage of allowances (e.g., 90% - 95%) should be allocated at no cost, rather than auctioned, at least in the initial years of a cap-and-trade system. A small initial allowance auction can fund transition assistance and research, development and deployment of climate-friendly technologies. This auction may serve as a price discovery mechanism to give firms an initial idea of the market price for an emissions allowance. Over time, the amount auctioned could increase, as firms successfully transition into the trading system and the associated expenditures decrease. In providing federal funding for technology development, a competitive process, such as a “reverse auction” in which funding is allocated based on emission reduction potential, can reduce program costs. In the early years of the program, the highest priorities for allocation should be transition assistance and technology development; over time the priorities should shift toward rewarding low-emitting technologies and practices.

The choice of allocation approaches may have strong distributional impacts, and thus may be a very contentious decision. For large point sources, allocation can be made either on the basis of historical emissions or against a sector-specific benchmark or set of benchmarks. Power plant allocations, for example, may be made on an input, net output, or gross output basis. The goal of allocation is to encourage the transition to a cleaner, more efficient generation fleet, but to do so in a way that recognizes that players in the industry have different starting points.

If the point of regulation is at the power plant level, policymakers must also decide whether to allocate allowances to non-emitting generators, and whether allocation will be fuel-specific or fuel-neutral. Allocating allowances to non-emitting generation would create incentives for the expansion of these sources, but may increase the burden on emitting generation. Fuel-neutral allocation may promote fuel switching and efficiency, while similarly increasing the burden on higher-emitting generation sources.

Another important issue is whether subsequent allocations should be fixed at the same level, or should be updated over time. The argument for updating is that a fixed allocation may disadvantage new and growing businesses. However, many economists argue that updating is economically inefficient because it encourages emitters to modify their behavior in order to increase future allocations, rather than simply meet the emissions cap at the lowest cost.⁴ Updating also creates uncertainty for business decisions as well as emissions outcomes.

⁴ For example, if allowances are distributed per kwh of generation, that would provide an incentive to increase generation, lowering electricity prices and encouraging fuel switching and plant efficiency over end-use efficiency. Some argue that, if allowances are allocated based on average emission rates, updating would not encourage generators with high emissions rates to generate more because they would still have to buy additional allowances to cover their incremental emissions.

Ultimately, however, the inefficiencies and behavioral consequences of updating are an empirical question. While preliminary evidence on the Ozone Transport Commission NO_x program suggests that behavior is not significantly different in states that update versus those that do not, there is some consensus that the inefficiencies of updating grow as the magnitude of the program grows. (See RGGI Allocation Workshop Summary and Proceedings for more detail on this question.)

A reasonable compromise might be to update over long time periods (e.g., 5 or 10 years), which should not affect economic efficiency significantly and would contribute to a fairer allocation over time.

Another important issue is how to deal with new entrants. Updating automatically does this, but there are other methods that may be useful, especially if updating only occurs infrequently. The simplest is to require new entrants to purchase allowances on the open market. To the extent that allowances are allocated largely to existing sources, this means that new sources would need to purchase allowances from existing sources. Allowances could also be set aside in a “reserve” at a fixed price – this was the approach taken under the U.S. acid rain program. This reserve was never actually used because cheaper allowances were available on the market, but it was an important insurance policy for new entrants. Finally, allowances for new sources could be set aside and given to eligible new sources for free.

A federal cap-and-trade system may either directly allocate allowances, or may “apportion” allowances to the states, which can individually decide how to allocate allowances. (The Regional Greenhouse Gas Initiative does the latter.) Alternatively, the federal government may foster some degree of harmonization by requiring a certain percentage of each state’s allowances go to certain purposes or entities, and then permitting states to allocate the remaining percentage as they wish. The Pew Center believes that it is preferable for the federal government to oversee the allocation process. Allocation is politically very difficult; addressing it at the federal level would save considerable state-by-state trouble and create an uneven playing field. In addition, although difficult, federal-level allocation can enable political solutions, which Congress may be able to utilize to reach agreement.⁵

Some analysts believe that a high level of free allocation will result in windfall gains for allowance recipients. The potential for windfall gains depends, for each economic actor, on the relationships between its compliance obligation, its allowance allocation, and its ability to pass along price increases. While windfall gain may accrue to some sectors that are able to pass along price increases (in excess of cost increases); it will not accrue to all firms within that sector and more importantly will not be available to all sectors. Furthermore, because some firms will experience additional costs, free allocation can serve to minimize this impact while still sending the appropriate signal that emission reductions are valuable. There is disagreement among analysts about the degree to which various sectors and firms are able to pass along price increases, and what level of free allocation may compensate those affected.

Company Perspectives on Design Considerations

⁵ Further analysis on allocation can be found in Nordhuas, R. 2003. *Designing A Mandatory Greenhouse Gas Reduction Program for the United States*. Arlington, VA: Pew Center on Global Climate Change, pgs. 27 – 29.

Among the companies the Pew Center surveyed, there was little consensus on the method of allocation. Opinions fell into a small number of distinct “camps” based on financial implications of various allocation methodologies.

The electric power utilities hold the strongest views, but these differ significantly, based largely on the relative carbon intensity of their generating fleets, which in turn corresponds to their fuel mix. Power companies with a relatively low-carbon fuel mix prefer allocation based on electricity output. Power companies with relatively high-carbon fuel mix prefer allocation based on historic emissions. Some manufacturing companies agree with the latter approach, based in part on their interests as large power users and depending on the carbon intensity of the generators supplying their electricity. Power companies in both camps indicate a willingness to consider compromise approaches depending on other aspects of a regulatory design package. Some utilities note that a compromise approach might involve beginning with an input-focused allocation that transitions over a period of years toward a more output-based allocation. Another utility points out the challenge and importance of reconciling differences between regions and economies fueled primarily by coal and regions with abundant natural gas.

Allocation is just one aspect of the larger picture in which all design elements will be considered. Some note that allowance distribution could serve as a means for awarding credit for early action. One utility holds that it is better to minimize the cost impacts on power customers in advance – i.e., at the allocation stage – rather than through the recycling of allowances. Another company suggests allocating allowances based on technology “benchmarking,” which would determine a reasonable baseline level that reflects a balance of technologies used across an industry.

Another company suggests that the allocation system can and should be used to encourage the power generation sector to transition from higher carbon-intensity fleet to a lower one. They believe that instead of viewing allocation as a “compensation” issue, it is important to use the allocation process both to create the bridge to a new energy future and to send a message to the power sector of the overall direction Congress wants the industry to take.

One utility makes the important point that allocation is not the driving force on new plant investment decisions – rather, choice of new plants is based on the overall price signal created by the cap and associated flexibility mechanisms. Finally, there were differing opinions among the surveyed companies as to whether the federal or state government should play the role of deciding how much to allocate to individual emitters.

Clarifying Questions 2a:

Technology R&D and Incentives

- What level of resources should be devoted to stimulating technology innovation and early deployment?
- What portion, if any, of the revenues from permits or the auction of allowances should be reserved for technology development? If some portion is reserved for this purpose, should that set-aside flow to the federal government with funds spent through the traditional appropriation process? Or should the funds be allocated directly to a non-profit research consortium, chartered by the federal government, which would then administer technology development and deployment projects? Or should there be some combination of these two options?
- What criteria should be used to determine how such funds are spent and which projects are chosen?
- What other mechanisms should be used to promote technology deployment? Options include tax credits, cost-sharing for demonstration projects, assistance to state energy programs, etc.

Pew Center Response

Effective research, innovation, development, and deployment strategies will be critical to enabling a low-carbon energy future. Current levels of federal RD&D need to be significantly increased to reflect parity with other sectors in the U.S. economy (on the basis of RD&D dollars spent per GDP) and with the magnitude of the challenge of enabling a low-carbon energy future. Equally as important, strategies for managing these funds need to be revamped. Current RD&D efforts on low-carbon technologies suffer from a cultural focus on niche markets, inter- and intra-agency “stove-piping,” uncertainty caused by the annual appropriations process and cycle, and detrimental Congressional earmarks on scarce funds. The federal government needs a more integrated approach to RD&D in order to focus the appropriate agencies and resources on critical RD&D needs at appropriate times within a long-term R&D framework. Management modeled on the Defense Advanced Research Projects Administration (DARPA) is needed to instill a culture focused on development and commercialization of these technologies, and forward funding would help reduce the level of uncertainty and detrimental earmarks. Public/private partnerships and government procurement have a key role to play as developers and incubators of technology and to foster “learning by doing”—a critical step in bringing down the cost of low-carbon technologies and increasing deployment. While support for breakthrough technologies is often appealing, experts point out that what often appears to be a breakthrough is indeed the result of years of incremental investment and work. Public/private partnerships are an effective vehicle for enabling sustained incremental improvements in the performance and cost of low-carbon technologies.

