

The Evolution and Anatomy of Recent Climate Change Bills in the U.S. Senate:

Critique and Recommendations



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Prepared by:

Kenneth R. Richards

Associate Professor
School of Public and Environmental Affairs, Indiana University

Senior Visiting Fellow
Smith School of Enterprise and the Environment, University of Oxford

Stephanie Hayes Richards*

Managing Principal
Bloomington Energy and Environmental Intelligence, LLC

**Corresponding author may be reached at stephanie_richards@bloomingtoneei.com*

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EXECUTIVE SUMMARY



The United States' current financial conditions notwithstanding, climate change remains at the forefront of our national policy agenda. During a joint session of Congress on February 24, 2009, President Obama asked the 111th Congress to send him cap-and-trade legislation that limits carbon emissions. On March 31, Representatives Waxman and Markey issued a discussion draft of a comprehensive climate change and energy bill. After extensive amendments, that bill was passed by the House of Representatives by a vote of 219 to 212. The action has now shifted to the Senate.

This is not the first time that Congress has considered comprehensive climate legislation. During the 110th Congress, three climate change bills were considered in the U.S. Senate: the Bingaman-Specter bill (S. 1766), the Lieberman-Warner bill (S. 2191), and the Manager's Amendment to the Lieberman-Warner bill (S. 3036). In the midst of political disagreements and the urgency of the U.S. economic crisis, the Senate was unable to pass a climate change bill during the 110th Congress. However, a comparison of the bills and consideration of their timing suggests that during that short period of time the Senate was evolving toward an increasingly cost-effective approach to climate legislation.

Lawmakers can learn much from a careful analysis of previous climate legislation, particularly the key elements of broad climate legislation, the policy principles that should guide development of the legislation, and some pitfalls to avoid in the process. Working through the lens of sound policy principles, this report provides a detailed review of the three primary Senate bills in the 110th Congress. The report begins with a brief review of the criteria and fundamental principles used to evaluate policy options. Then, it works through the major elements of the bill with a side-by-side comparison, emphasizing the strengths and weaknesses of each bill and the remaining need for improvement.

Policy Principles

The process of environmental policy development is, in the simplest terms, one of choosing an appropriate emissions target and finding the most cost-effective program to reach that target within the constraints that Congress faces. An appropriate target is ideally set through an assessment of the costs and benefits associated with pollution abatement, although goal setting more generally involves political negotiation. The costs of achieving that target include not only those associated with emissions reductions, but the costs associated with program implementation, including information gathering, rulemaking, negotiations, litigation, monitoring, and enforcement. Costs also include any negative effects to the system of public finance, such as the distortionary effects of revenue-raising to finance subsidies.

While Congress attempts to minimize the total social costs of achieving the emissions target, it also operates in a constrained legal and political environment. The former includes

constitutional and statutory laws on the domestic side and trade and environmental agreements on the international side. Political constraints arise in a number of forms, but these often include pressure from domestic industry and environmental interest groups, public officials whose constituents would be adversely influenced by the legislation, and global leaders concerned that the United States contributes its share of emissions reductions.

The analysis in this report tends to emphasize cost-minimization and legal constraints, placing less emphasis on political constraints. While sound policy must accommodate political realities, the philosophy here is that whatever goals Congress sets for the country, those goals should be pursued in the most cost-effective manner. Ultimately, it is up to Congress to determine the extent to which cost-effectiveness must be compromised to accommodate political reality, but at a minimum the decision should be based on an understanding of the social cost associated with political compromise.

Emission Reduction Targets

While all economic analyses of climate change seem to support a “climate-policy ramp” with more modest emission reductions in the short term accompanied by steeper reductions in subsequent years, economists have tended to disagree on the level and timing of emissions reductions. Despite this disagreement among economists, in its Fourth Assessment Report the Intergovernmental Panel on Climate Change indicated that a 50 to 85 percent reduction in global greenhouse gas emissions levels was necessary by 2050 (relative to 2000 levels) to “stabilize greenhouse gas emission levels in the atmosphere.” Each of the U.S. Senate’s iterations of a national climate change bill has come closer to achieving the IPCC’s recommendations, suggesting the U.S. Congress is moving toward meeting the environmental goals set forth by this important climate change advisory body. The Bingaman-Specter bill (S. 1766) prescribed a 4 percent decrease economy wide decrease in emissions, relative to 2000 levels, by 2050 independent of action by other countries and a 59 percent decrease should the United States’ five major trading partners adopt comparable policies by the year 2030. The Lieberman-Warner bill (S. 2191) recommended a 17 percent decrease by 2025 and a 42 percent decrease by 2050. The more recent Manager’s Amendment (S. 3036) recommended a 16 percent decrease by 2025 and a 47 percent decrease by 2050. In his most recent budget proposal to Congress, President Obama pledged to decrease greenhouse gas emissions 23 percent by 2025 and 83 percent by 2050 (relative to 2000 levels). Considered as a whole, this timeline suggests that the U.S. Congress is well-informed of the best available scientific data on climate change.

Congress also needs to be careful about a number of forces that could erode the emissions cap, including cost containment mechanisms, border adjustments (or lack thereof), investment incentives, and offsets. Obviously, a price ceiling or “safety valve” for allowances can lead to emissions that exceed the targets. But so, too, can increased imports of energy-intensive primary products from countries without similar greenhouse gas emissions limits. Significant bonuses for Carbon Capture and Storage (CCS), such as the 3.9 billion off-budget allowances in the Lieberman-Warner bill, could also affect the bill’s environmental efficacy. Perhaps most importantly, an offset system with inadequate estimation protocols could seriously – perhaps completely – erode the abatement gains expected under an emissions cap.

With respect to setting and protecting emissions targets, Congress should

- When describing emissions reductions, use economy-wide emissions levels compared to the year 2000 levels. This will facilitate comparison of proposals and is consistent with the format of the IPCC recommendations.
- Consider the emissions reductions recommended by the IPCC.
- Reconsider greenhouse gas emission reduction goals when more robust cost-benefit analysis is available;
- To prevent confusion and unnecessary duplication of efforts, clarify that the new climate legislation completely supplants the Clean Air Act with respect to greenhouse gas emissions; and
- Be both careful and transparent in the use of mechanisms such as price ceilings, reserve allowances, offsets and competitiveness adjustments that could increase emissions beyond the cap.

Cost-Containment Measures

With climate change policy, there is a balance to be struck between environmental goals and costs of compliance, a balance made all the more difficult by uncertainty regarding costs and benefits of greenhouse gas emission reductions. To minimize the costs of compliance there are several available cost containment measures. The primary measure, of course, is the use of a cap-and-trade system itself (or as an alternative, an emissions fee system). In addition provisions for banking of allowances permit firms to postpone the use of an allowance designated for a particular year until a later time if the firm decides doing so will have greater value. In the same manner, in instances where the cost of compliance is greater in the near term, borrowing provisions allow firms to use allowances designated for subsequent years. Finally, a price cap (or safety valve) in its simplest form provides for the release of additional allowances if the market price rises above a preset level, essentially transforming the mechanism into an emissions tax.

Beyond trading provisions, the Bingaman-Specter bill (S. 1766) includes two different cost containment measures. The first, is a simple banking provision. The second is a Technology Accelerator Payment (TAP), a price cap, beginning at \$12/metric ton of carbon dioxide equivalent and increasing by 5 percent above inflation each year so that if the costs of compliance became higher than this price cap, the government would issue additional allowances at this price cap level. With this TAP, emissions could rise significantly above even the modest targets set in the bill. The United States could also limit its opportunities to participate in a global trading system if other countries perceive the United States is not sufficiently limiting its greenhouse gas emissions. However, the price ceiling would provide protection against unexpectedly high compliance costs.

The Lieberman-Warner bill (S. 2191) would allow unlimited banking and permit regulated facilities to cover up to 15 percent of emissions each year with allowances borrowed from their own future allocations at an interest rate of 1.1 times “the number of years beginning after the use year and before the source year.” If implemented as written, this would lead to an

unsatisfactory outcome in which firms paid no interest for the first year and then 110 percent in subsequent years.

The Manager's Amendment (S. 3036) includes numerous cost containment measures, adapting measures present in both the original two bills. The revised bill calls for unlimited banking. It allows regulated entities to cover up to 15 percent of annual emissions with allowances borrowed from up to 5 years from the use year at a 10 percent compound interest rate. The bill includes a cost containment "auction" (a misleading name since the prices are not set by a periodic auction) through which regulated entities can purchase up to 450 million allowances each year from 2012 through 2027 – allowances that are deducted from allowances budgeted for the years 2030 through 2050 – at a price of between \$22 and \$30 per metric ton beginning in 2012 and increasing by 5 percent each year in inflation-adjusted dollars. Finally, the revised bill establishes a Carbon Market Efficiency Board with the discretion to take additional cost-containment measures, including increasing the number of allowances regulated entities can borrow from future allocations, expanding the time period for repayment, and relaxing constraints on the use of foreign allowances and the generation of offset credits. In addition, the Manager's Amendment includes a mirror image of the TAP – a price floor of \$10 per metric ton in 2012 (increasing by 5 percent each year in inflation-adjusted dollars) for the regular auctions so that emissions reductions will occur faster than required under the emissions cap if the costs of compliance are lower than expected.

Although some additional improvements are necessary, the Manager's Amendment clearly improved upon many of the provisions included in its predecessors. It clarified the Senate's intent regarding the borrowing provision originally included in the Lieberman-Warner bill, though the borrowing provisions could be improved as described below. The cost containment auction in the Manager's Amendment represents a modification of the price cap of the Bingaman-Specter bill that provides more environmental protection but less of a check on compliance costs by increasing the trigger price from \$12/metric ton to \$22 to \$30/metric ton, limiting the number of extra allowances that will be issued, and drawing reserve allowances from future allotments. The Manager's Amendment also included a provision for a price floor for allowances sold during regular auctions to ensure that emissions reductions occur more rapidly if compliance costs are lower than anticipated. And finally, the Manager's Amendment gives considerable discretion to the CMEB to tweak these provisions as circumstances require.

Congress could further improve on the Manager's Amendment by:

- Revising the cost containment auction to make it a real annual auction. Congress should also remove the price ceiling from the cost containment auction to avoid the potential for excess demand caused by the fixed supply of allowances.
- Linking the interest rate on borrowing to a benchmark interest rate such as prime interest rate.
- Developing mechanisms to protect against defaulting borrowers. If borrowers have a future allocation of allowances, they can borrow against that allocation as collateral, but

as discussed below, it would be better to auction all allowances. In this case another mechanism to secure loans will be required.

- Paying interest on banked allowances to encourage delays in emissions and the damages they cause.

Point and Scope of Regulation

The point and scope of regulation imbedded in the Manager's Amendment demonstrates that the U.S. Senate has developed a keen understanding of the nature of greenhouse emissions that will hopefully inform the final design of a national climate change program. With greenhouse gas emissions, regulation can occur upstream by regulating companies that produce fossil fuels whose use will eventually result in emissions, or downstream by placing limits on end-users that ultimately produce emissions. The Bingaman-Specter bill regulates carbon dioxide emissions almost entirely upstream so that approximately 85 percent of all emissions are regulated (the exception being coal, which is regulated downstream through electric companies). The Lieberman-Warner bill regulates coal, natural gas, and industrial users of oil downstream, thus regulating only 80 percent of emissions. The Manager's Amendment adopts the Bingaman-Specter bill's regulation scheme but excludes some non-fuel chemicals to be regulated in a parallel policy, thereby regulating approximately 84 percent of greenhouse gas emissions. By regulating a significant percent of greenhouse gas emissions while targeting only a limited number of entities, the Manager's Amendment and Bingaman-Specter bill have reduced administrative complexity and implementation costs relative to the Lieberman-Warner bill.

To cost-effectively reduce carbon emissions, climate legislation should:

- Generally, adopt caps that cover as many sources as is administratively practical, thus maximizing the range of opportunities for cost-effective emissions reductions.
- Target upstream producers – oil refineries, natural gas processors, and coal mines (or at least electric utilities) – to reduce administrative costs and broaden coverage. Controls should be placed at the point in the production chain with the fewest entities.

Incentives for Activities Outside the Covered Facilities

None of the caps in the proposed U.S. Senate bills cover all sources of greenhouse gas emissions. Moreover, it is also possible to remove carbon dioxide from the atmosphere by expanding biomass in forests and agricultural lands (terrestrial sequestration) and to capture carbon dioxide from some electricity generation and industrial processes and permanently store it deep underground (geological sequestration). The bills include measures to encourage emission reductions among facilities not regulated by the legislation and to provide incentives for terrestrial and geological sequestration of carbon dioxide. All three bills include provisions to reward a range of domestic offset projects; allowances and offset credits obtained from foreign markets; early action; carbon capture and sequestration projects (CCS); and agriculture and forestry projects.

These rewards/incentives can be categorized as on-budget, meaning they reward behavior with allowances accounted for in the bills' annual budgets; or off-budget, meaning they create new

allowances outside the budget. The incentives can also be categorized as output-based, meaning they employ careful measurement to ensure that rewards are proportional to the emissions reductions or sequestration achieved by the activity; or input-based, meaning they simply provide rewards for potentially beneficial activities. Output-based approaches are generally more likely to result in actual emissions reductions or sequestration than input-based approaches. At the same time, off-budget activities are likely to have a negative impact on greenhouse gas emissions if reductions and sequestration are not carefully measured.

While the original climate change bills use various combinations of input-based and output-based approaches, the Manager's Amendment uses only output-based measurement strategies. Moreover, the Manager's Amendment, unlike its predecessors, requires that any offset estimation methodologies issued by the Administrator of the Environmental Protection Agency must not only be tested to demonstrate that the reductions in emissions be "real, permanent, additional, and verifiable," but also that the estimates must be independently reproducible. This will substantially increase the credibility of the offset provisions.

For some categories of activities, however, it may not be possible (or may be prohibitively difficult) to develop methodologies that meet this standard. If it is important to promote activities in those categories, then a mechanism other than the offset approach may be appropriate.

Some additional improvements need to be made to the Manager's Amendment including:

- Clarify that all offset project developers must use the approved methodologies developed by the Administrator to estimate the amount of emissions reduction or carbon sequestration.
- Clarify that the same estimation methods apply to international offset projects.
- Clarify that the same standards for independent reproducibility in offset estimation methods apply to agriculture and forestry projects that do not fall in the established offset categories.
- Because of the difficulty in estimating agriculture and forestry sequestration projects, consider removing those categories of projects from the domestic and international offset programs entirely and funding them under Farm Bill and international financial aid types of provisions.

Distribution of Allowances and Auction Revenue

The economics literature provides a clear prescription to auction allowances and recycle the revenue into the public finance system – reducing taxes or government deficits. The Manager's Amendment comes closer to adopting that widely accepted prescription. It could be improved, however, by expanding the auction, recycling more of the revenue, removing all provisions that interfere with the price signal, and addressing regional equity concerns by selective recycling of revenues through the state tax systems.

Under a cap-and-trade program, emissions are restricted by limiting the number of allowances available and requiring that a covered entity submit one allowance for every metric ton of carbon

dioxide equivalent emitted. Allowances established under the three Senate cap-and-trade bills would be either directly allocated (given away) or auctioned. The allowances that are allocated are either given to covered facilities based on their past emissions levels or number of employees, or directed for public purposes (e.g. given to the states, agriculture, international forestry). The revenues from the auctioned allowances are either earmarked for various public purposes (e.g. low-income energy assistance, technology development) or used for revenue-raising purposes (e.g. tax reductions, national debt relief).

From a policy perspective, the ideal approach is to auction all allowances and direct the revenue to lower taxes, or alternatively, reduce deficits, and pay back debt. The Manager's Amendment was the only Senate bill inclined toward this approach, directing a portion of the program's auction revenues to deficit reduction. The revised bill also wisely eliminated the 3.9 billion off-budget allowances designed to provide bonuses for the development of carbon capture and sequestration projects. At the same time, the Manager's Amendment still provides unnecessary incentives aimed at rewarding covered entities for past activities. It also complicates the allocation scheme by both grandfathering and auctioning allowances for the same purposes (i.e. adaptation, technology, states, and CCS) when choosing one distribution method would simplify program administration. Finally, the Manager's Amendment perpetuates price distortions from its predecessors by allowing electric companies and the states to use allowances to decrease transmission charges. These allowances should be used to provide rebates or tax cuts unrelated to energy usage if they are to have their intended effect of decreasing demand for energy.

To promote cost-effective reductions in greenhouse gas emissions, climate legislation should:

- Auction all allowances and direct the revenues to contribute to general funds that lower distortionary taxes, reduce the federal deficit, or pay down government debt.
- If, for political purposes, it is necessary to address regional differences in economic impacts of the climate legislation, the revenues from the auctions should be directed to state treasuries to reduce distortionary state taxes or address other public finance needs.
- Avoid measures that dampen the price signal (i.e., the increase in the cost of greenhouse gas emissions) including those provisions that would (1) allocate allowances to electric utilities in states with ratemaking controls, (2) provide bonus allowances for specific technologies such as carbon capture and storage, (3) subsidize firms in the electric and manufacturing sectors by reserving allowances for new entrants, and (4) assist low- and middle- income families through reduced electricity charges.
- Aid low- and middle-income families via direct payments or reductions in their taxes that do not induce them to consume more energy.
- Avoid transfers to electric utilities that are not subject to ratemaking as this will mostly benefit the shareholders without any gain in efficiency.
- Avoid the long-term technological lock-in that arises from long-term bonus allowance provisions for CCS; rather, to promote technological development, provide short- to medium-term R&D and capital investment incentives, then allow new technologies to compete under the prevailing price signal.
- If it is necessary for Congress to engage in earmarking or even direct allocation to promote public goals, choose either one or the other of the two approaches to promote transparency.

Addressing Leakage and Competitiveness

If the United States implements a national climate change policy while other countries do not, it is possible that there will be counterproductive market responses to the change in the cost structure of U.S. companies. This will disadvantage U.S. products in both domestic and foreign markets, leading to increased imports and decreased exports. That may induce some companies to transfer their operations to countries that do not have greenhouse gas emissions regulation. The concern about the loss of U.S. industry competitiveness is compounded by the fact that a shift to overseas production facilities would decrease the effectiveness of the U.S. emissions policy.

As a result of these concerns – competitiveness and emissions leakage – there has been significant attention devoted to designing a border adjustment system for the U.S. climate change program. All three of the U.S. Senate bills grandfather allowances to affected industries based on historical emissions, require importers of greenhouse gas intensive primary products to purchase international reserve allowances to cover the emissions associated with their products, and include some level of adjustment for the import and export of petroleum- and coal-based fuels and non-fuel chemicals (under the cap).

It appears that aside from a few key industries, leakage is a fairly limited problem. Furthermore, there are substantial legal barriers and implementation costs associated with developing trade restrictions that would curtail carbon leakage and level the competitive field. This report examines a number of different provisions for border adjustment, arriving at several conclusions:

- Consider whether the international reserve allowances should be under or separate from the cap.
- Avoid direct allocation of allowances, either through grandfathering allowances based on historic emissions or providing a “home rebate” based on current output levels.
- Use full border adjustment to address leakage and competitiveness issues, which would entail requiring importers of energy intensive primary products to acquire allowances equivalent to the emissions involved in the production of the goods and providing credits to cover the emissions associated with energy intensive primary products that are exported.
- To contain implementation costs Congress should include border adjustments only for those energy intensive industries subject to the greatest international trade competition.
- To address the legal barriers, Congress should include a clear statement that the provisions are designed for environmental protection, eliminate grandfathering of domestic allowances, and provide additional opportunities to appeal decisions regarding the regulation of imported goods.

Examining the progression of the U.S. Senate climate change bills during the 110th Congress provides a valuable guide to the essential elements of climate legislation. Identifying useful improvements to these bills could help the U.S. Congress to develop an even more effective national climate change program during the 111th Congress. It may also be useful to other nations that are grappling with similar issues around the design of domestic climate change legislation.

I. Introduction¹

Despite concerns with the United States' current financial conditions, climate change remains at the forefront of our national policy agenda. Following several months of inaction on a climate change bill, the issue moved to the forefront of the U.S. policy agenda again in early 2009.

On February 17, 2009 the EPA began its reconsideration of whether carbon dioxide should be regulated as a criteria pollutant under the Clean Air Act.² The very next week during a joint session of Congress, President Obama asked Congress to send him cap-and-trade legislation that limits carbon emissions.³ Just days later in his first budget proposal, President Obama included a provision to reduce greenhouse gas emissions by 23 percent below 2000 levels by the year 2025 and by 83 percent, by the year 2050.⁴ On April 17, the EPA issued a proposed endangerment finding for greenhouse gases and will begin a period of public comment before beginning the regulation process.⁵

In close tandem, the U.S. House of Representatives took the lead in legislative efforts to address climate change. On June 26, 2009 the House of Representatives passed the Waxman-Markey bill,⁶ which borrows heavily from the Dingell-Boucher discussion draft from last October and the recommendations of the U.S. Climate Action Partnership.⁷ This shifts the focus of attention and discussion to the Senate. Throughout this process, Obama staff members have been meeting with the "Gang of 16", moderate Senators who expressed reservations about the cap-and-trade approach during the 110th Congress, with the hope of influencing the national climate change program. Politically, the Gang of 16 could prove critical in overcoming resistance to climate change legislation during the 111th Congress.⁸

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² "EPA Administrator Jackson Orders Review of Key Clean Air Document." February 17, 2009. <http://yosemite.epa.gov/opa/admpress.nsf/6424ac1caa800aab85257359003f5337/3274377ad2d9fc42852575600077efb5!OpenDocument> (Last visited April 29, 2009).

³ "Remarks of President Barack Obama – Address to Joint Session of Congress." February 24, 2009. http://www.whitehouse.gov/the_press_office/remarks-of-president-barack-obama-address-to-joint-session-of-congress/ (Last visited April 29, 2009).

⁴ "Inside Obama's First Budget." February 26, 2009. <http://www.npr.org/news/specials/2009/budget/> (Last visited April 29, 2009).

⁵ "EPA Finds Greenhouse Gases Pose Threat to Public Health, Welfare / Proposed Finding Comes in Response to 2007 Supreme Court Ruling." April 17, 2009. <http://yosemite.epa.gov/opa/admpress.nsf/0/0EF7DF675805295D8525759B00566924> (Last visited April 29, 2009).

⁶ H.R. 2454, 111th Congress (2009).

⁷ "Chairmen Waxman and Markey Release Draft Climate Change and Clean Energy Legislation." April 3, 2009. <http://www.vnf.com/news-alerts-347.html> (Last visited April 29, 2009).

⁸ "Weekly Climate Change Update – April 13, 2009." <http://www.vnf.com/news-policyupdates-353.html> (Last visited April 29, 2009); "Moderate Senate Dems build 'Gang of 16' to influence cap-and-trade bill." <http://climateprogress.org/2008/10/04/moderate-senate-dems-build-gang-of-16-to-influence-cap-and-trade-bill/> (Last visited April 29, 2009).

While the debate has developed particular salience with the threat of regulation under the Clean Air Act, Congress has carefully considered this issue before. For much of the 110th Congress there were two leading broad-based, cap-and-trade climate change bills in the U.S. Senate - the Low Carbon Economy Act of 2007 (Bingaman-Specter bill)⁹ and America's Climate Security Act of 2007 (Lieberman-Warner bill).¹⁰ The Bingaman-Specter bill, S.1766, was introduced after Senator Bingaman (D-N.M.) circulated a draft bill based on a report developed by the National Commission on Energy Policy.¹¹ The Lieberman-Warner bill, S.2191, was the successor to the McCain-Lieberman bill, one of the first broad climate change bills introduced in Congress. As these two bills evolved they showed convergence from their earlier incarnations, but substantial differences between them remained.

On May 20, 2008 Senator Boxer, Chair of the Senate Committee on Environment and Public Works, introduced a Manager's Amendment to the Lieberman-Warner bill. In fact, while the new version retained the short title "Lieberman-Warner Climate Security Act of 2008" and is described by many as a modification of S.2191, the newer legislative language itself describes the change as a complete substitute and is embodied under a new bill number, S.3036. The new bill is better understood as a blending of many of the features of both the Bingaman-Specter bill and the original Lieberman-Warner bill, with several amendments adopted from other parties.

As Congress and the Obama Administration craft new legislation for the 111th Congress, there are many lessons available from a close examination of the Senate bills in the 110th Congress. First, compared side-by-side, the bills indicate the major issues that must be addressed in any climate legislation. This exercise can help assure that successors are appropriately comprehensive in scope.

Second, the release of the Manager's Amendment, S.3036, provides an opportunity to consider which elements of the two predecessors the Senate chose to adopt. This, in turn, provides a basis for evaluating whether the successor to the first two bills represents an improvement over the previous versions – legislative evolutionary progress, so to speak.

Third, the gradual improvements notwithstanding, there are several issues in all three bills that could benefit from further refinement. It is important to recognize those opportunities and build toward still more efficient and effective legislation.

The purpose of this report is to provide insight into the most important features of the Bingaman-Specter bill (S.1766), the Lieberman-Warner bill, (S.2191) and the Manager's Amendment (S.3036)¹² from the 110th Congress. Applying fundamental principles of policy analysis and program design, the analysis offers discussions of the differences among the bills, the strengths and weaknesses of each, the general direction of change, and recommendations intended to improve Congress' final product.

⁹ S. 1766, 110th Cong. (2007).

¹⁰ S. 2191, 110th Cong. (2007).

¹¹ "Energy Commission Praises Bingaman-Specter Legislation to Reduce US GHG Emissions." July 11, 2007. <http://www.energycommission.org/ht/display/ReleaseDetails/i/1547/pid/500> (Last visited April 29, 2009).

¹² Although S.3036 is also known as the Lieberman-Warner bill, for purposes of clarity, it will heretofore be referred to as the Manager's Amendment to distinguish it from S.2191.

The underlying principles that guide the analysis are (1) regardless of the emissions targets Congress adopts, the program should be implemented in the most cost-effective manner possible; and (2) while politics may compel Congress to adopt measures that are less than optimal from a cost-effectiveness perspective, lawmakers should at least be aware that the political compromise involves a cost to society relative to “best” policy practices.

The results of the analysis are pleasantly surprising. While there remains substantial room for improvement from a policy efficiency perspective, the Manager’s Amendment has incorporated many sound policy principles. Some of the improvements include:

- Auction of a portion of allowances for revenue-raising and assignment of those auction revenues to the Deficit Reduction Fund;¹³
- A requirement that any estimation methodologies adopted to measure the achievements of offsets lead to independently reproducible results when tested by teams of experts;
- Adoption of a predominantly upstream point of regulation for carbon emissions reductions;
- Reduction in the number of provisions that interfere with the price signal that forms the very basis of the cap-and-trade system, particularly by potentially reducing the use of subsidies to low-income consumers and reducing the magnitude of the CCS bonus allowances;
- An environmental safety valve that places a minimum price below which the government will not sell allowances at auction;
- Adoption of a cost containment mechanism that also protects environmental efficacy;
- Improved integrity of the emissions targets by elimination of the nearly four billion tons of allowances that comprised the initial balance in the account for CCS bonuses under the Lieberman-Warner bill;
- Reduced technological lock-in, particularly by decreasing the number of allowances designated for CCS and auction revenues earmarked for specific technology programs;
- Acknowledgement of the critical relation between the pending climate change legislation and the Clean Air Act;
- Smoothing the reductions in national emissions required in the first year by the initial Lieberman-Warner bill;
- An increased emphasis on adaptation and individual consumer choices; and
- A clearer approach to address international competitiveness and emissions leakage through border adjustment.

Section II summarizes key criteria used by economists to evaluate policy options. Sections III to VIII of this report are organized around the major design features of each of the three bills: emissions reduction targets; cost-containment mechanisms; point and scope of regulation; incentives for activities outside the covered facilities; the distribution of allowances and auction revenues; and mechanisms to address border adjustments for leakage and competitiveness. Each section describes the provisions of the three bills, discusses the implications of those provisions, and makes recommendations for potential improvements in Congress’ final climate change bill. Section IX provides a synthesis of the results and conclusions.

¹³ S. 3036 §1401.

II. Policy Perspective

To compare the Senate climate change bills, this study employs a descriptive approach, designed to highlight many of the key elements of the legislation. We have particularly tried to highlight the most critical differences among the bills. This alone is an important exercise because it demonstrates different approaches that the Senate used in the 110th Congress, and illustrates how that chamber's approach evolved over the two-year period. However, the real emphasis of this analysis is to examine whether the bills incorporate sound policy principles in their design. This invites at least a brief discussion of what these principles entail.¹⁴

Appropriate Targets

The first step for sound environmental policy development is to choose appropriate targets or goals. In the case of climate change legislation this would include delineating which greenhouse gases are covered and what levels of emissions will be allowed. Ideally, pollution emissions levels are set at a point where the costs of abating an additional unit of pollution are just equal to the benefits of abating that unit.¹⁵ It is often the case, however, that there is simply insufficient information to develop a convincing cost-benefit analysis. In this case, decision makers must rely even more heavily on judgment, politics and focal points.

Cost-effective Abatement

Whatever the environmental emissions target chosen, sound policy seeks to achieve those levels at the lowest possible costs to society. First and foremost, this means that the policy must encourage parties to adopt the least-cost emissions reduction options before moving on to more costly options. Cost-effectiveness is promoted by a few related provisions that, taken together, seek to cover as many sources as possible and to get each to contribute to the point where the cost of an additional unit of reductions is the same for each.

Equal Marginal Abatement Costs

The primary condition necessary for cost-effectiveness is that the costs of additional abatement across all polluting parties are equal.¹⁶ In the case of a pollutant as ubiquitous as carbon dioxide, everyone is a polluting party. Unfortunately, many environmental policies do not lead to this condition of equal costs. For example, because of the wide range of applications involved, mandating performance standards for electricity generation and minimum biofuels content for transportation fuels is unlikely to lead to equal marginal costs within the application of the standard, and even less so between standards.¹⁷

¹⁴ The principles incorporated here draw heavily upon the more detailed discussion provided by Kenneth R. Richards. 2000. "Framing Environmental Policy Instrument Choice," *Duke Environmental Law & Policy Forum* 10: 221-285.

¹⁵ In economics, this is described as the point where marginal abatement costs equal marginal abatement benefits.

¹⁶ In economics, this is known as the equimarginal condition – equal marginal costs of abatement across all firms that have additional abatement opportunities.

¹⁷ For a discussion of the optimal level and distribution of pollution abatement, see Chapter 12 on "Efficiency of Policy Instruments" in Thomas Sterner. 2003. *Policy Instruments for Environmental and Natural Resource Management*. Washington, DC: Resources for the Future; Robert W. Hahn and Robert N. Stavins. 1992. "Economic

It is well established that price signals – either in the form of marketable allowance prices or emissions taxes – are one of the best mechanisms for inducing abatement to a point where the cost of an additional unit of reduction is roughly equal across all parties.¹⁸ This result, however, is based on assumptions that all the parties know what their costs and their options are for making reductions, that there are no barriers to the price signal passing through the production chain, and that all parties with opportunities for reduction are covered by the regulatory system.

Incentives for Innovation

To the extent possible, sound policy implementation also provides incentives for innovation for the development and diffusion of new practices and technologies.¹⁹ The more prescriptive approaches such as technology specifying regulations tend to emphasize compliance over innovation. In contrast, the incentive-based approaches such as taxes and marketable allowances provide rewards to innovation through lower costs.

Broad Coverage – Pollutants

Climate change is a complex global phenomenon. While carbon dioxide is the primary greenhouse gas, many other gases contribute as well, including methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Cost-effectiveness is promoted by including as many gases as possible because this provides more opportunities for low-cost abatement.²⁰

Sound policy, then, would first establish the relative impact of each of the greenhouse gases on climate change. This is generally addressed by assessing the “global warming potential” of each greenhouse gas relative to carbon dioxide on a weighted basis. By this accounting, for example, methane has a 100-year global warming potential of 21, meaning that a ton of methane has 21 times as much impact on climate change as a ton of carbon dioxide.²¹ Often times the expression “carbon dioxide equivalent” (CO₂-e) is used to express this relation.

Having established the relative impact of a ton of each greenhouse gas, the next step is to establish provisions that would induce reductions to the point where the ratio of the cost of additional reductions of a greenhouse gas to the cost of additional carbon dioxide reductions is equal to its CO₂-e ratio.

Incentives for Environmental Protection: Integrating Theory and Practice.” *American Economic Review* 82(2): 464-468; and Robert N. Stavins. 2001. “Lessons From the American Experiment With Market-Based Environmental Policies.” Resources for the Future. Discussion Paper 01–53. Washington, D.C.

¹⁸ See for example Chapter 12 on “Efficiency of Policy Instruments” in Thomas Sterner. 2003. *Policy Instruments for Environmental and Natural Resource Management*. Washington, DC: Resources for the Future.

¹⁹ Kenneth R. Richards. 2000. “Framing Environmental Policy Instrument Choice,” *Duke Environmental Law & Policy Forum* 10: 221-285; Robert W. Hahn and Robert N. Stavins. 1992. “Economic Incentives for Environmental Protection: Integrating Theory and Practice.” *American Economic Review* 82(2): 464-468.

²⁰ J.M. Reilly, H. D. Jacoby, and R.G. Prinn. 2003. “Multi-Gas Contributors to Global Climate Change: Climate Impacts and Mitigation Costs of Non-CO Gases.” Pew Center on Global Climate Change. Arlington, VA.

²¹ United Nations Framework Convention on Climate Change. “Global Warming Potentials.” http://unfccc.int/ghg_data/items/3825.php (last visited May 19, 2009).

Broad Coverage – Economic Sectors

Just as sound policy should attempt to cover as many greenhouse gases as is practical, for the same reason it should also cover as much of the economy as feasible (subject to administrative costs as discussed below). Covering more facilities provides more opportunities for low-cost emissions reductions. For a given level of emissions reduction, it will be less expensive to achieve the goal with reductions across the electricity, transportation, manufacturing, commercial and residential sectors than from any one sector alone.²²

Administrative Costs

While most environmental economics studies focus on the costs of the abatement activities themselves, it is also important to consider administrative costs associated with a given policy option. The administrative costs include the costs of establishing the program, setting up the bureaucracy, educating covered parties, monitoring emissions and compliance, and taking enforcement action against violators. They also include the government's costs of making credible commitments to maintain the system so that long-term investments are protected.²³

All other things being equal, sound policy seeks approaches that minimize the administrative burden. Generally this means there is a preference for approaches that achieve the same effects as the alternatives, but require monitoring fewer parties and use more readily available information.

Clearly, there is a trade off between the breadth of a program's coverage of gases and emissions sources and the administrative costs. Controlling the largest sources and the primary gases, particularly CO₂ in the case of climate change, will be administratively simpler than controlling many small or scattered sources of less significant gases.

Public Finance Impacts

The government can use a variety of policy tools to influence emissions – taxes, subsidies, standards, quotas, marketable allowances and others. Generally, when the government imposes taxes to raise revenue, it creates what economists call "deadweight loss," inefficiencies that result from distorting prices in otherwise efficient markets for labor, capital, goods, or property. It is also generally true that if the government wants to discourage an activity such as pollution it is more efficient to do this with a revenue-raising approach such as emissions fees or auctioned allowances. This is because the tax (or other imposed price) is driving the activity toward its efficient level, not away from it.

But the use of the revenue is critical to this conclusion. To gain the social benefits of the environmental taxes or auctioned allowances, the revenues need to be used in a way that reduces

²² C. Fischer et al., "Using Emissions Trading to Regulate U.S. GHG Emissions—Part 1 of 2: Basic Policy Design and Implementation Issues." <http://www.rff.org/rff/Documents/RFF-CCIB-10.pdf> (Last visited April 29, 2009).

²³ See Kenneth Richards. 2000. "Framing Environmental Policy Instrument Choice," *Duke Environmental Law & Policy Forum* 10:221-285; *Evaluating Economic Instruments for Environmental Policy*. 1997. Paris, France: Organisation for Economic Co-operation and Development; and C.S. Russell. 2001. "Monitoring, Enforcement, and the Choice of Environmental Policy Instruments," *Regional Environmental Change*. Volume 2: 73 – 76.

distortionary taxes such as income tax or payroll taxes. That can be achieved by directly linking the revenues from environmental taxes or auctioned allowances to reductions in marginal income taxes – a “revenue-neutral” approach.²⁴

Environmental Efficacy

Sound policy also seeks a system that provides an appropriate level of assurance that the environmental goal will be met.²⁵ If it is critical that the environmental goal is met – that a particular emissions level is not exceeded – then use of an approach that strictly limits emissions is preferred. If there is flexibility in the environmental goal, then the policy can accommodate tradeoffs between the certainty of reaching a particular target and other factors such as the goal of not exceeding a particular cost.

Relation to Other Laws

New environmental programs are seldom enacted in a vacuum. At a minimum, all legislation in the United States must comply with constitutional provisions such as the Commerce Clause and the Takings Clause.²⁶ Moreover, new legislation should be crafted to avoid conflict with existing legislation or regulations. For example, the Clean Air Act could impinge on some of the areas that might be covered by new climate legislation.

Perhaps most significantly, it is important that the provisions of domestic legislation withstand any challenges based on international trade law under the WTO. Moreover, in the case of climate legislation in particular, sound policy would require that the new program be designed to accommodate existing or emerging international agreements to which the United States is, or might become, a party. In this sense, sound policy requires a structure that anticipates integration within an international system.

Political Feasibility and Equity

New environmental programs are not developed in a vacuum; rather they emerge from a political process. To this end sound policy must acknowledge political constraints arising from distributional issues (who gains, who pays), differences in values, or differences in beliefs about outcomes.²⁷ The distributional issues can take the form of regional or income class equity. Because the low-income households spend a greater percent of their income on energy than do

²⁴For more discussion on the public finance impacts of environmental policy, please see *Evaluating Economic Instruments for Environmental Policy*. 1997. Paris, France: Organisation for Economic Co-operation and Development; Ian W.H. Parry and Robertson C. Williams III. “A Second Best Evaluation of Eight Policy Instruments to Reduce Carbon Emissions. 1999. *Resource and Energy Economics* Volume 21: 347-373.

²⁵ Kenneth Richards. 2000. “Framing Environmental Policy Instrument Choice,” *Duke Environmental Law & Policy Forum* 10: 221-285; and *Instruments for Environmental Policy*. 1997. Paris, France: Organisation for Economic Co-operation and Development.

²⁶ *Id.*

²⁷ For more on the politics of environmental policy, please see Nathaniel O. Keohane, Richard. L. Revesz and Robert N. Stavins. 1998. “The Choice of Regulatory Instruments in Environmental Policy,” *Harvard Environmental Law Review*. Volume 22: 313-367; and Chapter 16 on “Politics and Psychology of Policy Instruments,” in Thomas Sterner. 2003. *Policy Instruments for Environmental and Natural Resource Management*. Washington, DC: Resources for the Future.

high-income households, they will be hit particularly hard by a rise in energy prices. Similarly, Midwest states will bear a greater part of the cost of carbon dioxide emissions reductions because they are more reliant on coal than their coastal counterparts.

Sound policy must accommodate political realities. At the same time the best policies seek to structure that accommodation with as little compromise of the cost-effectiveness principles as possible.