Policy-makers should be wary of the dangers of “picking winners” among technologies, but some support to push the likely candidates along can overcome cost barriers that would otherwise be insurmountable.⁶ Research has shown that focusing exclusively on technology-push policies (instruments that offer technology funding incentives without motivating a corresponding demand for these technologies) or exclusively on technology-pull policies (mandates that generate demand for advanced technologies without corresponding support for their development) is more expensive than a combination of the two approaches.⁷ Opportunities to introduce competition into the incentive process will reduce the costs of the program and avoid picking winners.

A competitive process to distribute incentives will reduce the costs of the program and avoid picking winners. A “reverse auction”, in which bidders compete to provide some technology or service for the lowest cost, would allow reduction projects to compete for these incentives on a level playing field. An auction could specify technology categories as well as offer a broad competition to elicit new, as-yet-unknown technologies. Alternative funding mechanisms include forward funding, technology prizes⁸, tax rebates, guaranteed government purchase agreements (i.e., renewable energy or IGCC-CCS energy), green loans and public-private partnerships.

The private sector is generally a more efficient engine of technological innovation than the government. The private sector is particularly good at identifying and allocating resources to those technologies that have the best potential to become financially self sustaining, since private investment is almost uniquely profit-oriented and return-driven. One example raised by companies is in energy efficiency programs. If the government creates frameworks incentivizing but not directing the private sector (tax credits, cap and trade rules that allow efficiency-based offsets, etc.) and allowing private companies and investors to easily monetize the value of efficiency investments, there is ample evidence that the private sector can achieve these at costs per kilowatt or BTU lower than those for which the government is an intermediary.

When it comes to large-scale, longer-term technologies, companies note that it can be effective to match private investment with public funding in some way, as in the case of existing partnerships for clean coal, nuclear power, and fuel cells. Companies expressing a view favor direct government investment and guidance for early stages of research development – the pre-commercial stages of product life cycle. Where infrastructure and programs already exist and are successful, (e.g., NIST grants or the Department of Energy’s Industrial Technologies Program) these should be used and consistently funded.

⁶ “The 10-50 Solution: Technologies and Policies for a Low-Carbon Future”. Washington DC, March 25-26, 2004. Alic, J.; D. Mowery; E. Rubin. 2003. *U.S. Technology and Innovation Policies: Lessons for Climate Change*. Arlington, VA: Pew Center on Global Climate Change.

⁷ Goulder, L. 2004. *Induced Technological Change and Climate Policy*. Arlington, VA: Pew Center on Global Climate Change.

⁸ A technology prize grants a monetary award for a specific goal in R&D to spur innovative step-changes in technologies. The best-known example has been the 2004 “ANSARI X PRIZE,” which was awarded for the first successful private space flight.

Given the relative advantages of the private sector in generating innovation, while it is important to fund federal R&D and deployment activities for certain climate-friendly technologies, it is also important to design a GHG cap-and-trade program to leave the greatest share of the money in private hands, where it will be most efficiently spent, rather than flowing to the federal agencies. For example, a cap-and-trade program that sets a meaningful target and allocates a high percentage of allowances for free to a large number of covered emitters would likely foster a robust private market in allowances. The money in such a market would stay in private hands, without the government acting as middle-man, creating with minimum waste a direct incentive for every company to deploy climate-friendly technologies and practices.

In 2004, the Pew Center conducted a workshop called “The 10-50 Solution: Technologies and Policies for a Low-Carbon Future,”⁹ and published recommendations in several technology areas for types and levels of investment needed. Some specific funding recommendations included:

- International coordination to plan, fund, and deploy coal gasification with CCS trial projects that focus on remaining technical issues and with publicly shared results (e.g., adequately addressing remaining uncertainties will likely require four to six projects, at an estimated cost of approximately \$5 billion, and an estimated project lifetime of 10 years)
- Establishment of carbon sequestration trial projects in the United States to validate the integrity of geologic storage (e.g., such validation will likely require four such projects at an estimated cost of approximately \$1 billion, and an estimated project lifetime of 10 years)
- Reinvent the U.S. electricity grid to facilitate distributed power generation and consumption in ways that make this new model attractive to utilities, and promote energy storage technologies. The estimated price of this upgrade is in the \$100 billion range.

Other mechanisms can provide incentives for deployment without direct funding. These include:

- Carbon capture and sequestration: Development of a regulatory system for sequestered carbon, including clarity about state-federal split of jurisdiction, and about which agencies at both levels have jurisdiction. In addition, companies note that public-private partnership in the development of private sector insurance products to cover various liabilities would reduce the financial uncertainty for those in the CO₂ chain of custody.
- Renewables: Development of a uniform system to track renewable energy credits in a consistent way across the country and facilitate trading between multiple state programs; utilities and other companies with interest in generation, as well as firms in the investment community, note the value of improvements to the national power grid that facilitate distributed generation as a driver for renewable energy technology.
- Nuclear power: Expansion of scope of U.S. Department of Energy nuclear waste R&D to options beyond Yucca Mountain

⁹ “The 10-50 Solution: Technologies and Policies for a Low-Carbon Future”. Washington DC, March 25-26, 2004.

- Combined heat and power (CHP) and distributed generation (DG): Support for net metering and incentives for uniform grid interconnection standards at the state level. Development of national test beds for new electricity grid systems.
- End-use efficiency: Promotion of state adoption of building codes. Expansion and tightening of product standards, potentially made tradable between manufacturers. Product standards on emissions will pull technologies into the marketplace by generating demand for them, and can complement a downstream cap-and-trade program by capturing emissions that would not be covered in a large-source system. Combining end-use standards with large-source emissions trading and funding for technology R&D can allow all sectors of the economy to play a role in reducing emissions in a cost-effective way.

Clarifying Questions 2b:

Adaptation Assistance

- What portion of the overall allowance pool should be dedicated to adaptation research or adaptation-related activities?
- How should these allowances or funds be administered?
- What is the appropriate division between federal vs. regional, state, and local initiatives?

Pew Center Response

The Pew Center recommends a national adaptation strategy that would assess the range of needs and provide guidelines or standards for infrastructure planning, as well as reform existing policies that promote maladaptive behavior. In addition to the needs outlined in this strategy, funding should be provided for the development of early-warning systems for heat waves and other related threats, enhanced monitoring of infectious diseases, and evaluations of the implications of climate change for disaster management. Support should also be given for efforts at local, state, and regional levels, which is where much of the adaptation measures will be taken. Indeed, because we are already observing effects of climate change (sea-level rise, increased storm intensity, ecosystem impacts), the funding needs for adaptation will grow substantially over time – from funding research and planning to supporting on-the-ground changes in infrastructure and response.

Clarifying Questions 2c:

Consumer Protections

- What portion of the overall allocation pool should be reserved to assist consumers?
- Should funds from the sale of permits or allowances be targeted primarily to low-income consumers, or should they be more widely distributed to benefit all consumers?

Pew Center Response

Initially, some portion of auction funds should be used for transition program for affected workers and communities, end-use efficiency investments, and otherwise addressing increased consumer costs as needed.

An earlier Pew Center report, *Worker Transition & Global Climate Change*,¹⁰ indicated that for the average non-supervisory worker in a goods-producing sector (mining, construction, and manufacturing) who does not find a job until having completed two years of training, the total cost of a transition program would be about \$106,000 per worker in 2010.

A separate report, *Community Adjustment to Climate Change Policy*,¹¹ concluded that that a new federal adjustment program for at-risk communities should be part of U.S. climate change policy. The report recommended that the U.S. government take the following actions:

- Designate and fund the Economic Development Administration (E.D.A.) of the U.S. Department of Commerce to design and implement an economic adjustment program for communities;
- Identify and assist communities that are particularly dependent on energy-producing and energy-intensive sectors before dislocations occur;
- Leverage and integrate additional resources by involving multiple federal agencies and state and local governments through federal and regional task forces; and
- Be flexible in addressing community needs by supporting locally determined, comprehensive strategies for five to seven years after the implementation of new climate policies.

While the amount of resources required for program implementation is difficult to determine, the authors suggested that an appropriate federal commitment might be \$550 million (\$50 million for planning, \$500 million for implementation), and that resources be allocated so that a community has five to seven years to pursue adjustment.

¹⁰ Barrett, J. 2001. *Worker Transition & Global Climate Change*. Arlington, VA: Pew Center on Global Climate Change

¹¹ Greenwald, J.; B. Roberts; A. Reamer. 2001. *Community Adjustment to Climate Change Policy*. Arlington, VA: Pew Center on Global Climate Change

Note that, while transition programs are not formally part of the RGGI allocation process, the program does set aside 25% of the allowances for energy efficiency and strategic energy investments.

Clarifying Questions 2d:

Set-Aside Programs

- What portion of the allocation pool should be reserved for the early reduction credit program and the offset pilot program?
- Are other set-aside programs needed?

Pew Center Response

The Pew Center believes early reduction credit and offsets need not be treated as set-aside programs, but rather as cost-containing flexibility mechanisms. Early reduction credit provides temporal flexibility, while offsets may provide geographic and sectoral flexibility to covered entities, and will be evaluated as part of the overall legislative package.

The Pew Center and nearly every company surveyed by the Center feel that credit or recognition should be given for GHG emission reductions achieved before the program becomes mandatory. The system should be designed so that the many companies that have voluntarily reduced their GHG emissions (as urged by the last three presidents) will not be implicitly penalized for doing so. Without such credit, companies that have taken early action could face higher costs for future emissions reductions than companies that did not pursue early voluntary reductions and thus have more “low hanging fruit” to harvest – therefore putting the early actors at a competitive disadvantage.

Credit should be provided not only to companies that registered their reductions under the U.S. Department of Energy’s Voluntary Reporting of Greenhouse Gases Program (established under section 1605(b) of the Energy Policy Act of 1992), but also to those conforming to U.S. EPA Climate Leaders guidelines, the reporting protocol developed by the World Business Council on Sustainable Development and the World Resources Institute, the protocol developed by the World Economic Forum, and equivalent state and private registries, such as the California Climate Action Registry. The test should be whether the reductions were real and verifiable.

Note that the establishment of a “set-aside” program is by no means the only way to provide recognition of early action. Companies could be directly allocated allowances based on their registered emissions reduction. Some companies have suggested that covered emitters be allocated allowances as a function of their “baseline” emissions levels – the default baseline level being the amount emitted during a given year (or period of years). Emitters who could document beginning their emission reductions earlier than the default baseline year (or years) could move their baseline to that earlier period, leading to their being allocated a greater number of allowances. Such a program could either use set-aside credits or direct allowance allocation.

Offsets are generally defined as out-of-system GHG reductions achieved by non-covered entities. Examples include greenhouse sequestration projects or verifiable credits from the

programs of other countries with capped emissions. The use of offsets to meet allowance submission requirements should not be restricted, as long as the offsets reflect real, measurable, and verifiable reductions. In general, offset programs have significant benefits, because they provide flexibility in the geographic and sectoral location of emissions reductions. Inclusion of an offset program expands incentives for emissions reductions beyond those entities covered by the cap. These reductions opportunities will lower the overall cost of program compliance, and motivate a continuous search for low-cost, verifiable reduction opportunities.

Most companies note that offsets are a fundamental tool to efficiently lower the cost of emissions reductions both for firms and for the economy as a whole. They are also a critical market-based mechanism for directing investment to promising technologies and approaches for energy efficiency, low or no-carbon energy, low GHG manufacturing, and carbon sequestration. Offsets specifically expand the scope of the program and serve to unleash the power of the market to stimulate innovation and cost-effectively reduce emissions. One company notes that it will take decades to transition capital stock of power generating plants to low carbon sources, so there is a critical need for offsets as a way of cutting net emissions affordably in the short and medium term. Several companies note that the very function of a market-based system that allows offsets with firm rules regarding verifiability and liability for actual reductions will by its nature favor sources of offsets (all the way down to the specific project level) that are real and verifiable, and steer investment away from projects for which the expected reductions must be discounted due to risk factors (technical, commercial, political, etc.)

Regarding the special case of carbon sequestration, a broad “results-based” program — which provides rewards to project developers in proportion to the amount of additional carbon sequestered — has the potential to improve the cost-effectiveness of a national GHG mitigation program. A results-based program is also likely to result in more innovative solutions than “practice-based” approaches – approaches that give credit for certain practices without verifying the amount of carbon sequestered by each project. Nevertheless, some observers believe the government—in cooperation with researchers, landowners, and project developers—may be able to develop project-measurement and monitoring methods that are sufficiently accurate and reproducible to protect the environmental integrity of a large-scale program that allocates rewards on the basis of evaluations of individual projects.

The following would be needed to provide such integrity:

- A description of accepted practices for sampling and measuring carbon stocks at the project site;
- Methods to develop reference cases or baselines against which observed changes in carbon levels can be compared. Several different approaches to reference case development may be needed to accommodate the wide range of potential activities and settings.
- Methods to estimate or address the leakage effects, including permanence, geographical, and trade-offs among different GHGs;
- Program methodologies designed to provide results that are reproducible by competent, independently-operating evaluators.

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In order to verify emission reductions that are fungible with reductions made within the capped sectors, a robust system of measurement and verification is required. The Clean Development Mechanism in the Kyoto Protocol initially provided for a project-by-project review of proposed offsets that presents significant burden and uncertainty for entities seeking offsets. The Pew Center prefers the “standards” approach to offsets taken by the northeast Regional Greenhouse Gas Initiative (RGGI). RGGI’s standards approach seeks to balance reduction verification with regulatory burden. Rather than reviewing projects one at a time, making judgments as to whether the project baseline is appropriate, whether project reductions are additional and real, etc., standards are set for a specific category of offsets, and project applications are assessed against that standard. This approach has two benefits: it makes program administration easier and project approvals more predictable, thus benefiting governments, environmental advocates and offset project developers by lowering the risk premium for such reductions. In the case of RGGI, the program is starting with the following offset categories: natural gas, heating oil, and propane efficiency; landfill gas capture and combustion; methane capture from animal operations; forestation of non-forested land; reductions of sulfur hexafluoride (SF₆) emissions from electricity transmission & distribution equipment; and reductions in fugitive emissions from natural gas transmission and distribution systems. RGGI expects to add project categories over time.¹²

The RGGI offset categories are not necessarily the right categories for a national program; they make sense for RGGI because RGGI only covered power plants. Offsets should be in source categories not covered by the cap-and-trade program; therefore, once the scope of the trading program is determined, one can evaluate which offsets are appropriate.

¹² Further information on offsets can be found in “Summary of RGGI Stakeholder Workshop on Greenhouse Gas Offsets”, accessed at http://www.rggi.org/docs/offsets_workshopsummary.pdf.

Clarifying Questions 2e:

Special considerations for fossil-fuel producers?

- Would some upstream fossil fuel producers be unable to pass the cost of purchasing permits or allowances through in fuel prices if they are the regulated entity?
- Is there a sufficient policy rationale for addressing these costs to justify the complexity of setting up and administering an allocation system for these entities?
- What other options exist to address the inability of fossil fuel producers to pass through these costs?

Please begin your response HERE. (no page limit)

Clarifying Questions 2f:

Allocations for downstream electric generators?

- Should electricity generators be included in the allocation if they are not regulated? (Clarification: We mean to ask if an electric generator should be included in the allocation if the greenhouse gas regulation occurs at a point of regulation that is upstream or downstream from the generator, but not the generator itself.)
- What portion of the total allocation should be granted to the electric power sector? Should it be based on the industry's share of greenhouse gas emissions or some other factor?
- Should generators in competitive and cost-of-service markets be treated differently under an allocation scheme?
- How should permits or allowances be distributed within the electric sector? Should it be based on historic emissions? Electricity output? Heat input?

Pew Center Response

The Pew Center disagrees with the white paper's assertion that "All told, these costs would be offset completely by an allocation of roughly 5 to 10 percent of the total permit or allowance pool to fossil fuel producers," and would support a much larger free allocation, as described at the beginning of the response to Question 2.

The Pew Center supports allocating most allowances at the same point that regulation takes places in order to compensate those who are required to comply.

Power companies with a relatively low-carbon fuel mix prefer allocation based on electricity output. Power companies with a relatively high-carbon fuel mix prefer allocation based on historic emissions. Some manufacturing companies agree with the latter approach, based in part on their interests as large power users and depending on the carbon intensity of the generators supplying their electricity. Power companies in both camps indicate a willingness to consider compromise approaches depending on other aspects of a regulatory design package. They also generally agree that the most critical goal in reducing power sector GHG emissions in the medium and long term is to facilitate new plant investment in low-carbon and no-net-carbon technology, and many agree that the system should aim to phase out the highest-carbon plants in the generating fleet.

One utility notes that a compromise approach might involve beginning with a relatively input-focused allocation that transitions over a period of years toward a more output-based allocation. This sort of approach is one under consideration by a number of industry players. Another utility points out the importance of fairly reconciling differences between regions and economies dependent on coal and regions with abundant natural gas.