III. Emissions Reduction Targets

The emissions targets incorporated into the broad-based climate change bills are perhaps the most visible, and therefore the most politically volatile, attribute of the legislation. In an ideal world of policy formation we would turn to cost-benefit analyses for estimates of the environmental benefits and emissions abatement costs associated with various levels of emissions reductions. The appropriate target is the one where the damages associated with slightly higher emissions are just equal to the costs of avoiding those emissions.

In the real world, the impacts of climate change and the corresponding estimates of optimal emissions levels for greenhouse gases have been highly uncertain.²⁸ A practical alternative to the economist's optimization exercise is to identify targets that limit damage to an "acceptable" level and are economically manageable. One place that policy makers and government officials turn is the authoritative Intergovernmental Panel on Climate Change, whose most recent assessment report calls for 50 to 85 percent reductions in global GHG emissions relative to 2000 levels by 2050, stabilizing atmospheric concentrations of carbon dioxide at 445 to 490 parts per million.²⁹ While the IPCC prescription refers to global emissions levels, much of the United States' domestic public debate about targets has focused on these recommendations. All three of the proposed climate change bills use these figures as a focal point.³⁰

Because of the challenges associated with calculating an optimal level of emissions reductions, an appropriate target for U.S. greenhouse gas emissions reductions levels may be determined by political decision as was the case with SO₂ emissions.³¹ While this analysis has little in the way of concrete recommendations in this area, leaving the choice of targets to the political process, it is important to understand the differences among the three bills.

1. Provisions

The three major climate change bills in the U.S. Senate are cap-and-trade legislation, with the important goal of minimizing the costs of achieving their established environmental objectives. The basic concept of cap-and-trade legislation is that a specified number of allowances are issued. Covered facilities are required to hold allowances equal to their greenhouse gas emissions levels. Facilities are permitted to buy and sell allowances from each other to minimize the costs of compliance.

²⁸ William D. Nordhaus. 1993. "Reflections on the Economics of Climate Change," *Journal of Economic Perspectives* 7(4): 11-25.

²⁹ D. Gordon et al., *Findings of the IPCC Fourth Assessment Report: Climate Change Mitigation*, http://www.ucsusa.org/global_warming/science_and_impacts/science/findings-of-the-ipcc-fourth-1.html (Last visited April 29, 2009). For the United States to contribute proportionately to a global reduction of 50 to 85 percent below 2000 levels, the country would have to reduce its annual emission of greenhouse gases to between 1,047 and 3,489 million metric tons of CO₂-equivalent.

³⁰ S. 1766, §2; S. 2191, §2; S.3036, §2.

³¹ Robert N. Stavins. 1998. "What Can We Learn from the Grand Policy Experiment?: Lessons from SO₂ Allowance Trading," *Journal of Economic Perspectives* 12(3): 69-88.

In the case of emissions reductions, the bills could differ in several ways: (1) gases covered; (2) number of allowances issued; (3) timetables for reductions; and (4) sectors covered. While all three bills cover all greenhouse gases, they differ substantially in terms of targets, timetables, and covered facilities for GHG emissions reductions (Figure 1).³²

All three bills cover six basic greenhouse gases (GHGs): carbon dioxide (CO₂); methane; nitrous oxide; hydrofluorocarbons; perfluorocarbons; and sulfur hexafluoride. The Bingaman-Specter bill and the Lieberman-Warner bill explicitly regulate all six greenhouse gases; whereas, the Manager's Amendment calls for the regulation of hydrofluorocarbons in separate, parallel legislation. This broad coverage has important implications for the cost-effectiveness of the bills because it maximizes the opportunities to identify the covered entities with the lowest marginal abatement costs.³³

a. Bingaman-Specter

The Bingaman-Specter bill allows the President to adjust environmental goals based on the actions of the United States' major trading partners, which means the bill could result in either the most modest or the most ambitious environmental objectives of the three bills. Under the basic scenario, the Bingaman-Specter bill would result in a 1 percent increase in GHG emission levels relative to 2000 levels by 2025 and a 4 percent reduction in emissions by 2050 for the entire economy (Figure 1).³⁴ However, the President has the authority to direct the United States to further reduce annual emissions if the five largest trading partners of the United States take comparable actions to reduce GHG emissions.³⁵ If the President adopts the more stringent conditional targets the United States could achieve a 59 percent reduction in GHG levels by 2050 (relative to 2000 emissions).³⁶

³² The Appendix outlines the methods used to derive the projected emission levels discussed in this section. Also, this section discusses the breadth of coverage of each bill. Section V will provide a more detailed discussion of which specific types of facilities are regulated.

³³ J.M. Reilly, H. D. Jacoby, and R.G. Prinn. 2003. "Multi-Gas Contributors to Global Climate Change: Climate Impacts and Mitigation Costs of Non-CO Gases." Pew Center on Global Climate Change. Arlington, VA.

³⁴ S. 1766, 110th Cong. §101.

³⁵ *Id.*, §501. The President is authorized to make a decision in 2030 to mandate reductions of at least 60 percent below 2006 levels by 2050.

³⁶ *Id.* §101, §501. 2006 U.S. GHG emissions levels were 7,076 million metric tons of carbon dioxide equivalent. If the President is allowed to mandate reductions to 60 percent below this level, emissions would be 2,830 million metric tons of CO₂ equivalent in 2050. Since 2000 emission levels were 6,978 million metric tons, the reduction would be equivalent to 59 percent below 2000 levels.

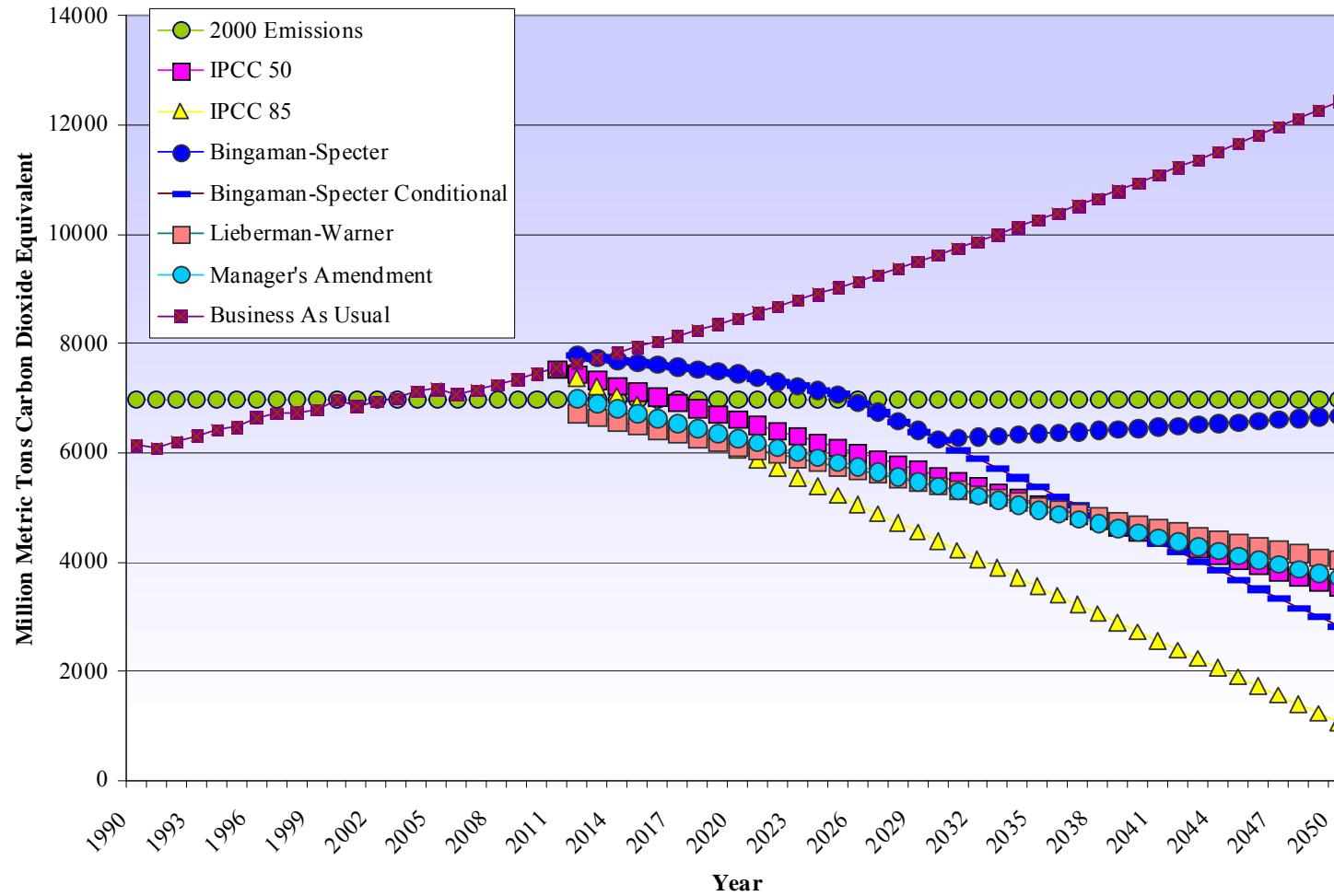


Figure 1: Anticipated GHG Emissions under Proposed Climate Change Legislation

Sources:

S. 2191, 110th Cong. §1201; S. 1766, 110th Cong. §101; S. 3036, 110th Cong. §201; Energy Information Administration. U.S. Carbon Dioxide Emissions from Energy for 1990-2006 provided by EIA. <http://www.eia.doe.gov/oiaf/1605/ggrpt/excel/tbl1.xls> (Last visited April 29, 2009); Office of Atmospheric Programs, U.S. EPA. EPA Analysis of the Low Carbon Economy Act of 2007. http://www.epa.gov/climatechange/economics/pdfs/S1766_EPA_Analysis.pdf (Last visited April 29, 2009); World Resources Institute. *Assumptions and Methodology of Comparison of Legislative Climate Change Targets in the 110th Congress*. http://pdf.wri.org/usclimatetargets_071207.pdf (Last visited April 29, 2009); D. Gordon et al. *Findings of the IPCC Fourth Assessment Report: Climate Change Mitigation*. http://www.ucsusa.org/global_warming/science_and_impacts/science/findings-of-the-ipcc-fourth-1.html (Last visited April 29, 2009). **For more information on the data and methods used in constructing Figure 1, please see the Appendix.**

b. Lieberman-Warner

The Lieberman-Warner bill includes ambitious environmental objectives, though it still falls shy of the goals recommended by the IPCC. The Lieberman-Warner bill would achieve a 17 percent reduction in GHG emission levels (below 2000 levels) by 2025 and a 42 percent reduction by 2050 for the entire economy, whereas the IPCC recommended 50 to 85 percent reductions by the year 2050 (Figure 1).³⁷ The Lieberman-Warner bill also includes

substantial incentives for carbon capture and storage technology in the form of bonus allowances that give away as much as 4.5 tons of allowances for every ton of carbon emissions avoided via CCS.³⁸ As will be elaborated upon in Sections VI and VII of this paper, the Lieberman-Warner bill includes a CCS bonus allowance account with a starting balance of 3,932,160,000 emission allowances.³⁹ Potentially, this account could increase the total level of emissions, particularly during the early years of the program.

Box 1: Greenhouse Gas Emissions Under S. 2191 and S. 3036

	Greenhouse Gas Emissions in million metric tons CO₂ equivalent	
Year	S. 2191	S. 3036
2000	6,978	6,978
2011	7,448	7,448
2012	6,728	6,998
2025	5,757	5,836
2050	4,047	3,722

c. The Manager’s Amendment

The Manager’s Amendment provides a compromise approach to emission targets⁴⁰ by combining the sector coverage of the Bingaman-Specter bill with the emissions reduction goals of the Lieberman-Warner bill, while adjusting required reductions in early years to limit transition pains (Figure 1 and Box 1).

By expanding its sector coverage, the Manager’s Amendment places caps on approximately 84 percent of total greenhouse gas emissions.⁴¹ Also, the Manager’s Amendment reduces the emissions reduction required between 2011 and 2012; Lieberman-Warner would have required a reduction of nearly 11 percent in one year, whereas the Manager’s Amendment requires just over a 7 percent reduction.

³⁷ S. 2191, 110th Cong. §1201.

³⁸ *Id.*, §3603.

³⁹ *Id.*, §3601.

⁴⁰ S.3036, 110th Congress §201.

⁴¹ Since HFCs currently contribute to less than one percent of total U.S. greenhouse gas emissions, the Manager’s Amendment sector coverage has been assumed to be equal to that of the Bingaman-Specter bill minus one percent. For more information, please see Science Daily. “Beyond Carbon Dioxide: Growing Importance Of Hydrofluorocarbons (HFCs) In Climate Warming.” July 9, 2009. <http://www.sciencedaily.com/releases/2009/06/090622171503.htm> (Last visited July 13, 2009).

2. Discussion and Recommendations

Given the uncertainties surrounding the impacts of climate change and the costs of abatement, it is difficult for economists to prescribe an “optimal level” of greenhouse gas emissions abatement. While economists’ modeling attempts have yielded very different results, they have tended to include modest reductions in the short-term followed by deeper reductions in the medium- and long-term⁴² as are included in the Lieberman-Warner bill and the Manager’s Amendment. It is interesting to note, however, that in the case of SO₂ emissions trading, the environmental objective was based on a political decision rather than precise economic modeling. In his analysis of the SO₂ trading program, Stavins points out that one of the reasons this trading program was so successful was economists focused on determining the most cost-effective means of achieving the environmental goal rather than entrenching themselves in identifying the “optimal level” of abatement.⁴³

Similarly, this report will focus on merely contributing to a better understanding of the different political goals embedded in the U.S. Senate climate change bills. After all, because of the long time-frame associated with this policy it is always possible that Congress could reconsider the environmental goals of the program when additional information is available about the costs

and benefits of emissions abatement. One of the primary advantages of a tradable permit system is its relative flexibility since the government can change the environmental objectives by adjusting the cap over time to provide a smaller or larger number of allowances.⁴⁴

To fully understand the environmental objectives of these bills, it is important to evaluate all three bills using comparable emission reduction measures. There have been many differing

Box 2: Reports of Emissions Reductions from Manager’s Amendment	
Richards & Richards	Pew Center
47% Emission Reductions by 2050	71% Emission Reductions by 2050
Base Year: 2000 Coverage: Entire Economy	Base Year: 2005 Coverage: Capped Sectors
<small>Source: Pew Center. 2008. “Summary of the Boxer Substitute Amendment to the Lieberman-Warner Climate Security Act.” http://www.pewclimate.org/docUploads/L-WFullSummary.pdf; Richards and Richards. 2008. “An Analysis of the Leading Climate Change Bills in the U.S. Senate.” <i>Environmental Law Reporter</i> 38: 10388-10417.</small>	

⁴² William Nordhaus. “The *Stern Review* on the Economics of Climate Change.” May 3, 2007. http://nordhaus.econ.yale.edu/stern_050307.pdf (Last visited May 19, 2009).

⁴³ Robert N. Stavins. 1998. “What Can We Learn from the Grand Policy Experiment?: Lessons from SO₂ Allowance Trading,” *Journal of Economic Perspectives* 12(3): 69-88.

⁴⁴ See, e.g., Anita Engels, Lisa Knoll and Martin Huth. 2008. “Preparing for the ‘Real’ Market: national Patterns of Institutional Learning and Company Behavior in the European Emissions Trading Scheme (EU ETS)” *European Environment* 18: 276-279, explaining that the European Emissions Trading Program involved an initial period, Phase I, during which there was an over-allocation of allowances leading to variable, and ultimately very low, price for carbon, followed by a revised Phase II with real allowance scarcity and higher prices.

reports regarding the amount of emissions reductions that each bill is likely to achieve.⁴⁵ As Box 2 illustrates, two primary reasons for the variation among the numbers that appear in this and other analyses, reports and Congressional documents are base year and sector coverage.⁴⁶

One factor that substantially affects the apparent percent reduction is whether the estimates are based on emissions reductions for the entire U.S. economy or just the covered sectors. On a percentage basis, the capped sectors will necessarily show greater reductions than for the entire economy. This analysis is based on the assumption that while emissions from capped sectors will decrease substantially, the emissions from uncovered sectors will increase at an average “business as usual rate” of 1.29 percent each year.⁴⁷ For example, a summary of the Manager’s Amendment stated the bill “will reduce emissions from covered facilities 19 [percent] below current levels by 2020, and 71 [percent] by 2050. It is estimated to reduce total US emissions (from all sources, capped and non-capped) by up to 66 [percent] by 2050.”⁴⁸

A second factor that creates a difference in apparent reductions is the base year to which later emissions are compared. The higher the emissions in the

Box 3: Leader vs. Follower Approach	
Leader	Follower
<p>Lieberman-Warner Bill</p> <ul style="list-style-type: none"> • 17% decrease by 2025 • 46% decrease by 2050 <p>Manager’s Amendment</p> <ul style="list-style-type: none"> • 16% decrease by 2025 • 47% decrease by 2050 	<p>Bingaman-Specter Bill</p> <ul style="list-style-type: none"> • 1% increase by 2025 • 10% decrease by 2030 • 4% decrease by 2050 <i>without further action</i> • 59% decrease by 2050 <i>if 5 major trading partners take “comparable” action</i>
<p><small>*Note: All reductions are relative to 2000 levels</small></p>	

⁴⁵ There have been varying reports regarding the impacts the Bingaman-Specter bill would have on greenhouse gas emissions:

- 7.6% below BAU by 2020; 21.9% below BAU by 2030 (Resources for the Future Analysis. http://www.rff.org/rff/News/Features/upload/26848_1.pdf - Last visited April 29, 2009);
- 60% below 2006 levels by 2050 (EPA Analysis. <http://www.epa.gov/climatechange/downloads/s1766analysispart1.pdf> - Last visited April 29, 2009); and
- 2006 levels in 2020, 1990 levels in 2030, and at least 60 percent below 1990 levels by 2050 (EIA Analysis. http://www.eenews.net/features/documents/2008/01/10/document_gw_02.pdf - Last visited April 29, 2009).

There have been equally diverse summaries of the Lieberman-Warner bill/Manager’s Amendment, including:

- 7 percent below 2006 emission levels by 2012, 39 percent below 2006 levels by 2030, and 72 percent below 2006 levels by 2050 (EIA Analysis. [http://www.eia.doe.gov/oiaf/servicert/s2191/pdf/sroiaf\(2008\)01.pdf](http://www.eia.doe.gov/oiaf/servicert/s2191/pdf/sroiaf(2008)01.pdf) – Last visited April 29, 2009); and
- 19 percent below 2005 levels by 2020 and 71 percent below 2005 levels by 2050 (Pew Center. <http://www.pewclimate.org/docUploads/L-WFullSummary.pdf> - Last visited April 29, 2009).

⁴⁶ Other factors such as assumptions about the impact of offsets, the Business As Usual scenario, and estimated percentage of sector coverage will also have a lesser impact on estimates of GHG emissions reductions.

⁴⁷ See methodological assumptions in the Appendix.

⁴⁸ “A Summary of the Boxer Substitute Amendment to the Lieberman-Warner Climate Security Act.” http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=441a4c27-8df5-4008-8931-7e07e8914a51 (Last visited April 29, 2009).

base year, the greater the reductions appear in a later year. So, for example, emission levels in 2000 were 6,978 million metric tons of CO₂ equivalent and in 2005 they were 7,181 million metric tons. Hence, when future emission levels drop to 5,000 million metric tons, that would be a 28 percent decrease relative to 2000 levels but a 30 percent decrease relative to 2005 levels.

The IPCC recommended reductions – 50 to 85 percent – are based on global, economy-wide emissions reductions in the year 2050 relative to 2000 levels. Therefore, the percent reductions calculated for this analysis are based on economy-wide reductions for the same years.

The Lieberman-Warner bill and the Manager's Amendment apply a different political approach than that used by the Bingaman-Specter bill (Box 3). The Lieberman-Warner bill and the Manager's Amendment seem to embrace the commitment to developed country leadership embodied in the United Nations Framework Convention on Climate Change.⁴⁹

Article 4 of the Convention states that:

Each of these [Annex I] Parties shall adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs. These policies and measures will demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of the Convention. . .

The Bingaman-Specter bill takes a more cautious approach to emission reductions. It couples limited initial reductions with a promise that if the U.S.'s five largest trading partners⁵⁰ take comparable actions, then the President has the authority to introduce more stringent emission reduction targets. In the absence of "comparable" actions by our major trading partners, the U.S. would only reduce GHG emissions 4 percent below 2000 emissions by 2050. The reserved approach of the Bingaman-Specter bill is certainly understandable given the global nature of carbon dioxide emissions.⁵¹ As the economies of large developing countries like China and India continue to grow and their energy usage soars,⁵² legislators might understandably be concerned that the U.S. will spend billions of dollars on climate change mitigation efforts only to have the nation's efforts dwarfed by continued increases of carbon dioxide emissions in developing countries.

⁴⁹ UN Framework Convention on Climate Change, Article 4.

⁵⁰ The U.S.'s five largest trading partners are currently Canada, China, Mexico, Japan, and Germany. Please see <http://www.census.gov/foreign-trade/top/dst/current/balance.html> (Last visited on April 29, 2009).

⁵¹ Because of the long atmospheric residence time of greenhouse gases, emissions in Ottawa, Beijing, Mexico City, Tokyo and Berlin have essentially the same effect on climate change as emissions in the United States. For a discussion of the slight global variations in atmospheric concentrations of carbon dioxide in the atmosphere, see "NASA Maps Shed Light on Carbon Dioxide's Global Nature" at <http://www.nasa.gov/topics/earth/features/airs-20081009.html> (Last visited April 15, 2009).

⁵² Some reports show China's carbon dioxide emissions exceeded those of the U.S. in 2006 while others predict the country will surpass the U.S. in the next year or two. See LiveMint.com, "China surpassed US in carbon emissions in 2006: Dutch report" at <http://www.livemint.com/2007/06/20235536/China-surpassed-US-in-carbon-e.html> (Last visited April 29, 2009).

It is difficult to determine whether the United States could exert more influence on the course of international negotiations by taking unilateral action to reduce emissions or by holding out to try to force broader coverage under a multilateral treaty.⁵³ Ultimately, the issue of international strategy is a matter for political deliberation.

If Congress decides to pursue a “developed country leadership” approach, then it is important to note that the Manager’s Amendment offers an improved implementation strategy relative to the original Lieberman-Warner bill. By expanding its sector coverage, the Manager’s Amendment places caps on approximately 84 percent of total greenhouse gas emissions compared to 80 percent for the Lieberman-Warner bill. By providing broader sector coverage, the Manager’s Amendment offers more opportunities to identify the covered entities with the lowest marginal abatement costs.

In his response to the *Stern Review on the Economics of Climate Change*, William Nordhaus indicated “[o]ne of the major findings in the economics of climate change has been that efficient or ‘optimal’ economic policies to slow climate change involve modest rates of emissions reductions in the near term, followed by sharp reductions in the medium and long term.”⁵⁴ Lieberman-Warner would have required a reduction of nearly 11 percent in annual emissions between 2011 and 2012, whereas the Manager’s Amendment requires just over a 7 percent reduction during the same time. In this sense the Manager’s Amendment reduces the impact of the transition.

Also, where the targets for Lieberman-Warner would involve economy-wide emissions reductions in 2025 and 2050 of 17 and 42 percent, respectively, relative to 2000 levels, the figures are 16 and 47 percent for the Manager’s Amendment. In essence, the Manager’s Amendment has delayed emissions reductions slightly in favor of greater ultimate reductions.

It is also important to note that the Lieberman-Warner bill includes substantial reliance on geological carbon capture and storage, which could have compromised the program’s environmental efficacy, meaning the CCS provisions may compromise the bill’s ability to meet its stated environmental objectives. As will be elaborated upon in Sections VI and VII of this paper, the Lieberman-Warner bill includes a CCS bonus allowance account with a starting balance of 3.9 billion emission allowances.⁵⁵ The purpose of these “off budget” allowances is to encourage CCS projects. However, the incentive comes in the form of bonus allowances that give away as much as 4.5 allowances for every ton of carbon emissions avoided via CCS.⁵⁶ This effectively increases the emissions level in each year in which the bonus is used. The amount is not trivial. The starting balance of the bonus allowance account, 3.9 billion, is equal to 75 percent of all allowances available in the first year of the program. These extra allowances are nearly equal to all of the scheduled reductions for the first decade of the program. This could have the effect of seriously compromising the claimed emissions targets of the bill. As will be

⁵³ For a concise discussion of theories regarding strategic positions of negotiating partners in international agreements, see D.F. Sprinz & M. Wei. “Domestic Politics and Global Climate Policy.” In U. Luterbacher & D.F. Sprinz. 2001. *International Relations and Global Climate Change*. Cambridge: MIT Press.

⁵⁴ William Nordhaus. “The *Stern Review* on the Economics of Climate Change.” May 3, 2007. http://nordhaus.econ.yale.edu/stern_050307.pdf (Last visited May 19, 2009).

⁵⁵ S. 2191, §3601.

⁵⁶ *Id.*, §3603.

discussed again in Sections VI and VII, this mass quantity of off-budget CCS bonus allowances should be eliminated from the final climate change bill.

Finally, while the Manager's Amendment represents an improvement over the original Lieberman-Warner bill, the final climate change bill should resolve any ambiguity between the new law and the Clean Air Act (CAA).⁵⁷ Unlike its predecessors, the Manager's Amendment contains multiple references to the Clean Air Act. Unfortunately, these references are largely limited to borrowing procedural provisions from the Clean Air Act.⁵⁸ The Manager's Amendment does, however, require the President to submit to Congress a report on "any direct regulation of carbon-dioxide emissions that has occurred or may occur under the Clean Air Act."⁵⁹ While the Manager's Amendment does make some attempt to address the relationship between the new climate change legislation and the Clean Air Act, the language in the bill needs to further clarify this relationship. To avoid confusion, to prevent counterproductive duplication of regulations, and to encourage consistency in programs, the final Senate bill should clearly supersede or be integrated with the Clean Air Act on all matters related to climate change.

⁵⁷ The Supreme Court decision in *Massachusetts v. U.S. Environmental Protection Agency* 549 U.S. 497 (2007), which declared that EPA has authority to regulate greenhouse gases, may invite speculation about whether a new, broader, climate change act is intended to supersede the CAA on matters of climate change. For more discussion on the implications of this case, see Jonathan H. Adler. "Massachusetts v. EPA Heats Up Climate Policy No Less Than Administrative Law: A Comment on Professors Watts and Wildermuth," N.W. U. L. Rev. Colloquy (2007). Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=993511 (Last visited April 29, 2009). For a thoughtful discussion of how greenhouse gas legislation might fit within the existing structure of environmental law, see William Pedersen. "Adapting Environmental Law to Global Warming Controls." <http://www1.law.nyu.edu/journals/envtllaw/issues/vol17/Pedersen%20Macro.pdf> (Last visited April 29, 2009).

⁵⁸ S. 3036, 110th Cong., §1722(b)(1) and §1751.

⁵⁹ *Id.*

IV. Cost-Containment Mechanisms

As discussed above, given the emissions abatement target, well designed policy will attempt, among other things, to minimize the costs of compliance. This is generally addressed by providing flexibility to entities through incentive-based systems such as taxes or marketable allowances.

In addition, there is a great deal of uncertainty regarding the eventual costs of a climate change program, particularly one that sets significant limits on national GHG emissions. Policy analysts attempting to model and predict the economic costs of various proposals derive a wide range of estimates.⁶⁰ Because of this uncertainty, there may be an advantage to including provisions designed to limit the range of potential costs in the final national climate change bill.

This section considers the provisions in each of the bills that are designed to control the cost of compliance. Provisions for activities outside the cap, such as the use of offsets, are often categorized as cost-containment mechanisms since they have the effect of lowering compliance costs. However, offsets are fundamentally different than other cost-containment mechanisms, and present unique implementation challenges. They are discussed separately in Section VI of this paper.

1. Provisions

All three climate change bills encourage trading of marketable allowances to facilitate cost-effective GHG abatement. However, the bills differ substantially with respect to the other strategies they have adopted to limit the costs of the GHG emissions cap.

⁶⁰ The EIA estimates the economic costs of the climate change bills, in terms of declines in Gross Domestic Product (GDP), would be as follows:

S. 1766 – approximately \$66 billion in 2000 dollars from 2009 – 2030, using a 4 percent discount rate

S. 2191 – between \$444 and \$1,306 billion in 2000 dollars from 2009 – 2030, using a 4 percent discount rate

This same report presents the annual economic costs of the bills in non-discounted dollars:

S. 1766 - \$11 billion in 2020 and \$12 billion in 2030 (in 2000 dollars)

S. 2191 – Between \$43 billion and \$141 billion in 2020 and between \$59 billion and 163 billion in 2030 (in 2000 dollars)

[http://www.eia.doe.gov/oiaf/servicerpt/s2191/pdf/sroiaf\(2008\)01.pdf](http://www.eia.doe.gov/oiaf/servicerpt/s2191/pdf/sroiaf(2008)01.pdf) (Last visited April 29, 2009).

The EPA estimates the resulting decline in GDP to be as follows:

S. 1766 – Between \$78 billion and \$386 billion in 2020 and between \$124 billion and \$757 billion in 2030 (in 2005 dollars)

S. 2191 – Between \$99 billion and \$506 billion in 2020 and between \$158 and \$938 billion in 2030 (in 2005 dollars)

http://www.epa.gov/climatechange/economics/pdfs/S1766_EPA_Analysis.pdf (Last visited April 29, 2009);

http://www.epa.gov/climatechange/downloads/s2191_EPA_Analysis.pdf (Last visited April 29, 2009).

a. Bingaman-Specter

The Bingaman-Specter bill includes a Technology Accelerator Payment (TAP), also known as a price cap or safety valve, of \$12 per metric ton for CO₂ in 2012.⁶¹ The TAP would increase 5 percent each year in addition to annual adjustments for inflation. Under this provision, covered facilities could buy extra allowances if the cost of compliance and the market price of allowances become greater than the current TAP.⁶²

The Bingaman-Specter bill does not include a provision for borrowing allowances. However, covered facilities may bank allowances for an unlimited number of years.⁶³

b. Lieberman-Warner

In addition to trading, the Lieberman-Warner bill enlists banking and borrowing as its cost-containment mechanisms. The borrowing provision would allow covered facilities to borrow allowances for up to 15 percent of current year requirements (use year)⁶⁴ from their expected future allocations up to five years after the current year (source year). Borrowed allowances must be repaid at a rate of 1.1 times “the number of years beginning after the use year and before the source year.”⁶⁵ The banking provision simply allows facilities to hold allowances indefinitely with no penalty.⁶⁶

c. Manager’s Amendment

The Manager’s Amendment introduced several changes intended to ameliorate the economic burden of the new regulations. It clarified the Senate’s intent to allow covered facilities to “borrow” allowances from future allocations⁶⁷ and provides numerous opportunities for discretionary executive branch intervention in the cap-and-trade program through the creation of a Carbon Market Efficiency Board (CMEB).⁶⁸

First, the Manager’s Amendment clarifies the borrowing mechanism introduced in the Lieberman-Warner bill. Covered facilities may borrow allowances for the current year against future allocations up to five years from the source year.⁶⁹ Emitters are allowed to borrow enough

⁶¹ S.1766, 110th Cong. §102 (a), (d).

⁶² For further discussion of combined price- and quantity-based controls in global climate change policy, see W. Pizer. “Combining Price and Quantity Controls to Mitigate Global Climate Change,” *Journal of Public Economics*. 85: 409-434.

⁶³ S.1766, 110th Cong. §103. For further discussions of emissions banking, see, e.g., R. Innes. “Stochastic Pollution, Costly Sanctions, and Optimality of Emission Permit Banking,” *Journal of Environmental Economics and Management* 45: 546-568; M. Liski, and J. Montero. “A Note on Market Power in an Emissions Permits Market With Banking,” *Environmental and Resource Economics* 31: 159-173.

⁶⁴ S. 2191, 110th Cong. §2301.

⁶⁵ *Id.*, §2303.

⁶⁶ *Id.*, §2201.

⁶⁷ S. 3036, 110th Cong., §§ 511-513.

⁶⁸ *Id.*, §§ 521 – 527.

⁶⁹ *Id.*, § 512.

allowances to cover up to 15 percent of total emissions in the source year⁷⁰ at an annual compound interest rate of 10 percent.⁷¹

Second, like the other two bills, the Manager's Amendment allows facilities to bank allowances indefinitely.⁷²

The Manager's Amendment also added several "emergency off-ramp" provisions that serve a purpose analogous to the Bingaman-Specter safety valve. The bill delegates responsibility for many of its cost relief measures to the CMEB.⁷³ These provisions allow the CMEB to provide cost relief by (1) increasing the emissions allowances that covered entities can borrow,⁷⁴ (2) expanding the repayment period for borrowed allowances,⁷⁵ and (3) relaxing constraints on the use of foreign emissions allowances and the generation of offset allowances.⁷⁶

The emergency off-ramp provisions of the Manager's Amendment also establish a cost-containment auction⁷⁷ in addition to a regular auction.⁷⁸ The cost containment auction is essentially a type of limited safety valve or price ceiling. The CMEB⁷⁹ will hold a cost-containment auction each December from 2013 to 2027, during which the government will sell up to 450 million allowances annually⁸⁰ from a pool of reserved allowances. The pool consists of an initial amount of six billion allowances taken from the quantities that were established for the years 2030 to 2050⁸¹ and supplemented by any allowances from current and preceding years that were not sold at the regular auction. The price of allowances will be between \$22 to \$30 in 2012, rising by five percent per year in subsequent years, adjusted for inflation. The proceeds of the cost-containment auction are earmarked – 70 percent to pay for offset style projects and 30 percent to supplement the Climate Change Consumer Assistance Fund.⁸²

Through the regular auction, the CMEB will sell the allowances under the cap for a given year that are not otherwise allocated to entities. For the regular auction, the Manager's Amendment establishes a reserve price, initially set at \$10 and rising in inflation adjusted dollars by five percent per year, below which the government will not sell allowances.⁸³ While the price cap used in the cost-containment auction helps protect against excessive abatement costs, the regular auction reserve price counterpart ensures that pollution abatement will occur at a faster rate if compliance costs turn out to be lower than anticipated.

⁷⁰ S. 3036, § 511(a)(2).

⁷¹ *Id.*, § 513.

⁷² *Id.*, § 501.

⁷³ Established under S. 3036, 110th Cong. §421.

⁷⁴ S. 3036, § 521(a)(1).

⁷⁵ *Id.*, § 521(a)(2).

⁷⁶ *Id.*, § 521(a)(3-4).

⁷⁷ *Id.*, § 522.

⁷⁸ *Id.*, § 4(41).

⁷⁹ *Id.*, § 526. The quantity available for auction declines by about one percent per year.

⁸⁰ Under §526, the number of allowances that may be sold in 2012 is 450 million, and that number decreases by one percent each year through 2027.

⁸¹ S. 3036, 110th Cong. § 522(a) and 525(b)(1).

⁸² *Id.*, § 527.

⁸³ *Id.*, § 524.

2. Discussion and Recommendations

While compliance flexibility and cost-containment measures may be a political necessity of any U.S. climate change bill, it is important to consider how efforts to negotiate numerous cost-containment components into a single bill may affect the extent to which the bill is able to achieve the stated environmental objective.

Use of Cap-and-Trade System

In the case of climate change, it is advisable to use a policy instrument with economic incentives such as a carbon tax or a cap-and-trade system because it helps ensure that greenhouse gas emissions reductions are achieved at the lowest possible cost.⁸⁴ With a carbon tax, a regulated entity would continue to decrease emissions as long as the costs associated with emissions reductions were lower than the tax rate and would pay the tax on any remaining emissions that were more expensive to abate. With a cap-and-trade system, the government would issue a set amount of allowances; then, the entities with the lowest abatement costs would reduce their emissions the most and sell their excess allowances to companies with higher abatement costs.

The economics literature has debated whether a carbon tax or a cap-and-trade system would be more efficient in the case of climate change legislation. In a case of perfect information, either a tax or a cap-and-trade system would have the same efficiency outcome. However, many economists argue that in the face of uncertainty, a carbon tax would be the superior choice to regulate greenhouse gas emissions. A cap-and-trade system places more emphasis on quantity control than price control. The economic argument is that where there is uncertainty around the costs and benefits, if the value of additional abatement is relatively constant, then a price-based approach is preferable. But if the damages from additional emissions are rising rapidly then it is likely that a cap and trade system is preferable.⁸⁵ In general, the economics literature has found that given the characteristics of the climate change challenge, a price-based approach (i.e., a tax) has lower overall costs for a given target.⁸⁶

At the same time, it is important to consider the political realities of this decision. Most of the climate change bills that have been set forth in Congress have been cap-and-trade proposals. In his remarks to a joint session of Congress on February 24 of this year, President Obama specifically asked Congress to send him “cap-and-trade” legislation to cover greenhouse gas emissions. So perhaps it is most pragmatic to accept the reality that the United States will be using a cap-and-trade system to address climate change and focus efforts on ensuring that policy tool is structured in the most efficient and effective manner possible.

There are many reasons why the President and Congress may be focusing on cap-and-trade legislation. First, since the European Union took action prior to the United States and has chosen

⁸⁴ Robert W. Hahn and Robert N. Stavins. 1992. “Economic Incentives for Environmental Protection: Integrating Theory and Practice,” *American Economic Review* 82(2): 464-468.

⁸⁵ For a more detailed explanation of the pros and cons of the use of these policy tools with regard to climate change, see Warwick J. McKibbin and Peter J. Wilcoxon. 2002. “The Role of Economics in Climate Change Policy,” *Journal of Economic Perspectives* 16(2): 107-129.

⁸⁶ See e.g., Harrison Fell and Richard Morgenstern. 2009. “Alternative Approaches to Cost Containment in a Cap-and-Trade System.” Resources for the Future Discussion Paper 09-14. Washington D.C.

to regulate greenhouse gases with a trading system, a cap-and-trade system would make it easier for the United States to collaborate with global partners. Second, because of Americans' distaste for taxes virtually all economic incentive instruments implemented in the United States have involved tradable permits.⁸⁷ Third, despite economists' prescriptions for auctioning of allowances, tradable permits have generally been given away in the past⁸⁸ so legislation is more likely to gain the support of industry groups and legislators seeking rents for their constituents. Finally, some argue that the ability for politicians to address distributional issues through the allocation of allowances is one of the key advantages of a tradable permit system.⁸⁹

Borrowing Provisions

The borrowing provision in the Manager's Amendment is an improvement compared to the one described in the original Lieberman-Warner bill. Both bills allow entities to borrow allowances from the EPA Administrator to cover their current year ("use year") needs. The Administrator can only lend allowances from the next five years ("source years") following the use year. So, for example, if an entity needs to borrow additional allowances to cover emissions in 2015, the Administrator can only provide allowances from 2016 to 2020. The borrower must then pay back the allowances in the source year from which the allowances were borrowed. In the hypothetical, if the Administrator provided allowances from 2018, the loan would, by definition, be a three-year loan and must be repaid in 2018 with 2018 allowances. The number of allowances due for each allowance borrowed would be 1.33 (i.e., $(1.1)^3$) allowances.

The difference between the two bills relates to the number of allowances that must be paid back in the source year. The original Lieberman-Warner borrowing provision was poorly worded with the potential for confusion regarding its intent. The original text established an interest rate of 1.1 times "the number of years beginning after the use year and before the source year,"⁹⁰ which could be interpreted to have a number of three different meanings.