Clarifying Questions 2g:

Allocations for energy-intensive industries?

- Is there a sufficient policy rationale to have an allocation to selected energy-intensive industries? What industries should be included in the allocation?
- What portion of the overall allocation framework should be reserved for these industries?
- What are the appropriate metrics for determining allocations across different industries?

Pew Center Response

Allocation as a policy vehicle can serve multiple purposes – reducing costs, motivating and compensating early action, addressing transition issues, etc. However, it will also likely be the most contentious element of the trading system development. Implementation may be made more straightforward by using a consistent rule for allocation across all sectors. On the other hand, sectoral tailoring may be necessary to address concerns about global competitiveness. Allowance allocation may be a particularly effective way of accounting for the relative price insensitivity of different sectors.

For vulnerable stationary sources that face intense competition that could lead to offshoring (and even higher GHG emissions), allowances can be provided to help ease the transition of capital stock to newer, more efficient technologies and cleaner fuels.

In transportation, while there is no clear consensus on how to reduce emissions from private vehicles, many observers believe that demand from U.S. private vehicle drivers is inelastic in the short term, i.e., that vehicle drivers will be willing to pay a very high price for gasoline without significantly modifying their travel behavior (with the exception of short term reaction to dramatic price spikes) or vehicle preferences. One serious negative effect of this price inelasticity is that if vehicle drivers are essentially included in a national cap-and-trade program — for example, by requiring allowance submission by the importers and refiners of petroleum products burned for transportation — they might bid the emissions allowance prices very high, to the detriment of the more price-sensitive manufacturing sector. As is the case with any potential damage to certain industries, allowance allocation might be a mechanism to make whole those requiring relief — and to do so in a way that changes over time to increase pressure for those industries to reduce emission at a pace they can afford.

Clarifying Questions 2h:

Allocations to other industries/entities?

- What other industries/entities (e.g. agriculture, small businesses, etc.) should be considered in the allocation pool?
- What should be the basis for their share of the total allocation as well as for the distribution among such industries/entities?

Please see response to Question 2g.

Question 3. International Linkage

Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

Pew Center Response

Yes. The ability to link to other programs is critical in order to minimize mitigation and transaction costs, and to harmonize obligations under various systems. Companies whose obligations differ in the many nations in which they operate will have a much harder time complying with the requirements. For this reason it is crucial not only to link programs, but also to minimize the differences between relevant aspects of the programs as they are developed.

This position is corroborated by the extensive and ongoing discussions the Pew Center has had with member companies of the Business Environmental Leadership Council (BELC) and other domestic and international corporations about U.S. and international greenhouse gas (GHG) markets. Those that have expressed an opinion unanimously support designing U.S. cap and trade to allow for linkage to other national and regional trading systems. They cite several reasons.

- Most note that a well-functioning global trading market is perhaps the most critical mechanism for minimizing the long-term costs of GHG reductions for firms and society as a whole.
- Among cost-containment approaches, the linking of global GHG markets is among the least distortionary.
- Generally, larger trading volume and greater liquidity of GHG allowances will result in clearer, more stable prices. More stable prices will allow firms to project future prices more accurately and provide the certainty to plan and invest appropriately for the future (for example, in breakthrough technologies).
- Globalizing GHG markets supports the goal of encouraging all countries, including China and India, to participate in making real and verifiable reductions. (Companies note that offsets originating in large emitter developing countries will be among the lowest cost reductions and can be combined with export opportunities for U.S. firms.)

Note that the Northeast Regional Greenhouse Gas Initiative (RGGI) will accept EU and Clean Development Mechanism (CDM) allowances if certain price triggers are reached, but that under the Kyoto Protocol the EU can not accept RGGI allowances because the United States is not a party to Kyoto. RGGI analyses indicate that international agreements that enable two-way linkages would be economically beneficial.

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

Pew Center Response

In order to link a U.S. program with other systems, reductions would have to be considered real and verifiable by the respective systems. Deciding whether to link would involve evaluating the inventory, methodologies, monitoring protocols and compliance mechanisms of the other systems, and as well as the design of these programs to make sure that the environmental effect of a given reduction is roughly equivalent across the two programs. In addition, care should be taken to design a U.S. program that other countries will be interested in linking with. In particular, mechanisms that alter the environmental integrity of the program (e.g., a low safety valve) would make reductions in one program not necessarily equivalent to reductions in another, jeopardizing the ability to link the two.

Federal legislation will need to address the state and regional GHG cap-and-trade programs now under development, some of which may be linked to each other and to other countries. As with any area of federal policy in which the states have taken the lead, Congress will have to decide on the extent to which the federal program will defer to pre-existing state programs, for example, governing allowance allocation.

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

Pew Center Response

Because the validity and verifiability of reductions is critical for trading, measuring, monitoring, and compliance mechanisms would need to be comparable. While this may or may not require a central overseeing body, a shared platform on which to carry out the trades – such as an agreement to use a common monitoring and reporting protocol – would be required.

While elements within each country differ, Kyoto signatory countries, including the EU, Canada and Japan, have trading systems that are inherently linked by means of the treaty requirements. Requirements stipulate that each country needs to develop a consistent national system for estimating emissions and removals of GHGs by their common definition of trading units – Assigned Annual Units (AAUs), Joint Implementation (JI) credits and Clean Development Mechanism (CDM) credits – and by the requirement that an international transaction log (ITL) be established. This shared platform will enable the tracking and the issuance of credits, cancellation, retirement and carry-over to the commitment periods following 2012. In essence, Kyoto parties are linked because they share common definitions, common requirements and a common platform for trading.

Question 4. Developing Country Participation

If a key element of the proposed U.S. system is to “encourage comparable action by other nations that are major trading partners and key contributors to global emissions,” should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

Pew Center Response

It is important to distinguish between two distinct but related policy objectives: 1) achieving adequate action by all major emitting countries, and 2) protecting U.S. firms against competitiveness impacts. Each requires a different set of policy approaches.

Ensuring that other countries act against climate change is important from a competitiveness standpoint. However, it is first and foremost an environmental imperative: without adequate action by all major emitters, the goal of climate protection cannot be met. Of steps the United States can take to encourage other nations to act, establishing a mandatory program to limit and reduce U.S. emissions may in and of itself be the most critical. Lack of action by the United States stands as the major impediment to stronger efforts by other countries. Demonstrating the will – and establishing the means – to reduce U.S. emissions will greatly alter the international political dynamic and improve prospects for international cooperation.

Making future U.S. action expressly contingent on the efforts of other countries may provide some further inducement for action. Alternatively, by appearing irresolute, it may deter others from commencing ambitious long-term efforts. A more effective means of achieving adequate and comparable effort by all major emitters would be the establishment of mutual commitments through multilateral negotiation and agreements. In the case of developing countries, this should include or be complemented by positive incentives, preferably through market mechanisms.

Ensuring that efforts are broadly comparable, however, will not necessarily achieve the second objective: protecting against competitiveness impacts. It is not the competitiveness of the U.S. economy as a whole that is at issue. Competitiveness at the national scale is largely a reflection of productivity, and the U.S. economy consistently ranks among the world’s most competitive.¹³ The cost of achieving mandatory GHG limits at the levels under consideration

¹³ The United States ranked second only to Finland in the World Economic Forum’s 2005-2006 Global Competitiveness Report. (World Economic Forum, *Global Competitiveness Report 2005-2006*. Available: <http://www.weforum.org/site/homepublic.nsf/Content/Global+Competitiveness+Programme%5CGlobal+Competitiveness+Report>)

would only marginally affect projected economic growth and is unlikely to affect overall competitiveness.¹⁴

To the degree there are competitiveness impacts, they would fall on specific sectors – energy-intensive industries whose goods are traded internationally, a relatively small segment of the U.S. economy.¹⁵ However, these sectors could remain vulnerable even if efforts by all major emitters are broadly comparable because countries will choose to allocate effort differently.¹⁶ For instance, a country may reduce overall emissions but exempt a given sector from controls, giving that sector an advantage over foreign competitors that are subject to controls. In that case, a review of comparability, unless undertaken sector by sector, offers little assurance against competitiveness impacts.