One interpretation of the original Lieberman-Warner text is that it allows one year of borrowing free of charge. Such a system creates a strong incentive for companies to take full advantage of the borrowing system, creating the carbon equivalent of a "12 months, no money down sale" for allowances. Under the provision that borrowed allowances must be repaid at a rate of 1.1 times "the number of years beginning after the use year and before the source year," if an allowance were borrowed for use in 2012 from 2013, the business would pay no interest. A subsidized interest program essentially encourages all parties to borrow at least 15 percent from the next year.

A second possible interpretation of the original Lieberman-Warner text suggests that the bill will charge exorbitant interest for borrowing. The provision for interest at 1.1 times the number of years between the use and source year could be interpreted to mean that if a business were to

⁸⁷ Robert N. Stavins. 1998. "What Can We Learn from the Grand Policy Experiment?: Lessons from SO₂ Allowance Trading," *Journal of Economic Perspectives* 12(3): 69-88.

⁸⁸ Robert N. Stavins. 2001. "Lessons From the American Experiment With Market-Based Environmental Policies." Resources for the Future Discussion Paper 01-53. Washington, D.C.

⁸⁹ *Id.*

⁹⁰ S. 2191, 110th Cong. § 2303.

borrow an allowance for 2012 from the year 2016, it would have to pay 3.3 allowances in 2016 (1.1 x 3 years), i.e., 230 percent interest over the four years. This was surely not what the bill intended to accomplish.

A third interpretation of the Lieberman-Warner bill's language suggests that the drafters intended to charge a 10 percent interest rate. The Manager's Amendment, in fact, clarifies the intent of the bill to offer a 10 percent compounded annual interest rate on borrowed allowances.⁹¹ The problem with charging a flat interest rate, rather than an interest rate that varies according to prevailing market rates, is that it does not account for inflation or respond in any way to market forces, possibly creating substantial opportunities for arbitrage. For example, if inflation rates rise to 10 percent in a given year, companies will be paying no interest in real terms. Similarly, if prevailing business interest rates are at 15 percent, companies would have an incentive to borrow allowances and sell them in today's markets, assuming allowance prices are expected to be stable. Conversely if the prime interest rate is closer to 3 percent as it is now,⁹² then the borrowing provision would be unlikely to achieve its goals of decreasing compliance costs and preventing system shocks.⁹³ While the Manager's Amendment is an improvement over the earlier Lieberman-Warner bill, it could be further improved by tying the interest rate to variations to a benchmark interest rate.

While the Manager's Amendment eliminates the confusion regarding the design of the borrowing provisions, its implications in practice may still be unclear. It would be easy to assume that borrowing entities would pay an annual compound interest rate of 10 percent. However, the allowances must be paid back with allowances from the year in which they were borrowed. The effective interest rate would have to reflect the rise in real terms, assuming there is one. So, if the real (inflation adjusted) price of allowances is rising by five percent per year, the effective interest rate in real terms would be 15.5 percent. In practice, it is likely to be difficult to predict the trajectory of allowance prices, even over five years, so borrowers will have some difficulty predicting the real cost of borrowing. This suggests that a secondary market may develop to insure against price fluctuation risks.

The borrowing provision in the Manager's Amendment may also result in a high default rate among borrowers. Given the potentially high and uncertain effective rates charged for borrowing, companies with sufficient access to capital and credit will likely opt to cover their current year emissions by purchasing allowances on the open market, buying allowances from the cost-containment auction (see below), or obtaining allowances from offset projects. It is possible that borrowers will be comprised primarily of distressed companies that do not have

⁹¹ S. 3036, § 513.

⁹² "U.S. Prime Interest Rate Forecast Percent Average of Month." <http://www.marketvector.com/interest-rate/prime-rate.htm> (Last visited July 8, 2009).

⁹³ A recent study has suggested that borrowing provisions can help contain the cost of implementing a program for any particular emissions target by cushioning against external shocks to firms. However, based on a simulation exercise, the study shows that the advantages of borrowing provisions largely disappear if the interest rate charged for borrowing allowances is above a six percent annual rate. That specific conclusion, of course, is largely dependant upon the assumed parameters of the model. However, the observation that high interest rates could obviate the benefits of the system is generally applicable. See Harrison Fell and Richards Morgenstern. 2009. "Alternative Approaches to Cost Containment in a Cap-and-Trade System." Resources for the Future Discussion Paper 09-14. Washington, D.C.

viable alternatives. This in turn suggests the possibility of a high default rate on borrowing. However, there are no provisions in the Manager's Amendment to require that entities provide security for their loans. It is possible that this oversight could be addressed when the EPA develops specific rules. However, it would be better to include explicit provisions in the legislation.

Banking

All three bills include provisions for unlimited banking of allowances. Banking provisions provide covered entities the opportunity to save allowances for subsequent years when they believe the costs of pollution abatement will be more expensive.⁹⁴ The temporal flexibility created by such banking provisions has provided significant cost savings in past tradable permit programs.⁹⁵ Consequently, banking was not a controversial component of climate change legislation.

It is interesting to note, however, that while the borrowing provisions in the Lieberman-Warner and Manager's Amendment bills charge a form of interest on borrowed allowances, there is no corresponding provision for interest to be paid on banked allowances. An argument can be made that banked allowances delay damages and therefore should be encouraged.⁹⁶

Cost Relief Measures

A recent study of cost containment mechanisms illustrates the significance of price ceilings and price floors, used individually and in conjunction with banking and borrowing. The study also describes a mechanism called a price collar, essentially a combined price ceiling and price floor. One of the conclusions of the study is that using a price collar, particularly in tandem with banking and borrowing, reduces the cost of implementing a program with any particular emissions target. But, the study also demonstrates that there is a tradeoff between the cost savings from using a price collar and control over the precise level of emissions – i.e., the cost savings comes with greater variability in the actual emissions levels.⁹⁷ The choice of tradeoff between control costs and emissions variability will be a matter for Congress to resolve as it is largely a political choice.

⁹⁴ Kenneth R. Richards. 2000. "Framing Environmental Policy Instrument Choice," *Duke Environmental Law & Policy Forum* 10: 221-285.

⁹⁵ A. Denny Ellerman, Richard Schmalensee, Paul L. Joskow, Juan Pablo Montero, and Elizabeth M. Bailey. 1997. "Emissions Trading Under the U.S. Acid Rain Program: Evaluation of Compliance Costs and Allowance Market Performance." Cambridge: MIT Center for Energy and Environmental Policy Research; Suzi Kerr and David Maré. 1997. "Efficient Regulation Through Tradeable Permit Markets: The United States Lead Phasedown." Department of Agricultural and Resource Economics. Working Paper 96-06. University of Maryland, College Park; Robert N. Stavins. 2001. "Lessons From the American Experiment With Market-Based Environmental Policies. Resources for the Future." Discussion Paper 01-53. Washington, D.C.

⁹⁶ See, e.g., Kenneth Richards, 1997. "The Time Value of Carbon in Bottom-up Studies." In Roger A. Sedjo, R. Neil Sampson, and Joe Wisniewski, eds. 1997. *Economics of Carbon Sequestration in Forestry*. Boca Raton: CRC Press.

⁹⁷ Harrison Fell and Richard Morgenstern. 2009. "Alternative Approaches to Cost Containment in a Cap-and-Trade System." Resources for the Future Discussion Paper 09-14; Washington D.C.

The Bingaman-Specter bill and the Manager's Amendment contain more extensive cost-containment measures than the Lieberman-Warner bill. While a price ceiling like the Bingaman-Specter TAP would limit the costs of compliance, it might also limit the environmental benefits of the policy. While the provisions for "emergency off ramps" incorporated into the Manager's Amendment appear to be a reasonable discretionary power to afford to the Carbon Market Efficiency Board, it may be possible to design a system that will more reliably and efficiently protect the environment.

The TAP provision in the Bingaman-Specter bill has been the subject of considerable attention and analysis. The U.S. Department of Energy's Energy Information Administration projects that the TAP will be triggered in 2017; the U.S. Environmental Protection Agency estimates the TAP is triggered in 2030.⁹⁸ In any case, this safety valve could compromise the environmental efficacy of this legislation and is considered to be a "dealbreaker" among some environmentalists.⁹⁹ This effect could be counterbalanced, at least partially, by the provisions in the bill that create an opportunity for tightening the GHG emissions limits, i.e., pursuing more aggressive reductions.¹⁰⁰ However, even if the more constraining target is imposed, the TAP could render this target meaningless by allowing much higher emissions.

At the same time, the Bingaman-Specter TAP could limit opportunities for the United States to participate in the global carbon emissions trading market. The \$12/metric ton TAP is lower than the current EU Environmental Trading System market clearing price of €13.40¹⁰¹ (approximately \$18.85).¹⁰² Therefore, such a policy could decrease the United States' credibility in the international arena and limit opportunities to participate in the global trading market.¹⁰³

It is interesting to note, however, that actual compliance costs of environmental regulations have historically been much lower than forecasted.¹⁰⁴ If history is any indicator, it is entirely possible that the TAP, which rises at a rate of 5 percent per year after adjustment for inflation, will never be used.

The question of whether to include a safety valve such as the TAP in the Bingaman-Specter bill will remain a matter of politics. Some economists have supported such a hybrid policy on the grounds that it would protect covered entities if the actual costs of the program substantially

⁹⁸ Bill Wicker. "Key Findings From EIA and EPA on Bingaman-Specter 'Low Carbon Economy Act' of 2007." http://www.energy.senate.gov/public/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=095669c2-ca5b-4b72-adf5-51239cbd9216&Month=1&Year=2008&Party=0 (Last visited April 29, 2009).

⁹⁹ D. Samuelsohn. "Behind 'Safety Valve' Debate Resides 30+ Years of History," <http://www.eenews.net/climatewire/2008/03/11/1/> (Last visited April 29, 2009).

¹⁰⁰ S. 1766, 110th Cong. §501.

¹⁰¹ "Point Carbon EUA OTC Assessment," <http://www.pointcarbon.com> (Last visited June 30, 2009).

¹⁰² "Online Currency Calculator," <http://www.x-rates.com/calculator.html> (Last visited June 30, 2009).

¹⁰³ If the United States participated in an international cap-and-trade system but retained the TAP, when the global price of an allowance exceeded the trigger price for the TAP, the United States would be in a position to introduce an unlimited number of allowances, the equivalent of printing money. Viewed alternatively, retaining a TAP would make it difficult for the United States to meet internationally agreed upon caps with any certainty.

¹⁰⁴ See Winston Harrington, Richard D. Morgenstern and Peter Nelson. 2000. "On the Accuracy of Regulatory Cost Estimates," *Journal of Policy Analysis and Management* Volume 19(2):297-322; comparing *ex ante* and *ex post* cost estimates for 28 different environmental rules. This research looked at eight different economic incentive policies. *Ex ante* compliance costs were overestimated in seven of the eight rules. Insufficient data in the eighth case prevented conclusive results about the final case study.

exceed its expected costs.¹⁰⁵ At the same time, if the TAP is triggered, it would allow emissions to exceed the targets set by the program, thereby compromising the purpose of the emissions abatement program. This trade-off is the type of compromise that is best resolved within the political sphere.

As mentioned above, the “cost relief” measures in the Manager’s Amendment provide an alternative to the TAP, varying in four important respects. First, the cost containment auction has a higher trigger price than the TAP, \$22 - \$30 per metric ton of carbon dioxide equivalent rather than \$12 per metric ton, creating less opportunity for the price cap to be used. Second, the cost containment auction limits the number of allowances potentially added to the emissions to 450 million metric tons of carbon dioxide equivalent per year, whereas there is no limit to the number of allowances the TAP could add to the market. Third, the cost containment auction derives its allowances by deducting allowances from the allocation to future years. Finally, the price cap is supplemented by a regular auction price floor of \$10 per allowance to encourage low-cost abatement reductions.¹⁰⁶ All of these variations operate to reduce the potential for actual emissions to exceed the stated target and contribute to economic efficiency.

While the cost-containment auction incorporated into the Manager’s Amendment is arguably more sophisticated than the Bingaman-Specter TAP, it could still lead to implementation difficulties. In fact, the term “auction” is a misnomer. In 2012 the government will determine the allowance price based on “economic modeling,” constrained to a price range of \$22 to \$30 per allowance.¹⁰⁷ In subsequent years the price of allowances in the cost-containment “auction” will be set automatically as five percent above the previous year with adjustments for inflation.¹⁰⁸

There are potentially several problems with this Manager’s Amendment cost-containment mechanism. First, the initial price is entirely derived from models rather than developed from actual bids, and may diverge significantly from the market clearing price. Second, the fact that the price in subsequent years is derived by an automatic increase means that the potential for a wedge between prices and demand could further widen.

Third, the fact that there is a limit on the number of allowances sold in the cost-containment auction, even as the price is fixed by the government, raises the possibility of excess demand. To address this potential excess demand, the bill directs the Administrator of the EPA to establish a limitation on the amount that each entity can purchase at the cost-containment auction “that ensures fair access to emission allowances by all covered entities.”¹⁰⁹ There is virtually no guidance to help define what constitutes “fair access.”

¹⁰⁵ See for example Warwick J. McKibbin and Peter J. Wilcoxon. 2002. “The Role of Economics in Climate Change Policy,” *Journal of Economic Perspectives* 16(2): 107-129; Chapter 13 on “Role of Uncertainty and Information Asymmetry.” In Thomas Sterner. 2003. *Policy Instruments for Environmental and Natural Resource Management*. Washington, DC: Resources for the Future; W. A. Pizer. 2002. “Combining Price and Quantity Controls to Mitigate Global Climate Change,” *Journal of Public Economics* 85(3): 409–34.

¹⁰⁶ Harrison Fell and Richard Morgenstern. 2009. “Alternative Approaches to Cost Containment in a Cap-and-Trade System.” Resources for the Future Discussion Paper 09-14; Washington D.C.

¹⁰⁷ S. 3036, 110th Cong. §523.

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*, §526(d).

Finally, it is important to recognize that the cost-containment auction is essentially a mechanism by which the allowances allocated to one period (2030 to 2050) are reassigned to another (2012 to 2027). The revenues are not allocated to relieve burdens on entities in future years. This raises intergenerational issues that should not be lost in the obscurity of the bill's language. At a minimum it suggests that decreases in emissions could occur less rapidly than expected.

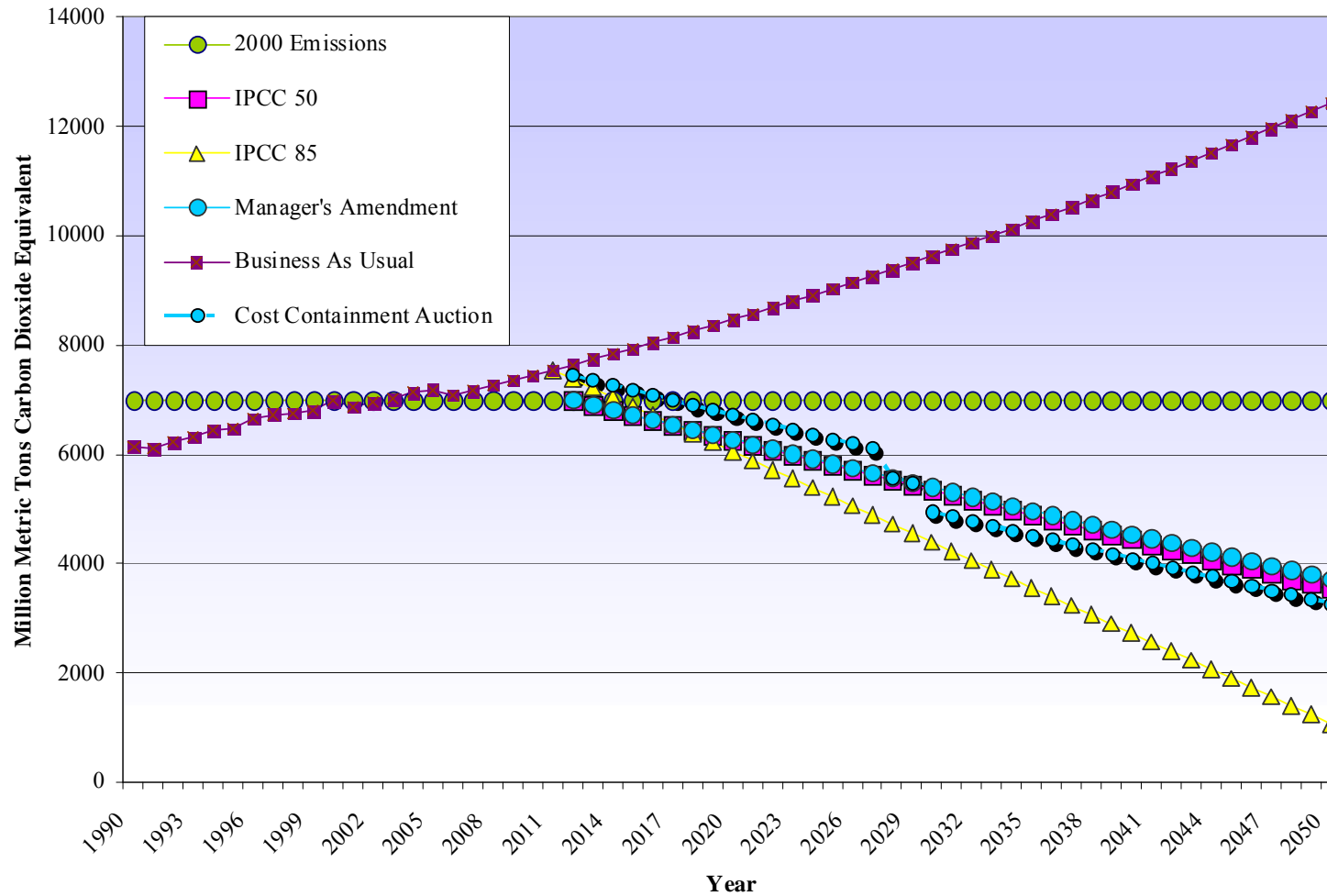


Figure 2: Potential Impact of Manager’s Amendment Cost-containment Measures

Sources:

S. 2191, 110th Cong. §1201; S. 1766, 110th Cong. §101; S. 3036, 110th Cong. §201; Energy Information Administration. U.S. Carbon Dioxide Emissions from Energy for 1990-2006 provided by EIA. <http://www.eia.doe.gov/oiaf/1605/ggrpt/excel/tbl1.xls> (Last visited April 29, 2009); Office of Atmospheric Programs, U.S. EPA. EPA Analysis of the Low Carbon Economy Act of 2007. http://www.epa.gov/climatechange/economics/pdfs/S1766_EPA_Analysis.pdf (Last visited April 29, 2009); World Resources Institute. *Assumptions and Methodology of Comparison of Legislative Climate Change Targets in the 110th Congress*. http://pdf.wri.org/usclimatetargets_071207.pdf (Last visited April 29, 2009); D. Gordon et al. *Findings of the IPCC Fourth Assessment Report: Climate Change Mitigation*. http://www.ucsusa.org/global_warming/science_and_impacts/science/findings-of-the-ipcc-fourth-1.html (Last visited April 29, 2009).

As illustrated in Figure 2, adding in allowances from the cost-containment pool¹¹⁰ could result in a substantial increase (7.8 to 10.8 percent) in emissions for the years 2012 to 2027. At the same time, in the “out years,” 2030 to 2050, the cost-containment auction would lead to even greater reductions because allowances from those years would have been reduced by 9.4 to 21.0 percent per year in 2030 to 2050, assuming an equal allocation of deductions across those years.

Of course, the political reality is that when the time comes, Congress may override the decision to reduce emissions in 2030 to 2050 by the amount of the borrowed emissions allowances. This capacity to unilaterally increase the number of allowances will worry potential international trading partners and devalue U.S. allowances.

Despite these problems, the cost-containment auction in the Manager’s Amendment provides clearer environmental efficacy than the Bingaman-Specter TAP and lower expected abatement costs than the Lieberman-Warner bill, which included no such cost relief measures. The Manager’s Amendment places a limit on the number of additional allowances that can be introduced annually. It substantially raises the price of the supplemental supply of allowances contained in the Bingaman-Specter bill. And, at least in concept, it reduces long-term emissions allowance caps by the same amount as near-term increases.

The cost containment auction could be further improved, however. First, by conducting a real auction each year (rather than deriving the price directly from economic modeling), the United States government could ensure the allowance price represents what the market will bear. Second, by not placing an upper limit on the cost containment auction price, the government could avoid the potential for excess demand at an artificially constrained price. Whether this approach is preferable to a price collar, which simply combines a price floor and a price ceiling, involves a trade-off between cost containment and environmental efficacy. That is ultimately a political decision best resolved by Congress.

The Manager’s Amendment also delegates substantial responsibility to the Carbon Market Efficiency Board.¹¹¹ The seven members of the CMEB, appointed by the President with the advice and consent of the Senate, are appointed to 14-year staggered, nonrenewable terms. The composition is designed to assure balanced representation of “financial, agricultural, industrial, commercial sectors, and the geographical regions, of the United States, and include a representative of consumer interests.”¹¹²

The CMEB controls several cost relief measures, including relaxing limits on borrowing, expanding the period of repayment for borrowed allowances, and expanding the percent of foreign and offset allowances that can be used by covered entities. Each of these provisions could significantly affect the efficacy of the program in reaching the stated emissions goals.

¹¹⁰ Under S. 3036, §523, up to 450 million allowances will be available for purchase through the cost-containment auction in 2012. Every year thereafter through 2027, the limit of allowances available through the cost-containment auction will decrease by one percent.

¹¹¹ S.3036 §§421-423, 521.

¹¹² It is interesting to note that the specifications for the CMEB do not include representation of environmental interest groups.

Although the long appointments and carefully balanced representation suggest that the CMEB could be relatively insulated from the most severe political pressure, there is relatively little guidance to the Board regarding how to exercise its power. The bill directs the CMEB to “exercise the cost relief measure[s] incrementally, and only as needed to avoid significant economic harm during the applicable allocation year.”¹¹³ Given that the CMEB directly affects the tradeoff between costs and efficacy, an inherently political issue, Congress might consider providing the Board more specific guidance.

¹¹³ S.3036, §521(a).

V. Point and Scope of Regulation

A cost-effective cap-and-trade program will regulate as many emitters as is administratively practical. Regulating more emitters, rather than fewer, under a cap-and-trade program increases the opportunity for low cost emissions reductions.

In the design of a cap-and-trade program, a government may regulate emitters *downstream* by placing limitations on parties that emit the pollution, or the government may regulate *upstream* by regulating companies that produce products (primarily fossil fuels), use of which will eventually result in emissions. In past air emissions regulations, controls have generally been focused downstream on the point of emissions. For example, sulfur dioxide controls are applied—in the form of technology requirements, such as scrubbers or emissions allowance requirements—on larger emitters of the pollutants such as electricity generation facilities.

Despite historical preferences for downstream regulation, research shows that carbon dioxide may be more effectively regulated upstream. Unlike sulfur dioxide emissions, carbon emissions cannot be reduced by installing scrubbers at the point of emissions. In addition, when the amount of pollution emissions is highly correlated to some other activity, such as the production of fossil fuels, it is possible to control the pollution by controlling the level of the correlated activity. In the case of CO₂ emissions, it is generally true that “carbon in equals carbon out,” i.e., the amount of carbon in combusted fossil fuels is directly related to the amount of CO₂ emitted. Thus, in the case of CO₂ emissions reductions, it is administratively simpler to control the amount of carbon entering the economy rather than the amount of emissions from end-users.¹¹⁴

1. Provisions

One of the primary design differences among the bills is that the original Lieberman-Warner bill relies more on downstream controls than the Bingaman-Specter bill and the Manager’s Amendment (Table 1).

¹¹⁴ For further discussion of the economic rationale for upstream versus downstream controls, see C. Fischer et al., “Using Emissions Trading to Regulate U.S. GHG Emissions--Part 1 of 2: Basic Policy Design and Implementation Issues.” <http://www.rff.org/rff/Documents/RFF-CCIB-10.pdf> (Last visited April 29, 2009).

Table 1: Climate Change Bills and Regulated Facility Coverage

Energy Source	S. 1766 Low Carbon Economy Act (Bingaman-Specter)		S. 2191 America's Climate Security Act (Lieberman-Warner)		S. 3036 Manager's Amendment to America's Climate Security Act	
	Direction of Regulation	Facilities Regulated	Direction of Regulation	Facilities Regulated	Direction of Regulation	Facilities Regulated
Coal	Downstream	Coal facilities that emit or convert coal into synthetic fuels; Entities that consume more than 5,000 metric tons of coal annually	Downstream	Electric Utilities Large Consumers that emit more than 10,000 metric tons CO ₂ annually	Downstream	Electric Utilities Any entity that consumes more than 5,000 metric tons of coal annually in the United States
Natural Gas	Upstream	Natural gas processors and importers	Downstream	Facilities that emit > 10,000 metric tons CO ₂ ; <i>Includes electric utilities</i>	Upstream	Natural gas processing plants in the United States (but not in the State of Alaska); natural gas producers in the State of Alaska or the Federal waters of the Alaska Outer Continental Shelf; natural gas importers
Oil	Upstream	Oil refineries and importers	Upstream - transportation fuel; Downstream - industrial	Oil refineries that produce transportation fuel; large industrial companies that emit more than 10,000 metric tons CO ₂	Upstream	Facilities that produce or import petroleum-based liquid fuel
Nonfuel Chemicals	Upstream	Facilities that produce or import nonfuel chemicals, including aluminum smelters and manufacturers	Upstream (Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrous oxide)	Facilities that produce or import nonfuel chemicals and that emit more than 10,000 metric tons CO ₂	Upstream	Facilities that manufacture or import nonfuel, non-HFC chemicals that emit more than 10,000 metric tons CO ₂ equivalent
Emissions Regulated		85 percent		80 percent		84 percent
Emissions Excluded		15 percent <i>Non-electric coal</i> <i>Small electric coal</i>		20 percent <i>Non-electric coal</i> <i>Small electric coal</i> <i>Small natural gas/oil</i> <i>Small non-fuel entities</i>		16 percent <i>Non-electric coal</i> <i>Small electric coal</i> <i>Some non-fuel chemical manufacturers/producers</i>

Sources: S. 2191, 110th Cong., §4; S. 1766, 110th Cong., §3; S. 3036, §4(16); U.S. ENVIRONMENTAL PROTECTION AGENCY OFFICE OF ATMOSPHERIC PROGRAMS, EPA ANALYSIS OF THE LOW CARBON ECONOMY ACT OF 2007; WORLD RESOURCES INSTITUTE, ASSUMPTIONS AND METHODOLOGY OF COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS IN THE 110TH CONGRESS; ENERGY INFORMATION ADMINISTRATION, GREENHOUSE GAS, CLIMATE CHANGE, AND ENERGY (<http://www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html>).

a. Bingaman-Specter

The Bingaman-Specter bill would regulate CO₂ emissions from petroleum and natural gas on an upstream basis by requiring natural gas processing plants and petroleum refineries to submit allowances for their carbon content.¹¹⁵ Coal would be regulated downstream, requiring facilities that consume 5,000 tons of coal or more per year to submit allowances for the carbon content¹¹⁶ of the coal they consume.¹¹⁷ The bill also would regulate fossil fuel importers and producers/importers of other GHGs.¹¹⁸

b. Lieberman-Warner

The Lieberman-Warner bill regulates most facilities downstream. It explicitly identifies the following four types of covered facilities:

- (A) any facility within the electric power sector that contains fossil fuel-fired electricity-generating units that together emit more than 10,000 CO₂ equivalents of GHG in any year;*
- (B) any facility within the industrial sector that emits more than 10,000 CO₂ equivalents of GHG in any year;*
- (C) any facility that in any year produces, or any entity that in any year imports, petroleum- or coal-based transportation fuel, the use of which will emit more than 10,000 CO₂ equivalents of GHG, assuming no capture and permanent sequestration of that gas; or*
- (D) any facility that in any year produces, or any entity that in any year imports, non-fuel chemicals that will emit more than 10,000 CO₂ equivalents of GHG, assuming no capture and destruction or permanent sequestration of that gas.¹¹⁹*

The first provision applies primarily to CO₂ emissions from electric utilities. The second provision applies to industrial emissions. These first two provisions are downstream-type approaches. The third provision applies to facilities, primarily petroleum refineries, which introduce carbon into the economy in the form of transportation fuels. This is an exception to the downstream approach to CO₂ regulation in the Lieberman-Warner bill. Finally, the last section implies upstream regulation of non-fuel sources of GHG emissions.

c. Manager's Amendment

Compared to the Lieberman-Warner bill, the Manager's Amendment has shifted the focus of regulation upstream.¹²⁰ The bill covers upstream natural gas processors and oil refineries as did the Bingaman-Specter bill and, like that bill, the one exception is in the coal industry, where the new bill would cover any entity that consumes more than 5,000 metric tons of coal.¹²¹ The effect

¹¹⁵ S. 1766, 110th Cong. §102(a).

¹¹⁶ *Id.*, §3(22).

¹¹⁷ There is a significant range of conversion factors for tons of CO₂ emissions per ton of coal. The factors, by coal type, are approximately 1.4 for lignite, 1.9 for subbituminous, 2.5 for bituminous, and 2.8 for anthracite. Derived from figures at <http://www.eia.doe.gov/oiaf/1605/coefficients.html>.

¹¹⁸ S. 1766, §3.

¹¹⁹ S. 2191, 110th Cong. §4(7).

¹²⁰ S. 3036, 110th Cong. § 4(16).

¹²¹ *Id.*, § 4(16)(A).

is to broaden the coverage of the bill relative to the original Lieberman-Warner bill, and to increase the portion of total national emissions that are under the cap.

At the same time, however, certain sources of emissions are exempt from regulation. First, control of hydrofluorocarbons (HFCs) has been assigned to a separate, parallel program for later development¹²² although it appears that at least a portion of HFCs are covered under the current provisions.¹²³ And, a bit puzzling perhaps, while imports of natural gas and oil would be subject to the cap,¹²⁴ the Manager's Amendment would exempt imports of petroleum-based liquid fuels from NAFTA countries that have enacted national greenhouse gas emissions reduction requirements that are as strict as the ones in the United States.¹²⁵

2. Discussion and Recommendations

The predominantly *upstream* approach utilized in the Manager's Amendment and the Bingaman-Specter bill is the superior approach to regulating carbon dioxide emissions.¹²⁶ The differences between the upstream and downstream approaches are significant, and warrant an in-depth comparison. There are two main problems with the downstream approach in the Lieberman-Warner scheme: it covers a narrower range of emitters and it increases administrative complexity.

First, the Lieberman-Warner bill spans a narrower range of emitters than the coverage scheme of either the Bingaman-Specter bill or the Manager's Amendment. While all three bills take largely the same approach to coal, i.e., concentrating attention on the primary user,¹²⁷ the original Lieberman-Warner bill would have regulated utilities that produce more than 10,000 metric tons of CO₂ equivalent per year, whereas the Bingaman-Specter bill and the Manager's Amendment would cover any coal consumer that uses more than 5,000 tons of coal per year. This means that for higher quality coal (i.e. coal that has more energy and more carbon per ton than lower quality coal), the Lieberman-Warner bill would cover smaller utilities than would the other two bills.

As illustrated by Table 1, the Lieberman-Warner bill does not control all the emissions flowing from commercial, residential, or small industrial users of natural gas or oil. Under the upstream approach, the Bingaman-Specter bill and the Manager's Amendment capture virtually all of the carbon flowing into the economy via natural gas or oil, regardless of the size of the end-users – only the smallest oil refiners and natural gas processors would be excluded.

The difference between the upstream and downstream approaches is at least part of the reason that the Bingaman-Specter scheme would cover 85 percent of emissions¹²⁸ and the Manager's

¹²² S. 3036, 110th Cong. § 1501.

¹²³ *Id.*, § 202(a)(4).

¹²⁴ *Id.*, § 4(16)(D)&(F).

¹²⁵ *Id.*, § 202(c).

¹²⁶ For a more detailed discussion of the benefits of upstream regulation of carbon dioxide, please see A. Keeler. "Designing a Carbon Dioxide Trading System: The Advantages of Upstream Regulation." July 2002. http://www.earthscope.org/p1/ES2_7944/7944.pdf (Last visited May 22, 2009).

¹²⁷ Approximately 92% of coal produced in the United States is used for electricity production. EIA. "U.S. Coal Consumption by End-Use Sector." <http://www.eia.doe.gov/cneaf/coal/quarterly/html/t25p01p1.html> (Last visited April 29, 2009).

¹²⁸ Office of Atmospheric Programs, U.S. EPA. "EPA Analysis of the Low Carbon Economy Act of 2007." http://www.epa.gov/climatechange/economics/pdfs/S1766_EPA_Analysis.pdf (Last visited April 29, 2009).

Amendment would cover approximately 84 percent of emissions while the original Lieberman-Warner approach would cover only 80 percent.¹²⁹ In general, it is more cost-effective to cover as many sources of pollution as possible, thus allowing as broad a base as possible to seek low-cost emissions reductions.¹³⁰ It also reduces migration of emitting activities from the covered sectors of the economy to those that are not covered.

The second disadvantage of the downstream approach is that it will be more administratively challenging than the upstream regulation. Under the predominantly upstream approach employed by the Bingaman-Specter bill and the Manager's Amendment, all fossil fuel-related CO₂ emissions are controlled by monitoring a limited number of natural gas processors, petroleum refineries, and coal-burning electric utilities.¹³¹ These are all entities that are accustomed to keeping records and reporting their fuel production or use. The downstream approach, in contrast, will substantially increase the number of reporting entities and require far more effort to implement while simultaneously controlling a smaller percentage of total GHG emissions.

Given these problems, why do so many legislators and activists focus on inefficient downstream controls? The first reason is regulatory habit. Past air emissions regulations have been applied at the point of emissions; it is the familiar approach. But CO₂ is a fundamentally different pollutant than its predecessors in regulatory history. Virtually all carbon introduced into the economy via fossil petroleum, natural gas, and coal ends up as CO₂ emissions. (The only exceptions are carbon capture and storage (CCS), an as-yet unproven technology, and non-fuel uses, a minor portion of fossil fuel use.) Thus, estimation and control of emissions is much more easily accomplished upstream by limiting the amount of carbon introduced into the economy by a relatively small number of energy producers, rather than downstream, attempting to estimate actual emissions from a substantially larger number of emitters. In fact, the downstream issue is not one of just estimating emissions from covered sources. Smaller sources will have to demonstrate that they are not covered by providing their emissions are below the threshold covered by the regulation. This problem is substantially ameliorated by the upstream approach.¹³²

Second, some observers have suggested that a downstream approach applied closer to the users will somehow encourage more investment in energy efficiency than an upstream approach. But this suggestion does not stand up to even the most cursory scrutiny. The upstream approach, by definition, limits the amount of carbon that can be turned into CO₂. Thus, the price of fossil fuels will increase, inducing investment in energy efficiency just as the downstream approach would.

¹²⁹ World Resources Institute, *Assumptions and Methodology of Comparison of Legislative Climate Change Targets in the 110th Congress*, http://pdf.wri.org/usclimatetargets_071207.pdf (Last visited April 29, 2009).

¹³⁰ S. Paltsev et al., *Emissions Trading to Reduce GHG Emissions in the United States: The McCain-Lieberman Proposal (2003)*, available at <http://dspace.mit.edu/handle/1721.1/3595> (Last visited April 29, 2009).

¹³¹ The most effective strategy is to focus on the point in the production chain, from extraction to consumption, that has the fewest entities. For natural gas that is processors and for oil it is refiners. For coal, it is coal mines, though the vast majority of coal goes to electricity generation plants, and the numbers of generators are roughly comparable to the number of mines.

¹³² A. Keeler. 2002. "Designing a CO₂ Trading System: The Advantages of Upstream Regulation." http://www.earthscope.org/p1/ES2_7944/index.html (Last visited April 29, 2009).

In fact, by passing those costs on to a larger portion of CO₂ emitters, the upstream approach induces a broader range of energy efficiency investments.¹³³

Finally, the push for downstream controls may result from simple political pressure. It is interesting to note that the initial draft of the Bingaman-Specter bill would have controlled the amount of carbon introduced via coal at the mines themselves. It is possible that the push to move controls to a subset of the end-users—electric utilities in the case of mines, industry in the case of all fuels—is a result of energy producers’ reluctance to invite further scrutiny of the energy production process.

The final Senate legislation should focus controls upstream for all fossil fuels. This upstream approach would reduce both administrative and compliance costs.¹³⁴ This is most important for petroleum and natural gas where the number of upstream parties is limited and the number of downstream emitters is potentially quite large. Logically, even coal-based carbon should be controlled at the point of production, i.e., the mine mouth, but it seems it is likely less important than in the case of the other fuels because the vast majority of coal goes to a limited number of large electric utilities.

¹³³ This is not to say that energy utilities have no role to play in promoting energy efficiency improvements. In fact, given their superior position with respect to data on energy use and their ready access to energy customers, it may be a natural function for utilities, particularly regulated utilities, to facilitate consumer’s efforts to conserve on energy use. This would, of course, require regulatory bodies to provide a framework that would induce companies to encourage reductions in the very product the firm sells.

¹³⁴ Robert N. Stavins. 1998. “What Can Be Learned from the Grand Policy Experiment?: Lessons from SO₂ Allowance Trading,” *Journal of Economic Perspectives* 12(3): 69-88.

VI. Incentives for Activities Outside the Covered Facilities

While all of the bills place caps on a substantial portion of emissions of CO₂ and other GHGs, there were still some sources that are not included. To create additional opportunities to cost-effectively reduce net GHG emissions, the bills recognize and provide incentives for activities that capture and store or destroy GHGs in a way that will further reduce (or “offset”) net emissions. To varying degrees and in varying manners, the bills allow parties to claim credit for these activities that are not covered directly under the emissions cap and trading programs.

While the “offset” concept is attractive, implementation of the programs present challenges for measurement and monitoring of the projects. To ensure the environmental efficacy of the national climate change program, projects must be scrutinized to assure that they actually offset at least the amount of greenhouse gases for which they are being credited.

1. Provisions

There are several types of activities that might be considered as offsets. This paper will address five main categories of offsets: domestic offset projects, which can include a wide range of activities that avoid or sequester greenhouse gas emissions; international credits and offsets; early action allowances; carbon capture and sequestration projects (CCS); and agriculture and forestry projects.

Two important distinctions exist among the offset and crediting programs. The first distinction is what action is rewarded. Under an *input-based* approach, simply taking an action that is apt to lead to positive results is sufficient. Under an *output-based* approach, rewards in the form of emissions allowances or monetary payments are intended to be directly proportional to the measured (or estimated) emissions reductions or carbon sequestration. This distinction is important because an output-based approach is generally more likely to lead to actual GHG emissions reductions than an input-based approach, but it also faces greater estimation challenges.

Table 2: Incentives for Mitigation Outside the Emissions Cap: S.1766, S.2191, and S.3036

Proposed Bill	Accounting Mechanism	Method of Measurement	
		Input-Based	Output-Based
S. 1766 (Bingaman-Specter)	On-Budget	Early Action - § 206	Agricultural Projects - § 205 Carbon Capture and Storage Bonuses- § 207
	Off-Budget	Methane Offset Projects - § 303(b) Unclassified Offset Projects - § 303(c)(2)	Carbon Capture and Storage Offsets- § 302 Use of Fuels as Feedstocks - § 301(b) Exports of Covered Fuels or HFCs - § 301(c) and (d) Credits from Foreign Markets - § 501(d) International Offset Projects - § 501(e)
S. 2191 (Lieberman-Warner)	On-Budget	Domestic Agriculture and Forestry - § 3701 Early Action - § 3301	Carbon Capture and Storage Bonuses - § 3601 International Forestry - § 3803
	Off-Budget		Agricultural and Rangeland Offset Projects- § 2403(b) Afforestation, Reforestation, and Forest Management Offsets- § 2403(b) Manure Management Offset Projects - § 2403(b) Fugitive Emissions Offset Projects - § 2403(b) Credits or Allowances from Foreign Markets - § 2501 Carbon Capture and Storage Bonuses (3.9 b Initial Balance)* - § 3601
S. 3036 (Manager's Amendment)	On-Budget		Early Action - § 702 Carbon Capture and Storage Bonuses- § 1011 International Forestry - § 1313 Domestic Agriculture and Forestry - § 331
	Off-Budget		Agricultural and Rangeland Offset Projects - § 303(b)(2)(A) Afforestation, Reforestation, and Forest Management - § 303(b)(2)(A) Manure Management - § 303(b)(2)(C) Fugitive Emissions - § 303(b)(2)(D) Methane Capture and Combustion - § 303(b)(2)(A), 202(e) International Allowances - § 322 International Offset Projects - § 321 Use of Fuel as Feedstocks - § 202(g) Carbon Capture and Storage - § 202(f) Removal of GHG Precursors - § 202(e) Fuel Exports - § 202(h) Fuel for International Flights - § 202(i)

*3.9 billion starting balance in bonus allowance account is not part of annual budget

The second distinction is related to the source of the award. Under some programs, the award comes out of the annual budget of allowances. Other programs, in contrast, create additional allowances beyond the annual scheduled amount to reward activities. These are the *on-budget* versus *off-budget* approaches, respectively. The off-budget approach creates more risk for compromise of the environmental objectives of the national climate change program, and hence raises the stakes for correctly evaluating the emissions reductions or sequestration of the projects.

Note that recognizing the two alternatives on these two dimensions creates four possible approaches to rewarding activities outside covered facilities. These three climate change bills use all of the four approaches (Table 2). The on-budget, output-based programs are the most likely to result in verifiable emission reductions. The on-budget, input-based programs will have a positive or at least neutral effect on emissions. The off-budget, output-based activities need to be closely scrutinized to ensure they do not have a negative impact on emissions. Provisions for off-budget, input-based activities need to be eliminated from the program or rewritten to ensure they do not undermine the environmental objectives of the climate change program.

Domestic Offset Projects

a. Bingaman-Specter

The Bingaman-Specter bill would allow facilities to use an unlimited number of domestic offsets to cover their emissions.¹³⁵ Credit towards allowances could be earned by taking GHG precursors out of the emissions stream, for example, by using fossil fuels as feedstocks,¹³⁶ exporting fuels to other countries,¹³⁷ exporting hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrous oxide to other countries;¹³⁸ destroying hydrofluorocarbons;¹³⁹ and sponsoring carbon sequestration projects.¹⁴⁰ The bill also sets forth certain types of projects that will allow “the use of streamlined procedures for distributing credits,” including landfill, animal waste, municipal wastewater or coalbed methane use¹⁴¹ or reducing sulfur hexafluoride emissions from transformers.¹⁴² Under this bill, the President also has the option to issue credits to a covered facility for “unclassified projects” not otherwise eligible for credits¹⁴³ and could distribute less than one credit for each ton of GHG emissions avoided.¹⁴⁴

¹³⁵ S. 1766, 110th Cong. §303(a).

¹³⁶ *Id.*, §301(b).

¹³⁷ *Id.*, §301(c).

¹³⁸ *Id.*, §301(e).

¹³⁹ *Id.*, §301(d).

¹⁴⁰ *Id.*, §302.

¹⁴¹ *Id.*, §303(b).

¹⁴² *Id.* §303(b).

¹⁴³ *Id.* §303(d), i.e., ineligible under §§205, 206, 207, 301 & 302.

¹⁴⁴ *Id.* §303(c).

The Bingaman-Specter bill delegates broad responsibility for monitoring and reporting offsets to the executive branch¹⁴⁵:

- The President is to establish any procedures deemed necessary for reporting information, standardizing evaluation methods, avoiding double counting, verifying emissions, etc.
- The President is to develop processes by which to determine whether the entity has achieved actual GHG emissions reductions or sequestration.

Unclassified projects, for which the President is allowed to distribute less than one credit for each ton of GHG emission avoided; and methane projects, for which the President is to develop streamlined procedures for issuing credits are classified as off-budget, input-based (Table 2). The other offset programs mentioned in this section are classified as off-budget, output-based since they are easily measured as to ensure credits issued are proportional to GHG emission reductions.

b. Lieberman-Warner

The Lieberman-Warner bill allows facilities to offset up to 15 percent of emissions through allowances awarded for domestic offset projects.¹⁴⁶ An offset allowance is defined as:¹⁴⁷

a unit of reduction in the quantity of emissions or an increase in sequestration equal to 1 carbon dioxide equivalent at a facility that is not a covered facility, where the reduction in emissions or increase in sequestration is eligible to be used as an additional means of compliance for the submission requirements established under section 1202.

The legislation also states that “[t]he term ‘offset project’ means a project, other than a project at a covered facility, that reduces greenhouse gas emissions or increases sequestration of carbon dioxide.”¹⁴⁸ Eligible projects,¹⁴⁹ however, are limited to a number of specified agricultural and rangeland projects,¹⁵⁰ land use change and forestry activities,¹⁵¹ manure management and disposal practices,¹⁵² and other terrestrial offset practices.¹⁵³ The list of eligible domestic activities does not appear to encompass avoided deforestation.

¹⁴⁵ S. 1766, §601(c).

¹⁴⁶ S. 2191, §2402(a).

¹⁴⁷ *Id.* §4(20).

¹⁴⁸ *Id.* §4(21).

¹⁴⁹ *Id.* §2403(b).

¹⁵⁰ *Id.* §2403(a)(1). Eligible agricultural and rangeland practices include altered tillage practices, winter cover cropping, continuous cropping, conversion of cropland to rangeland or grassland, reduction of nitrogen fertilizer use, reduction in flooding of rice paddies, reduce in carbon emissions from organic soils.

¹⁵¹ *Id.* §2403(a)(2). Land use change and forestry activities are limited to afforestation or reforestation and forest management.

¹⁵² *Id.* §2403(a)(3). Manure management and disposal projects include waste aeration and methane capture and combustion.

¹⁵³ *Id.* §2403(a)(4). Terrestrial offset practices include capture or reduction of noncovered fugitive emissions, methane capture and combustion at non-agricultural facilities, and any other practice recognized by the Administrator of the EPA.

The Lieberman-Warner bill charges the Secretary of Agriculture, in consultation with the EPA Administrator, to publish a handbook “that provides easy-to-use guidance on achieving, reporting, registering, and marketing offsets.”¹⁵⁴ The Administrator, in consultation with the Secretary of Agriculture, is charged with developing regulations for the “issuance and certification of offset allowances” that “ensure that those offsets represent real, verifiable, permanent, and enforceable reductions in greenhouse gas emissions or increases in biological sequestration.”¹⁵⁵

The Lieberman-Warner bill provides relatively detailed guidance to the Administrator regarding the rigor of the offset quantification, monitoring, and verification standards that should be developed,¹⁵⁶ offering the following standards for offsets:

- Project developers must first petition the EPA Administrator for project approval;¹⁵⁷
- Within 180 days of the petition, the EPA Administrator will review the petition and issue offset allowances for approved projects;¹⁵⁸
- Project developers must submit a quantification plan for monitoring carbon sequestration/reductions in GHG emissions that includes a project description, accounting periods, reporting responsibilities, measurement procedures, baseline emissions, discounts for leakage, and additionality determinations;¹⁵⁹
- The project developer must submit a GHG Initiation Certificate to the Administrator that estimates GHG emissions in the four years preceding the implementation of the regulations;¹⁶⁰
- To claim credit for offsets, the project developer must submit a Verification Report, completed by an Administrator-approved third party;¹⁶¹
- The project developer is required to submit a Reversal Certificate to the Administrator if the project experiences a complete or partial reversal of reduced or sequestered emissions and relinquish enough offset allowances or emission allowances to cover the reversal;¹⁶² and
- The Administrator may count preexisting projects if they satisfy the requirements of the law.¹⁶³

¹⁵⁴S. 2191, §2401(c)(1).

¹⁵⁵*Id.* §2402(b).

¹⁵⁶*Id.*, §§2404-2411.

¹⁵⁷*Id.* §2404(b).

¹⁵⁸*Id.* §2404(c)(1)(D).

¹⁵⁹*Id.* §2404(d).

¹⁶⁰*Id.* §2404(e)(2).

¹⁶¹*Id.* §2405.

¹⁶²*Id.* §2406.

¹⁶³*Id.* §2408.

To improve and simplify the offset process, the Administrator is to take the following actions:

- Develop standardized tools for monitoring projects and determining baselines, additionality, and leakage;¹⁶⁴
- Within 18 months of approval of regulations, develop regulations regarding accreditation of third party verifiers and make information about verifiers available on a publicly available database;¹⁶⁵
- Design regulations regarding the reversal of offsets;¹⁶⁶
- Within two years of the enactment of the bill, develop regulations regarding the examination and auditing of offsets;¹⁶⁷
- Within two years of enactment of the bill, the EPA Administrator is to consult with the Department of Agriculture and submit a report to Congress detailing what complimentary programs or policies would help improve human health and the environment and the costs of such initiatives;¹⁶⁸
- Within 18 months of the passage of the bill, develop with the Department of Agriculture rules that give preferential consideration to the use of native species;¹⁶⁹ and
- Within five years of the enactment of the bill, begin reviewing and revising regulations.¹⁷⁰

Because of the relatively stringent requirements set for offset credits, the aforementioned programs are classified as off-budget, output-based in Table 2.

c. Manager's Amendment

As with the Lieberman-Warner bill, the Manager's Amendment allows regulated facilities to cover up to 15 percent of their allowance obligations with domestic offset projects.¹⁷¹ If a covered facility does not use offset projects to cover 15 percent of its obligations, it can use additional international allowances or international carbon credits.¹⁷² Alternatively, the covered facility may "carry over" these remaining domestic offsets into the subsequent year.¹⁷³

¹⁶⁴ S. 2191, §2404(f-i).

¹⁶⁵ *Id.*, §2405.

¹⁶⁶ *Id.*, §2406.

¹⁶⁷ *Id.*, §2407.

¹⁶⁸ *Id.*, §2410.

¹⁶⁹ *Id.*, §2410(c)(1).

¹⁷⁰ *Id.*, §2411.

¹⁷¹ S. 3036, § 302(b)(1).

¹⁷² *Id.*, § 302(b)(2).

¹⁷³ *Id.*, § 302.

The Manager's Amendment combines, and even expands upon, the opportunities for offsets under the Bingaman-Specter bill and the Lieberman-Warner bill. The Manager's Amendment highlights numerous circumstances under which a party would receive credit:

- Removal of GHG precursors;¹⁷⁴
- Carbon Capture and Storage;¹⁷⁵
- Use of Fuel as a Feedstock;¹⁷⁶
- Fuel Exports;¹⁷⁷ and
- Fuels Purchased for International Flights.¹⁷⁸

The aforementioned credit opportunities, with the exception of fuel purchased for international flights, also appear in the Bingaman-Specter bill.

The Manager's Amendment also includes opportunities for offset credits referenced in the original Lieberman-Warner bill¹⁷⁹: agricultural and rangeland, land use and forestry, manure management and disposal, fugitive emissions, and methane capture and combustion.¹⁸⁰

The Manager's Amendment includes processes for project approval¹⁸¹ identical to those in the Lieberman-Warner bill.¹⁸² The Manager's Amendment has, however, taken one step that may ameliorate the substantial estimation difficulties associated with offset projects. The bill directs the Administrator to develop a list of categories of agricultural, forestry, and land use-related projects that are eligible for offset credit¹⁸³ and to develop methodologies that can be used to assess reductions or sequestration associated with each type of project.¹⁸⁴ What distinguishes this provision from other climate change bills – or from any other offset program, for that matter – is that it provides for testing of the methodologies; it is the first scheme to require offset estimates to be reproducible by independent evaluators:¹⁸⁵

METHODOLOGY TESTING.—The Administrator may not issue a methodology under this section until the Administrator determines that—

- (1) the methodology has been tested by 3 independent expert teams on at least 3 different offset projects to which that methodology applies; and*
- (2) the emission reductions or sequestrations estimated by the expert teams for the same offset project do not differ by more than 10 percent.*

¹⁷⁴ S. 3036, § 202(e).

¹⁷⁵ *Id.*, § 202(f).

¹⁷⁶ *Id.*, § 202(g).

¹⁷⁷ *Id.*, § 202(h).

¹⁷⁸ S. 3036, § 202(i).

¹⁷⁹ S. 2191, §2403.

¹⁸⁰ S. 3036, § 303.

¹⁸¹ *Id.*, §304-311.

¹⁸² S. 2191, §2404-2411.

¹⁸³ S. 3036, § 303(b).

¹⁸⁴ *Id.*, § 303(c).

¹⁸⁵ *Id.*, § 303(e). This language was adopted from the report “Designing Offset Policy for the U.S.”, the Nicholas Institute, Duke University, Durham NC. <http://www.nicholas.duke.edu/institute/offsetpolicy.pdf> (Last visited April 29, 2009).

This provision will further ensure that offset projects result in real reductions in carbon dioxide emissions or carbon sequestration. This program was classified as off-budget, output-based (Table 2).

International Credits and Offsets

a. Bingaman-Specter

The Bingaman-Specter bill would allow the President to decide to accept credits from foreign GHG regulatory programs that “the President determines to have a level of environmental integrity that is not less than the level of environmental integrity of the programs under this Act.”¹⁸⁶ International credits, then, are classified as off-budget, output-based (Table 2).

In addition, the President could establish a program to give offset credits for projects undertaken outside the United States.¹⁸⁷ Regulated parties could satisfy up to 10 percent of their compliance obligations with international offset credits.¹⁸⁸ The provisions of the Bingaman-Specter bill allow for the development of “streamlined procedures for distributing credits for the greenhouse gas emission mitigation benefits of projects for which the President determines there are broadly accepted standards or methodologies for quantifying and verifying those benefits.”¹⁸⁹ Because the goal of the aforementioned streamlined procedures is to maintain processes that quantify and verify emission reductions, the Bingaman-Specter international offset provisions have been classified as off-budget, output-based in Table 2.

b. Lieberman-Warner

The Lieberman-Warner bill allows covered facilities to satisfy an additional 15 percent of their allowances with “credits obtained on a foreign GHG market.”¹⁹⁰ Since the EPA was required to develop rules regarding the use of international credits that ensure the foreign government’s program is at least as stringent as that of the United States, this program is classified as off-budget, output-based (Table 2).¹⁹¹

c. Manager’s Amendment

Relative to the other two bills, the Manager’s Amendment limits the quantity of international credits. Rather than concentrating on limits to facilities, however, the system limits the number of allowances available in the aggregate. International offset allowances are limited to an additional five percent beyond each year’s basic allowance cap.¹⁹² However, if the number of international offset allowances is less than the allowable five percent, the program will allow the difference to be made up with allowances from an authorized foreign carbon market.¹⁹³

¹⁸⁶ S. 1766, §501(d).

¹⁸⁷ *Id.*, §501(e)(1).

¹⁸⁸ *Id.*, §501(f)(2).

¹⁸⁹ *Id.*, §501(e)(2).

¹⁹⁰ S. 2191, §2501.

¹⁹¹ *Id.*, §2502.

¹⁹² S. 3036, § 321(b)(1).

¹⁹³ *Id.*, § 321(b)(2).

Alternatively, the system can roll over allowances in excess of five percent for use in a subsequent year.¹⁹⁴

The Manager’s Amendment requires that within two years of the bill’s enactment the EPA Administrator develop rules regarding the distribution of offset allowances to “projects that reduce greenhouse gas emissions or increase sequestration of carbon dioxide in countries other than the United States.”¹⁹⁵ The regulations for this international program must meet the same requirements as those for the domestic offset program, making this an output-based, off-budget system (Table 2).¹⁹⁶

As with the other bills, the EPA Administrator must develop rules that allow the use of foreign allowances only from countries with national climate change program “of comparable stringency to the program established by this Act, including comparable monitoring, compliance, and enforcement.”¹⁹⁷ As a result, this program’s international allowances are classified as off-budget, output-based in Table 2.

Early Action Allowances

a. Bingaman-Specter

Between 2012 and 2020, 1 percent of annual allowances will be used to reward covered facilities that took early actions to reduce GHG emissions.¹⁹⁸ If the amount of allowances set aside for early action in the allocation scheme is insufficient to cover all eligible projects, then the President can establish procedures for allocating the available early action credits among eligible projects. The amount of allowances available for early action cannot exceed the 1 percent allocation.¹⁹⁹

The basis for the early action awards is not entirely clear. The bill requires entities making early reduction claims to substantiate the amount of reduction under the 1605(b) Voluntary Reporting of Greenhouse Gases Program, the Environmental Protection Agency’s Climate Leaders Program, or through a State-administered or private registry.²⁰⁰ At least some of the eligible systems do not require rigorous estimation methods. Consequently, the Bingaman-Specter early action program is classified as on-budget, input-based in Table 2.

b. Lieberman-Warner

The Lieberman-Warner bill also stipulates that the EPA Administrator is to allocate to owners or operators of covered facilities allowances for actions taken since the beginning of 1994 “that

¹⁹⁴ S. 3036, § 321(b)(3).

¹⁹⁵ *Id.*, § 321(a).

¹⁹⁶ *Id.*, § 321(c)(2).

¹⁹⁷ *Id.*, § 322.

¹⁹⁸ S. 1766, §201(a)

¹⁹⁹ *Id.*, §206(a)(2).

²⁰⁰ *Id.*, 206(c)(2).

resulted in verified and credible reductions of [GHG] emissions.”²⁰¹ The amount allocated to reward early actions is:²⁰²

- 5 percent of emission allowances designated for 2012;
- 4 percent of emission allowances for 2013;
- 3 percent of emission allowances for 2014;
- 2 percent of emission allowances for 2015; and
- 1 percent of emission allowances for 2016.

To receive credits for early action, an entity must have reported emission reductions through the Environmental Protection Agency’s Climate Leaders Program, the 1605(b) Voluntary Reporting of Greenhouse Gases Program, a state or regional greenhouse gas emission program, or a voluntary entity program.²⁰³ Due to the reporting requirements associated with the voluntary programs outlined above, the Lieberman-Warner early action program has been classified as on-budget, input-based in Table 2.

c. Manager’s Amendment

The Manager’s Amendment would offer early credit from 2012 – 2025²⁰⁴:

Year	% of Allowances for Set Aside for Early Action
2012	5
2013	5
2014	5
2015	4
2016	3
2017	3
2018	1
2019	1
2020	1
2021	1
2022	1
2023	1
2024	1
2025	1

This represents a more extensive use of early action credit than either of its predecessors.

²⁰¹ S. 2191, §3301.

²⁰² *Id.*

²⁰³ *Id.*

²⁰⁴ S. 3036, § 702.

Early action allowances are to be distributed to entities:

- Holding allowances from the State of California or the Regional Greenhouse Gas Initiative,²⁰⁵
- Repowering power plants²⁰⁶ or
- Leading early carbon capture and storage projects “monitored by a network developed by an international collaborative government and industry research program.”²⁰⁷

Because of the selective nature of the Manager’s Amendment early action initiative, this program has been classified as on-budget, output-based in Table 2.

Carbon Capture and Sequestration Projects

Carbon capture and sequestration (CCS) refers to the practice of separating CO₂ from the exhaust stream in electric generation or industrial processes, compressing the gas, transporting it to a suitable geological structure and injecting it deep below the earth’s surface for permanent disposal. One of the advantages of the CCS strategy is that it is relatively easy to measure the amount of CO₂ that has been stored. For this reason, the CCS programs under all of the bills are output-based (Table 2).

a. Bingaman-Specter

The Bingaman-Specter bill provides for the President to establish the conditions for long-term carbon sequestration and storage in geological structures and the distribution of credits equal to the amount stored.²⁰⁸ In addition, another 8 percent of annual allowances will be used to further encourage CCS projects. The bonus allowances decrease from 3.5 per ton in 2012 to 0.5 per ton in 2039, after which time the bonuses will be discontinued. Qualifying projects can receive bonuses for a maximum of 10 years. If there are not enough bonus allowances to cover all eligible projects, then additional allowances will be deducted from the amount available for auction. If there are excess bonus allowances, those additional allowances will be sold at auction.²⁰⁹ Since the intent of the offset provision is to distribute credits for CCS projects proportionate to “the quantity of carbon dioxide sequestered by the entity during the calendar year,” the Bingaman-Specter CCS bonus program is classified as on-budget, output-based in Table 2. Note, however, that the bonus allowances are in excess of the amount of the sequestration.

b. Lieberman-Warner

The Lieberman-Warner bill also provides special incentives for capture of CO₂ and storage in geological formations.²¹⁰ The program establishes a bonus allowance account with a 2012 initial balance of 3,932,160,000 windfall emission allowances that, from 2012 and 2035, would be augmented by another 4 percent of each year’s annual allowances. Eligible facilities then would

²⁰⁵ S. 3036, § 704.

²⁰⁶ *Id.*, § 705.

²⁰⁷ *Id.*, § 706.

²⁰⁸ S. 1766, §302.

²⁰⁹ *Id.* §207.

²¹⁰ S. 2191, §3601.

be awarded credits “equal to the product obtained by multiplying the number of metric tons of CO₂ geologically sequestered by the project and the bonus allowance rate for that calendar year,” where the rate decreases from 4.5 in 2012 to 0.5 in 2039.²¹¹ This rate apparently constitutes the entire reward for CCS, i.e. there is no initial credit for the CCS “offset” project itself as there is under the Bingaman-Specter bill. Thus, by 2039 each ton of sequestered carbon will only receive a half ton of credit.

Projects may only receive bonus allowances for the first 10 years of the project or from 2012 through 2021 if the project began operation before 2012.²¹² If the bonus allowance account is not sufficient to cover the number of eligible projects, the EPA Administrator will “(1) distribute the remaining bonus allowances only to qualifying projects that were already qualifying projects during the preceding calendar year, (2) distribute the remaining bonus allowances to those qualifying projects on a pro rata basis; and (3) discontinue the program established under this subtitle as of the date on which the Bonus Allowance Account is projected to be fully used based on projects already in operation.”²¹³

Since the Lieberman-Warner bill calls for the distribution of bonus allowances in a manner that is proportionate to the “metric tons of carbon dioxide sequestered by the project,”²¹⁴ the initial starting balance of 3.9 billion allowances has been classified as off-budget, output-based and the annual allocations have been classified as on-budget, output-based in Table 2.

c. Manager’s Amendment

The Manager’s Amendment offers a far more measured approach to CCS than either of its predecessors. It offers a smaller percentage of allowances to CCS projects, eliminates the windfall of off-budget allowances provided for in the Lieberman-Warner bill, and establishes clear performance measures for such projects.

The bonus allowance rate is approximately half of that of the other bills, starting at a ratio of 2:1 and declining to zero by year 2040.²¹⁵ The Manager’s Amendment also includes a CCS “Kick-Start” program,²¹⁶ which sets aside 1 percent of all allowances from 2012 through 2022 with the “goal of rapidly bringing into operation in the United States not fewer than 5 nor more than 10 commercial facilities that capture and geologically sequester carbon released when coal is used to generate electricity.”²¹⁷

As with the other bills, projects can receive bonus allowances only for ten years.²¹⁸ Should the number of allowances in the bonus account be insufficient to reward all eligible projects, then the Administrator is to “(1) distribute the remaining bonus allowances only to qualifying projects that were already qualifying projects during the preceding calendar year; (2) distribute the

²¹¹ S. 2191, §3603.

²¹² *Id.* §3604.

²¹³ *Id.* §3605.

²¹⁴ *Id.*, §3603.

²¹⁵ S. 3036, §1013(a).

²¹⁶ *Id.*, §1005.

²¹⁷ *Id.*, §1002.

²¹⁸ *Id.*, §1014.

remaining bonus allowances to those qualifying projects on a pro rata basis; and (3) discontinue the program established under the subtitle as of the date on which the Bonus Allowance Account is projected to be fully used based on projects already in operation.”²¹⁹

Unlike its predecessors, the Manager’s Amendment establishes performance standards for CCS projects (Table 3).

Table 3: Carbon Capture and Sequestration Performance Standards under the Manager’s Amendment²²⁰

Type of Facility	Begin Date for CCS Operation	Performance Standard for CCS Projects
Existing Electric Generation Plant that was built before enactment of S. 3036	Before January 1, 2016	Must capture at least 85 percent of carbon dioxide in flue gas; must treat flue gas for at least 100 megawatts of output.
	On or after January 1, 2016	Must achieve an average annual emissions rate of \leq 1,200 pounds CO ₂ /megawatt of electricity after carbon capture and storage.
New Electric Generation Plant that was built after enactment of S. 3036	Before July 1, 2018	Must achieve an average annual emissions rate of \leq 800 pounds CO ₂ /megawatt of electricity after carbon capture and storage.
	On or after July 1, 2018	Must achieve an average annual emissions rate of \leq 350 pounds CO ₂ /megawatt of electricity after carbon capture and storage.
Covered entities (other than electric generation plants)	NA	Must capture at least 85 percent of carbon dioxide produced by the unit.

Agriculture and Forestry

a. Bingaman-Specter

The Bingaman-Specter bill sets aside allowances to provide incentives for agricultural projects.²²¹ Between 2012 and 2050, 5 percent of allowances will be set aside to reward agricultural carbon sequestration projects.²²²

²¹⁹S. 3036, §1015.

²²⁰*Id.*, §1012.

²²¹S. 1766, §205(b).

²²²*Id.* §201(a).

There is significant ambiguity regarding the basis for allocation of those allowances. It would appear, however, that the allowances will be allocated on the basis of actual carbon sequestration (output-based) rather than on the basis of project implementation (input-based). The Bingaman-Specter bill requires the Secretary of Agriculture to develop a “standardized system of measurements for agricultural greenhouse gases” and “delineate the most appropriate system of certification of credit.”²²³ Taking into account this information, the Secretary of Agriculture is to develop “a program under which agricultural sequestration allowances may be distributed to entities that carry out sequestration projects on agricultural land that achieve long-term greenhouse gas emission mitigation benefits.”²²⁴

If the amount of carbon calculated for agricultural sequestration projects exceeds the 5 percent allocation, additional allowances can be drawn from the portion allocated for auction. Given the emphasis on agricultural soil carbon sequestration, it is unclear whether conversion of cropland to forest stands is a permissible project. It is possible that forestry projects, such as cropland conversion, may be included as unclassified projects.²²⁵

b. Lieberman-Warner

Beyond the off-budget, output-based provisions of the offset program, there are two other programs under the Lieberman-Warner bill that address agriculture and forestry. First, the bill allocates 5 percent of annual allowances to encourage emission reductions and sequestration increases in the agriculture and forestry sectors.²²⁶ While the provisions of this program require the Secretary of Agriculture to develop methods of soil carbon management,²²⁷ those methods are never referenced in the distribution provisions. The system seems to be designed more to reward practices than outcomes, as the allocation is directed to “entities that carry out sequestration projects on agricultural and forest land.”²²⁸

The bill also allocates 3 percent of allowances for international forest activities, which, unlike the domestic offset provisions, includes prevention of deforestation.²²⁹ This international program appears to emphasize making rewards for carefully measured results. The EPA Administrator is to develop, in consultation with the Secretary of State, the Secretary of the Interior, and the Secretary of Agriculture, regulations regarding the reward of international forestry allowances “that ensure that the emission reductions or sequestrations are real, permanent, additional, and verifiable, with reliable measuring and monitoring and appropriate accounting for leakage.”²³⁰ The EPA Administrator, in consultation with the Secretary of State, is to keep an updated list of countries capable of implementing such projects, based on the existence of historical data regarding carbon stocks, their technical ability to monitor changes in carbon stocks, and their institutional capacity to lead forestry programs.²³¹ Within three years of the enactment of the

²²³ S. 1766, §205(a)(2).

²²⁴ *Id.*, §205(b).

²²⁵ *Id.* §303.

²²⁶ S. 2191, §3701.

²²⁷ *Id.* §3702.

²²⁸ *Id.* §3703. There is a significant ambiguity in this provision.

²²⁹ *Id.* §3803.

²³⁰ *Id.* §3804.

²³¹ *Id.*, §3805.

bill, and every five years after that, the EPA is to conduct a review of the international forestry program. Ten years after the bill's enactment, the EPA is to conduct a review of all countries that contribute to at least 0.5 percent of global greenhouse gas emissions and apply a discount to forest credits imported from any country that has not enacted legislation to cap those emissions.²³² Consequently, the Lieberman-Warner international forestry program is classified as on-budget, output-based in Table 2.

c. Manager's Amendment

The Manager's Amendment offers a smaller percentage of allowances to agriculture and forestry projects than either of its predecessors. It would allocate 4.25 percent of allowances to these projects in years 2012 through 2030; and 4.5 percent, from 2031 through 2050.²³³

Within two years of the bill's enactment, the Secretary of Agriculture is to develop regulations for the distribution of the aforementioned allowances to reward the achievement of the following practices: (1) "real, verifiable, additional, permanent, and enforceable reductions in greenhouse gas emissions from the operations of the entities"; (2) "real, verifiable, additional, permanent, and enforceable increases in greenhouse gas sequestration on land owned or managed by the entities;" and (3) "pilot projects or other research regarding innovative practices for use in measuring – (A) greenhouse gas emission reductions; (B) sequestration; or (C) other benefits and associated costs of the pilot projects."²³⁴ In addition, the Secretary of Agriculture is to ensure that about 0.5 of the 4.25 to 4.5 percent annual allowances set aside for agriculture and forestry projects (11 to 12 percent of ag and forestry allowances) go to enteric fermentation and manure management programs.²³⁵ Another 0.25 of the 4.25 to 4.5 percent annual allowances set aside for agriculture and forestry (5 to 6 percent of ag and forestry allowances) will be used to encourage the development of new project types and methodologies.²³⁶ The Secretary of Agriculture is also supposed to ensure that entities receiving credit for agricultural and forestry projects under Section 331 of the act do not receive more allowances than they would as an offset project under Subtitle A.²³⁷ Overall, the program is classified in Table 2 as on-budget, output-based, although the use of a small percentage of allowances to encourage new project types and methodologies suggests there may be some input-based rewards.

Under the Manager's Amendment, one percent of annual allowances will be set aside for international forestry projects between 2012 and 2050. The Manager's Amendment includes standards for international forestry projects similar to that of the original Lieberman-Warner bill. Therefore, the Manager's Amendment international forestry projects are classified as on-budget, output-based in Table 2.

²³² S. 2191, §3806.

²³³ S. 3036, § 331.

²³⁴ *Id.*, § 332.

²³⁵ *Id.*

²³⁶ *Id.*

²³⁷ *Id.*

2. Discussion and Recommendations

There are two key, interrelated issues in the area of offsets and other activities outside the emissions cap: (1) the relation of the offsets to the annual allocation of allowances and (2) the measurement and integrity of the offset projects and the credits with which they are rewarded.

In general, programs that use offset projects simply as a mechanism for allocating allowances under the cap will not compromise the environmental efficacy of the emissions targets. All three bills allocate a portion of the annual allowances to reward early actions and agriculture projects and to provide bonuses for CCS. In addition, the Lieberman-Warner bill and the Manager's Amendment both offer on-budget allowances for domestic and international forestry projects. These on-budget provisions do not change the amount of allowances available each year. While their allocation could have significant implications for the parties involved, their availability does not change the amount of potential emissions.²³⁸

In contrast, the off-budget, or offset, provisions under the three bills effectively create new allowances, augmenting the number of allowances circulated each year. In theory, the amount of realized net emissions remains unchanged because the additional allowances are perfectly offset by the reduction in emissions associated with the offset projects.²³⁹ This difference between on-budget provisions, which merely affect the allocation of allowances, and off-budget provisions that actually create new allowances underscores the importance of accurate assessment of the impacts of the off-budget provisions.

The hazard with the off-budget, output-based approach is that if the activities or projects fail to deliver on their promised emissions reductions/sequestration enhancements, then the level of net national emissions will increase. This suggests that to justify an off-budget program, it will be necessary to assure that the projects will in fact offset emissions that are at least equal to the offset credits they generate. Unfortunately, developing methods for reliably estimating the emissions reductions associated with offset projects has proven difficult.

This, in turn, raises the question of whether the executive branch can develop regulations for an offset program, as all three bills require of the executive branch. While a full assessment of carbon offset project evaluation protocols is beyond the scope of this legislative analysis, it is important to observe that Federal government, state government, and private parties have been working on this issue for well over a decade and have yet to demonstrate a system that is not vulnerable to substantial manipulation.

The primary challenges revolve around two key issues. First, project analysis requires comparing the observed levels of emissions (or sequestration) to a reference case — i.e., what would have happened in the absence of the project. The problem is that the reference case cannot be observed. As such, it could be manipulated significantly by project developers subject to a profit motive.²⁴⁰ Second, while it is possible to observe what happens within the boundaries of a well-

²³⁸ S. 2191, §§3601, 3701, 3801; S. 1766, §§206, 207.

²³⁹ S. 2191, §2402; S. 1766, §301.

²⁴⁰ Kenneth Richards, Neil Sampson and Sandra Brown. 2006. "Agricultural and Forestlands: U.S. Carbon Policy Strategies." Report for the Pew Center on Global Climate Change. Arlington, Virginia.

defined project, there are often secondary (unintended) effects, potentially as large as the primary (intended) effects that could dissipate the beneficial effects of the project. Many of those who advocate including offset projects as part of a trading system have attempted to address these issues. None have done so in a convincing manner. The result has been that there is a history of manipulation and obfuscation in the realm of carbon offsets.

The significance of this problem should not be underestimated. Under the original Lieberman-Warner bill and the Manager's Amendment, it would be possible to generate as much as an additional 15 percent of allowances under the offset provisions. It is not beyond the realm of possibility that those offset projects, implemented under an inevitably flawed protocol, would result in no additional real reductions. Inclusion of the offset projects, then, could delay the onset of real emissions reductions by a decade or more. Because there are no limits to the use of offsets under the Bingaman-Specter bill, the entire climate program could be vitiated by the offset provisions.

The Manager's Amendment has attempted to address the problems associated with measurement in offset projects, although additional measures need to be taken to ensure the environmental efficacy of the bill. One step that would garner confidence for existing or proposed protocols would be to demonstrate reproducibility of results. This would require that independent, impartial teams of expert evaluators who apply a model protocol (or estimation method) to a variety of projects would derive roughly the same results across the range of projects.²⁴¹ It appears that despite calls for such an exercise,²⁴² this type of demonstration project has never been conducted.

As mentioned previously, the Manager's Amendment directs the Administrator to develop a list of categories of agricultural, forestry, and land use-related projects that are eligible for offset credit²⁴³ and to develop and test methodologies that ensure independent reproducibility of results.²⁴⁴ Unfortunately, the Manager's Amendment has not used the concept of "reproducibility" to its best advantage. First, it has applied it only to domestic offset programs. Second, it has applied it only to agricultural, forestry and land-use projects. Finally, it has applied the concept in a muddled fashion.²⁴⁵ While Section 303(c) and (e) provide clear direction to develop the methodology, the directions to developers in Section 304 do not clearly

²⁴¹ Kenneth Richards and Krister Andersson. 2000. "The Leaky Sink: Persistent Obstacles to a Forest Carbon Sequestration Program Based on Individual Projects," *Climate Policy* 1: 41-54.

²⁴² See, e.g., Kenneth Richards 2004. "A Brief Overview of Carbon Sequestration Economics and Policy," *Environmental Management* 33(4):545-558.

²⁴³ S. 3036, § 303(b).

²⁴⁴ *Id.*, § 303(c) and (e). In the interest of full disclosure, the concepts and language on reproducibility were provided by the authors of this report in Richards, Kenneth R. and Stephanie Hayes Richards, 2008, "An Analysis of the Leading Climate Change Bills in the U.S. Senate," *Environmental Law Reporter* 38: 10388-10417 and in "Designing Offset Policy for the U.S.," Nicholas Institute, Duke University. Durham, NC. <http://www.nicholas.duke.edu/institute/offsetpolicy.pdf> (Last visited April 29, 2009).

²⁴⁵ This is not the only example of a muddling of a bill's treatment of measurement protocols. In its treatment of agriculture and forestry projects (S.2191 §3702), the Lieberman-Warner bill borrowed its language on the development of soil carbon sequestration estimation directly from the Bingaman-Specter bill's section on agriculture projects (S.1766 §205(a)(2)). Unfortunately, the soil carbon methods developed for agriculture would not be an appropriate basis for evaluating forestry projects. The drafters of the Lieberman-Warner, however, bill did not adjust the requirements when they expanded the scope of the coverage.

state that the developer must employ the methods of Section 303(c). In fact, those methods are not referenced anywhere in the bill.

To protect its environmental goals, the national climate change program should include a requirement that the standardized measurement methods used to evaluate any type of project, domestic or international, methane reduction or carbon sequestration, must lead to results that are reproducible by independent experts and are not subject to strategic manipulation. It may be possible to develop such rigorous methods for some project types, particularly methane capture projects.

There will inevitably be some types of beneficial projects for which it is simply not possible to develop sufficiently credible methods of estimation. This is not to say that the projects are not beneficial, but rather that estimations may be idiosyncratic, subject to manipulation and gaming. For these types of activities or projects Congress should consider providing incentives via input-based payments under the Farm Bill or a similar vehicle.

These general guidelines allow us to provide very specific recommendations regarding the different types of activities outside the covered facilities.

Domestic Offset Projects

The Manager's Amendment effectively combines all the different types of domestic offset projects mentioned in its predecessors. Therefore, it is useful to look at the wording of the Manager's Amendment to provide more specific guidance on the future of domestic offset projects. The Manager's Amendment includes numerous types of offset project types for which emissions reduction/sequestration are easy to estimate and can remain off-budget: removal of GHG precursors, carbon capture and storage, use of fuel as a feedstock, fuel exports, fuels purchased for international flights, and methane capture and combustion. At the same time, the Manager's Amendment mentions several types of offset projects for which identifying a baseline and contending with leakage have proven to be an illusive exercise: agriculture and rangeland, land use and forestry, manure management and disposal, and fugitive emissions. These categories of projects should be encouraged through the same budgeting process as the environmental provisions of the Farm Bill. Delinking the projects from the trading system eliminates the risk that they will undermine the environmental efficacy of the climate change legislation. Alternatively, financing these project categories with on-budget allowances would also protect environmental efficacy.

International Credits and Offsets

The requirements for international credits and offsets should parallel those for domestic projects. Project types that are relatively easy to assess may remain off-budget, output-based. Project types that are more difficult to assess, such as agriculture and forestry projects, need to be financed through the regular budgeting process or through on-budget allowances. Thus, additional detail needs to be incorporated into section 321 of the Manager's Amendment.