A full assessment of policy options for addressing competitiveness would require a more thorough analysis of the potential impacts on vulnerable sectors than is presently available. Generally, the impacts on a given sector or firm would depend on its specific competitive positioning and its ability to substitute and innovate. Most analyses of U.S. industry experience with past environmental regulation find little evidence of competitive harm. One comprehensive review – synthesizing dozens of studies across a range of U.S. regulations and sectors – concluded that while environmental standards may impose significant costs on regulated industries, they do not appreciably affect patterns of trade.¹⁷ Some economic literature suggests that, to the contrary, innovation spurred by regulation may in fact confer a competitive advantage.¹⁸

In the design of a cap-and-trade system, the best way to protect broadly against competitiveness impacts is to set the caps at modest levels and minimize compliance costs by, for instance, allowing offsets and full banking of allowances. The choice of allocation approach also has implications. A free “grandfathering” of allowances based on historic emissions provides inherent protection for potentially vulnerable firms by conferring assets whose sale can offset losses.

¹⁴ EIA projects that achieving the emission targets of the Climate Stewardship Act would diminish U.S. GDP by 0.4 percent in 2028, thus total GDP is projected to be 89.6 percent higher rather than 90 percent higher than GDP in 2006. (EIA, *Analysis of Senate Amendment 2028, the Climate Stewardship Act of 2003*. May 2004. Available: http://www.eia.doe.gov/oiaf/analysispaper/sacsa/pdf/s139amend_analysis.pdf)

¹⁵ Repetto et al. found in a 1997 analysis that, among all U.S. industries producing tradeable goods and services, roughly 90 percent of output and employment was in industries with energy costs representing 3 percent or less of output value. (Repetto, R., C. Maurer and G.C. Bird. “U.S. Competitiveness is Not at Risk in the Climate Negotiations.” *WRI Issue Brief*, October 1997.)

¹⁶ The Carbon Trust recently suggested that differences between National Allocation Plans within the EU Emissions Trading system has significant implications on sectoral competitiveness even though country efforts under the overall system are widely viewed as compatible (Carbon Trust, “The European Emissions Trading Scheme: Implications for Industrial Competitiveness.” June, 2004. See also IISD, “Climate Change and Competitiveness: A Survey of the Issues,” March 2005; and European Commission, “International Trade and Competitiveness Effects,” Emissions Trading Policy Brief No. 6, 2003.)

¹⁷ Jaffe, A.B., S.R. Peterson, P.R. Portney, and R.N. Stavins. “Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?” *Journal of Economic Literature*. Vol. XXXIII, March 1995.

¹⁸ Porter, M. “America’s Green Strategy,” *Scientific American*, 264, 4: 96, 1991; Porter, M. and C. van der Linde, “Toward a New Conception of the Environment-Competitiveness Relationship,” *Journal of Economic Perspectives* 9, 4:97-118, 1995.

One option to mitigate potential competitiveness impacts is to provide supplemental allowances to sectors deemed to be vulnerable. Another is to dedicate funds — possibly by auctioning a portion of allowances — to assist vulnerable sectors. Assistance could include:

- Incentives for the deployment of cleaner or more efficient technologies, such as accelerated depreciation of existing stock, or tax credits for the deployment of specific technologies or the production of less emissions-intensive products.
- Support for research and development of long-term technology.
- Transition assistance for workers in sectors likely to experience job losses.

Further steps to address competitiveness would require some mechanism to identify vulnerable sectors based on an analysis of export patterns among energy-intensive industries and relative energy pricing in competing countries.

Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

Pew Center Response

Apart from its limited value in addressing competitiveness, a periodic review of other countries' overall climate efforts would pose serious methodological challenges. No metric is straightforward and all rely at least in part on qualitative assessment or assumptions. Comparing government expenditures is difficult because not all governments tally their climate-related spending and, among those that do, each does it differently. A 2004 GAO report showed, for example, that even in the United States it is difficult to track climate-related expenditures over time.¹⁹ Adoption and implementation of policies that directly or indirectly reduce emissions is another measure of effort, but only a qualitative one, unless the policies' emissions impacts can be reliably quantified.

Even with reliable emissions data, however, any comparison hinges heavily on the chosen indicator. If the measure is emissions intensity, a country like China can show tremendous improvement (a 47% reduction from 1990 to 2000) even as its absolute emissions soar.²⁰ In per capita terms, India's emissions are projected to rise 50% by 2025, nearly twice the world average, yet will still be just one-fourteenth those of the United States.²¹ The measure of "effort" that translates most directly into "result" is absolute emissions. However, among the major emitters, the absolute emission increases projected for 2025 vary tremendously – from roughly 10 percent in the European Union to 130 percent in China.²² Any reasonable comparison must take into account wide disparities in natural endowment, economic structure, stage of development, and other national circumstances. While such analysis can and should inform the policy process, any determination of "comparability" is ultimately subjective.

If periodic Congressional review is to be mandated, it should also take into account new scientific and technological developments and other factors bearing on the feasibility, cost, and urgency of emissions reduction.

¹⁹ While reported federal spending rose from \$3.3 billion in 1993 to \$5.1 billion in 2004, the GAO found, the government's accounting had changed considerably over that period as successive administrations added programs not previously counted as climate-related. (US GAO, "Climate Change: Federal Reports on Climate Change Funding Should be Clearer and More Complete." GAO-05-461, August 2005.)

²⁰ Baumert, K. and J.Pershing, with T. Herzog and M. Markoff. "Climate Data: Insights and Observations." Prepared for the Pew Center on Global Climate Change, November 2004.

²¹ EIA. *2005 International Energy Outlook*. DOE/EIA-0484, July 2005.

²² EIA. *2005 International Energy Outlook*. DOE/EIA-0484, July 2005.

Clarifying Question 4b:

- What process should be used to evaluate the efforts of other nations and how frequently should such an evaluation take place?

Please begin your response HERE. (no page limit)

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

Please begin your response HERE. (no page limit)

Pew Center Response

Three strategies can provide additional incentive to developing countries to reduce emissions: direct bilateral assistance; multilateral agreements that recognize developing country actions; and market-based incentives through a domestic and/or an international emissions trading system

Bilateral assistance – Direct U.S. support for developing country efforts should be expanded, better targeted, and tailored to the needs of developing countries. The highest priority for most developing countries is economic growth and development. Rather than viewing climate-friendly technology deployment solely as an exercise in increasing exports or funding demonstration projects, our objective should be to integrate climate-friendly activities into national strategies for economic growth, poverty reduction, and sustainable development. For instance, energy policies and plans are critical to achieving economic and development objectives. U.S. assistance should help developing countries build their capacity to assess clean energy options and establish policy frameworks that will favor such options even after our funding assistance is gone.

U.S. assistance also should support and promote efforts by the largest developing countries to identify specific goals for limiting their emissions of greenhouse gases – recognizing that their goals may vary in form, content and timing. One way to do that would be to require that the largest developing countries, in agreeing to receive bilateral assistance, establish goals consistent with their development strategies, and periodically report progress towards meeting them.

Developing country commitments – Achieving broad participation in a strengthened multilateral effort will require a more flexible framework allowing different countries to take on different types of commitments best suited to their national circumstances. In the case of developing countries, this could mean allowing for non-target approaches such as policy commitments in which governments commit to undertake national policies that will advance core economic and development priorities, such as energy access or security, while contributing to climate mitigation. These could include energy efficiency standards, renewable energy targets, technology standards phasing in advanced electrical generation technologies, or policies to preserve forests and promote sequestration practices.²³

²³ Pew Center on Global Climate Change. “International Climate Efforts Beyond 2012: Report of the Climate Dialogue at Pocantico.” November 15, 2005.

A multilateral framework allowing such commitments would provide international recognition of developing country efforts and, thereby, an incentive for strengthening these efforts.

Market incentives – An important driver for developing country efforts to reduce emissions is access to emissions trading markets. The Clean Development Mechanism (CDM) established under the Kyoto Protocol enables developing countries to market certified emission reduction credits resulting from projects that reduce emissions below business as usual. Despite a slow startup, the CDM is now operational, with nearly 150 projects approved and several hundred more in the pipeline.

As presently structured, however, the CDM allows crediting only of discrete projects, limiting its potential reach. Kyoto parties agreed recently to open consideration of a more “programmatic” approach that could potentially allow crediting of reductions resulting from a much broader range of activities. One possibility would be crediting of reductions across an entire sector driven by policies such as energy efficiency standards (reductions would have to be quantified and verified). Such an approach could complement the type of policy commitments described above, providing a powerful market incentive for developing countries to enact and faithfully implement such policies.²⁴

A programmatic crediting mechanism of this type could be established as an adjunct to a domestic emissions trading system or as a feature of a future multilateral approach.

²⁴ Pew Center on Global Climate Change. “International Climate Efforts Beyond 2012: Report of the Climate Dialogue at Pocantico.” November 15, 2005; Figueres, C. “Draft Proposal for the Implementation of Programmatic CDM Project Activities within the Existing Regulatory Framework of CDM Project Activities.” Prepared for the Carbon Finance Business Unit of the World Bank, November 29, 2005. Available: http://carbonfinance.org/docs/Programmatic_CDM_Implementation_Paper.pdf.