Early Action Allowances

Allowances set aside for early action would ideally be eliminated. While the allowances for early action are on-budget and would not compromise the environmental efficacy of the legislation, such provisions will simply reward past activities and have no impact on current or future emissions levels. They also increase the program's administrative costs.

Carbon Capture and Storage

While the Manager's Amendment provides less preferential treatment to CCS technology than its predecessors, the rewards for CCS projects need to be proximate to the carbon sequestration achieved by a particular project to prevent inefficient choices between technology investments. Under the Bingaman-Specter bill, CCS projects would receive one allowance for every metric ton of carbon dioxide sequestered²⁴⁶ and between 3.5 and 0.5 bonus allowances between 2012 and 2039.²⁴⁷ The Lieberman-Warner bill sets aside 4 percent of annual on-budget allowances between 2012 and 2035 and an additional 3.9 billion off-budget allowances to reward each metric ton of carbon dioxide sequestered with between 4.5 (in 2012) and .5 (in 2039) allowances.²⁴⁸ The Manager's Amendment would auction 1 percent of allowances in years 2012 through 2022 to "kick start" CCS projects, and would set aside between 3 percent (2012 to 2025), 4 percent (2026 to 2030), and 1 percent (2031 to 2050) for long-term CCS projects to provide between 2 (2012 to 2017) and 0.5 (2030 to 2039) bonus allowances for such endeavors.²⁴⁹

It is preferable to fund the development and deployment of the basic technology rather than to over-incentivize its operation. The knowledge and experience that accompany the initial phases of development and deployment contribute broadly to social intellectual capital. The same cannot be said of operations. Although the CCS bonus rewards in all the bills are output-based, the CCS projects receive proportionately more allowances than the carbon sequestration achieved. This could lead to some unfortunate incentives. At a minimum it could lead to inefficient dispatch across plants. In the extreme, if the value of the bonus allowances exceeds the operating costs of the plant, as it likely would in the early years of the program, there would be an incentive for operators to overproduce, running plants even in time of low demand just to earn the bonus allowances. Thus, bonuses for CCS projects should be eliminated from the final national climate change bill.

Agriculture and Forestry

Ideally, the on-budget and off-budget agriculture and forestry provisions would be combined into one Farm Bill type provision, funded through the general budgeting process, to ensure these projects do not compromise the environmental efficacy of the climate change bill. Alternatively, these provisions would be combined into one on-budget program for the same reason.

²⁴⁶ S. 1766, §302.

²⁴⁷ *Id.*, §207.

²⁴⁸ S. 2191, §3601-3605.

²⁴⁹ S. 3036, §1005-1015.

All three bills contain on-budget allowances for agriculture and forestry projects. This is arguably appropriate, given the challenges associated with the measurement of project contributions. Keeping the programs on-budget avoids the possibility of compromising the environmental efficacy of the climate legislation. The fact that the Manager's Amendment requires the Secretary of Agriculture to assure that the projects under the agriculture and forestry provisions do not receive more allowances than they would under the offset program, acknowledges the possible overlap between the two approaches.

Two recommendations emerge from this discussion. First, the provisions of all three bills would be improved by moving all agriculture and forestry sequestration projects out of the offset provisions and into this on-budget approach. Rather than measuring each offset project to protect against fraud the emphasis would shift to evaluation of the program as a whole to check for effectiveness.

Second, better still would be funding the agriculture and forestry programs through the general budget process. Under such a process, they would compete with other public priorities – neither automatically funded nor limited by the amount of revenue from allowance auction revenues.

VII. Distribution of Allowances and Auction Revenues

Generally, there are two methods of distributing the allowances issued under a pollution cap-and-trade program: giving them away or selling them.²⁵⁰ Under the former approach, the allowances are allocated to entities in proportion to their historic emissions (i.e., grandfathered) or given to particular industries, possibly as a means of developing political support. Under the latter approach, the government or another entity offers allowances for sale at an open auction, with the revenues going to either special earmarked funds or to the general revenue fund.

Box 4: Strategies for Distributing Allowances

Given Away	Auctioned	
<i>Direct Allocation</i>	<i>Earmarking</i>	<i>Revenue Raising</i>
Pre-committed		General Purpose
Allowances are given directly to specified entities or for specific uses.	Federal government sells the allowances at auction and the revenues are directed to specific uses, programs, or entities.	Federal or state governments sell the allowances to contribute to general fund or other public finance purpose such as debt, deficit or tax reductions.

Often this decision is cast as one of allocation versus auction. As discussed below, it is more useful to think of the difference as one of precommitted (through either direct allocation or earmarking) versus general government finance use (Box 4). *Direct allocation* simply means that the allowances are given to entities for their use, which may include selling the allowances on the market. *Earmarking* means that the government is selling the allowances and allocating the revenues to a predetermined purpose. In contrast, if the government sells the allowances and uses the revenues for deficit reduction, debt repayment, offsetting tax reductions, or otherwise lowering the social cost of government finance, or some other general public finance purpose, then it is a *revenue raising* approach. Included in this latter category could be allocation of allowances to individual state governments so they can auction the allowances for a revenue raising purpose.

1. Provisions

All three bills use a combination of distribution approaches. Each allocates allowances for a variety of purposes including industry, agriculture, early action, CCS, and state programs. At the same time, they each auction a portion of allowances and earmark funds for a variety of purposes, such as technology development, adaptation, worker training, energy assistance, and administrative costs. Only the Manager’s Amendment, however, engages in revenue raising.

²⁵⁰ Carolyn Fischer et al., “Using Emissions Trading to Regulate U.S. GHG Emissions: An Overview of Policy Design and Implementation Issues,” *National Tax Journal* 51: 456-57.

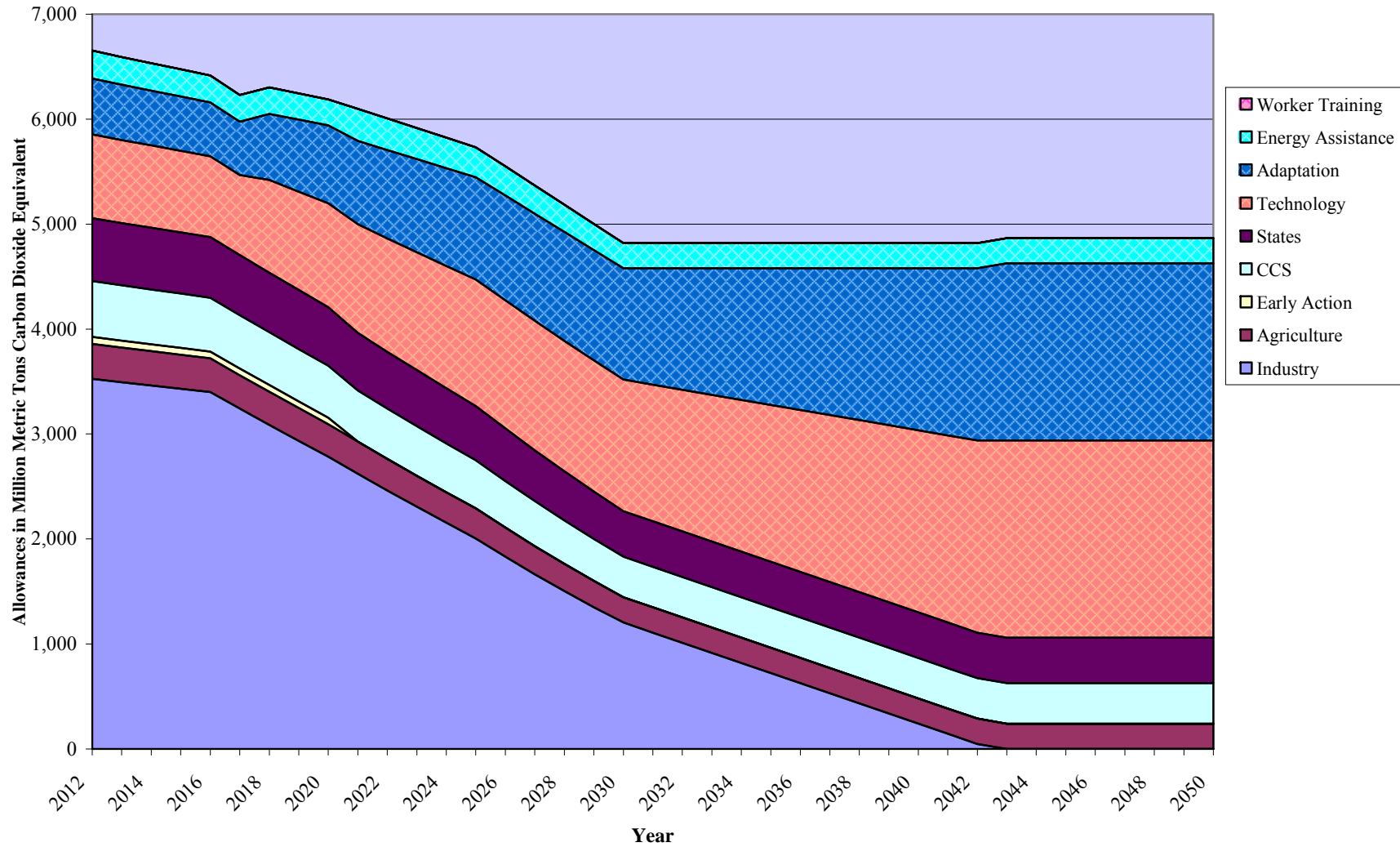


Figure 3: Bingaman-Specter Allocation of Allowances and Auction Revenue

Solid colors represent direct allocation of allowances. Crosshatched areas indicate earmarking of auction revenue.

Direct Allocation

a. Bingaman-Specter

Industry

Beginning in 2012, the Bingaman-Specter program would allocate 53 percent of allowances to industry, that amount declining to 1 percent by 2042 and zero thereafter (Figure 3).²⁵¹ Within the industrial sector, the allocation among facility types is as shown in Table 4.²⁵²

For each of the first five sectors, 92 percent of the allowances would be allocated to existing sources according to historic levels of carbon content or CO₂ emissions and 8 percent would be allocated to new sources according to the potential emissions of each.²⁵³ If the amount allocated for new sources is insufficient to cover all eligible new sources, allowances will be shifted for this purpose from the allowances allocated for auction.²⁵⁴

Table 4: S. 1766 Bingaman-Specter Bill Direct Allocation of Allowances within Industry – 2012

Industry Sector	Facilities within Industry Sector	Percentage of Allowances Allocated to Industry
Coal	Eligible Coal Mine	12
Refining	Eligible Petroleum Refineries	7
Natural Gas	Eligible Natural Gas Processing Plants	4
Electric Power	Eligible Electric Generation Facilities	54
Nonfuel Entities	Eligible Nonfuel Regulated Facilities	4
Carbon-Intensive Manufacturing	Eligible Manufacturing Facilities	19

For the carbon-intensive manufacturing sector, the program would allocate 96 percent of the allowances to currently operating facilities.²⁵⁵ Each facility would be assigned to one of several major industrial categories. The allowances would first be allocated to categories of facilities based on the relative levels among the categories of the previous year's emissions.²⁵⁶ Within each category the allowances available for that category would be allocated to individual facilities in proportion to the number of production employees the facility employs.²⁵⁷ Facilities that shut down would have to return any allowances that have been allocated for the post-shutdown time periods.²⁵⁸ Four percent of the allowances allocated to the carbon-intensive manufacturing sector would be reserved for new entrants; and those entities would be awarded allowances on the same basis—number of employees—as the existing operations.²⁵⁹ If the

²⁵¹ S. 1766, §201(a).

²⁵² *Id.* §201(c).

²⁵³ *Id.* §202(b).

²⁵⁴ *Id.* §202(b)(3)(C).

²⁵⁵ *Id.* §203(b).

²⁵⁶ *Id.* §203(c).

²⁵⁷ *Id.* §203(d).

²⁵⁸ *Id.* §203(e).

²⁵⁹ *Id.* §203(f)(2).

number of allowances reserved for new entrants is insufficient to cover those eligible, allowances could be shifted from those allocated for auction.²⁶⁰

Early Action

In the years 2012 to 2020, the Bingaman-Specter plan would allocate 1 percent of allowances to reward parties that carried out projects to reduce emissions or increase sequestration prior to 2012.²⁶¹ The projects eligible for early action allowances are limited to (1) those reported under EIA's §1605(b) Voluntary Reporting of Greenhouse Gas Program, (2) EPA's Climate Leader's Program, or (3) a state-administered or private registry.²⁶²

States

In all years of the Bingaman-Specter program, 9 percent of the allowances would be allocated to states.²⁶³ One half of those allowances would be allocated among the states in proportion to their historic levels of GHGs. The other half would be allocated in proportion to their population.²⁶⁴ While states have a great deal of discretion, they are expected to use the allowances to support low-income energy consumers and displaced workers, to promote energy efficiency and technology development, and to promote investment in the energy sector.²⁶⁵

Carbon Capture and Storage

Each year, the program would allocate 8 percent of allowances to a bonus allowance account to "encourage near-term development of certain geological sequestration projects."²⁶⁶ In addition to any allowances earned for the offset of CO₂, the CCS program would provide extra rewards ranging from 3.5 (in 2012) down to 0.5 (in 2032 through 2039) allowances per ton sequestered.²⁶⁷ CCS projects would only be eligible for the bonuses during the first 10 years of their operation.²⁶⁸ If there were insufficient allowances to cover bonuses for all of the eligible projects, the deficit would be made up by deducting allowances from the amount to be auctioned.²⁶⁹

Agriculture

For all of the years, 2012 to 2050, the Bingaman-Specter bill would allocate 5 percent of allowances to agricultural carbon sequestration.²⁷⁰ As with the CCS bonus allowances, the scheme would shift additional allowances from the auction account should the demand for allowances under this provision exceed its allocation.²⁷¹

²⁶⁰ S. 1766, §203(f)(3).

²⁶¹ *Id.* §201(a)(1).

²⁶² *Id.* §206(c).

²⁶³ *Id.*, §201.

²⁶⁴ *Id.*, §204(b).

²⁶⁴ *Id.* §204(c).

²⁶⁵ *Id.* §204(c). To the extent that the states sell the allowances and use the revenue for predetermined uses, the direct allocation to states could also be cast as a form of earmarking.

²⁶⁶ *Id.* §207(a)(1).

²⁶⁷ *Id.* §207(a)(3).

²⁶⁸ *Id.* §207(a)(4).

²⁶⁹ *Id.*

²⁷⁰ *Id.* §205(c).

²⁷¹ *Id.* §205(d).

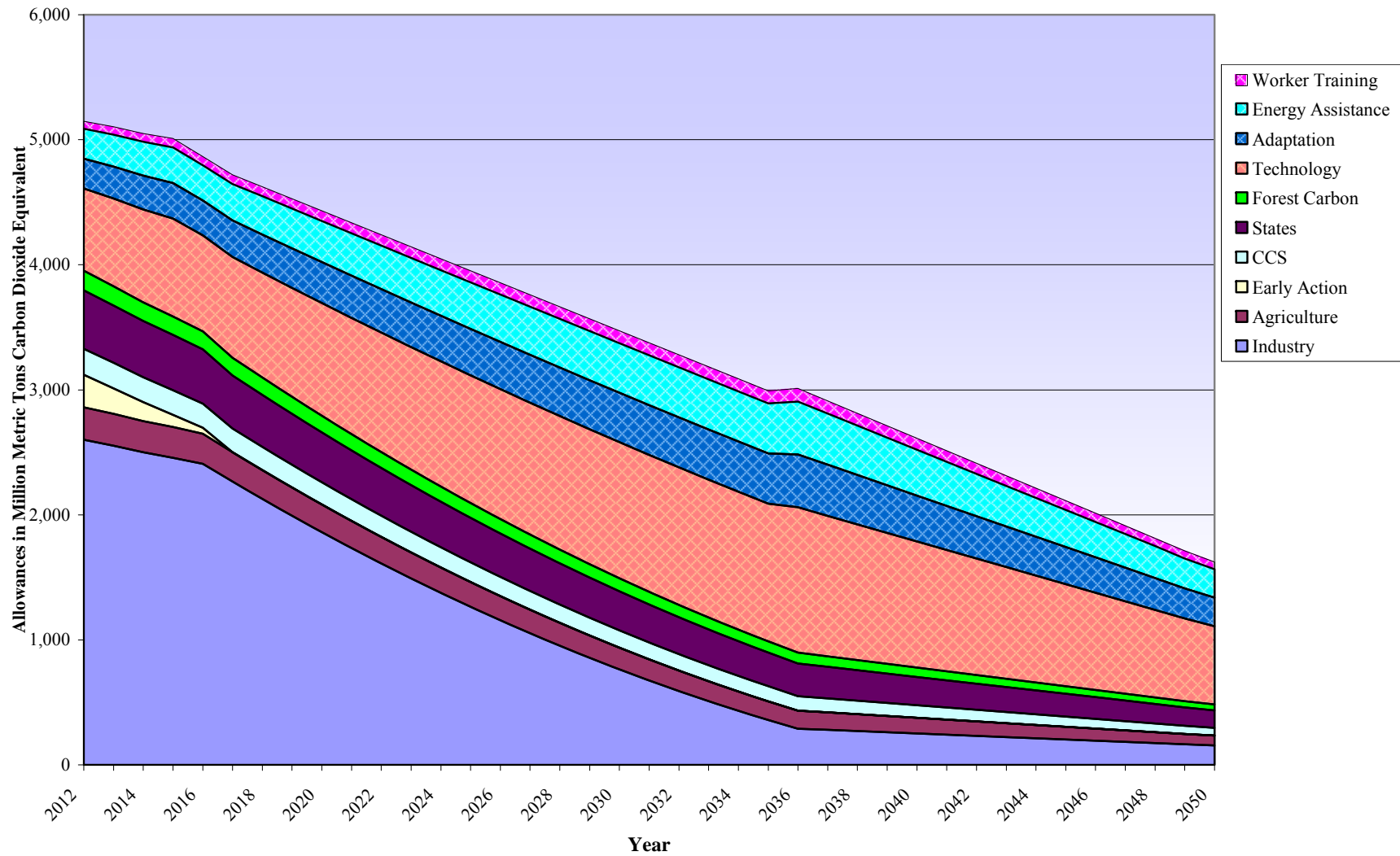


Figure 4: Lieberman-Warner Allocation of Allowances and Auction Revenue
 Solid colors represent direct allocation of allowances. Crosshatched areas indicate earmarking of auction revenue.

b. Lieberman-Warner

Industry

At the outset of the Lieberman-Warner climate program, a majority of allowances would be directly allocated to various purposes and sectors (Figure 4). First, the bill allocates an amount to be split evenly between covered facilities in the electric utilities and the industrial sector, starting at 40 percent of allowances in 2012 and declining to 2 percent in 2035, after which there would be no direct allocation for these firms per se.²⁷² For the distribution of allowances in both of these sectors, there are provisions for new entrants to receive a portion of the allowances.²⁷³ In the electric industry, the rural electric cooperatives are given preferential treatment in the allocation of allowances inasmuch as they are allocated a quantity of allowances equal to the amount of their CO₂ equivalent emissions in 2006.²⁷⁴ There is no provision for what would happen when the amount of allowances allocated to the electric utility sector falls below the amount of rural electric cooperative emissions in 2006.

Another 10 percent of annual emissions allowances would be allocated to electric cooperatives and regulated utilities that have a legal obligation to serve customers. The allowances are to be sold on the market and the proceeds used to mitigate economic impacts on low- and middle-income consumers via rebates or reduced charges, and to promote end use energy efficiency.²⁷⁵

Early Action

A small percentage of allowances in the first years of the program, 5 percent in 2012 declining to 1 percent in 2016, would be allocated to parties that have taken actions since 1994 “that resulted in verified and credible reductions of GHG emissions,”²⁷⁶ particularly under programs such as the Climate Leaders Program, the 1605(b) Voluntary Reporting of Greenhouse Gas Program, state or regional emissions reduction programs, and other voluntary programs.²⁷⁷

States

The Lieberman-Warner scheme would also allocate to states 9 percent of allowances, most of which would be intended to encourage and reward energy efficiency, early adoption of stringent emissions reduction targets, and expenditures on low-income home energy assistance.²⁷⁸ One of the nine percent of allowances set aside for states will be distributed to states that have adopted regulations that allow for the automatic adjustment of gas and electricity rates to cover the fixed costs of service, have provided incentives for energy utilities to invest in both demand and supply side energy efficiency, and have adopted the most recent energy performance codes for new buildings.²⁷⁹ Another one of the nine percent of allowances will be distributed to states that are in compliance with the Energy Conservation and Production Act.²⁸⁰ Two of the nine percent will be distributed to states with more stringent greenhouse gas emission reduction policies than

²⁷² S. 2191, §3901.

²⁷³ *Id.* §§3903(a) and 3904(a).

²⁷⁴ *Id.* §3903(b).

²⁷⁵ *Id.* §3501.

²⁷⁶ *Id.* §3301.

²⁷⁷ *Id.* §3302(b).

²⁷⁸ *Id.* §§3401-3403.

²⁷⁹ *Id.* §3401(a).

²⁸⁰ *Id.* §3401(b).

that required by the Federal government.²⁸¹ Each year, 1.67 of the 9 percent will be allocated based on the states' relative expenditures for low-income energy assistance.²⁸² Another 1.67 of the 9 percent would be allocated to states in proportion to their populations.²⁸³ The final 1.67 of the 9 percent of the annual allowances are allocated according to how much carbon is contained in the fuels the states mine (coal), process (natural gas) or refine (petroleum).²⁸⁴ There are also provisions to allow allocation of 0.5 percent of total annual emissions allowances to tribal communities,²⁸⁵ which could thereby reduce the amount of allocations to states from 9 percent to 8.5 percent.²⁸⁶

Carbon Capture and Storage

For the years 2012 to 2035, the bill would allocate 4 percent of the allowances to provide added incentives for geological CCS.²⁸⁷ In addition, the Bonus Allowance Account commenced the program with a balance of 3.9 billion emission allowances that were not part of the annual allowance budget.²⁸⁸ The bonus allowance program awards rates ranging from 4.5 allowances per ton of CCS in 2012 to 0.5 in 2039.²⁸⁹

Agriculture and Forestry

Throughout the life of the program, 5 percent of annual allowances would flow to an emission allowance account for domestic agricultural and forestry terrestrial sequestration projects.²⁹⁰ This section is distinct from the offset program, essentially bringing forestry and agriculture on-budget rather than off-budget. This provision looks more like a program that subsidizes beneficial actions rather than a payment for carefully measured carbon outcomes.

International Forestry

Between 2012 and 2050, another 3 percent of annual allowances would flow to an emission allowance account that provides incentives for reduced deforestation and increased reforestation in foreign countries.²⁹¹ The basis for the rewards appears to be for outcomes achieved, as measured in terms of carbon; however, the language is ambiguous.

²⁸¹ S. 2191, §3402.

²⁸² *Id.* §3403(b)(1).

²⁸³ *Id.* §3403(b)(2).

²⁸⁴ *Id.* §3403(b)(3).

²⁸⁵ *Id.* §3403(d).

²⁸⁶ *Id.* §3403(d)(3).

²⁸⁷ *Id.* §3601(a).

²⁸⁸ *Id.* §3601(b).

²⁸⁹ *Id.* §3603.

²⁹⁰ *Id.* §3701.

²⁹¹ *Id.* §3803.

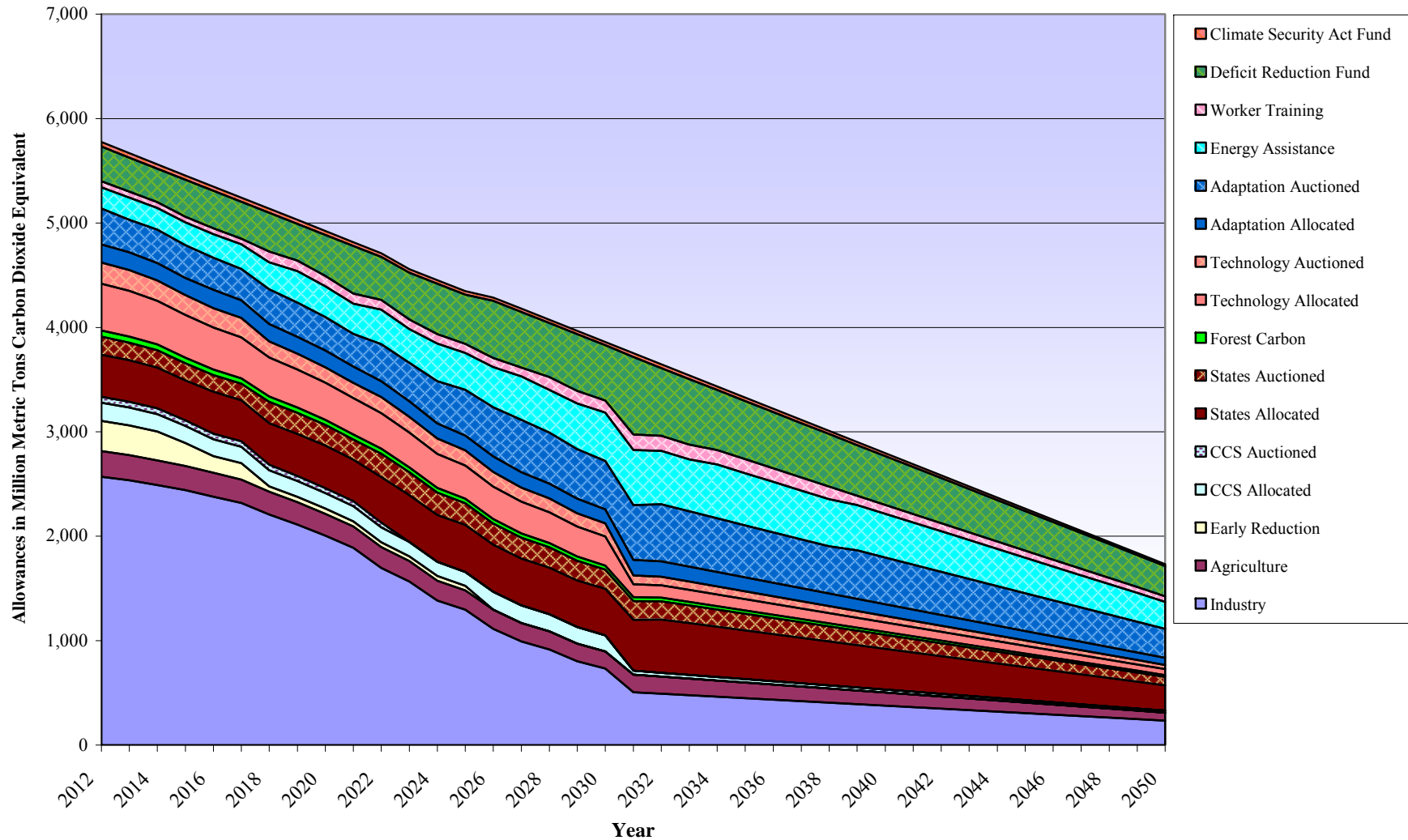


Figure 5: Manager’s Amendment Allocation of Allowances and Auction Revenue

Solid colors represent direct allocation of allowances. Green crosshatched area represents revenue-raising for public finance. Other crosshatched areas indicate earmarking of auction revenue.

c. Manager’s Amendment

Industry

The Manager’s Amendment allocates 44.5 percent of allowances to industry in 2012, declining to 13.5 percent in 2050 (Figure 5).²⁹² Within the industrial sector the new bill provides more favorable treatment to the natural gas, electric power, and carbon-intensive manufacturing industries at the expense of the coal, refining, and non-fuel entities (Table 5). It also provides that four percent of the allowances for carbon-intensive manufacturing be reserved for new entrants.²⁹³

Table 5: S. 3036 Manager’s Amendment Direct Allocation of Allowances within Industry – 2012²⁹⁴

Industry Sector	Facilities within Industry Sector	Percentage of Allowances Allocated to Industry
Natural Gas	Eligible Natural Gas Processing Plants	9
Electric Power	Eligible Electric Generation Facilities	62
Carbon-Intensive Manufacturing	Eligible Manufacturing Facilities	25
Refining	Eligible Petroleum Refineries	4

Early Action

The Manager’s Amendment includes provisions for rewarding early action. The system would initially allocate 5 percent of annual allowances to this purpose in 2012, decreasing to one percent in 2018, and phasing out after 2025.²⁹⁵

States

The Manager’s Amendment eventually allocates a substantially larger percentage of allowances to the states, and its approach differs from the original bills. The Manager’s Amendment allocates 7 percent of total annual allowances to the States in 2012 rising to 14 percent by 2050,²⁹⁶ and it auctions another 3 percent of annual allowances for this purpose in 2012 rising to 4.75 percent by 2050 (total allocation/auction of 10 percent in 2012 and 18.75 percent by 2050).²⁹⁷ In contrast, both the Bingaman-Specter bill and the Lieberman-Warner bill consistently allocate 9 percent of allowances for this purpose each year.²⁹⁸ The Manager’s Amendment allocates 3 percent of annual allowances to states that are economically reliant on coal and manufacturing in 2012, rising to 4 percent in 2050.²⁹⁹ In addition the bill allocates another 4 percent of annual allowances in 2012 to states that have led the efforts to combat climate change, and that percentage increases to 10 percent by 2050.³⁰⁰ The Manager’s Amendment gives the states significant leeway regarding the use of these allowances, which may

²⁹² S.3036, §§541, 551, 561, 571, 601.

²⁹³ *Id.* §542 (g).

²⁹⁴ *Id.*, §§541, 551, 561, 571, 601.

²⁹⁵ *Id.*, §702

²⁹⁶ *Id.*, §§602,614.

²⁹⁷ *Id.*, §§611,613.

²⁹⁸ S. 1766, §201; S. 2191, §3401-3403.

²⁹⁹ S. 3036, §602.

³⁰⁰ *Id.*, §614.

be dedicated to any of the following purposes: consumer energy assistance, low carbon energy technologies, public transportation, relocation or adaptation assistance for coastal communities, relief for electricity generation or energy-intensive manufacturing, assistance for displaced workers, habitat protection, water projects, recycling programs, or improved health plans.³⁰¹

Carbon Capture and Storage

The Manager's Amendment has substantially decreased national reliance on CCS technology relative to the two earlier bills. The Manager's Amendment directs 3 percent of allowances in 2012 to 2025; 4 percent, from 2026 to 2030; and 1 percent, from 2031 to 2050 for long-term CCS projects.³⁰² Most importantly, the Manager's Amendment eliminates the 3.9 billion starting balance for the CCS bonus allowance account included in the original Lieberman-Warner bill.³⁰³

Agriculture and Forestry

The newer bill offers a comparable, yet slightly smaller proportion of allowances to agriculture and forestry projects. It dedicates 4.25 percent of allowances from 2012 through 2030 and 4.5 percent from 2031 through 2050 for such projects.³⁰⁴

International Forestry

The Manager's Amendment has also decreased allowances for international forestry projects. It distributes only 1 percent of annual allowances,³⁰⁵ rather than the 3 percent provided by the original Lieberman-Warner bill.³⁰⁶

Technology Development

The Manager's Amendment directs a substantially smaller proportion of allowances for advanced technology than the original climate change bills.³⁰⁷ In 2012, the Manager's Amendment allocates 7.75 percent of total allowances for advanced technology programs (0.75 percent for the Efficient Buildings Program, 0.75 percent for Efficient Equipment and Appliances, 0.75 percent for the Efficient Manufacturing Program, 4 percent for Renewable Energy, 0.5 percent for Clean Commercial Fleets, and 1 percent for Cellulosic Biofuel).³⁰⁸ By 2050, the Manager's Amendment allocates only 3.25 percent of total allowances for technology programs (0.75 percent for the Efficient Buildings Program, 0.75 percent for Efficient Equipment and Appliances, 0.75 percent for the Efficient Manufacturing Program, and 1 percent for Renewable Energy).³⁰⁹ At the same time, the Manager's Amendment will auction 3.5 percent of allowances in 2012 declining to 2.25 percent of allowances in 2050 for technology development.³¹⁰ This combination of allocated/auctioned allowances provides 11.25 percent of

³⁰¹ S. 3036, §614.

³⁰² *Id.*, §1011. In addition, the Manager's Amendment also earmarks 1 percent of allowances from 2012 to 2022 to "kick start" the CCS program under section 1001.

³⁰³ S. 2191, §3601.

³⁰⁴ S. 3036, §331.

³⁰⁵ *Id.*, §1312.

³⁰⁶ S. 2191, §3803.

³⁰⁷ Another difference among the bills is that the two original bills only use earmarking for technology development, whereas the Manager's Amendment uses both earmarking and direct allocation.

³⁰⁸ S. 3036, §§801, 811, 821, 831, 1101, 1121.

³⁰⁹ *Id.*

³¹⁰ *Id.*, §§901, 911, 1321, 1111.

allowances in 2012 and 5.5 percent of allowances in 2050 for technology development.³¹¹ This is a completely different strategy than that employed by the original two bills, the Bingaman-Specter bill offering 12 to 39 percent of allowances³¹² and the Lieberman-Warner bill directing 13 to 40 percent of annual allowances for this same purpose.³¹³

Adaptation

The Manager's Amendment directs a similar proportion of allowances for adaptation efforts to the Bingaman-Specter bill. Overall, the Manager's Amendment allocates/auctions 9 percent of allowances in 2012 and 20 percent of allowances in 2050 for this purpose.³¹⁴ The Bingaman-Specter bill allocates 8 percent in 2012 and 35 percent in 2050 for adaptation,³¹⁵ while the original Lieberman-Warner bill allocates between 5 and 15 percent of annual allowances for this purpose.³¹⁶ When one examines the Manager's Amendment allowance distribution more closely, one will notice that only 3 to 4 percent of annual allowances are directly allocated to adaptation programs,³¹⁷ whereas 6 to 16 percent of annual allowances are auctioned for this same purpose.³¹⁸

Auction for Earmarking

a. Bingaman-Specter

The Bingaman-Specter bill would auction 24 percent of allowances in 2012 with increases of 0 to 2 percent each year until the year 2043, when the proportion of allowances auctioned would stabilize at 80 percent (Figure 3).³¹⁹ The Bingaman-Specter bill provides the following schedule for sale of the allowances available for auction:

- 2009--50 percent of 2012 auctioned allowances and 50 percent of 2013 auctioned allowances
- 2010--50 percent of 2014 auctioned allowances
- 2011--50 percent of 2015 allowances
- 2012 to 2050--50 percent of allowances for current year and 50 percent of allowances from calendar year four years from current.³²⁰

Assuming that the price of allowances is \$8/metric ton in 2012 as predicted by the EIA analysis,³²¹ the Bingaman-Specter bill would raise \$12.8 billion in revenues in 2012.³²² By 2030

³¹¹ S. 3036, §§801, 811, 821, 831, 901, 911, 1321, 1101, 1111, 1121.

³¹² S. 1766, §201.

³¹³ S. 2191, §§3101, 3201, 4302.

³¹⁴ S. 3036, §§621, 631, 1201, 1331. As with technology development, the Manager's Amendment directs resources for adaptation through both direct allocation and earmarking, whereas the original bills utilize earmarking for adaptation programs.

³¹⁵ S. 1766, §201.

³¹⁶ S. 2191, §§3101, 3201, 4302.

³¹⁷ S. 3036, §621.

³¹⁸ *Id.*, §§631, 1201, 1331.

³¹⁹ *Id.* §201.

³²⁰ S.1766, 110th Cong. §208(e).

³²¹ Bill Wicker. *Key Findings From EIA and EPA on Bingaman-Specter "Low Carbon Economy Act" of 2007*. http://www.energy.senate.gov/public/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=095669c2-ca5b-4b72-adf5-51239cbd9216&Month=1&Year=2008&Party=0 (Last visited April 29, 2009).

when the price of allowances has reached \$25/metric ton, the legislation would produce revenues closer to \$63.9 billion.³²³

Table 6: Bingaman-Specter Allocation of Allowances via Auction Revenue

Year	Energy Assistance Fund	Energy Technology Deployment Fund	Adaptation Fund
2012			
Percent of Total Allowances	4	12	8
Percent of Auction Revenues	17	50	33
Projected Total Revenue (\$ billions)	2.2	6.4	4.2
2030			
Percent of Total Allowances	5	26	22
Percent of Auction Revenues	9	49	42
Projected Total Revenue (\$ billions)	5.7	31.3	26.8

In 2012, the revenues from allowances are to be used for the following purposes (Table 6): low-income energy assistance (17 percent), technology deployment (50 percent), and adaptation (33 percent).³²⁴ In pure financial terms, this would mean that \$2.2 billion would be used to assist low-income residents with their energy bills, providing weatherization assistance, and helping individuals in rural areas where electricity prices are 150 percent above the national average.³²⁵ Approximately \$6.4 billion would be used to develop and deploy zero or low-carbon energy technologies, advanced coal and sequestration projects, cellulosic biomass initiatives, and advanced technology vehicles.³²⁶ The final \$4.2 billion would be used to address the impacts of climate change, with 25 percent going to coastal regions; 25 percent, to U.S. regions above 50 degrees North latitude (i.e. Alaska); 20 percent, for the contiguous United States; and 30 percent, for fish and wildlife.³²⁷ By 2030, revenues from allowance auctions could reach \$63.9 billion--\$5.7 billion for energy assistance, \$31.3 billion for technology development, and \$26.8 billion for adaptation.

³²² This projected revenue for 2012 was determined using the following calculation:

$$24\% \times 6,652 \text{ allowances (million metric tons of CO}_2\text{)} \times \$8/\text{metric ton} = \mathbf{\$12,771,840,000.00}$$

[Percent allowances auctioned] x [total allowances issued] x [expected allowance price]

The estimated revenues are based on an assumption that no allowances originally earmarked for auction have to be diverted to new entrant facilities or agricultural or carbon sequestration projects or supplemented by allowances that ended up not being issued by the president or were returned to the president due to a plant closing or by a state that failed to use the allowances within the allotted time frame (S. 1766, 110th Cong. §208).

³²³ Based on:

$$53\% \times 4,819 \text{ allowances (million metric tons of CO}_2\text{)} \times \$25/\text{metric ton} = \mathbf{\$63,851,750,000.00}$$

[Percent allowances auctioned] x [total allowances issued] x [expected allowance price]

³²⁴ S. 1766, §201.

³²⁵ *Id.*, §403.

³²⁶ *Id.* §401.

³²⁷ *Id.* §402.

b. Lieberman-Warner

The Lieberman-Warner bill would auction 24 percent of allowances in 2012³²⁸ with increases of 1 to 3 percent per year, until 2036, after which the proportion of allowances auctioned would remain stable at 73 percent (Figure 4).³²⁹ To jump start the Energy Technology Deployment provisions,³³⁰ the bill provides for auction, within 180 days of passage, of a small percentage of the earliest allowances:

- 6 percent of 2012 allowances;
- 4 percent of 2013 allowances; and
- 2 percent of 2014 allowances.³³¹

These early auction allowances would be in addition to the percentages of allowances allocated for later auction for those years. All the revenues from early and ongoing auctions would be assigned to one of four funds (Table 7).

In 2012, 13 percent of all allowances would be auctioned for the Technology Deployment Fund with that portion increasing to 40 percent in 2036 through 2050. This fund is designed to develop and deploy zero- or low-carbon energy technologies, advanced coal and sequestration projects, cellulosic biomass initiatives, and advanced technology vehicles.³³²

In the early years of the program 5 percent of the total allowances will be auctioned for both the Adaptation Fund and the Energy Assistance Fund, each increasing to 15 percent in years 2036 and beyond. The Secretary of Energy would use the Adaptation Fund for assisting low-income residents with their energy bills, providing weatherization assistance, and helping individuals in rural areas where electricity prices are 150 percent above the national average.³³³ The Adaptation Fund would be split between the Department of the Interior, EPA, the Army Corps of Engineers, and the Department of Commerce to help fish, wildlife, plant species, and habitats adapt to the impacts of climate change.³³⁴

Between 1 and 4 percent of all allowances would be auctioned each year to support the Climate Change Worker Training Fund. The Climate Change Worker Training Fund would be managed by the Secretary of Labor and used to provide job training, temporary wages and benefits for individuals whose jobs are displaced by this legislation and for training workers to fill jobs created by this legislation.³³⁵

³²⁸ The 24 percent includes 6 percent auctioned during the early auction and 18 percent from the regular annual auction.

³²⁹ S. 2191, 110th Cong. §3201.

³³⁰ *Id.* §§4401-4405. The Energy Technology Deployment program provides funding for the development of zero- and low-carbon, advanced coal and sequestration, cellulosic biomass, ethanol, and advanced vehicle technologies.

³³¹ *Id.* §3101.

³³² *Id.* §§4302, 4401.

³³³ *Id.*, §§4501-4502.

³³⁴ *Id.* §4702.

³³⁵ *Id.* §4302, 3201. The percentage of allowances auctioned would range from 18 percent in 2012 to 73 percent in years 2036 – 2050. At the same time, the distribution of auction revenues will remain the same each year: 55

Table 7: Lieberman-Warner Indirect Allocation of Allowances via Auction Revenue

Year	Energy Assistance Fund	Energy Technology Deployment Fund	Adaptation Fund	Climate Change Worker Training Fund
2012				
Percent of Total Allowances	5	13	5	1
Percent of Auction Revenues	20	55	20	5
Projected Total Revenue (\$ billions)	4.7	13	4.7	1.2
2030				
Percent of Total Allowances	11	31	11	3
Percent of Auction Revenues	20	55	20	5
Projected Total Revenue (\$ billions)	24	66	24	6

The Lieberman-Warner bill also establishes a Climate Change and National Security Fund³³⁶ to pay for recommendations made by the Climate Change and National Security Council³³⁷ on steps to reduce the politically destabilizing effects of climate change on global politics. The provisions state that the amounts distributed to the fund from auction of allowances are to be made according to the provisions of §4302(b). But that section allocates all the auction funds among the four other programs listed in Table 7. Apparently, the funds for the Climate Change and National Security Fund, up to five percent of total auction revenues, are to be deducted from the 45 percent of auction revenues that are allocated to the Energy Assistance Fund, the Climate Change Worker Training Fund, and the Adaptation Fund.³³⁸

To get a better sense of the magnitude of funds available for technology development, energy assistance, and adaptation involved in this bill, it is necessary to estimate the revenue that could be raised through the auction system. Assuming the price of allowances is \$19/metric ton in 2012 as predicted by the EIA analysis of the Lieberman-Warner Bill,³³⁹ it is reasonable to assume the Lieberman-Warner bill could raise in excess of \$23 billion in revenues from allowance

percent for technology, 20 percent to energy assistance, 20 percent to adaptation, and 5 percent for worker training programs.

³³⁶ S. 2191, §§4101-4103.

³³⁷ *Id.* §4801.

³³⁸ *Id.* §4802.

³³⁹“Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007.” <http://www.eia.doe.gov/oiaf/servicerpt/s2191/execsummary.html> (Last visited April 29, 2009).

auctions.³⁴⁰ By 2030, when the price of allowances has reached closer to \$61/metric ton,³⁴¹ the legislation could produce annual revenues closer to \$121 billion.³⁴²

c. Manager's Amendment

The Manager's Amendment auctions a smaller percentage of the total annual allowances than either of its predecessors. The newer bill would auction 24.5 percent of allowances in 2012, with increases of 0.5 to 10.5 percent per year, until 2032, after which the proportion of allowances auctioned would remain stable at 58.75 percent (Figure 5).³⁴³

All the revenues from early and ongoing auctions would be assigned among several funds (Table 8).³⁴⁴ The new bill reflects different priorities than either the Bingaman-Specter or the Lieberman-Warner bills. The Manager's Amendment auctions a substantially smaller proportion of allowances for technology development than either of its predecessors. In 2012, the Manager's Amendment will auction 3.5 percent of allowances for technology development and those numbers will decline to 2.25 percent in years 2031 through 2050.³⁴⁵ In contrast, the original Lieberman Warner bill would have auctioned 13 percent of allowances in 2012 and up to 31 percent of allowances in 2030 for this same purpose.³⁴⁶ The Bingaman-Specter bill dedicated 12 percent of allowances in 2012 and 26 percent in 2030 for this purpose.³⁴⁷

Unlike its predecessors, the Manager's Amendment increases funding for energy assistance over time. In 2012, 14 percent of auction revenues would go to energy assistance and that proportion would increase to 24.2 percent in 2030 (Table 8). In contrast, the Lieberman-Warner plan consistently dedicates 20 percent of auction revenues to energy assistance each year (Table 7). The Bingaman-Specter bill provides 17 percent of auction revenues for energy assistance in 2012, decreasing to just 9 percent in 2030 (Table 6).

Relative to the original Lieberman-Warner bill, the Manager's Amendment dedicates a comparable proportion of allowances to adaptation, energy assistance, and worker training. The Manager's Amendment will auction 6 percent of allowances in 2012 rising to 12 percent of allowances in 2030 for adaptation.³⁴⁸ It will auction 3.5 percent of allowances in 2012

³⁴⁰ This projected revenue was determined using the following calculation:

$$24\% \times 5,200 \text{ allowances (million metric tons of CO}_2\text{)} \times \$19/\text{metric ton} = \mathbf{\$23,712,000,000.00}$$

[Percent allowances auctioned] x [total allowances issued] x [expected allowance price]

³⁴¹ "Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007." <http://www.eia.doe.gov/oiaf/servicerpt/s2191/execsummary.html> (Last visited April 29, 2009).

³⁴² "Leading Senate emissions bill would raise energy costs – EIA." April 30, 2008. <http://www.eenews.net/EEDaily/2008/04/30/3> (Last visited April 29, 2009).

$$57\% \times 3,472 \text{ allowances (million metric tons of CO}_2\text{)} \times \$61/\text{metric ton} = \mathbf{\$120,721,440,000.00}$$

[Percent allowances auctioned] x [total allowances issued] x [expected allowance price]

³⁴³ S. 3036, 110th Cong. §§1001, 613, 611, 631, 1201, 1331, 901, 911, 1321, 1111, 581, 532, 1401, 1701.

³⁴⁴ *Id.* §4302.

³⁴⁵ *Id.*, §§801, 811, 821, 831, 901, 911, 1321, 1101, 1111, 1121.

³⁴⁶ S. 2191, §§4302, 3201.

³⁴⁷ S. 1766, §581.

³⁴⁸ S. 3036, §621, 631, 1201, 1331.

increasing to 12 percent of allowances in 2030 for energy assistance.³⁴⁹ The Manager's Amendment will auction 1 to 4 percent of allowances to worker training each year.³⁵⁰

The Manager's Amendment also incorporates the Climate Security Act fund. The Manager's Amendment borrows the concept of the Climate Security Act fund from the Lieberman-Warner bill, and sets aside 0.75 percent of allowances each year to assist with administrative costs of policy implementation.³⁵¹

In 2012, the Manager's Amendment would raise approximately \$26 billion dollars in auction revenues, including \$6.4 billion for adaptation, \$3.8 billion for technology development, \$3.8 billion for energy assistance, \$3.1 billion for the states, \$1.0 billion for worker training, \$1.0 billion for CCS Kickstart, and the remaining \$800 million for the Climate Security Fund.

By 2030, the Manager's Amendment may raise as much as \$89.1 billion in auction revenue, with \$21.6 billion for adaptation, \$21.6 billion for energy assistance, \$8.6 billion for the states, \$5.9 billion for technology development, \$5.4 billion for worker training, and the remaining \$1.3 billion for the Climate Security Fund.

³⁴⁹ S. 3036, §581.

³⁵⁰ *Id.*, §532.

³⁵¹ *Id.*, §1701.

Table 8: Manager’s Amendment Revenue Raising and Earmarking of Allowance Auction Revenue

Year	Deficit Reduction Fund	Energy Assistance	Technology Development	Adaptation	Worker Training	CCS (Kickstart)	States	Climate Security Fund
2012								
Percent of Total Allowances	5.75	3.5	3.5	6.0	1.0	1.0	3.0	0.75
Percent of Auction Revenues	23.5	14.0	14.0	24.5	4.0	4.0	12.0	3.0
Projected Total Revenue (\$ billions)*	6.1	3.8	3.8	6.4	1.0	1.0	3.1	0.8
2030								
Percent of Total Allowances	13.75	12.0	3.25	12.0	3.0	0.0	4.75	0.75
Percent of Auction Revenues	27.8	24.2	6.6	24.2	6.1	0.0	9.6	1.5
Projected Total Revenue (\$ billions)	24.8	21.6	5.9	21.6	5.4	0.0	8.6	1.3

*Assuming allowance price of \$18.54/ton in 2012 and \$46.00/ton in 2030 (2005 US\$). See Brent D. Yacobucci and Larry Parker, “Climate Change: Comparison of S. 2191 as Reported (now S. 3036) with Proposed Boxer Amendment,” CRS Report for Congress, 30 May 2008, Order Code RL34515, Washington DC; Council of Economic Advisers, 2009. To convert these allowances prices to 2006 US\$, it is necessary to multiply these allowance prices by 1.0138 (\$18.80 for 2012 and \$46.63 for 2030). The producer price index for total industrial commodities was 122.8 in 2005 and 124.5 in 2006 (change of 1.38 percent). *The 2008 Economic Report of the President*. Table B-67, p. 304.

Auction for Revenue Raising

a. Bingaman-Specter

The Bingaman-Specter bill does not include any provisions for revenue-raising.

b. Lieberman-Warner

Like the Bingaman-Specter bill, the Lieberman-Warner bill does not include any provisions for revenue-raising.

c. Manager's Amendment

The primary departure from the earlier bills is the substantial percentage of allowances the Manager's Amendment dedicates to deficit reduction. Unlike its predecessors, the Manager's Amendment dedicates from 5.75 (2012) to 19.75 (2032) percent of annual allowances to a Deficit Reduction Fund established at the U.S. Treasury. As illustrated in Table 8 above, auction revenues from the Manager's Amendment are expanded to provide \$6.1 billion in 2012 and \$24.8 billion in 2030 for deficit reduction. The bill does not define, however, the purpose or uses of this new fund beyond its suggestive name and the fact that "No disbursement shall be made from the Deficit Reduction Fund, except pursuant to an appropriation Act."³⁵²

2. Discussion and Recommendations

The distribution of allowances is a critical issue for the design of a climate change bill. The choice among direct allocation of allowances, earmarking of auction proceeds, and revenue raising profoundly affect the distribution of costs and benefits of the program. Moreover, an examination of the distribution schemes of the bills reveals other underlying issues that affect the fundamental efficiency of the various approaches.

This section starts with a brief comparison of the basic provisions of the three bills. It then moves to a discussion of the fundamental policy issues related to the three approaches to distribution. The discussion examines a number of specific issues, making recommendations for improvements in the three bills.

³⁵² S. 3036, §1404.

Table 9: Allowance Distribution under Proposed Climate Change Bills

	% Total Allowances directed to purpose		
	Bingaman-Specter	Lieberman-Warner	Manager's Amendment
2012			
Worker Training	0.00%	1.00%	1.00%
Energy Assistance	4.00%	5.00%	3.50%
Adaptation	8.00%	5.00%	9.00%
Technology	12.00%	13.00%	11.25%
Forest Carbon	0.00%	3.00%	1.00%
States	9.00%	9.00%	10.00%
CCS	8.00%	4.00%	4.00%
Early Action	1.00%	5.00%	5.00%
Agriculture	5.00%	5.00%	4.25%
Industry	53.00%	50.00%	44.50%
Climate Security Act	0.00%	NA*	0.75%
Deficit Reduction	0.00%	0.00%	5.75%
2030			
Worker Training	0.00%	3.00%	3.00%
Energy Assistance	5.00%	11.00%	12.00%
Adaptation	22.00%	11.00%	15.50%
Technology	26.00%	31.00%	10.50%
Forest Carbon	0.00%	3.00%	1.00%
States	9.00%	9.00%	16.25%
CCS	8.00%	4.00%	4.00%
Early Action	0.00%	0.00%	0.00%
Agriculture	5.00%	5.00%	4.25%
Industry	25.00%	22.00%	19.00%
Climate Security Act	0.00%	NA*	0.75%
Deficit Reduction	0.00%	0.00%	13.75%
2050			
Worker Training	0.00%	4.00%**	3.00%
Energy Assistance	5.00%	15.00%**	15.00%
Adaptation	35.00%	15.00%**	20.00%
Technology	39.00%	40.00%**	5.50%
Forest Carbon	0.00%	3.00%	1.00%
States	9.00%	9.00%	18.75%
CCS	8.00%	4.00%	1.00%
Early Action	0.00%	0.00%	0.00%
Agriculture	5.00%	5.00%	4.50%
Industry	0.00%	10.00%	13.50%
Climate Security Act	0.00%	NA*	1.00%
Deficit Reduction	0.00%	0.00%	16.75%

*Under the Lieberman-Warner bill, up to 5 percent of total auction revenues may be deducted from the 45 percent of auction revenues dedicated to Energy Assistance, Worker Training, and Adaptation.

**In years 2036 through 2050, the Lieberman-Warner bill indicates that 73 percent of allowances will be auctioned for worker training, energy assistance, adaptation, and technology; however, the end result is an allocation of 104 percent of allowances.

Comparison of the Bills

There are significant differences among the bills with respect to how they would directly allocate allowances (Table 9). The Lieberman-Warner bill would allocate 40 percent of allowances to industry, split evenly between manufacturing and the electric industry (plus an extra 10 percent of allowances for electric cooperatives and regulated utilities to mitigate the costs of increased electricity prices). In contrast, the Bingaman-Specter bill is much more favorable to the electric power sector, allocating 53 percent of all allowances to industry, and 54 percent of the industry allowances (28.6 percent of all allowances) to the electric power sector, with no restrictions on use. In addition, as the primary consumers of coal and a major consumer of natural gas, the electric utilities will benefit from the allocation of 12 percent of industry sector allowances that go to coal mines and from the 4 percent that goes to natural gas. The Manager's Amendment represents a compromise between the other two bills. It allocates 44.5 percent of allowances are to industry, of which 62 percent go to the electric utility industry (27.6 percent of all allowances). This percentage is similar to the allowances for the electric sector under Bingaman-Specter, but the bill eliminates the indirect allocation to the electric sector through allocation to coal companies.

All three bills also provide small, but significant allocations for agricultural programs, geological carbon capture storage, state programs, and early action. The Manager's Amendment rewards early action more generously than the other bills, but provides fewer rewards for carbon capture and storage.

The bills also differ substantially with respect to their use of earmarking (Table 10). Each bill earmarks auction revenues, often for similar purposes, but the amounts differ substantially over the life of the programs. For example, all three bills offer a different plan for energy assistance. The Bingaman-Specter bill would provide its peak level of energy assistance in the early years of the program, dedicating 17 percent of auction revenues to this cause in 2012 and as little as 6 percent of all auction revenues after 2042. The Lieberman-Warner bill consistently devotes 20 percent of auction revenues to this purpose. The Manager's Amendment dedicates between 14 and 26 percent of auction revenues to energy assistance, with the peak level of funding occurring in the later years of the program.

The Bingaman-Specter bill provides more funding to adaptation than the Lieberman-Warner bill and the Manager's Amendment. The Lieberman-Warner bill provides 20 percent of auction revenues to adaptation, whereas the Manager's Amendment provides between 19 and 27 percent of auction revenues for this purpose and the Bingaman-Specter bill devotes between 33 and 44 percent of annual auction revenues to assist with adaptation measures.

The Lieberman-Warner and Bingaman-Specter bills include higher spending levels for technology development. Both the Lieberman-Warner and the Bingaman-Specter bills maintain consistent spending for technology development. Each year, Bingaman-Specter would dedicate 49 to 50 percent of auction revenues each year to this purpose whereas Lieberman-Warner would dedicate 55 percent of revenues to this initiative. The Manager's Amendment dedicates between 4 and 14 percent of auction revenues to technology development each year.

Table 10: Detailed Distribution of Auction Revenues

(Bold figures in parentheses indicate allocation of auction revenues in 2012 and direction of change, if any over subsequent years)

Lieberman-Warner (S. 2191)	Bingaman-Specter (S. 1766)	Manager’s Amendment (S. 3036)
<p>Energy Assistance Fund (20 percent) 50 percent low-income home energy assistance 25 percent Weatherization Assistance 25 percent rural energy assistance (§ 4501)</p>	<p>Energy Assistance Fund (17 percent and decreasing) 50 percent low-income home energy assistance 25 percent Weatherization Assistance 25 percent rural energy assistance (§ 403)</p>	<p>Energy Assistance Fund (14 percent and increasing to 25.5 percent) Funds are to be used to formulate a tax policy that assists consumers with increases in energy and related costs. (§ 581 - 585)</p>
<p>Climate Change Worker Training Fund (5 percent) Job training, temporary wages and healthcare, transportation to interviews, relocation (§ 4601 – 4605)</p>	<p>Climate Change Worker Training Fund Not applicable</p>	<p>Climate Change Worker Training Fund (4 percent and increasing) 60 percent for Climate Change Worker Assistance program wages, healthcare, and training for displaced workers 10 percent for Workforce Training Safety, aimed at keeping US university and colleges at forefront of science education and research and to train workers in zero and low carbon energy technologies 30 percent for Energy Efficiency and Renewable Energy Worker Training Program established by the Green Jobs Act of 2007 (§ 531 - 534)</p>
<p>Adaptation Fund (20 percent) 40 percent to Interior for fish and wildlife conservation strategies 20 percent to Interior for existing strategies (i.e. endangered species, migratory birds, etc.) 5 percent for cooperative grant programs 5 percent for Agriculture for adaptation activities by National Forests and National Grasslands 12.5 percent for EPA for ecosystems 12.5 percent to Army Corps of Engineers for ecosystems 5 percent to Commerce for restoration and conservation (§ 4702)</p>	<p>Adaptation Fund (33 percent and increasing) 25 percent for coastal regions 20 percent for contiguous United States 25 percent for northern latitudes (Alaska) 30 percent for fish and wildlife conservation (§ 402)</p>	<p>Adaptation Fund (24.5 percent and increasing) State Wildlife Adaptation Fund 78 percent for Secretary of Interior and made available to States for adaptation efforts 22 percent for Land and Water Conservation Fund (§ 631) Bureau of Land Management Emergency Firefighting, Forest Service Emergency Firefighting, and Federal Wildlife Adaptation Fund \$300,000,000/year to Bureau of Land Management \$800,000,000/year to Forest Service Remainder goes to National Wildlife Adaptation (§ 1202) International Climate Change Adaptation Development of adaptation plans, technology transfer, capacity-building, etc. (§ 1331)</p>

The Evolution and Anatomy of Recent Climate Change Bills in the U.S. Senate

Lieberman-Warner (S. 2191)	Bingaman-Specter (S. 1766)	Manager's Amendment (S. 3036)
<p>Energy Technology Deployment (55 percent) 45 percent zero or low carbon energy 28 percent advanced coal and sequestration 7 percent cellulosic biomass 20 percent advanced technology vehicles (§ 4401)</p>	<p>Energy Technology Deployment (49 - 50 percent) 45 percent zero or low carbon energy 28 percent advanced coal and sequestration 7 percent cellulosic biomass 20 percent advanced technology vehicles (§ 401)</p>	<p>Energy Technology Deployment (14 percent and decreasing to 4 percent) 44 – 62 percent for zero and low carbon energy (§ 903) 29 – 44 percent for advanced vehicle manufacturers, (§ 1112) 7 – 11 percent for advanced energy research (§ 911) 14 percent for clean technology deployment (years 2012 – 2017), (§ 1321)**</p>
<p><i>States</i> Not Applicable</p>	<p><i>States</i> Not Applicable</p>	<p>States (12 percent decreasing to 8 percent) Energy Efficiency Block Grant Funds given to States for helping low-income consumers, conserving energy, promoting investment in new technologies, improving public transit, assisting with adaptation, encourage new entrants into electricity and manufacturing, helping displaced workers, creating green jobs, etc. (§ 613)</p> <p>Partnerships with States, Local Governments, and Indian Tribes Funds are given to subsidize public transportation, reduce travel, and improve bicycle and pedestrian infrastructure. (§ 611)</p>
<p><i>Deficit Reduction Fund</i> Not Applicable</p>	<p><i>Deficit Reduction Fund</i> Not Applicable</p>	<p>Deficit Reduction Fund (23.5 – 33 percent variable) Low of 23.5 percent in 2012 and high of 33 percent in 2032 (§ 1402)</p>
<p>Climate Security Act Fund (up to 5 percent) Funds used for national security measures recommended by Climate Change and National Security Council (§ 4802) – though 100 percent of revenues are already incorporated into areas mentioned above</p>	<p><i>Climate Security Act Fund</i> Not Applicable</p>	<p>Climate Security Act Fund (3 percent and decreasing) Funds used for administrative purposes (§ 1702)</p> <p>Kickstart CCS (4 percent in 2012 decreasing to 0 percent by 2024) (§ 1001)</p>

****Note:** Although the Manager's Amendment devotes a substantially smaller portion of auction revenues to energy technology deployment, allowances are also directly allocated to the following purposes: 0.75 percent of annual allowances for Efficient Buildings Program, 0.75 percent of annual allowances for Super Efficient Equipment and Appliances, 0.75 percent of annual allowances for Efficient Manufacturing, 4 percent in years 2012 through 2030 and 1 percent in years 2031 through 2050 for Renewable Energy, 0.5 percent of annual allowances in years 2012 through 2017 to encourage Clean Commercial Fleets, and 0.75 – 1 percent of annual allowances in years 2012 through 2030 for Cellulosic Biofuels.

Unlike its predecessors, the Manager's Amendment devotes auction revenues to the States. Between 8 and 12 percent of annual auction revenues would go directly to the States to fund Energy Efficiency Block Grants and to help states improve mass transit as well as pedestrian and bicycle infrastructure.

As mentioned previously, the Manager's Amendment also sets aside a significant portion of auction revenues for deficit reduction, a positive step forward from the earlier two bills.

Policy Perspective on Distribution of Allowances

All other things being equal, policy analysts prefer to see allowances auctioned for revenue-raising rather than allocated based on past emissions levels or auctioned for earmarked purposes. Relative to direct allocation, the revenue raising approach has several advantages. First, it is a more consistent with the polluter-pays principle.³⁵³ Second, it is a defensible, principled approach that rises above politics and favoritism.³⁵⁴

Third, and most persuasive to the efficiency-seeking analyst, if it is conducted in a revenue-neutral manner, revenue raising auctions allow the government to displace distortionary taxes on goods, such as those on labor, capital, and sales, with a tax on an activity—GHG emissions—that is already being constrained. In other words, it can replace a distortionary tax with a non-distortionary tax.³⁵⁵ This is not a trivial point. At least one analysis suggests that the social cost of the sulfur dioxide provisions of the 1990 Clean Air Act Amendments could have been reduced by more than 24 percent if the allowances had been auctioned rather than grandfathered.³⁵⁶

Finally, auctioning allowances better preserves clear price signals that convey information to consumers about the costs of energy consumption.³⁵⁷ Grandfathering may show up as a subsidy to energy consumption in some markets, as for example in regulated electricity markets. In this respect the higher the percentage of allowances auctioned for government revenue-raising, the better.

It has been suggested that it is politically necessary to engage in grandfathering or other forms of direct allocation to build a political coalition that will support a broad climate change bill. Ultimately, that is a decision that the members of Congress will have to make, but at a minimum they should recognize that there is a substantial cost associated with that direct allocation.

³⁵³ The polluter-pays principle (PPP) has been a guiding tenet for environmental policy on the national and international level since its acceptance by the Organization for Economic Cooperation and Development (OECD) in 1972. The PPP holds that (1) the polluter should bear the financial responsibility for pollution prevention and clean-up and that (2) the government should not subsidize these costs. See James A. Tobey & Henri Smets, *The Polluter-Pays Principle in the Context of Agriculture and the Environment*, 19 *WORLD ECON.* 1, 63-64 (1996).

³⁵⁴ If the allowances are grandfathered, it is likely that regulated entities will hire lobbyists to influence how allowances are distributed. See Peter Cramton & Suzi Kerr. "Tradeable Carbon Permit Auctions: How and Why to Auction Not Grandfather." <http://www.market-design.com/files/98wp-tradeable-carbon-permit-auctions.pdf> (Last visited April 29, 2009).

³⁵⁵ *Id.*

³⁵⁶ Goulder, L., I. Parry and D. Burtraw. 1997. "Revenue-Raising vs. Other Approaches to Environmental Protection: The Critical Significance of Pre-Existing Tax Distortions," *RAND Journal of Economics* 28(4):708-731.

³⁵⁷ *Id.*

Moreover, there may be politically feasible alternatives that retain the efficiency advantages of the revenue raising approach. For example, it is often argued that it is important to allocate allowances to the electric utility industry to protect low-income consumers from increased electricity prices. But this means that those low-income families can only reap the benefits of that allocation by consuming electricity. Better to auction the allowances and use the revenues to offset tax cuts to those same low-income families, allowing them to spend the money on any number of beneficial uses, not just electricity.

It has also been asserted that direct allocation of allowances is necessary to overcome regional differences in the impacts of the climate bill. For example, states whose electricity generation is particularly reliant on coal may oppose a climate bill unless they receive preferential treatment. While that may be true, there is no need to pass the benefits on to the states in an inefficient manner. Better to give those states (not their industries) the allowances or revenues from auctions, and allow them to lower distortionary state taxes or reduce their deficits.

Some observers have suggested that while it is clearly better to auction allowances than to give them away, the revenues should be earmarked for purposes related to mitigating and adapting to climate change - uses such as renewable energy technology development and deployment, habitat protection programs, and incentives for geological carbon capture and storage.

There are numerous advantages to earmarking funds raised from the sale of allowance auctions, but also some serious disadvantages. Some would argue the earmarking process ensures a base level of funding for climate change programs and provides predictability in the long-term administration of programs, although this argument would only prove true for projects that may likely be cut in the general budgeting process. One could also say that earmarking creates a kind of social justice, in that it forces the activities that contribute to climate change to finance solutions to the problems they have created for society.³⁵⁸ The bills' drafters may also believe administering agencies will receive more funding for climate change mitigation and adaptation when the issue is considered separately rather than when evaluated as part of a broader budgeting process. For example, it may be easier for Senators to fund climate change initiatives as part of this bill than when the issue is considered as part of the general budgeting process alongside other important, politically charged issues such as healthcare, Medicare, education, and the ever-growing federal budget deficit.

But there are problems with this argument. At a conceptual level, there is no more reason to insist on earmarking revenues from the auction of allowances for climate change applications than requiring that wage taxes be used only to support labor or that capital gains tax revenues be used only to safeguard and promote investment. It may well be important to use government revenues to support research, education, and adaptation related to climate change. However, there is no reason to believe that the appropriate level of support for these activities is directly related to the revenues from allowance auctions.

At a practical level, it is virtually impossible to forecast more than thirty years into the future which uses of the revenues will be most productive. Earmarking tends to lock Congress into particular activities, even specific technologies, making it difficult to adjust to new

³⁵⁸ Joel Michael, *Earmarking State Tax Revenues: A Brief for the Minnesota House of Representatives*, <http://www.house.leg.state.mn.us/hrd/pubs/earmarking.pdf> (Last visited April 29, 2009).

information and developments. For example, both the Bingaman-Specter and Lieberman-Warner bills would commit the country to long-term support of geological carbon capture and storage. While this technology may prove an important element in mitigating emissions, it is much too early to be sure what role it will play.

Earmarking would also make funding for climate change initiatives vulnerable to fluctuations in revenues since it will be challenging to predict the exact revenues that would be collected from an allowance auction. Furthermore, having an off-budget account like this could increase administrative costs since revenues generally must be tracked and accounted for outside the normal accounting procedures.³⁵⁹

In addition, there is a risk that lawmakers, believing that all allowance auction revenues must be earmarked, will treat that money as somehow “cheaper” than money raised via taxes. They may commit funds to activities that they would not otherwise be willing to fund. While this may be the very attraction of earmarking to those engaged in climate change and environmental activism, it does not lead to more efficient policy.

Climate change programs, like all activities for which Congress appropriates funds, should be subject to regular review, to competition with the many other important, socially beneficial, programs that the government has to evaluate. This is best achieved by directing revenues from the auction of allowances to general revenue fund to either the state or federal government treasuries.

In this regard, the Manager’s Amendment presents an encouraging development. That bill introduces the Deficit Reduction Fund, which will receive between 23 and 33 percent of auction revenues to improve the federal government’s finances. While this is an important step, Congress could do better still by first extending the percentage of auction revenue directed to this fund and then clarifying the specific purpose and mechanisms that govern the fund.

Efficiency arguments notwithstanding, legislatures generally allocate new allowances on the basis of direct allocation. Whether this choice arises from ignorance of the efficiency issues or political motivation is not entirely clear, but one suspects the latter.³⁶⁰ It is important, though, to appreciate the full implications of the specific provisions of the three bills with respect to their allowance distribution schemes.

Electric Utility Industry

The provisions for distribution of allowance to the electricity industry, in particular, raise several issues. First, none of the bills have fully accounted for the differential effects that allocating allowances to regulated versus restructured electric utilities will have. Allocation to the former will likely dull the price signal and advantage consumers while allocation to the latter will advantage stockholders. This difference has implications for both equitable treatment of electricity consumers and the efficacy of the price signal.

³⁵⁹ Joel Michael, *Earmarking State Tax Revenues: A Brief for the Minnesota House of Representatives*, <http://www.house.leg.state.mn.us/hrd/pubs/earmarking.pdf> (Last visited April 29, 2009).

³⁶⁰ Robert Stavins also presents the argument that grandfathering is used for political control over distributional effects. Robert N. Stavins. “What Can We Learn From the Grand Policy Experiment?: Positive and Normative Lessons From SO₂ Allowance Trading,” *Journal of Economic Perspectives* 12: 75.

Regulated utilities have argued that allocating significant allowances to them will protect their customers from sudden increases in rates. The allowances that are awarded to regulated entities will not be included as costs in the ratemaking process, which has the effect of dulling the price signal that would encourage greater conservation and energy efficiency among electricity consumers.

At the same time, customers of utilities in states that have restructured would not benefit from the protection of the ratemaking process; even though the allowances are awarded at no cost, their providers will certainly treat the allowances as valuable assets and include that value in the price they charge. Thus, the current approach to allocating allowances to the electric power industry will unfairly protect customers of regulated utilities, transfer assets to the shareholders of utilities in restructured states, and blunt the positive effects of the price signal in the regulated states.

Interestingly, the Lieberman-Warner bill also stipulates that from the allowances allocated to the electric power sector, rural electric cooperatives (RECs) are to receive an amount equal to their emissions in 2006.³⁶¹ Not only does this work greatly to the disadvantage of the non-REC entities, it creates the possibility in later years that more allowances will be due to the RECs than are available for the entire electric power sector. It appears that the Manager's Amendment has addressed this problem. Rather than providing RECs with a set number allowances throughout the duration of the climate change program, the Manager's Amendment states the Administrator will not distribute more than 5 percent of allowances to RECs.³⁶²

Controlling Entry and Exit by Firms

In general, Congress' climate change bill should avoid subsidies to new entrants by requiring new businesses to purchase their allowances on the open market. It is not clear why the bills provide a subsidy of new entrants in the manufacturing and electric power sectors by means of reserving allowances for that purpose. It is counterintuitive that new entrants, with new emissions, should not have to purchase allowances on the market, thereby bearing the full cost of their decision to enter the industry. The Bingaman-Specter bill sets aside 4 percent of manufacturing allowances and 8 percent of all other industry allowances for new entrants.³⁶³ The Lieberman-Warner bill also requires that the allocation system set aside allowances for new entrants.³⁶⁴

All three bills make a similar mistake with respect to the exit from industry. The bills require that an entity that shuts down would have to return any allowances that have been allocated for the post shutdown period.³⁶⁵ This could cause inefficient firms to stay in business because they cannot recover the value of the emissions allowance assets. It functions as a type of tax on exiting production.

Unfortunately, the Manager's Amendment has propagated the mistaken subsidization of new entrants into manufacturing and electricity production.³⁶⁶ The more recent bill sets aside 4

³⁶¹ S. 2191, §3903(b)(2).

³⁶² S. 3036, §552.

³⁶³ S. 1766, §§202-203.

³⁶⁴ S. 2191, §§3903-3904.

³⁶⁵ S. 1766, §203; S. 2191, §3904(c); and S. 3036, §542(h).

³⁶⁶ S. 3036, §541.

percent of allowances for new manufacturing companies and would presumably set aside allowances for other types of new covered facilities through the allocation system development process.³⁶⁷ These subsidies need to be eliminated from the final Congressional climate change bill to ensure appropriate incentives.

Low-Income Household Energy Assistance

Allowances that ease the economic burden of the climate change program on low-income families should be implemented carefully. All three bills include provisions for energy assistance in the form of allowances given to utilities, allowances auctioned for energy assistance programs, and auctions given to or sold to benefit the states. These allowances and the revenues from their auction need to be structured in a way that does not interfere with the market system to continue decreasing demand for electricity.

The Bingaman-Specter bill will auction up to 5 percent of all allowances for energy assistance.³⁶⁸ Half of the funds will be used for energy assistance for low-income individuals under the Low-Income Home Energy Assistance Act of 1981, through which the federal government subsidizes the electricity bills of low-income individuals. One-fourth of the funds will go to the Energy Conservation and Product Act Weatherization Assistance program. The remaining one-fourth of funds will go to a newly established Rural Energy Assistance Program, which will subsidize the energy bills in rural regions where electricity prices are more than 150 percent above the national average.³⁶⁹ The design of these energy assistance programs will dull the price signal.

The Bingaman-Specter bill also provides energy assistance to consumers through the allowances it sets aside for the states. Under Section 204, the Bingaman-Specter bill gives the states significant discretion over the use of allowances. These allowances may be used “to mitigate impacts on low-income energy consumers,” “to avoid distortions in competitive electricity markets,” and “to mitigate impacts on energy-intensive industries in internationally competitive markets.” Given the level of discretion this language affords, there is potential that the states will use their allowances in a way that dulls the price signal.

The Lieberman-Warner bill would set aside up to 15 percent of annual allowances for energy assistance,³⁷⁰ a small increase from the 5 percent set aside under the Bingaman-Specter bill. Half of the funds would be used for energy assistance for low-income individuals under the Low-Income Home Energy Assistance Act of 1981, through which the federal government subsidizes the electricity bills of low-income individuals. One-fourth of the funds will go to the Energy Conservation and Product Act Weatherization Assistance program. The remaining one-fourth of funds will go to a newly established Rural Energy Assistance Program, which will subsidize the energy bills in rural regions where electricity prices are more than 150 percent above the national average.³⁷¹ The language used in the bill is identical to that found in the Bingaman-Specter bill, and as with that bill these provisions could interfere with market mechanisms designed to decrease demand for electricity.

³⁶⁷ S. 3036, § 542 stipulates that 96 percent of allowances assigned for manufacturing companies would be distributed to existing companies.

³⁶⁸ S. 1766, §201.

³⁶⁹ *Id.*, §401.

³⁷⁰ S. 2191, §3501.

³⁷¹ *Id.*, §4301.

The Lieberman-Warner bill would also dedicate 10 percent of all allowances each year for electricity load-serving entities to provide rate relief and energy efficiency aid to consumers.³⁷² Under Section 3503, the Lieberman-Warner bill specifies that these allowances may be used “to mitigate economic impacts on low- and middle-income energy consumers, including by reducing transmission charges or issuing rebates.” At the same time, this section of the bill also prohibits electricity companies from issuing consumer rebates “based on the quantity of electricity used by the consumer.” This provision is likely intended to avoid giving customers a perverse incentive to increase their rebate by increasing their consumption of electricity. However, the reduction in transmission charges also subsidizes and encourages consumption. It would be far more efficient to return funds to low- and middle-income families via tax rebates or reductions in their tax burden.

In addition to these provisions for low-income consumers, the Lieberman-Warner bill, like the Bingaman-Specter bill, sets aside allowances for the states that could interfere with market mechanisms. Allowances given to the states can be used for a variety of purposes, including the mitigation of increased energy costs and alleviation of the impacts on energy-intensive industries.³⁷³

Again, the Manager’s Amendment represents a compromise between its two predecessors, earmarking revenues from the auction of 3.5 to 15 percent of total annual allowances for energy assistance.³⁷⁴ The Manager’s Amendment corrects the funding mistakes of its predecessors by requiring funds from these auctions be used “to fund a tax initiative to protect consumers, especially consumers in greatest need, from increases in energy costs and other costs.”³⁷⁵

But the Manager’s Amendment also subsidizes consumer energy costs through the allowances it grandfathers for industry. Under Section 601, the Manager’s Amendment sets aside a substantial proportion of annual allowances for local distribution companies so they can mitigate the impacts of increased energy costs through decreased transmission charges or rebates, implement new technologies, or develop demand response programs.³⁷⁶ At a minimum, the decrease in transmission charges would dull the price signal, decreasing incentives for conservation.

In addition, the Manager’s Amendment directs and earmarks between 10 and 18.75 percent of allowances for the states (Table 9).³⁷⁷ These allowances may be used to mitigate the impacts of increased energy costs on low-income consumers and energy-intensive industries.³⁷⁸ If implemented improperly, the states’ actions could interfere with market mechanisms so as to prevent decreased electricity demand that accompanies increased prices.

³⁷² S. 2191, §4302.

³⁷³ *Id.*, §3402.

³⁷⁴ S. 3036, §581. The Manager’s Amendment sets earmarks 3.5 percent of total allowances for energy assistance in 2012 and up to 15 percent in years 2035 through 2050.

³⁷⁵ *Id.*, §585.

³⁷⁶ The term “demand response” is not defined in the bill, but likely refers to demand management via energy efficiency improvements.

³⁷⁷ S. 3036, §§602, 611, 613, 614. For example, in 2012 the Manager’s Amendment would direct 7 percent of total allowances and auction 3 percent of total allowances for the states. By 2050, those numbers would increase to 14 percent of allowances directed to the states and 4.75 percent auctioned for this same purpose.

³⁷⁸ *Id.*, §614.

Some of the energy assistance provisions of the bills require or allow mechanisms that would decrease the price of electricity faced by low-income families. While aiding the economically vulnerable segment of the population is an important consideration, it should be done by direct redistribution, decreased tax burdens, or other mechanisms that focus on disposable income. Even providing aid for energy efficiency and support for weatherization can be economically cost-effective. But keeping the price of electricity from fully reflecting the cost of allowances dulls the very price signal that leads to a decrease in electricity use and greenhouse gas emissions. Moreover, using an electricity price subsidy approach means that the supposed beneficiaries, low-income families, can only reap the benefits by consuming more electricity.