Additional Topics

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The Pew Center respectfully wishes to submit material on two additional topics: cost containment and recent climate science.

Additional Topic #1 – Cost containment: a function of the whole package

The Pew Center and most of the over 30 large corporations surveyed by the Center believe that, rather than focusing on any one design element in isolation, any bill must be evaluated as a whole, especially in minimizing the costs to covered entities and the economy. The issue is raised by a design question not specifically mentioned in the White Paper: the concept of a “safety valve.” Under a safety valve provision, exemplified by the recommendation of the National Commission on Energy Policy (NCEP), covered entities would be allowed to pay the implementing agency a specified amount per ton of GHG instead of submitting emissions allowances, thus capping the cost per ton at the specified “safety valve” level. In fact, a safety valve is only one tool for providing cost containment. Moreover, it is one that could limit environmental effectiveness of the program and present complications for linking to other trading programs (as discussed in response to Question 3). A GHG cap-and-trade program can be designed to minimize costs using a variety of other approaches:

- selection of moderate targets and timetable;
- advanced notice of policy;
- banking of allowances and offsets;
- borrowing of allowances;
- staggering compliance deadlines;
- extending compliance deadlines;
- providing consumer dividends (payments made to energy consumers to compensate them for any increased energy costs);
- providing relief for individual emitters;
- inclusion of offsets;
- linkage with other trading systems; and
- complementary policies that drive energy efficiency and technological innovation

Additionally, low price caps act as a tax. Taxes have been shown to be fairly ineffective in the short term at eliciting significant results. (See attached chart on cost containment mechanisms.)

The companies surveyed by the Pew Center hold a wide range of opinions about the policy benefits of a safety valve, though most say that a safety valve may be politically necessary. Of companies that favor a safety valve, or at least think it might be politically

necessary, several note that \$7/ton of CO₂ (the initial level recommended by NCEP) is too low to achieve significant emissions reductions or to drive market-based transition to a wide range of low-carbon technologies. If a safety valve is used, it should be set high enough to encourage meaningful change. For instance, integrated gasification combined cycle (IGCC) coal or supercritical pulverized coal electric power generation combined with carbon capture and sequestration (CCS) may only become economically viable on a self-sustaining basis (without continued government subsidy) with CO₂ values at or above \$25-35 per ton. This does not necessarily mean the safety valve should be set immediately at \$25-\$35 per ton. Rather, the starting point and growth curve of the safety valve must be such that the net present value of paying it will be more than what companies project will be that of investment in IGCC-CCS.

One company notes that mere inclusion of some reasonable cost limit may be more important for getting legislation enacted than the limit's specific level. The presence of a safety valve, even at a high dollar level, could undercut assertions that GHG regulation will bring about the "end of the economy," since it would remove from consideration the modeling results that posit extreme cases of unlimited cost. Another company notes that, when GHG regulation is viewed as inevitable and may affect upstream energy producers, financial structuring for large new oil and gas production projects may not be possible without a price cap, since otherwise these projects would involve a large unknown liability that constrains equity value and cash flows.

A few companies oppose a safety valve altogether because of its distortionary effect on the market, or only favor a safety valve with a sunset clause. Companies express concern that a safety valve would complicate linkage between the U.S. carbon trading market and the cap-and-trade programs of other countries, which likely would increase the cost of U.S. reductions and reduce the economic efficiency of the system. Some companies point out that the market, left to develop without interference, will develop a range of financial products and services that provide cost certainty to firms but are less distortionary than safety valves. Under a mature carbon emissions trading market with adequate certainty about cap levels beyond the short term, financial services firms will offer hedging products such as forward call options that allow companies to lock in a maximum cost.

Additional Topic #2 – Recent Climate Science

The Pew Center commends the Senate Energy Committee for addressing the climate change issue and urges a continued high level of effort – especially in light of recent developments in climate science. In the past 3 years, and especially in 2005-06, the science attributing global warming to human enhancement of the greenhouse effect has become very compelling. At the same time, globally distributed impacts of climate change have occurred in patterns that are readily explained by global warming, and not by natural variations in regional climate. Many changes that have been predicted by models are now occurring.

1. Attribution of global warming to the enhanced greenhouse effect. Scientists have tested alternate hypotheses of natural versus anthropogenic forcings to explain observed climate change. Two recent studies illustrate the state of the science in this endeavor, but represent a small fraction of the studies that have produced similar conclusions.
 - a. *Physical simulation of 20th century surface warming:* A study (Meehl et al. 2004. Journal of Climate 17:3721-3727) by scientists at the National Center for Atmospheric Research (NCAR) examined a variety of natural (solar, volcanoes) and anthropogenic (GHG, ozone, sulfate aerosols) forcings on global surface temperature, comparing model output with observed changes during the 20th century. The study found that all of these factors act additively and all must be included as forcings in the model in order to closely mimic the observed temperature change. During the last half of the 20th century, the largest forcing explaining warmer global temperatures was anthropogenic GHG. These and many other results directly contradict claims that models fail to mimic observed changes.
 - b. *Physical simulation of heat penetration into the oceans.* Scientists at Scripps Institution of Oceanography, Lawrence Livermore National Lab, the UK's Hadley Center, and NCAR produced a study (Barnett et al. Science 309:284-287) showing that the global ocean basins are warming simultaneously as a result of global greenhouse warming. Whereas natural variations occur at different times, and often in direct opposite patterns, in different ocean basins, there has been a simultaneous warming of all the major ocean basins over the past 40 years. Moreover, the pattern of penetration of warming at different ocean depths varies from basin to basin. Modeling of natural internal variability alone did not reproduce these complex patterns, whereas combining internal variability with GHG forcing did. Hence, using a very different approach from the study above, scientists once again find that observed patterns of climate change can only be mimicked when anthropogenic GHGs are included as a climate forcing.
 - c. *Physical simulation of the increasing height of the tropopause.* The tropopause is a region of the atmosphere that separates the lower atmosphere (troposphere) from the upper atmosphere (stratosphere). Its height is determined by physical conditions in the troposphere and stratosphere, among them being the temperature of the troposphere below and the stratosphere above. As these conditions change, the height of the

tropopause changes in response. Forcings that either warm the troposphere or cool the stratosphere tend to increase the tropopause height, whereas those that cool the troposphere or warm the stratosphere decrease troposphere height. Changes in solar radiation and volcanic particles are natural forcings and changes in stratospheric ozone and tropospheric greenhouse gas concentrations are anthropogenic forcings.

Scientists from the US, UK, and Germany teamed up to test whether they could simulate observed changes in the height of the tropopause based on changes in the natural and/or anthropogenic forcings and their physical understanding of atmospheric dynamics (Santer et al. 2003. *Science* 301:479-483; Santer et al. 2004. *Journal of Geophysical Research* 109:D21104). Observations revealed a 620-foot increase in tropopause height between 1979 and 2001. The scientists obtained a similar increase in the simulated tropopause height when their model was forced by anthropogenic GHG and stratospheric ozone depletion (from man-made chemicals). About 40% of the effect was from GHG and 60% from ozone depletion. Including natural variability of solar input and volcanic emissions in the model had little effect on this outcome, suggesting that enhanced greenhouse warming and stratospheric ozone depletion were the main causes of global tropospheric height increase (Santer et al. 2003. *Science* 301:479-483; Santer et al. 2004. *Journal of Geophysical Research* 109:D21104). Because of the Montreal Protocol, ozone depleting substances will decline in the future. GHGs, however, are expected to increase. Hence, the model predicted that tropopause elevation will continue to rise in the future mainly because of anthropogenic GHG.

2. Linking major climate change impacts with global warming. In recent years, several important impacts have been observed that are readily explained by human-induced global warming. In some cases, global warming plus regional variability combine to produce impacts, but natural variability alone cannot explain the observations.
 - a. Global ice cover – In recent years, glaciologists and oceanographers have been surprised by the unprecedented rates of change in global ice cover, both for Arctic sea ice and land-based glaciers and ice sheets.

Greenland: The second largest land-based ice sheet, with enough water to raise the global sea level by 6 meters if melted, covers the Greenland continent. Fifteen years ago, glaciologists believed that the Greenland ice sheet was in balance (i.e., not losing or gaining ice). Over the past decade, glaciologists documented rapid melting around the coasts of Greenland and adjusted their estimates to reflect a net loss of ice due to melting. In February 2006, new satellite-based measurements of ice flow were published, revealing that Greenland is losing ice even more rapidly than realized as a result of ice flowing into the sea at high rates. This work doubled the estimated rate of ice loss from Greenland and its contribution to the rate of global sea level rise (Rignot et al. 2006. *Science* 311:986-990).