Technological Development, Deployment, and the Lock-in Problem

The national climate change program should prevent over-investment in particular technologies that causes premature “lock-in” to those technologies. Both the original Lieberman-Warner and the Bingaman-Specter approaches provide substantial, sustained, and disproportionate incentives for CCS. However, such technological lock-in appears to be limited in the Manager’s Amendment, which only dedicates between 1 and 4 percent of annual allowances for CCS and eliminates the 3.9 billion starting balance incorporated into the original Lieberman-Warner bill.

If the CCS technology is sufficiently promising, indeed the only option, for the future, the substantial commitment to CCS in the first two bills might be warranted as a way to promote innovation and positive spillover effects. However, it is not yet clear that CCS is going to yield all the benefits that its proponents promise. If in the next decade it is found that the technology has undesirable environmental, technological, or economic characteristics, it will take an Act of Congress to end what is essentially subsidization. That may prove to be politically infeasible once an interest group has developed to protect that subsidy. For this reason, the U.S. Senate should be wary of any efforts to incorporate elements of the CCS programs of the Lieberman-Warner or Bingaman-Specter bills into the final climate change bill.

At the same time, it is important that the country invest in developing new, more cost-effective mechanisms for addressing energy efficiency, energy security, and greenhouse gas emissions. This requires a long-term sustained investment in the research and development capital – both physical and human – that sustains technological advances. In this area in particular, Congress should commit to sustained funding over as much as a twenty-year or longer horizon. However, Congress should develop the program to maintain flexibility and not lock-in to specific technologies.

Credits for Early Action

The final climate change bill should eliminate credits for early action provided for in all three climate change bills. Early action is problematic for two reasons. First, it does nothing to change incentives because it will not lead to more emissions reductions or carbon sequestration. Second, deciding which claimants are deserving of rewards will place a significant burden on the Administration. The programs specifically mentioned by the bills—the 1605(b) Voluntary Reporting Program, the Climate Leaders Program, and various state and private programs—have not led to particularly credible estimates of offset project accomplishments. The early action provisions in the bills should be dropped; they have little

or no positive effects and will distract the government from effective implementation of more credible programs.

Adaptive Measures

The United States' policy towards climate change should include complementary policies that encourage adaptive efforts. More so than its predecessors, the Manager's Amendment encourages the States to use the allowances set aside for them to fund local adaptation measures such as relocation efforts, habitat protection, water projects, and health plans. It also encourages changes in individual consumption patterns by allowing the States to use their allowances for funding public transportation projects, supporting infrastructure for pedestrians and bicyclists, and developing recycling programs.³⁷⁹ Additional emphasis on understanding and changing consumer behaviors and implementing appropriate adaptation policies will also be necessary to mount an effective response to climate change. However, such measures should be included in complementary policies, financed through the general budgeting process rather than being one of many options given to the States for use of a relatively small portion of annual allowances.

Design Simplicity

In developing a final bill, Congress should strive for simplicity where possible. While the Manager's Amendment provides many advantages relative to its two immediate predecessors, a quick comparison of Figures 3, 4, and 5 above reveals that the newer bill has used an unnecessarily complicated mechanism to distribute allowances. Most notably, it uses both direct allocation and earmarking to direct support to CCS, states, technology development, and adaptation. This multiplicity of mechanisms not only obfuscates the true impact of the bill, it runs the risk of inviting the introduction of more and more provisions to fund special interests.

³⁷⁹ S. 3036, Title VI.

VIII. Border Adjustments for Leakage and Competitiveness

Some argue that if the United States implements a national climate change policy while other countries do not, there will be counterproductive market responses to the change in the cost structure of U.S. companies. U.S. companies will have to bear the cost of emissions allowances whereas foreign producers will not. This will disadvantage U.S. products in both domestic and foreign markets, leading to increased imports and decreased exports. That disadvantage, in turn, may induce some companies to transfer their operations to other countries without greenhouse gas emissions regulation.³⁸⁰ This result is particularly worrisome for stakeholders with interests in energy-intensive industries that engage in significant international trade or could be subject to substantial foreign competition.

The concern about the loss of U.S. industry competitiveness is compounded by the fact that a shift in production to overseas production facilities would decrease the effectiveness of the U.S. emissions policy. As productive activity shifts to countries that have not adopted comparable climate regulations, U.S. greenhouse gas emissions would decline, but global greenhouse gas emissions may actually increase, particularly if these companies relocate to countries with less energy efficient production processes.³⁸¹

As a result of these concerns – competitiveness and emissions leakage – there has been significant attention devoted to designing a border adjustment system³⁸² for the U.S. climate change program to level the playing field for all companies engaged in the production of energy-intensive goods and to prevent the migration of U.S. companies to countries without climate change regulation. Border adjustment policies, which have found their way into all three versions of the U.S. Senate bill, present numerous challenges of interest to the policy analyst including environmental efficacy, cost-effectiveness, and political and legal constraints.

1. Provisions

a. Bingaman-Specter

To “ensure that greenhouse gas emissions occurring outside the United States do not undermine the objectives of the United States to address global climate change” and “to encourage effective international action”³⁸³ on climate change, the Bingaman-Specter bill

³⁸⁰ Julia Reinaud. 2008. “Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry.” International Energy Agency Information Paper. Paris, France.

³⁸¹ This concept is generally referred to as carbon leakage. See Julia Reinaud. 2008. “Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry.” International Energy Agency Information Paper. Paris, France.

³⁸² As will be discussed later in this section, border adjustment policies may generally take the form of grandfathered allowances to energy-intensive industries based on historical emissions, grandfathering based on output levels, an emission allowance requirement for imports, an exports rebate, or a full border adjustment for imports and exports. All three U.S. Senate bills include an international reserve allowance program, which requires importers to submit allowances to cover the emissions associated with their imported product. See Julia Reinaud. 2008. “Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry.” International Energy Agency Information Paper. Paris, France; and Carolyn Fischer and Alan K. Fox. 2009. “Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments Versus Rebates.” Resources for the Future. Discussion Paper 02-09. Washington, DC.

³⁸³ S. 3036 §502(f)(3)(B)(i-ii).

categorizes countries as “covered” and “excluded.” Excluded countries are those that the President, with the advice of an interagency group established under section 501(a)(1), determines have taken “comparable action”³⁸⁴ to reduce greenhouse gas emissions,³⁸⁵ have been identified by the United Nations as “among the least-developed developing countries”³⁸⁶ or that contribute an insignificant amount of global greenhouse gas emissions.³⁸⁷

All countries that are not excluded are covered. Beginning in 2020, importers of greenhouse gas intensive primary products³⁸⁸ from covered countries must provide a declaration that the imported good is being accompanied by an appropriate number of international reserve allowances, foreign allowances, foreign credits, or credits for foreign offset projects or that the goods are exempt from the requirements.³⁸⁹

The President would determine the pricing and trading requirements for these international reserve allowances, which would come from a special pool of allowances separate from the domestic allowances.³⁹⁰ The President is charged with determining a pricing scheme for the international reserve allowances that ensures the price of these special allowances will not exceed the market clearing price of domestic allowances or the program’s “Technology Accelerator Payment” price cap.³⁹¹ He is also charged with designing “a trading system for the sale, exchange, purchase, transfer, and banking of international reserve allowances.”³⁹² Monies collected from the sale of the international reserve allowances are to be deposited into the “International Energy Technology Development Fund” and used for technology transfer to developing countries.³⁹³

In addition, the President is responsible for determining the appropriate number of international reserve allowances that must be submitted for the importation of each type of primary product from each foreign country. During the initial compliance year of 2020, the President will take into consideration the following factors: whether the production of a particular primary product in a particular foreign country is more greenhouse gas intensive than in the average production process; the amount of the particular covered good produced in the country that year; the number of allowances grandfathered to the domestic industry

³⁸⁴ S. 3036, §502(d) and (e).

³⁸⁵ Under §502(a)(2), comparable action is defined as being “comparable in effect to the action taken by the United States to limit greenhouse gas emissions. . . after taking into account the level of economic development of the foreign country.” Under §502(d)(f)(4)(B)(ii), S.1766 clarifies “comparable action” to mean a program that “places a quantitative limitation on the total quantity of greenhouse gas emissions of the foreign country (expressed in terms of tons per year) and achieves that limitation through an allowance trading system,” “satisfies criteria that the President shall establish for key requirements related to the enforceability of the cap and trade program, including requirements for monitoring, reporting, verification, procedures, and allowance tracking,” and “is a comparable action.”

³⁸⁶ S. 1766, §502(f)(3)(A)(ii).

³⁸⁷ *Id.*, §502(f)(3)(A)(iii). Under §502(f)(3)(C), the “de minimis” threshold is set at equal to or less than 0.5 percent of global greenhouse gas emissions, though the President is also allowed to consider annual deforestation rates in determining if a country falls below this threshold.

³⁸⁸ Under section 502, primary products include “iron, steel, aluminum, cement, bulk glass, or paper” or “any manufactured product that is sold in bulk for purposes of further manufacture” and generates greenhouse gas emissions comparable to primary products.

³⁸⁹ S. 1766, §502.

³⁹⁰ *Id.*, §502(f)(4).

³⁹¹ *Id.* As will be discussed further in Section VI on cost-containment, the Bingaman-Specter bill sets a price cap for allowances to limit the compliance costs of the legislation.

³⁹² *Id.*, §502(f)(4)(A)(v).

³⁹³ *Id.*, §502(f)(4)(A)(vii).

sector that manufactures the particular good in relation to the domestic emissions for that industry sector; and the economic development of the country from which the goods were imported.³⁹⁴ In subsequent compliance years, the President is also to consider the number of domestic allowances issued under section 201,³⁹⁵ the extra number of allowances issued due to compliance costs exceeding the TAP,³⁹⁶ and any other factors deemed relevant.³⁹⁷

Because of the challenges associated with this type of legislation, the President is given considerable discretion in adapting the international reserve allowance requirements to achieve its policy objectives and to conform with international law. The President is given the authority to adjust the international reserve allowance requirements if they are found to conflict with international agreements.³⁹⁸ Beginning in 2023 and each year thereafter, the President is supposed to report to Congress on whether the international reserve allowance requirements are achieving their objectives and to make any necessary adjustments to the program.³⁹⁹

It is important to note that certain importers of fuel and chemicals are covered through a separate provision in the Bingaman-Specter bill. Importers of petroleum products, coke, natural gas as well as non-fuel chemicals and chemical products (hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrous oxide) are covered under the domestic cap-and-trade program.⁴⁰⁰ Under section 301, entities that export non-fuel chemicals and covered fuels are granted credits for the emissions associated with their products.⁴⁰¹ Thus, fuels and chemicals are already subject to a type of full border adjustment under the Bingaman-Specter bill.

The Bingaman-Specter bill also assists companies that produce energy-intensive products by grandfathering allowances to them in the early years of the climate change program. As mentioned in the previous section, the Bingaman-Specter program gives away 53 percent of allowances in 2012 to covered entities, though that number decreases to 25 percent by 2030 and down to 0 by 2043.⁴⁰² Each year, the following industry sectors producing greenhouse gas intense primary products will receive a portion of these allowances:

Industry	Percent Allowances to Industry
<i>Refining</i>	7
<i>Nonfuel Entities</i>	4
<i>Carbon-intensive Manufacturing</i>	19
Natural Gas	4
Coal	12
Electric Power	54

The distribution of allowances to carbon-intensive manufacturing companies that produce “iron, steel, aluminum, pulp, paper, cement, chemicals, or such other products as the President may determine” is based on historical emissions levels and employment relative to

³⁹⁴ S. 1766, §502(f)(6)(A-C).

³⁹⁵ *Id.*, §201 establishes the allocation rules for the domestic emissions allowances.

³⁹⁶ *Id.*, §102(a)(2)

³⁹⁷ *Id.*, §502(f)(6)(D).

³⁹⁸ *Id.*, §502(f)(7).

³⁹⁹ *Id.*, §502(g)(1-3).

⁴⁰⁰ *Id.*, §3(6)(A)(iv) and (v).

⁴⁰¹ *Id.*, §301(c) and (d).

⁴⁰² *Id.* §201.

other firms in the same sector.⁴⁰³ Companies in other sectors would receive allowances based on historical emission levels.⁴⁰⁴ Grandfathered allowances would have to be returned if a company shut-down.⁴⁰⁵

b. Lieberman-Warner

The Lieberman-Warner bill includes a provision for an international reserve allowance program similar to that in the Bingaman-Specter bill. Beginning on January 1, 2019, the EPA Administrator will begin selling international reserve allowances to importers of greenhouse gas intensive primary products.⁴⁰⁶ These international reserve allowances are in addition to the allowances provided for domestic emissions. The price of these allowances is not to exceed the market clearing price for domestic allowances under the cap.⁴⁰⁷ The proceeds from the sale of international reserve allowances are to be used to mitigate the impacts of climate change in developing countries.⁴⁰⁸

Companies importing such greenhouse gas intensive products are required to submit enough international reserve allowances, foreign allowances, foreign credits, or credits for international offset projects to cover the emissions of the covered product.⁴⁰⁹ The EPA Administrator is to create a general formula for determining the number of international reserve allowances that must be submitted for each product in each country, based on the following factors: whether the production of a particular primary product in a particular foreign country is more greenhouse gas intensive than in the average production process; the amount of the particular covered good produced in the country that year; the number of allowances grandfathered to the domestic industry sector that manufactures the particular good in relation to the domestic emissions for that industry sector; and the economic development of the country from which the goods were imported.⁴¹⁰

Exemptions from this provision are granted to countries for the following reasons:

(1) The country has taken actions comparable to those of the United States to limit greenhouse gas emissions;⁴¹¹ (2) the country has been identified by the United Nations as one of the “least-developed of developing countries”;⁴¹² or (3) the country’s greenhouse gas

⁴⁰³ S. 1766, §203.

⁴⁰⁴ *Id.* §202. For non-fuel entities and refining companies, allocation to individual facilities would be based on their emissions relative to eligible existing facilities during the time period from January 1, 2004 through December 31, 2006.

⁴⁰⁵ *Id.*, §§202 – 203.

⁴⁰⁶ S. 2191, §6001(5) and (10). Under §6001(5), the Lieberman-Warner bill defines a “covered good” as a primary product that “generates, in the course of the manufacture of the good, a substantial quantity of direct greenhouse gas emissions and indirect greenhouse gas emissions” and “is closely related to a good the cost of production of which in the United States is affected by a requirement of this Act.” Under §6001(10), the bill clarifies the meaning of “primary product,” defining it as “iron, steel, aluminum, cement, bulk glass, or paper” or some other type of manufactured product that “is sold in bulk for purposes of further manufacture” and produces greenhouse gas emissions “comparable (on an emissions-per-dollar basis) to emissions generated in the manufacture of products by covered facilities in the industrial sector.”

⁴⁰⁷ *Id.*, §6006(a)(3).

⁴⁰⁸ *Id.*, §6006(a)(7).

⁴⁰⁹ *Id.*, §6006.

⁴¹⁰ *Id.*, §6006(d).

⁴¹¹ *Id.*, §6006(c)(4)(B)(i), §6005, and §6004. “Comparable action” is determined by the President, with the advice of an interagency group. This determination considers the following factors: whether the program places a quantitative limit on greenhouse gas emissions through a cap-and-trade system; utilizes appropriate monitoring and enforcement measures; and amounts to actions comparable to that of the United States (§6006).

⁴¹² *Id.*, §6006(c)(4)(B)(ii).

emissions account for less than 0.5 percent of global greenhouse gas emissions, after accounting for the country's deforestation rates.⁴¹³

Like the Bingaman-Specter bill, the Lieberman-Warner bill grants considerable discretion to the executive branch. The EPA Administrator has the authority to adjust the international reserve allowance program, with the advice of the Secretary of State, to ensure the policy complies with international agreements.⁴¹⁴ Beginning in 2023 and every year thereafter, the President is to review the program and make any necessary adjustments to achieve the purposes of the program.⁴¹⁵

The Lieberman-Warner bill also assists companies that produce energy-intensive products by grandfathering allowances to them in the early years of the climate change program. As mentioned in the earlier discussion of distribution of allowances, the Lieberman-Warner program gives away 40 percent of allowances in 2012 to covered entities, though that number decreases to 2 percent by 2035 and down to 0 in later years.⁴¹⁶ Each year, the industrial firms would receive 50 percent of the allowances grandfathered to covered entities (equivalent to 20 percent all allowances in 2012, declining to 1 percent in 2035).⁴¹⁷ Allowances would be distributed to carbon-intensive manufacturing firms based on historical emissions relative to other manufacturing companies during the three years prior to enactment of the bill.⁴¹⁸ Grandfathered allowances would have to be returned if a company shut-down.⁴¹⁹

Unlike the Bingaman-Specter bill, the Lieberman-Warner proposal is unclear regarding how exports will be handled although imports of transportation fuels and non-fuel chemicals appear to be covered under the bill. Entities that produce or import petroleum- or coal-based transportation fuels or non-fuel chemicals in quantities sufficient to emit more than 10,000 metric tons of carbon dioxide equivalent annually are required to report the amount of emissions that will result from the use of their products.⁴²⁰ Under section 1104, the bill charges the EPA Administrator with determining methods for reporting greenhouse gas emissions for "fossil fuel production, refining, importation, exportation, and consumption." Although receiving credits for the emissions associated with exports is not specifically mentioned in the bill, the EPA Administrator could decide to include such a provision in the detailed regulations.

c. Manager's Amendment

"[T]o promote a strong global effort to significantly reduce greenhouse gas emissions," "to ensure, to the maximum extent practicable, that greenhouse gas emissions occurring outside the United States do not undermine the objectives of the United States in addressing global climate change," and "to encourage effective international action,"⁴²¹ the Manager's

⁴¹³ S. 2191, §6006(b)(2)(B).

⁴¹⁴ *Id.*, §6006(g).

⁴¹⁵ *Id.*, §6007.

⁴¹⁶ *Id.*, §3901.

⁴¹⁷ *Id.*

⁴¹⁸ *Id.*, §3904.

⁴¹⁹ *Id.*

⁴²⁰ *Id.*, §§4, 1201.

⁴²¹ S. 3036, §1302.

Amendment establishes an international reserve allowance program that is scheduled to begin in 2014.⁴²²

As with the other bills, companies that import covered greenhouse gas intensive products must submit international reserve allowances, foreign allowances, foreign credits, or credits from international offset projects to cover the emissions from the product's emissions.⁴²³ The EPA Administrator is charged with developing a trading system for the international reserve allowances. The Administrator would also be charged with determining a method to establish prices for the allowances. The method will involve setting the international reserve price equal to the average of the three "leading publicly reported daily price indices" from the preceding day. The proceeds from the sale of international reserve allowances are to be used to mitigate climate change in developing countries.⁴²⁴ Exceptions are granted for products imported from countries that have taken comparable action to combat climate change, that are considered by the United Nations as among the "least developed" of developing countries, or fall below the *de minimis* threshold based on their contributions to global greenhouse gas emissions.⁴²⁵

The Manager's Amendment extends the range of covered goods. Whereas both the Bingaman-Specter and Lieberman-Warner bills covered only primary products, the Manager's Amendment covers each primary product⁴²⁶ and any "manufactured item for consumption" that results in significant greenhouse gas emissions and "is closely related to a good the cost of production of which in the United States is affected by a requirement of this Act."⁴²⁷ The International Climate Change Commission, in consultation with the EPA Administrator, is to determine which manufactured items it will regulate based on administrative feasibility and necessity for achieving the objectives of the international reserve allowance requirements.⁴²⁸

The Manager's Amendment includes a more stringent test for determining comparable action than its predecessors. First, the International Climate Change Commission will determine if the foreign country achieved greenhouse gas emissions reductions equal to or greater than that of the United States for the time period in question.⁴²⁹ If the country does not meet this requirement, the Commission will next consider whether the country began using "state-of-the-art technologies" and implemented regulations in an effort to limit greenhouse gas emissions.⁴³⁰

The Manager's Amendment also requires a more stringent test for the *de minimis* threshold. To be considered exempt from the international reserve allowance provisions, a country must account for less than 0.5 percent of global greenhouse gas emissions, both when accounting for and excluding deforestation rates.⁴³¹

⁴²² S. 3036, §1306(c).

⁴²³ *Id.*, §1306(a) and (e).

⁴²⁴ *Id.*, §1306(a).

⁴²⁵ *Id.*, §1306(b).

⁴²⁶ *Id.*, §1301(15) expands the range of primary products to include "iron, steel, steel mill products (including pipe and tube), aluminum, cement, glass (including flat, container, and specialty glass and fiberglass), pulp, paper, chemicals, or industrial ceramics."

⁴²⁷ *Id.*, §1301(7).

⁴²⁸ *Id.*, §1301(13).

⁴²⁹ *Id.*, §1301(4)(B)(i).

⁴³⁰ *Id.*, §1301(4)(B)(ii).

⁴³¹ *Id.*, §1306(b)(2)(B)(ii).

The Manager's Amendment includes some additional documentation requirements to prevent gaming of the system. The declaration for imported goods must identify each country an imported good was processed in and what level of processing occurred in each country as well as an estimate of the number of international reserve allowances required for the good's importation. The importer may either submit the estimated number of international reserve allowances, foreign allowances, foreign credits, or credits for international offset projects required or deposit a bond, security, or cash to cover the estimated number of allowances required for the good's importation. Within 180 days of the importation, the EPA Administrator is to make a final determination regarding the number of international reserve allowances required for the good's importation. The importer must submit additional money or allowances within 14 days of this determination. If extra allowances or money were deposited with the Bureau of Immigration and Customs Enforcement, then any additional allowances or funds will be refunded to the importer.⁴³²

The methodology used for determining international reserve allowances required for product importation has been improved to limit fraud and to conform with international treaties. The calculation method for products processed in one country will consider the following factors: the average greenhouse gas intensity of the category of goods within the country; the number of allowances grandfathered to United States' companies in that sector; the extent to which the country has used state-of-the-art environmental technologies and made attempts to limit greenhouse gas emissions. The bill provides the EPA Administrator with authority to establish different allowance calculation methods for products processed in more than one foreign country, generally requiring the importer to submit the highest number of allowances applicable to any of the countries the product was processed in; however, an importer would have an opportunity to request adjustments to these requirements through an administrative hearing.⁴³³

The International Climate Change Commission is charged with reporting to the President and Congress if any changes are necessary to achieve the objectives of the international reserve allowances program. The Commission can recommend a change in the stringency of the provisions or make recommendations for improved compliance with international agreements. The EPA Administrator and the Commission are charged with working together to develop regulations that ensure the effectiveness of the international reserve allowance provisions.⁴³⁴

The Manager's Amendment allows for adjustments for the import and export of natural gas, petroleum- and coal-based fuels and some non-fuel chemicals. Entities that import natural gas, petroleum- and coal-based fuels, and non-fuel chemicals in quantities sufficient to emit more than 10,000 metric tons of carbon dioxide equivalent annually are required to cover the emissions associated with these products.⁴³⁵ The Manager's Amendment provides credits for the emissions associated with exported fuels or non-fuel (non- HFC) chemicals from covered entities.⁴³⁶ It also calls for the development of a parallel regulatory program that would regulate HFCs produced in or imported into the United States and provide credits for HFCs exported to other countries.⁴³⁷

⁴³² S. 3036, §1306(c).

⁴³³ *Id.*, §1306(d).

⁴³⁴ *Id.*, §1307.

⁴³⁵ *Id.*, §1501.

⁴³⁶ *Id.*, §202.

⁴³⁷ *Id.*, §1501.

As with its predecessors, the Manager's Amendment grandfathers allowances to affected entities to prevent carbon leakage. The Manager's Amendment allocates 44.5 percent of allowances to industry in 2012, declining to 13.5 percent in 2050.⁴³⁸ In 2012, 25 percent of the allowances given to industry will be given to manufacturing companies and 4 percent of these allowances will be given to refineries. The remaining 71 percent of industry allowances will go to natural gas processing plants and electric generation facilities.⁴³⁹ Allowances intended for producers of petroleum- and coal-based fuels are to be distributed to individual firms based on their relative historical emissions during the three years preceding enactment of the legislation.⁴⁴⁰ In the initial compliance year allowances will be distributed to individual companies that manufacture "iron, steel, pulp, paper, cement, rubber, chemicals, glass, ceramics, sulfur hexafluoride, or aluminum and other nonferrous metals" based on their relative emissions for the three years prior to enactment of the bill. Within a year of the bill's enactment, however, the EPA Administrator is to present a proposal regarding the feasibility of distributing allowances to individual manufacturing firms based on "energy-intensity."⁴⁴¹ Facilities that shut down have to relinquish their allowances.⁴⁴²

2. Discussion and Recommendations

As a normative matter, the goal of border adjustments should be to ensure that both U.S. and foreign energy-intensive industries most subject to international trade competition will experience similar changes in their cost structures as they compete in U.S. and foreign markets. This will do the most to preserve pre-regulatory competitive positions, while also providing appropriate protection against emissions leakage. However, the design of the border adjustment mechanism must account for both international legal constraints and implementation costs.

The border adjustment policies included in the three bills differ in ways that affect their environmental efficacy, implementation costs, and legal/political feasibility (Table 11). To explore the merits of the approaches adopted in the three Senate bills, we first consider generally the basic mechanisms for border adjustments and how each would affect the cost structure of domestic and foreign firms. Then we review the constraints imposed by the World Trade Organization (WTO) on nations' trade restrictions. We continue with a more detailed discussion of the bills' allowance pools for imports, stated legislative purposes, covered products, allowance price and requirements, regulatory exceptions, and commitment to international negotiations to consider how those provisions impact environmental efficacy, cost-effectiveness, and political and legal constraints.

⁴³⁸ S.3036, §§541, 551, 561, 571, 601.

⁴³⁹ *Id.*, §§541, 551, 561, 571, 601.

⁴⁴⁰ *Id.*, §561.

⁴⁴¹ *Id.*, §542. The term energy intensity is not defined in the language of the bill.

⁴⁴² *Id.*, §541.

Table 11: Summary of International Reserve Allowance Provisions

U.S. Senate Bill	Date of Effect	Goods Covered	Market Price	Use of Proceeds	Exemptions	Methodology for Determining Allowances Required	Declaration Process
<i>Bingaman-Specter (S. 1766)</i>	2020	Primary Products	Not to exceed market clearing price or TAP price	“International Energy Technology Deployment Fund” for transfer for technology to other countries.	Comparable Action (Determined by President) Programs, monitoring and enforcement measures taken, when considering the economic development of the country. “Least Developed” of Developing Countries De Minimis Global Emissions Less than 0.5 percent of global emissions; President can consider deforestation rates	Initial Compliance Year Average excess greenhouse gas emissions in that country for category of goods; Allowances grandfathered to domestic sector; Economic development of country Subsequent Years TAP payments/extra allowances issued and other factors deemed relevant by the President.	Submit international reserve allowances, foreign allowance, foreign credits, or credits for international offset projects to U.S. Customs.
<i>Lieberman-Warner (S. 2191)</i>	2019	Primary Products	Not to exceed market price of domestic allowances	Climate change mitigation in developing countries	Comparable Action (Determined by President) Cap-and-trade program that limits emissions; appropriate monitoring and enforcement; program amounts to comparable action. “Least Developed” of Developing Countries De Minimis Global Emissions Less than 0.5 percent of global emissions; President can consider deforestation rates	Average excess greenhouse gas emissions in that country for category of goods; Allowances grandfathered to domestic sector; Economic development of country	Submit international reserve allowances, foreign allowance, foreign credits, or credits for international offset projects to U.S. Customs.
<i>Manager’s Amendment (S. 3036)</i>	2014	Primary Products; Manufactured Items Identified by International Climate Change Commission (ICC) as feasible and necessary	Preceding day’s average of three “leading publicly reported daily price indices”	Climate change mitigation in developing countries	Comparable Action (Determined by ICC) 1. Percentage reduction is greater than or equal to that of the United States 2. Use of state-of-the-art technologies and regulatory programs “Least Developed” of Developing Countries De Minimis Global Emissions Less than 0.5 percent of global emissions, with and without deforestation rates	Produced in One Country Average greenhouse gas intensity of country for category of goods; Allowances grandfathered to domestic sector; Economic adjustment ratio that incorporates use of state-of-the-art technology and greenhouse gas regulatory programs. Processed in Multiple Countries Based on highest required allowances of any country in which product is processed, unless determined otherwise through administrative hearing.	Submit international reserve allowances, foreign allowance, foreign credits, or credits for international offset projects to U.S. Customs. Alternatively provide bond, other security, or cash deposit to U.S. Customs. Account reconciled within 180 days. Balance due within 14 days of reconciliation. Overage refunded.

Policy Options and their Relative Merits

There are generally five different policy options for addressing leakage and competitiveness issues. Each would apply only to energy intensive industries subject to significant international trade competition.

Grandfathering of allowances

The first option for addressing leakage issues is grandfathering allowances, based on historical emissions, to sectors at risk for carbon leakage and adverse competitiveness effects.⁴⁴³

“Home Rebate”

The “home rebate” for domestic industries is a subsidy in the form of allowances or payments⁴⁴⁴ sufficient to eliminate or compensate all allowance-related costs of production for both domestic and export markets. This “home rebate” is updated annually on the basis of output so allocations rise and fall with level of production.⁴⁴⁵

Adjustment for imports

An import adjustment places a tax or an allowance requirement on imported goods as a means of internalizing the environmental damage caused by the production of carbon.⁴⁴⁶ Under the U.S. cap-and-trade proposals, the import adjustments have taken the form of international reserve allowance requirements to mirror their domestic counterpart.

Adjustment for exports

An export adjustment involves giving credit to domestic companies who export greenhouse gas intensive products, essentially removing them from the cap requirements.⁴⁴⁷

Full border adjustment

A full border adjustment would combine the import and export proposals mentioned above. Thus, any covered goods sold in the United States, whether from domestic or foreign production, would have to internalize the cost of emissions allowances. At the same time, the same goods sold outside the United States would not require allowances – exports from the United States would receive a rebate or subsidy equal in value to the allowances required for their production.⁴⁴⁸

⁴⁴³ Julia Reinaud. 2008. “Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry.” International Energy Agency Information Paper. Paris, France

⁴⁴⁴ The home rebate could also take the form of an exemption from the allowance requirements for the program.

⁴⁴⁵ Carolyn Fischer and Alan K. Fox. 2009. “Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates.” Resources for the Future. Discussion Paper 09-02. Washington, DC. See also, Julia Reinaud. 2008. “Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry.” International Energy Agency Information Paper. Paris, France (referring to this mechanism as an “output based grandfathering of allowances.”)

⁴⁴⁶ Joost Paulwelyn. 2007. “U.S. Federal Climate Policy and Competitiveness Concerns: The Limit and Options of International Trade Law.” Nicholas Institute for Environmental Policy Solutions, Duke University. NI WP 07-02. Durham, North Carolina; Carolyn Fischer and Alan K. Fox. 2009. “Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates.” Resources for the Future. Discussion Paper 09-02. Washington, DC.

⁴⁴⁷ Carolyn Fischer and Alan K. Fox. 2009. “Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates.” Resources for the Future. Discussion Paper 09-02. Washington, DC.

⁴⁴⁸ *Id.*

To address both leakage and competitiveness, the primary goal of a border adjustment mechanism is, at least ostensibly, to assure that U.S. produced goods compete with foreign produced goods on an equal basis – either both are required to incorporate the cost of allowances or neither are. There are three basic observations that drive the optimal design of border adjustments. First, the United States obviously cannot require that foreign goods, produced and sold in foreign markets, incorporate the costs of emissions allowances. Therefore, in those markets, energy intensive goods produced in the United States for export need to have their emissions-related costs covered by grandfathered allowances, home rebates, or export border adjustments.⁴⁴⁹

Second, for sale of energy intensive goods in U.S. markets, comparable total costs can be maintained by requiring that both domestic and imported goods incorporate the cost of emissions allowances or by exempting both domestic and imported goods. The former can be achieved with tariffs or emissions allowance requirements for imports and no grandfathering of allowances or home rebates for domestic production. The latter can be achieved by complete grandfathering or home rebates for domestic goods and no border adjustment for imports.

The third observation is that the choice between grandfathering allowances and the home rebate approach matters in maintaining comparable cost structures.⁴⁵⁰ If, for example, the amount of allowances grandfathered is based on production levels from a year prior to the enactment of the legislation, then nothing the domestic energy intensive firms do will change the amount of allowances they are given. Whether they increase or decrease production for exports, they will receive the same amount of allowances. Alternatively, if the number of allowances given to exporting firms is based on recent production levels, updated each year as it is under the home rebate approach, then firms that increase their share of exports following passage of the climate legislation receive increasing relief. Grandfathering based on a fixed, pre-legislation date, is effectively a lump sum transfer – purely inframarginal. Home rebate based on current or recent production levels affects marginal costs. The home rebate approach keeps the cost structure for domestic and foreign producers comparable. Whereas under the grandfathered approach, domestic firms receive, in essence, a lump sum transfer but pay marginal costs for allowances, whereas foreign producers have no marginal costs for production.⁴⁵¹

Based on these three observations, there are two systems that preserve comparable cost structures for domestic and foreign firms – (1) a “home rebate” and (2) full border adjustment.⁴⁵² The primary difference between these two approaches is that the latter would impose the cost of allowances on both domestic and foreign goods sold in the domestic market, whereas the former would exempt both from those costs. Neither system would impose those costs on goods sold in foreign markets. Combining this observation with the recommendations for auction of all allowances⁴⁵³ favors a system in which the sale of any

⁴⁴⁹ We discuss below why the home rebate is preferable to the grandfathered allowances.

⁴⁵⁰ Carolyn Fischer and Alan K. Fox. 2009. “Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates.” Resources for the Future. Discussion Paper 09-02. Washington, DC.

⁴⁵¹ *Id.*

⁴⁵² While these two options represent the “pure” form of the mechanisms, there is also the possibility of partial home rebates with partial border adjustments. However, there is very little policy justification for that choice.

⁴⁵³ In other sections of the paper, we have noted several challenges associated with grandfathering allowances to industry, such as interference with the price signal, differential impact on regulated/deregulated states, and the inevitable lobbying that would occur if the issue is politicized.

energy intensive goods imported to the United States or exported from the country to markets in covered countries⁴⁵⁴ will be subject to full border adjustment. This means that domestic producers of energy-intensive goods do not receive grandfathered allowances for their entire production, but are given rebates equal to the value the allowances required for production of their exports. Importers of energy-intensive goods have to buy allowances or pay a fee equal to the cost of allowances sufficient to cover the emissions from the production of goods imported to the United States.

Legal Considerations

Any time a country considers border adjustments it must also consider potential challenges to the policy under prevailing international trade agreements. In the case of climate legislation, the United States may have to defend its border adjustment practices against a WTO challenge.

The border adjustment measures being proposed to resolve environmental and competitive issues could be limited by legal constraints. Article III of the General Agreement on Tariffs and Trade prohibits member states from applying taxes to foreign products that are not applied to similar domestic products.⁴⁵⁵ Additionally, Article I of GATT prohibits a member state from providing preferential treatment to one Most Favored Nation over another.⁴⁵⁶ Of course, exceptions may be granted if the trade restrictions are found necessary “to protect human, animal or plant life or health”⁴⁵⁷ or an “exhaustible natural resource.”⁴⁵⁸ Therefore, any border adjustment measures included in the U.S. climate change program will need to be carefully crafted to ensure they will pass muster from the World Trade Organization.

If a challenge is made, the United States would likely first try to argue that the provision does not represent an unfair trade restriction disallowed by Article III (National Treatment) or Article I (Most Favored Nation Status) of GATT.⁴⁵⁹ In making such a determination, WTO has in the past considered the following factors: “1) the properties, nature and quality of the products; 2) the end-uses of the product; 3) consumers’ perceptions and behavior in respect of the products; and 4) the tariff classification of the products.”⁴⁶⁰ To this end, the WTO will likely consider whether domestic companies received allowances for free; whether the cost of the international reserve allowances is comparable to domestic allowances; if the allowance calculations are based on emissions-intensity or, instead, discriminate against a company based on national origin; whether an adjustment is made to international reserve allowance requirements based on free allocation of domestic allowances; and whether some Most Favored Nations are given preferential treatment to others.⁴⁶¹

⁴⁵⁴ That is, countries that have not taken comparable actions, are not *de minimis* in emissions levels, and are not among the least developed of developing countries.

⁴⁵⁵ The General Agreement on Tariffs and Trade, Article III. Available at http://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm (last visited 16 June 2009).

⁴⁵⁶ *Id.*, Article I.

⁴⁵⁷ *Id.*, Article XX(b).

⁴⁵⁸ *Id.*, Article XX(g).

⁴⁵⁹ Article III of the General Agreement on Tariffs and Trade prohibits member states from applying taxes to foreign products that are not applied to similar domestic products. Additionally, Article I of GATT prohibits a member state from providing preferential treatment to one Most Favored Nation over another.

⁴⁶⁰ Harro van Asselt, Thomas Brewer, and Michael Mehling. “Addressing Leakage and Competitiveness in US Climate Policy.” Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁴⁶¹ *Id.*

Even if WTO finds that the policy constituted an unfair restriction on trade, it could still be upheld if WTO finds the restriction was “necessary to protect human, animal or plant life or health”⁴⁶² or “relating to the conservation of exhaustible natural resources.”⁴⁶³ To justify an exception under Article XX(b), the U.S. will have to demonstrate a “rational connection” between the policy and its environmental objective (i.e. argue that the measure will either provide an incentive for other countries to reduce their emissions or prevent migration of U.S. companies to countries without climate change regulations), though it is not necessary to establish a precise causal relationship.⁴⁶⁴ Even if the U.S. is unable to meet the burden of proof required under Article XX(b) for an environmental exception, the U.S. can try for an exception under Article XX(g), which requires the following legal test: 1) Is the atmosphere an “exhaustible natural resource”?; 2) Is the policy related to the “exhaustible natural resource” it is meant to protect?; and 3) Is there a sense of “evenhandedness” to the measure?⁴⁶⁵

If the WTO considers the policy for an Article XX(b) or (g) environmental exception, it will apply the following test to determine if the trade restriction is a “means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade”:⁴⁶⁶

- Does the legislation account for different local circumstances?
- Has the U.S. participated in “serious, across-the-board negotiations with the objective of concluding bilateral or multilateral agreements?”
- Does the policy respect the ideals of “basic fairness and due process?”
- Does the policy include provisions that run counter to its stated environmental objective?

Given the significant legal constraints placed on the resolution of this issue, it is important to keep the WTO process in mind while reviewing the various provisions of the U.S. Senate proposals.

Comparison of the Bills

Given the recommendation for full border adjustment, coupled with the considerations necessary to pass legal muster with the WTO, it is now possible to evaluate the specific characteristics (Table 11) as well as the relative merits of the three Senate bills with regard to environmental efficacy, cost-effectiveness, and political and legal constraints.