Antarctic ice sheet. Western Antarctica is losing ice rapidly. Until recently, East Antarctica was thought to be gaining ice, but now is thought to be just in balance, such that

future warming could quickly shift it to net ice loss. Overall, Antarctica appears to have lost about 450 km³ of ice just in the past three years (Velicogna. 2006. Science Online, March 2). Because these results are from the GRACE satellites launched in 2002, we do not know how long Antarctica has been losing ice. Antarctica holds enough ice to raise sea level by 70 m if melted.

Arctic sea ice: Arctic sea ice is being lost at an unprecedented rate, reaching a record low area during summer 2005. Some scientists estimate that by the end of the 21st century the Arctic Ocean will be completely free of ice during the summer, a condition that probably has not existed for at least a million years (Overpeck et al. 2005. EOS 86:309-312). This loss of ice has important implications for global climate change and for Arctic ecosystems and wildlife (Arctic Climate Impact Assessment. 2005. Cambridge Univ. Press, New York).

Mountain glaciers. For several decades, glaciologists have documented a continuing worldwide loss of mountain glaciers, which continue to dwindle at an accelerating rate (Dyurgerov. 2006. AAAS Symposium, St. Louis; Dyurgerov, 2005. INSAAR Occasional Paper No. 58, Univ. of Colorado). Billions of people around the world depend solely on glaciers for their water supply. In Central Asia, mountain glaciers are retreating rapidly and may be virtually gone within decades, creating a billion environmental refugees (V. Aizen, 2006. AAAS Symposium, St. Louis).

The global trend. There is a clear pattern of globally distributed loss of ice indicative of global greenhouse warming, and not isolated regional losses of ice resulting from natural regional variability, as asserted by some. While some regions of the globe may presently be in a phase of natural warming, in addition to enhanced greenhouse warming, other regions are in natural cooling phases that will also reverse at some point. Hence, the overall loss of ice is a fingerprint of global warming.

- b. Hurricanes – In 2005, two independent studies found that hurricanes were becoming more intense worldwide (Emanuel, 2005. Nature 436:686-688; Webster et al. 2005. Science 309:1844-1846). All ocean basins where tropical cyclones develop exhibited this change in recent decades. Immediately, some responded that this upswing resulted from natural variability, rather than from greenhouse warming. However, they overlooked the well-established knowledge that natural cycles do not occur in sync across the various basins. In fact, they tend to vary in opposite phases, for instance, in the North Atlantic and North Pacific basins. The existence of a trend of intensification in all six of the tropical cyclone-producing ocean basins thus represents a fingerprint of global warming, consistent with the enhanced greenhouse effect and not with natural variability alone.
- c. Species changes – Two recent studies have documented apparent connections between changes in species and anthropogenic climate change. One study (Root et al. 2005. Proceedings of the National Academy of Sciences 102:7465-7469) found that 130 species, including many different plants and animals, have responded to earlier spring temperatures between 1970 and 2000. The power of this study, however, was that it

linked these changes statistically to a climate model, demonstrating that the relationship between the timing of spring biological events (such as timing of flowering or migration) was well correlated with GHG-driven climate change, but not with natural variability alone. The species were distributed throughout Europe, North America, and Asia, thus representing a large portion of the Northern Hemisphere and not a particular region. Hence, the same type of response occurred regardless of differences in regional climate variability, again suggesting a global driving mechanism. The correlation with anthropogenically driven climate demonstrates that this global response can be explained by enhanced greenhouse warming, but not by natural climate variability alone.

A second study (Pounds et al. 2006. *Nature* 439:161-167) linked widespread mass amphibian extinctions in the tropics to the timing of climate change events associated with sea-surface and atmospheric temperatures. Warm years, which have increased in frequency over time, are followed closely by extinction events. Also, the majority of recorded extinction events are associated with warm years. While extinction rates correlate with the large-scale warming trend, they do not correlate with local variability associated with regional El Niño events, once again demonstrating that a global trend, rather than regional variability, is the more likely explanation for the impact. The authors explained this relationship as a function of pathogen outbreaks fostered by the observed warming and moistening trend in tropical mountain environments as a result of climate change.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Possible Cost Containment Strategies that can be used with Emissions Trading Programs

Table 1. Measures that provide **price certainty** to regulated entities and may or may not provide environmental certainty

Mechanism	Description	Where used	Enviro Certainty	Strengths	Weaknesses
Safety valve (variation 1 – cap not assured)	Places a ceiling price on CO ₂ permits. When price hits this level, one of many things may happen, e.g.: <ul style="list-style-type: none"> the program administrator (government) sells additional allowances at this specified price regulated entities pay the amount of the safety valve as a tax or into a fund without acquiring an allowance 	Bingaman-NCEP (S.Amdt.868) proposal (submit allowance or pay \$7 per metric ton of CO ₂ initially) UK trading system offers companies the option of paying the UK Climate Levy or taking an emissions target. Amount varies by industry.	No environmental certainty if price cap is low. More likelihood of certainty if cap is high.	<p>a) Generates revenue for the government – though this may be considered a weakness to the extent such revenue generation is considered a tax.</p> <p>b) Potential revenue recycling -- revenue received from safety valve payment could improve the efficiency of the program by reducing less efficient taxes in other parts of the economy (similar to the “double dividend” of auctioned allowances).</p> <p>c) Payment into a fund could be potentially more popular with industry than an undirected tax, especially if dollars directed at efforts that improve sectoral industrial</p>	<p>a) Level of reduction is uncertain. Depending on the safety valve level, the cap may be broken and emissions levels may not be significantly affected.</p> <p>b) Difficult to know the level of price that encourages the appropriate level of control.</p> <p>c) Innovation efforts are limited to those that are below the safety valve price. Depending on the level of the safety valve, the incentive for innovation (the reward for innovation) may be significantly reduced.</p> <p>d) If perceived as a tax, may diminish public acceptability of policy.</p> <p>e) With relatively low targets, small danger of high prices and thus no economic justification for cost certainty.</p> <p>f) Could result in taking money from private sector</p>

Mechanism	Description	Where used	Enviro Certainty	Strengths	Weaknesses
	Additional allowances are not made up in later periods.			efficiency.	investment and giving it to government, potentially without a link to emissions reductions. g) Can make linking to other trading systems difficult or impossible. h) If linking permitted, could set international prices because of arbitrage. (This could be limited by allowing only government-to-government trading or only if country price was equal or above international price.)
Safety valve (variation 2 – cap assured, firms responsible)	Same as safety valve 1, but additional tons are made up in later periods by firms (similar to penalty or to borrowing).	McCain-Lieberman (S.1151) allows borrowing and has a penalty for non compliance (see below).	Yes	Same as safety valve 1, plus: d) Private sector retains liability for reductions and incentive for improvement.	Same as safety valve 1, except (a).
Safety valve (variation 3 – cap assured, government responsible)	Same as safety valve 1, but additional tons are made up in later periods by government	The Canadian government implemented a \$15 CD/metric ton price guarantee, which will likely be paid into a fund and tons made up by government purchase.	Yes	Same as safety valve 1, except (a), (b).	Same as safety valve 1, except (a) and plus: (i) Government has liability instead of private sector. (j) Cost to government is uncertain, even though cost to firms is certain.
Penalty Cost	The penalty for noncompliance is set such that it can effectively offer an upper bound on the allowance prices. Penalties should provide an	Acid rain, initially \$2000/metric ton EU ETS Phase I penalty is 40 euros. Phase II is 100 euros. New South Wales	Yes if tons are made up and/or level is high. No if tons are not repaid and level is low.	If set high enough, does not interfere with the market. Sends a signal to comply. Can be set to level the playing field to assure that those who comply are not put at a	If tons are not repaid and the level of the penalty is too low, compared to other options, companies may choose to pay the penalty rather than invest in options that reduce emissions. To the extent that this is set low and becomes a cost containment mechanism rather than an enforcement mechanism, the term “penalty” may be viewed as

Mechanism	Description	Where used	Enviro Certainty	Strengths	Weaknesses
	<p>incentive to stay within the program and as such should be higher than the expected cost of compliance.</p> <p>To distinguish from safety valve, often repayment of allowances is required and level is relatively high.</p>	<p>has a \$13 penalty for non compliance</p> <p>McCain-Lieberman has a penalty of 3x the market value of the allowances that are not submitted.</p> <p>Bingaman-NCEP has a penalty of 3x the safety valve price for each allowance not submitted.</p>		<p>competitive disadvantage by those who fail to comply</p> <p>U.S. companies typically prefer to avoid the bad press associated with penalties.</p>	<p>inaccurately pejorative by some firms.</p>

Table 2. Measures that **minimize costs** of compliance and provide **environmental certainty**

Mechanism	Description	Where used	Strengths	Weaknesses
Safety valve (variation 4 – flexibility expansion)	When safety valve price is reached, different compliance strategies are allowed to minimize permit prices. (Increases offsets, extends compliance periods, etc.)	RGGI		Requires that compliance strategies (e.g., offsets, and other flexibility mechanisms) be restricted before the safety valve is reached, which is not preferable. Can significantly increase program complexity and administrative costs
Circuit Breaker	A scheduled decline in the cap is delayed, cancelled (or even reversed) when the trigger price is exceeded.	Proposed by some environmental advocates to minimize the threat of future more stringent targets. Proposed in lieu of a safety valve.	Avoids price spikes that would result from increase target stringency.	Does not provide cost or price certainty. Prices may still rise. Does not provide regulatory (target) certainty to firms. Does not provide environmental certainty beyond the first cap.
Allocation	Allowances given freely to those with targets can be seen as industry compensation for additional control costs.	Acid Rain Program EU ETS	Allocation does not impact the efficient function of the market. May compensate firms for the cost of control and help keep consumer prices low.	Distributional/competitive equity concerns. May give companies “windfall” profits, which may not get passed along to consumers in the form of lower energy prices. Firms see higher profits and consumers see higher prices.
Full banking of allowances and offsets	Firms are able to make reductions at any time and use those efforts toward compliance at any time.	McCain-Lieberman bill Acid Rain Program EU ETS, phase I	Allows a firm to determine when it is most cost effective to make reductions or buy offsets. Intertemporal flexibility reduces overall program cost.	More reductions may occur immediately and if not utilized in the near term could serve to increase the near term price of carbon Alternatively, if targets are seen as stable in the long run, firms may not make excess reductions and a bank of permits might be slow to develop and would thus not be available to prevent price spikes that might occur unexpectedly.

Mechanism	Description	Where used	Strengths	Weaknesses
Offsets	Emission reductions that occur voluntarily outside of a regulated requirement but which can be used in place of regulated requirements. For example, reducing one ton of methane emitted from an unregulated landfill could be seen and counted as an equivalent reduction for a firm that is required to reduce 1 ton of methane at its gas processing facility.	<p>Proposed in McCain-Lieberman, Bingaman-NCEP, and RGGI but limited.</p> <p>EU- ETS, international (CDM and JI) offsets only.</p> <p>Oregon, Washington new electricity rules</p> <p>Canadian Carbon trading system</p> <p>RGGI – regional offsets only</p> <p>New South Wales carbon reduction effort for electricity providers – regional reductions only.</p>	<p>Sends a market signal to the entire economy that carbon has a value. Provides an incentive for action and innovation in a wider variety of industrial sectors than a cap and trade program without offsets.</p> <p>The larger the pool of offsets to choose from, the more competitive the market for those offsets and the lower the cost.</p> <p>Unlimited usage of offsets allows a company to cost effectively manage their control costs.</p> <p>Allows a firm to choose the least cost path towards compliance.</p> <p>Gives firms the ability take advantage of the natural capital turnover rate by paying someone else to reduce.</p> <p>All reductions regardless of sector or location are equivalent in terms of climate change mitigation.</p>	<p>May allow financial capital to flow out of region.</p> <p>Offsets (and ancillary benefits) may not happen within the focus sector(s)/location(s).</p> <p>Monitoring, verification and compliance may be complicated.</p>
Stagger deadline for compliance	Stagger the dates by which entities are scheduled to comply, avoiding a spike in demand for permits at the compliance deadline.	RECLAIM	<p>Smooths out demand for permits and helps to avoid price spikes.</p> <p>The market determines the incentive for innovation.</p>	Potentially more difficult to administer.

Mechanism	Description	Where used	Strengths	Weaknesses
Incentives for improved energy efficiency	<p>Effort is aimed at reducing energy consumption. This can be consumer consumption or industrial consumption.</p> <p>Incentives, in the form of rebates, tax credits, accelerated depreciation etc., are given to promote more energy-efficient technology or better energy management.</p>	Common	<p>Energy efficiency is relatively cost effective. Reducing energy demand is a national goal.</p> <p>Consumers are made better off or “whole”.</p>	<p>Behavior change is a long-term effort and required sustained effort.</p> <p>Depending on structure of effort, may distort the market.</p>
Consumer Dividends (can be used to compensate for higher prices)	Payment is made to energy consumers to compensate them for the increased energy costs.	<p>Alberta gas rebates.</p> <p>Alaska gives back a resource dividend to state residents (may be to compensate them for higher resource costs)</p>	<p>Addresses consumer cost issues directly. Consumers are happy.</p> <p>Revenue recycling through lump sum payments to consumers in the form of rebates for energy expenditures should not reduce the efficiency of the program.</p> <p>Consumers would have the same incentive to efficiently use household energy sources because the rebate will not change the marginal cost of these energy sources.</p> <p>The energy expenditure commitment by the states will not distort the market for emissions allowances.</p>	<p>Wealth transfer back to consumers may in turn raise incomes and result in higher levels of energy consumption.</p> <p>Does not send a specific signal for energy conservation.</p> <p>Difficult to know how much to compensate. (How much of rate is due to policy?)</p> <p>Inefficient to manage—may cost more to administer than the resulting benefits.</p>
Hedging with forward contracts	Put and Call options are utilized to “lock in” a commodity price	Common practice in commodity markets	Little government involvement. Full advantage of the market-based approach is observed	Markets must be relatively mature and liquid. Rule certainty is essential before these types of financial tools will be made available.

Mechanism	Description	Where used	Strengths	Weaknesses
Extension of compliance deadline	If price of allowances reach some specified level, the compliance deadline is extended. Such an extension will relieve short-term demand pressure for permits. Near term price of allowances should stabilize or fall. Firms would have more time (and hopefully) more options that would serve to reduce longer term permit prices. In essence this is similar to borrowing.	RGGI	<p>The market for permits continuously determines the appropriate price and level of innovation and does not need additional government assessment.</p> <p>Cap remains intact.</p> <p>The reward for innovation is set and paid for by market forces.</p>	<p>A delay in compliance may not increase options and may only increase the level of reductions that a firm is liable to make in later periods.</p> <p>Complicates regulatory certainty to firms and may delay significant action.</p> <p>May make timely program review more difficult.</p>
Borrowing	Firms or governments are allowed to borrow allowances from future allocations. This could be with or without a cost of borrowing. (The cost could be in terms of dollars or tons.)	<p>McCain-Lieberman includes borrowing at a cost of 10% of tons borrowed per year.</p> <p>Kyoto's 1.3x metric ton penalty in the second period is a form of borrowing.</p>	<p>The market for permits continuously determines the appropriate price and level of innovation and does not need additional government assessment.</p> <p>Since climate change is a long-term problem, the timing of reductions is not a significant issue</p> <p>Cap remains intact.</p> <p>The reward for innovation is set and paid for by market forces.</p> <p>Provides additional time for capital stock turnover that will result in potentially larger future reductions outside of the initial compliance period.</p>	<p>Logistically, difficult to administer and enforce.</p> <p>Requires the setting of future caps to ensure meaningful borrowing and repayment.</p> <p>Firms may be afraid to assume they would get credit for future reductions if they borrow on future allocations.</p> <p>Firms may eventually lobby for "loan forgiveness."</p>

Mechanism	Description	Where used	Strengths	Weaknesses
Relief for individual emitters	Individual emitters or vulnerable sectors could apply for relief if it can show that its mitigation costs/ton are higher than some level. Government would allocate additional allowances to that emitter, and may or may not be required to make up reductions elsewhere.	Not used (possibly considered in EU for some sectors)	May allow relief to firms or sectors potentially hard hit by carbon constraints or high-energy costs. May have political support in key regions and may reduce concerns about capital and jobs moving off-shore.	<p>Impacts regulatory expectations and may distort the level of innovation. For example, some analysts have suggested that the expectation that the California Energy Commission would provide air permit regulatory relief for the CA electricity sector if electricity price rose significantly kept industry from investing in new infrastructure that would have prevented the electricity price spike of the 2001.</p> <p>High administrative costs relative to release of additional allowances into market.</p> <p>Distributional and equity concerns.</p> <p>Does not provide a market signal for economy wide participation</p> <p>If government does not makeup for additional allowances, cap would be broken.</p> <p>Disincentive for emitters to reduce costs.</p> <p>Enormous potential for corruption.</p>