With respect to the choice of basic mechanism, all three bills use some form of partial grandfathering allowances with partial import adjustments. As discussed above, grandfathering of allowances based on pre-legislation levels of production, is less effective than the home rebate in maintaining comparable cost structures between domestic and foreign producers. Furthermore, numerous scholars have also pointed out that the

⁴⁶² The General Agreement on Tariffs and Trade, Article XX(b). Available at http://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm (last visited 16 June 2009).

⁴⁶³ *Id.*, Article XX(g).

⁴⁶⁴ Harro van Asselt, Thomas Brewer, and Michael Mehling. “Addressing Leakage and Competitiveness in US Climate Policy.” Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁴⁶⁵ *Id.*

⁴⁶⁶ *Id.*

grandfathering of allowances may appear to be an unfair subsidy for domestic companies, which could result in a WTO challenge under GATT Article III.⁴⁶⁷ Moreover, the home rebate coupled with no border adjustment puts domestic consumption in covered industries outside the cap, running contrary to the earlier conclusion that broader coverage is generally better. For these reasons, grandfathering of allowances should be eliminated from the final climate change bill and a full border adjustment should be employed instead.

The international reserve allowance provisions of all three bills are similar, though the provisions have evolved into their most stringent and clear form in the Manager's Amendment. Each bill also creates a separate pool of international reserve allowances for importers, thus putting emissions associated with imports of energy-intensive goods outside the cap. Each bill requires importers of greenhouse gas intensive products to purchase international reserve allowances or submit alternative allowances/credits to cover the emissions associated with the production of these imported goods. As illustrated in Table 11, the Manager's Amendment program would be implemented much sooner than that of the other two U.S. Senate bills. The Manager's Amendment covers primary products as well as manufactured items. All three bills establish a price cap for the international reserve allowances that is based on the market clearing price for domestic allowances. The Manager's Amendment includes the most stringent tests for "comparable action" and "*de minimis*" emissions. The Manager's Amendment attempts to limit gaming of the system by differentiating between products processed in one versus multiple countries. The Manager's Amendment also sets up a more thoughtful declaration system, which would allow regulated companies to deposit allowances, credits, bonds or other securities, or cash with U.S. Customs until the number of international reserve allowances required for a good's importation is determined. The Bingaman-Specter bill and the Manager's Amendment both regulate petroleum- and coal-based fuels and non-fuel chemicals in a manner that requires the submission of domestic allowances for imports and credits for exports though the Lieberman-Warner is less precise on this issue. All three bills grandfather allowances to industries as a means of reducing leakage.

Separate Pool of International Reserve Allowances

All three U.S. Senate bills set aside a separate pool of international reserve allowances. If the final international reserve allowance system requires the purchase of allowances, it will be necessary to determine whether the allowances come from the pool of allowances under the cap or from a separate pool created specifically for imports. Even assuming that the price of the reserved allowances is based on the market price of allowances under the cap, the choice could be significant from the perspective of environmental efficacy. Having a separate reserved pool allows higher total emissions than if importers are required to purchase allowances under the cap. Moreover, if the allowances are from a separate reserved pool, the purchase of those allowances does not drive up the price of the allowances under the cap. In contrast, if importers have to purchase allowances under the cap, the greater the imports of energy-intensive goods, the higher will be the price of allowances under the cap as importers raise the demand for those allowances.

⁴⁶⁷ Harro van Asselt, Thomas Brewer, and Michael Mehling. "Addressing Leakage and Competitiveness in US Climate Policy." Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

It is largely a matter of politics whether importers subject to import adjustments buy their allowances from a special reserve or allowances outside the cap or from the same allowance market in which their domestic counterparts participate. To avoid artificial price setting and to keep all U.S. consumers' emissions, both direct and indirect, under one cap, it may be preferable to have importers buy allowances from the domestic market.

Stated Purposes for International Reserve Allowance Provisions

All three U.S. Senate bills cite concerns with carbon leakage as the reason for the border adjustments, which could help the border adjustments pass WTO muster. Even if the border adjustment system is found to violate certain provisions of GATT, it may still be upheld if the trade restriction is deemed necessary on environmental grounds. The Bingaman-Specter bill states that the purpose of the international reserve allowance provision is to “ensure that greenhouse gas emissions occurring outside the United States do not undermine the objectives of the United States to address global climate change” and “to encourage effective international action.”⁴⁶⁸ Similarly, the Lieberman-Warner bill states that its border adjustment provisions are “to promote a strong global effort to significantly reduce greenhouse gas emissions” and “to ensure, to the maximum extent practicable, that greenhouse gas emissions occurring outside the United States do not undermine the objectives of the United States in addressing global climate change.”⁴⁶⁹ Finally, the Manager's Amendment cites the U.S. Senate's desire “to promote a strong global effort to significantly reduce greenhouse gas emissions,” “to ensure, to the maximum extent practicable, that greenhouse gas emissions occurring outside the United States do not undermine the objectives of the United States in addressing global climate change,” and “to encourage effective international action.”

The reported purposes of the bill will certainly prove critical in a WTO hearing as countries are allowed to establish trade restrictions to protect the environment.⁴⁷⁰ As mentioned previously, Article XX(b) of GATT allows trade restrictions “necessary to protect human, animal or plant life or health.” Article XX(g) allows restrictions for the protection of an “exhaustible natural resource.” Although there are clearly environmental and non-environmental reasons for this program, van Asselt et al. suggest that the “hidden” reasons for the measure would not be considered at a WTO hearing as long as there is a rational connection/relation between the policy and its purported objective.⁴⁷¹ To this end, the United States would need to argue that the policy will provide an incentive for companies in other countries to reduce their emissions or discourage domestic companies from moving overseas to countries without national climate change policies.⁴⁷² Their cause would certainly be aided by a statement of environmental purpose, such as those provided in the three U.S. Senate proposals.

⁴⁶⁸ S. 1766, §502.

⁴⁶⁹ S. 3036, §6002.

⁴⁷⁰ The General Agreement on Tariffs and Trade, Article XX. Available at http://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm (last visited 16 June 2009).

⁴⁷¹ Harro van Asselt, Thomas Brewer, and Michael Mehling. “Addressing Leakage and Competitiveness in US Climate Policy.” Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁴⁷² *Id.*

Covered Products

The breadth of border adjustments, i.e., which products are covered and from which nations, needs to be determined by a careful balancing of the drive to limit leakage and preserve competitiveness on the one hand versus the implementation and administration costs on the other. Determining the amount of emissions that each imported or exported good for which each imported or exported good is responsible will be a demanding process. It should only be required for goods that are both energy intensive and actually (or potentially) subject to a great deal of international trade activity.

The Manager's Amendment significantly expands the range of covered products. The Bingaman-Specter and Lieberman-Warner bills cover only greenhouse gas intensive primary products. Both the Bingaman-Specter bill and Lieberman-Warner bill define primary product to be iron, steel, aluminum, cement, bulk glass, paper, and any other product that will be manufactured further but generates significant greenhouse gas emissions.⁴⁷³ The Manager's Amendment expands the specific definition of primary products to include "iron, steel, steel mill products (including pipe and tube), aluminum, cement, glass (including flat, container, and specialty glass and fiberglass), pulp, paper, chemicals, or industrial ceramics" in addition to any other unfinished good whose production results in significant greenhouse gas emissions.⁴⁷⁴ Furthermore, the Manager's Amendment allows the International Climate Change Commission to determine other finished goods whose production results in significant greenhouse gas emissions when the cost of production of a like good in the United States is affected by this legislation.⁴⁷⁵

Calculating the amount of carbon used to produce a primary product promises to be extremely difficult while some have suggested that making this calculation for manufactured products would be next to impossible.⁴⁷⁶ The process of ascribing emissions to specific goods from specific companies and countries will also likely engender significant disagreement.

Moreover, while there is significant uncertainty about carbon leakage, the general consensus is that carbon leakage will not be a major issue.⁴⁷⁷ Reinaud (2008) suggests that greenhouse gas intensive primary product industries, including aluminum, cement, pulp and paper, refineries, iron, steel, and chemical can expect some carbon leakage, though leakage rates would generally be higher in industries that are more heavily traded such as aluminum and steel.⁴⁷⁸ McKibben and Wilcoxon (2009) suggest the most significant leakage will occur in

⁴⁷³ S. 1766, §502; S. 2191, §6001.

⁴⁷⁴ S. 3036, §1301.

⁴⁷⁵ *Id.*

⁴⁷⁶ Julia Reinaud. 2008. "Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry." International Energy Agency Information Paper. Paris, France.

⁴⁷⁷ See for example Julia Reinaud. 2008. "Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry." International Energy Agency Information Paper. Paris, France ; Harro van Asselt, Thomas Brewer, and Michael Mehling. "Addressing Leakage and Competitiveness in US Climate Policy." Working Paper. 5 March 2009. Climate Strategies. Cambridge, England; and Warwick J. McKibben and Peter J. Wilcoxon. 2009. "The Economic and Environmental Effects of Border Tax Adjustments for Climate Policy." Lowy Institute for International Policy. Working Paper No. 1.09. Sydney, Australia.

⁴⁷⁸ Julia Reinaud. 2008. "Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry." International Energy Agency Information Paper. Paris, France.

oil markets,⁴⁷⁹ which is an industry that is already subject to full border adjustment under the domestic cap-and-trade program of the Bingaman-Specter bill and the Manager's Amendment.⁴⁸⁰

At the same time there will be significant pressure on Congress to protect the competitive position of energy intensive industries. Labor, capital owners, and suppliers of those companies are understandably concerned about the survival of these industries, as are the officials and politicians from the states in which the industries are located. At the same time, reinforcing WTO rules, there is also considerable pressure from U.S. trading partners not to raise artificial barriers to trade.

Because leakage is likely to be minimal for all industries, especially those outside the primary, energy-intensive products, and because of the significant costs associated with implementing the adjustment mechanisms, Congress should resist the inevitable domestic political pressure to expand the list of covered products. The International Climate Change Commission (ICCC) should conduct further studies through 2013 regarding the leakage associated with various industry subsectors based on level of international trade, the ability to pass-through increased costs of production, and market structure.⁴⁸¹ Armed with this information, the ICCC should make the final decision regarding subsectors to which the border adjustment should be applied.

Price of Allowances

All three bills base the cost of international reserve allowances on the market clearing price of domestic allowances, any of which would help the eventual national climate change bill pass muster from the WTO. The Bingaman-Specter bill specifies that the price is not to exceed the market clearing price or the Technology Accelerator Payment level.⁴⁸² The Lieberman-Warner bill states that the price of international reserve allowances is not to exceed the market clearing price for allowances under the cap.⁴⁸³ The Manager's Amendment requires the identification of three "leading publicly reported price indices" and making the price of international reserve allowances equal to the average of these three indices on the preceding day.⁴⁸⁴

Article III of the General Agreement on Tariffs and Trade prohibits member states from applying taxes to foreign products that are not applied to similar domestic products.⁴⁸⁵ All three of the bills show an attempt to apply consistent pricing to domestic and foreign goods, which is certainly consistent with GATT. However, the manner in which allowance requirements are calculated (i.e. based on average emissions of country of origin) and the

⁴⁷⁹ Warwick J. McKibben and Peter J. Wilcoxon. 2009. "The Economic and Environmental Effects of Border Tax Adjustments for Climate Policy." Lowy Institute for International Policy. Working Paper No. 1.09. Sydney, Australia.

⁴⁸⁰ S. 1766, §3(6)(A)(iv) and S. 3036, §202 and §1501. Both bills also provide full border adjustment for non-fuel chemicals under S. 1766, §3(6)(A)(v) and S. 3036, §202 and §1501.

⁴⁸¹ For a discussion of the variables that impact carbon leakage, please see Julia Reinaud. 2008. "Issues Behind Competitiveness and Carbon Leakage: Focus on Heavy Industry." International Energy Agency Information Paper. Paris, France.

⁴⁸² S. 1766, §502.

⁴⁸³ S. 2191, §6006.

⁴⁸⁴ S. 3036, §1306.

⁴⁸⁵ The General Agreement on Tariffs and Trade, Article III. Available at http://www.wto.org/english/docs_e/legal_e/gatt47_01_e.htm (last visited 16 June 2009).

exclusion of certain countries from the policy are likely to be found sufficiently discriminatory to outweigh the good intentions of the pricing mechanism mentioned above.⁴⁸⁶ Nevertheless, the pricing mechanisms included in all three bills demonstrate a good faith effort to adhere to the principles of international trade law.

Number of Required Allowances

All three bills consider similar factors in determining how many international reserve allowances are required for a good's importation, though the Bingaman-Specter and Lieberman-Warner bills would appear to give more consideration to level of economic development while the Manager's Amendment places more emphasis on the types of environmental policies that have been implemented in the country. The Bingaman-Specter bill and the Lieberman-Warner bill are similar in how they calculate the number of required allowances. They both intend to consider⁴⁸⁷ the average greenhouse gas intensity for the sector in the country, while making adjustments for the number of allowances grandfathered to domestic companies in the same industry and each country's level of economic development.⁴⁸⁸ The Manager's Amendment includes a similar calculation that considers greenhouse gas intensity, allowances grandfathered to domestic companies, and an "economic adjustment ratio" that is based on the regulatory programs and technology the country has adopted to mitigate climate change.⁴⁸⁹ In addition, importers of products that were processed in more than one country would have to submit the highest number of allowances required by any one of the countries in which the product was processed unless determined otherwise through an administrative hearing.⁴⁹⁰

The fact that the initial allowance requirements are based on the average greenhouse gas intensity for a sector in a particular country would appear to violate Article I of GATT, which prevents discrimination based on country of origin. The calculation method for exports is based on a country's sector average rather than individual company emissions, whereas domestic allowances are based on individual company emissions.⁴⁹¹ To avoid charges of discrimination, the emissions from the imported products may have to be estimated based on the "predominant method of production" or the "best available technology" in the United States as a means for dealing with the absence of missing individual company data.⁴⁹² However, the provision should remain unchanged for now in case the provision qualifies for an Article XX exemption.

⁴⁸⁶ Harro van Asselt, Thomas Brewer, and Michael Mehling. "Addressing Leakage and Competitiveness in US Climate Policy." Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁴⁸⁷ In defining baseline emissions to which a country's emissions from a particular product production will be compared, the Lieberman-Warner bill (in section 6001) mistakenly refers to "the total average annual greenhouse gas emissions attributed to a category of covered goods of a foreign country during the period beginning on January 1, 2012, and ending on December 31, 2014" rather than identifying the baseline as a measure of greenhouse gas intensity (which would be average emissions per unit).

⁴⁸⁸ S. 1766, §502.

⁴⁸⁹ S. 3036, 1306(d).

⁴⁹⁰ *Id.*

⁴⁹¹ Harro van Asselt, Thomas Brewer, and Michael Mehling. "Addressing Leakage and Competitiveness in US Climate Policy." Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁴⁹² "Predominant method of production" is the standard applied to imported chemicals regulated under Superfund. See Joost Pauwelyn. 2007. "U.S. Federal Climate Policy and Competitiveness Concerns: The Limits and Options of International Trade Law." Nicholas Institute. Working Paper 07-02. Durham, North Carolina.

Furthermore, this provision creates an economic disincentive to make environmental improvements at individual plants, which may be seen as inconsistent with the goals of the policy. If the policy is considered for an environmental exception, this provision may become a challenge since WTO considers whether the policy includes provisions that seem to run counter to its stated objectives in determining whether a policy constitutes “arbitrary or unjustifiable discrimination.”⁴⁹³

Although there may be some objections to the use of an industry average, the other factors considered in this calculation may help the measure pass muster from the WTO. For example, the second criterion all three U.S. Senate bills consider is the number of allowances grandfathered to domestic companies. While there have been disagreements about whether giving allowances to domestic companies constitutes an unequal treatment of domestic and foreign products, some have argued that the inclusion of this factor helps create a sense of equal treatment of foreign and domestic products.⁴⁹⁴ Of course, this debate could be avoided if the final climate change policy moves to a full border adjustment for exports and imports as a means for leveling the playing field rather than imposing import adjustments and grandfathering allowances to domestic companies.

In addition, the inclusion of an economic adjustment indicator in all three of the bills may also help the policy qualify for an environmental exception. As mentioned previously, if the policy is considered for an environmental exception under Article XX of GATT, WTO will consider whether the policy allows for differing local conditions. The inclusion of an adjustment based on local economic conditions would certainly help the U.S. case for such an exception.

The opportunity to contest the required number of allowances creates a sense of “basic fairness and due process” under the Manager’s Amendment plan will certainly help the U.S. case for an environmental exception. Under the Manager’s Amendment, importers of goods that are processed in more than one country are required to submit the maximum number of allowances required by production in any single country. However, an importer is allowed to challenge that requirement in an administrative hearing. This provision allows for due process, which may work in the United States’ favor if the issue is brought before WTO. While the provisions for determining the number of allowances involved in specific border adjustments described in the Manager’s Amendment may need some adjustment, they are fundamentally sound.

Exclusions

All three bills would place international reserve allowance requirements on countries that trade with the United States unless it has been determined that the country has taken “comparable action” to mitigate climate change, is considered to be one of the “least developed” of the developing countries, or makes an insignificant contribution to global greenhouse gas emissions.

⁴⁹³ Harro van Asselt, Thomas Brewer, and Michael Mehling. “Addressing Leakage and Competitiveness in US Climate Policy.” Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁴⁹⁴ *Id.*

Comparable Action

On its face, the Manager's Amendment would appear to contain the most stringent methodology for determining "comparable action," though it is not clear whether the results of the determination would be any different under the other two bills. The standard under the Bingaman-Specter bill is simply that the country has a cap-and-trade program that limits greenhouse gas emissions appropriate to its level of economic development.⁴⁹⁵ Under the Lieberman-Warner bill, the President considers whether the actions taken by a foreign country are "comparable in effect" to those actions taken by the United States after taking into account the country's level of economic development.⁴⁹⁶ The Manager's Amendment includes a two-part test under which the International Climate Change Commission considers whether the foreign country has achieved comparable emissions reductions to the United States. If the country's actions are not found to be "comparable" under this test, the ICCC will consider whether the country has adopted technologies and regulations in an attempt to curb greenhouse gas emissions.

"Least Developed" of the Developing Countries

All three bills include a provision that excludes the countries that have been identified by the United Nations as the "least developed" of the developing countries. A comparison of global greenhouse emissions against the United Nations "least developed" list⁴⁹⁷ suggests there is overlap between countries with "*de minimis* emissions" and classification as "least developed." It is not clear that this provision is more than a statement of political intent.

De Minimis Emissions

To avoid significant administrative costs to develop border adjustment data for trade where leakage and competitiveness are truly insignificant, all three bills provide exemptions for countries with *de minimis* emissions. The Manager's Amendment includes the strictest determination of *de minimis* emissions. The Bingaman-Specter and Lieberman-Warner bills allow the President to consider deforestation rates. The Manager's Amendment requires the country meet this standard both with and without consideration of deforestation rates.

The mere fact that the United States would exempt some countries from the border adjustment and not others constitutes a GATT Article I violation.⁴⁹⁸ As a result, the United States will likely have to justify the policy on environmental grounds, in which case the bills' consideration of country emissions and economic development will be well-received because of its respect for differing local conditions. The provision could, however, be strengthened by providing opportunities to appeal "comparable action" and "*de minimis*" emissions decisions.⁴⁹⁹ With that proviso, however, the Manager's Amendment provides a fundamentally sound approach to categorizing countries as covered and excluded.

⁴⁹⁵ S. 1766, §502.

⁴⁹⁶ S. 2191, §6001.

⁴⁹⁷ United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States. <http://www.un.org/special-rep/ohrlls/ldc/list.htm> (Last visited June 25, 2009).

⁴⁹⁸ Joost Pauwelyn. 2007. "U.S. Federal Climate Policy and Competitiveness Concerns: The Limits and Options of International Trade Law." Nicholas Institute. Working Paper 07-02. Durham, North Carolina.

⁴⁹⁹ Harro van Asselt, Thomas Brewer, and Michael Mehling. "Addressing Leakage and Competitiveness in US Climate Policy." Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

Implementation Date

The three U.S. Senate bills have gradually pushed back the implementation date of the program. The Bingaman-Specter envisioned an implementation date of 2020; Lieberman-Warner, 2019; and Manager's Amendment, 2014. The 2014 implementation seems appropriate because it provides other countries an opportunity to implement domestic climate change policies without providing enough time for the United States to experience significant leakage. Studies of the first phase of European Union Emissions Trading Scheme (EU ETS) have not shown any evidence of leakage during the first few years of the program, although scholars expect that leakage may become more of an issue as the emissions reductions goals become more stringent.⁵⁰⁰ One lesson to be learned from the EU experience is that there is a lag time between policy implementation and carbon leakage, so this two year lag will not provide enough of a gap so that domestic companies will not likely be harmed by any leakage that may occur. At the same time, it provides enough of a lag to provide opportunities for continued international negotiation and domestic action by other countries.⁵⁰¹ Thus, the final climate change bill should retain the 2014 implementation date of the Manager's Amendment.

Role of Negotiations

The Bingaman-Specter bill reaffirms the U.S. Senate's commitment to negotiating "multilateral or bilateral agreements on the reduction of greenhouse gas emissions."⁵⁰² Similarly the Lieberman-Warner bill states "[i]t is the policy of the United States to work proactively under the United Nations Framework Convention on Climate Change and, in other appropriate forums, to establish binding agreements committing all major greenhouse gas-emitting nations to contribute equitably to the reduction of global greenhouse gas emissions."⁵⁰³ The Manager's Amendment expands upon the negotiations approach included in its predecessors to clarify that if the U.S. and other nations cannot come to terms on an international agreement for addressing greenhouse gas emissions, the U.S. will make preparations for border adjustments and encourage other countries who have taken domestic action to implement similar border adjustment policies and request foreign countries to take comparable action, providing an estimate of the greenhouse gas emissions reductions the U.S. expects to achieve through its actions.⁵⁰⁴ The Manager's Amendment is very clear about what actions the U.S. will take with regard to international negotiations. This exceptionally clear approach suggests a "serious, across-the-board negotiations," which will certainly help the U.S. in a WTO challenge. Therefore, the final climate change program should adopt the international negotiation tactics of the Manager's Amendment.

In sum, the final national climate change bill should reconsider whether the international reserve allowances will be under or separate from the cap and eliminate the grandfathering of allowances. It should adopt a full border adjustment for subsectors the International Climate Change Commission finds it necessary to regulate, but given the implementation and administrative costs associated with that activity, both Congress and the Commission

⁵⁰⁰ Carol Fischer and Alan K. Fox. 2009. "Comparing Policies to Combat Emissions Leakage: Border Tax Adjustments Versus Rebates." Resources for the Future. Discussion Paper 09-02. Washington, DC.

⁵⁰¹ Harro van Asselt, Thomas Brewer, and Michael Mehling. "Addressing Leakage and Competitiveness in US Climate Policy." Working Paper. 5 March 2009. Climate Strategies. Cambridge, England.

⁵⁰² S. 1766, §502.

⁵⁰³ S. 2191, §6003.

⁵⁰⁴ S. 3036, §1303.

should attempt to keep the list of covered products narrow. Congress should incorporate additional opportunities for appeal of decisions regarding coverage under the international reserve allowance provisions, particularly for decisions about “comparable action” and “*de minimis*” emissions.

IX. Synthesis and Conclusions

This analysis has attempted to track the development of proposed climate legislation in the 110th U.S. Congress to determine how the Senate has responded to both the political debate and the advice of policy analysts. At the same time the study examines all three bills, and particularly the Manager's Amendment, through the lens of basic policy analysis principles. The underlying question is whether the bills are likely to achieve their stated goals in the most cost-effective manner, given the prevailing legal and political environment.

The Manager's Amendment, S. 3036, is more than an amended version of the initial Lieberman-Warner bill, S. 2191. The Manager's Amendment combines features of both the Lieberman-Warner and Bingaman-Specter bills, and addresses aspects of climate change legislation that were neglected by both previous bills.

Moreover there are signs that the evolution of the bills has been generally positive. The changes embodied in the Manager's Amendment, taken as a whole, represent important improvements over either of the predecessor bills. For example, the inclusion of the Deficit Reduction Fund demonstrates an inclination to follow economists' prescription to auction allowances and use the revenues to support the public finance system. The bill also eliminates the initial Bonus Allowance balance and fixes the borrowing provisions of the Lieberman-Warner bill, modifies the Technological Accelerator Payment ("safety valve") scheme of the Bingaman-Specter bill, and adds a kind of environmental safety valve.

However, there is substantial room for improvement in the Manager's Amendment. Based on the analysis in the previous sections, there are several principles that Congress should observe as it develops the next generation of cap-and-trade climate legislation.

Address Cost-Effectiveness, Environmental Efficacy, Law and Politics

The analysis in the previous sections of this report is anchored in good policy principles, motivated by an efficiency-seeking orientation. The philosophy here is that whatever goals Congress sets for the country, those goals should be pursued in the most cost-effective manner. This requires a design that would minimize the social cost of abatement, public finance and implementation, subject to environmental efficacy requirements and political and legal constraints. The analysis in this report tends to emphasize cost minimization and place less emphasis on political constraints. Ultimately, it is up to Congress to determine the extent to which cost-effectiveness must be compromised to accommodate political reality.

Avoid Sudden Forced Reductions in Emissions

The Lieberman-Warner would have required a reduction of nearly 11 percent in annual emissions between 2011 and 2012, whereas the Manager's Amendment requires just over a seven percent reduction during the same time. In this sense the Manager's Amendment reduces the impact of the transition. Gradual transitions general involve lower costs.

Clarify the Role of the CAA

Unlike its predecessors, the Manager's Amendment at least acknowledges the important relation between new climate change legislation and the Clean Air Act. Given the recent Supreme Court ruling in *Massachusetts v. EPA*, it is possible that EPA could be petitioned, and even be forced by the courts, into a dual regulatory system that would be both burdensome and counterproductive. Congress should clarify that the new legislation is intended to supersede the CAA in matters of GHG emissions.

Allow the Price Signal to Work

One of the primary advantages of cap-and-trade systems like those employed in these three bills is that they use prices to distribute CO₂ emissions allowances to their highest-valued users—they promote economic efficiency even as they protect the environment. Consequently, Congress should be careful to avoid provisions that might compromise the power of the price signal. While the Manager's Amendment may have moderated some of the provisions that would compromise the price signal, there is still room for improvement. There are three particular aspects of allowance allocation in the Manager's amendment that should be addressed.

First, the Manager's Amendment would allocate allowances to the electric power sector without discriminating between regulated and restructured states. Under the ratemaking procedures in the regulated states it is likely that utilities will be unable to include in their rate base the value of the allowances that have been freely allocated to them under these programs. As such, rates in regulated states will not reflect the real cost of electricity, which includes the value of the allowances required for generation. Conversely, consumers in states that have restructured are likely to pay more for electricity, something closer to real cost because prices are not regulated. In those states the stockholder will be the primary beneficiaries of the allowances allocated to the electric power sector.

Second, the Manager's Amendment continues the practice of awarding bonus allowances for CCS, albeit at a lower rate. The purpose of the CCS program incentives is to encourage firms to make investments in the research and development that will be needed to deploy the technology. By giving bonuses for the amount of CCS, the program runs the potential of encouraging firms to process more carbon than is efficient. It also runs the risk of programmatic lock-in to a particular technology. Given the goals of the program, it would be more consistent for the government to invest directly in research, development, deployment and information programs that would reduce the cost of engaging in CCS. The Manager's Amendment does, in fact, provide additional funding to develop the technology in the near term.

Congress should also avoid the temptation to influence entry and exit in the manufacturing and electricity generation sectors. The new bill subsidizes new entrants to the electric power and manufacturing sectors by establishing an annual allocation of allowances for those entities. This subsidy should be eliminated as it could encourage inefficient new entities that are not bearing the full cost of their operations.

Similarly, Congress should avoid the mistaken practice of insisting that any entities that shut down must return the allowances allocated to them. This could potentially induce inefficient

firms to remain in business even though their best option is to liquidate their assets to make way for more efficient firms.

Finally, programs that ease the economic burden of the climate change program on low-income families should be implemented carefully, avoiding programs that effectively subsidize energy use. Some of the provisions in the bills would allocate allowances for the purpose of providing rebates or subsidies to low-income electricity ratepayers. Better to auction the allowances and use the revenues to offset tax cuts to those same low income families (at least to the extent that they pay taxes), allowing them to spend the money on any number of beneficial uses, not only electricity.

Auction Allowances and Direct the Revenues to the General Fund

The Manager's Amendment has at least acknowledged the benefits of auctioning allowances and assigning them to the general fund. Many of regulatory design problems--price distortions, unanticipated distributional effects, technological and programmatic lock-in--are ameliorated or eliminated by adopting a more principled approach: auction of all allowances and assignment of all revenues to the federal government's general fund. The programs and projects supported by the bill could then compete on an even footing with other important public investments and goals, including the reduction of highly distortionary taxes.

All three bills allocate, rather than auction, a substantial portion of allowances. Some degree of direct allocation may be necessary to ensure passage of cap-and-trade legislation, but direct allocation should be minimized. By auctioning allowances it is possible to reduce distortionary taxes, such as the income and payroll taxes, and at the same time maintain government revenue. This also suggests that Congress should avoid multi-decadal earmarking. Climate change programs, like all activities for which Congress appropriates funds, should be subject to regular review, to competition with the many other important socially beneficial programs that the government must support.

One objection that has been raised to the auction of allowances is that it reduces the ability to help the states that will experience the greatest costs of compliance, particularly those that produce and consume the most coal. However, it is also possible to direct the proceeds of the auction to state treasuries, thereby offsetting distortionary state taxes. This would preserve the revenue recycling function of the auction while increasing the political palatability.

If Allocation and Earmarking are Unavoidable, Keep it Simple

The Manager's Amendment introduces an unnecessarily complicated scheme for supporting state level programs and promoting technology development and adaptation. All three of those categories are supported through both direct allocation and earmarking of auction revenue. While neither of these approaches is favored on policy grounds, if they must be used Congress should choose one or the other to promote administrative simplicity.

Regulate Upstream for Broad Coverage and Lower Administration Costs

Focusing the cap-and-trade provisions further upstream limits the number of covered entities even as it provides broader coverage, more opportunities for low cost emissions abatement and simpler administration. Wisely, the Manager's Amendment has adopted a largely

upstream approach to covered entities, focusing on oil refineries, natural gas processors and coal-fueled electric utility plants. The breadth of coverage could be further improved by covering coal mines rather than electric utilities.

Carefully Weigh Environmental Efficacy against Cost Containment

The Lieberman-Warner bill provides no cost relief measures beyond banking, borrowing and, of course, trading of allowances. In contrast the Bingaman-Specter bill provides a price ceiling on allowances to contain the cost of allowances. The Lieberman-Warner bill provided relative certainty regarding the quantity of emissions in any given year, where the Bingaman-Specter bill could potentially experience great variability in annual emissions, but more predictable costs.

The Manager's Amendment introduced a mechanism that combined (1) a system to set aside reserve allowances from previous years' allocations in the case of high prices with (2) a floor on the price the government would accept in the annual auction. These differences among the bills illustrate the tradeoffs that Congress will have to make between control of costs and low uncertainty in annual level of emissions.

Like emissions targets themselves, the tradeoff between cost containment and emissions variability is largely a political decision. However, Congress should think carefully about the implications for integration in an international climate agreement. The dominant paradigm for international cooperation, reflected in the Kyoto Protocol, has been to place limits on national annual emissions. If the United States opts for a system with lower costs but greater annual variability in annual emissions, it may be difficult to enter into the multilateral international program.

Address Potential Problems with Cost Containment Provisions

If Congress chooses to use a cost containment mechanism similar to the one in the Manager's Amendment, it will be necessary to address particular design problems with the proposed system. First, the mechanism is not a true auction because the bids are derived from a modeling exercise rather than being based on actual bids. Also, there is a price ceiling on the extra allowances. Combined with the limited number of allowances available, the price ceiling could lead to excess demand.

Second, the Manager's Amendment restricts its cost containment auctions to the sale of allowances taken from future years' budgets only. This avoids flooding the market with off-budget allowances, but introduces questions about intergenerational equity. The final bill should consider this trade-off. Perhaps more importantly, borrowing from future years' allocations raises the specter that a future Congress could decide not to respect the additional reduction in allocated allowances. Certainly other nations would be concerned about this possibility and it might make it difficult for the United States to engage in an international trading program.

If Congress retains a cost-containment auction similar to the one employed in the Manager's Amendment, the allowances should be subject to a simple auction each year without a price cap. This facilitates the movement of the allowances to their highest value users and avoids the possible excess demand that could otherwise emerge.

Redesign the Banking and Borrowing System

Banking provisions provide covered entities the opportunity to save allowances for subsequent years when the firms believe the costs of pollution abatement will be higher. Borrowing provisions allow interannual shifting of allowances to overcome temporary shocks. We reach two conclusions regarding these mechanisms. First, the banking system should pay interest on saved allowances to encourage the postponement of damages. Second, just as in financial systems, there should be a link between the interest rate offered on allowances and that paid on borrowing. This interest should be carefully derived, accounting for market rates of return on other financial transactions and the expected changes in the price of allowances.

None of the bills contain provisions for paying interest on banked allowances. And while the borrowing provision in the Manager's Amendment is an improvement compared to the one described in the original Lieberman-Warner bill, it still employs a rather arbitrary, and arguably high, annual interest rate of 10 percent.

All three bills involve substantial direct allocation of allowances. While this report recommends against that practice, it is also true that a promise of future allocations of allowance provide a pool of allowances against which firms could borrow. However, there will be many instances when firms with no allocation may need to borrow allowances. The final bill should address how the program will protect against borrowers who present substantial default risks. Congress should consider the possibility of requiring some form of collateralization of allowance loans.

Develop a Clearer Approach for Offsets

The bills do not cover, indeed no bill could cover, all activities that affect GHG emissions. As such, the bill stipulates provisions to encourage activities with expected positive effects on emissions. The bill uses two primary sources for rewards: allocating allowances from the annual schedule (on-budget rewards) and creating new allowances in addition to the amounts in the annual schedule (off-budget offsets).

It is important that Congress protect against compromising the environmental efficacy of whatever emissions cap it adopts. To this end, it is necessary that there be real reductions in emissions or increases in sequestration equal to or exceeding any new allowances created in an offset program. The Manager's Amendment not only directs the Administration to develop rules to assure the environmental efficacy of the proposed offset systems, but requires that the methods employed for estimation produce results that are consistently reproducible by independent teams of evaluators. This is a step in the right direction and should be adopted for any offset program.

Unfortunately, there remains ambiguity in the Manager's Amendment regarding the role of the new estimation methods. At no point is the role of the offset estimation methods clearly stated. Congress should clarify the role that the offset estimation methods play. Moreover, international offset projects should be subject to the same set of rules, including rigorous estimation methods leading to independently reproducible results, as the domestic offset program.

In general, the best arrangement is one in which offset projects are encouraged and the estimation methods used to evaluate the projects are highly credible and low cost.

Unfortunately, this outcome seems unlikely, at least for some types of projects. To protect against compromising the environmental efficacy of the program, Congress can adopt two options. The first is to limit the amount of allowances that can be issued under the offset provisions combined with stringent methods that lead to independently reproducible estimates for project outcomes. The second is to only reward these projects with on-budget allowances. The first approach may compromise the cost-effectiveness of the program by limiting the number of truly effective projects. The latter, by allocating allowances to an offset category, runs counter to the previous prescription to auction all allowances and recycle the revenue into the U.S. Treasury's General Fund or related public finance purpose such as tax reductions.

This creates a tension among the goals of the program that Congress will have to resolve. One possibility is to use off-budget credits for those projects that are most likely to meet the rigorous standards discussed above and to pay for the inputs to projects where estimation is more likely to be a problem.

Drop Early Action Awards

Early action provisions in the bills should be dropped. They have little or no positive effects on behavior and will distract the government from effective implementation of more credible programs.

Use Full Border Adjustment on a Limited Basis to Address Leakage and Competitiveness

The report examines a number of different provisions for border adjustment, arriving at two fundamental conclusions. First, avoid direct allocation of allowances, either grandfathering of allowances based on historical emissions or "home rebate" based on current output levels. Second, use full border adjustment to address leakage and competitiveness issues. For imports, this would entail requiring producers of energy intensive primary products to acquire allowances equivalent to the emissions involved in the production of the goods. For exports of energy intensive primary products, full border adjustment would provide subsidies or some other form of rebate equivalent to the value of the allowances that were required for production process.

It appears that aside from a few key industries, leakage is a fairly limited problem. The primary driver behind the concerns with trade effects seems to be competitiveness, and more basically, maneuvering for protection. However there are substantial legal barriers and implementation costs associated with developing trade restrictions such as full border adjustments. To ensure environmental efficacy, Congress should consider whether the international reserve allowance program will be under or separate from the cap. To address the legal barriers, Congress should include a clear statement that the provisions are designed for environmental protection and incorporate additional opportunities for appeals. To contain implementation costs, Congress should include border adjustments only for those energy intensive industries subject to the greatest international trade competition.

Double Check the Bill

Congress often has to work quickly to adjust bills to reflect new ideas or agreements. It is easy to make mistakes, but the implications can be significant. Consider three examples from the case of the Lieberman-Warner bill. First, the borrowing provisions in S.2191, §2303 were likely intended to adopt a 10 percent annual compound interest rate. However, by incorrectly specifying the terms, the system would have led to a 110 percent annual simple interest rate for all but the first year.

Second, in its treatment of agriculture and forestry projects under S.2191, §3702, the Lieberman-Warner bill took its language on the development of soil carbon sequestration estimation directly from the Bingaman-Specter bill's section on agriculture projects in S.1766, §205(a)(2). Unfortunately, the soil carbon methods developed for agriculture would not be an appropriate basis for evaluating forestry projects. The drafters of the Lieberman-Warner, however, bill did not adjust the requirements when they expanded the scope of the coverage.

Finally, to develop the standards for border adjustments, it is necessary to determine the emissions intensity of covered goods, measured in unit of greenhouse gas emissions per unit of product. But the Lieberman-Warner bill, in §6001, mistakenly refers to "the total average annual greenhouse gas emissions attributed to a category of covered goods of a foreign country during the period beginning on January 1, 2012, and ending on December 31, 2014," a measure of absolute emissions, not emissions intensity.

All three bills are complex, each more than its predecessor. Even the first draft of a bill can contain significant errors. A unified committee mark-up process could be an opportunity to identify and correct mistakes. Indeed, all three of the errors in the Lieberman-Warner bill identified above were corrected in the committee mark-up leading to the Manager's Amendment. However, when a bill is subject to multiple committee mark-ups and subsequent floor debate and amendment, there will be ample room for internal conflicts and mistakes.

Given the significant impacts that climate legislation could have on both the environment and the economy, Congress should take extraordinary measures to protect against clear errors. A detailed third-party, interdisciplinary, expert review or similar provision may be appropriate in this context.

Think Broadly

Like its predecessors, the Manager's Amendment continues to reflect a technology-oriented, supply-side emphasis on mitigation of GHG emissions. Little is offered in the way of understanding and changing consumer demands for polluting goods and services. In some cases, the bill is antithetical to reducing energy-related emissions. Moreover, the bill does not place sufficient emphasis on the adaptation to climate change that will be required even if the United States and other nations mount an aggressive mitigation program.

To be truly comprehensive, Congress' bill should not only try to encourage "technological fixes" such as increased energy efficiency and alternative fuels, but incorporate substantial programs for public education, research in the psychology of consumption and satisfaction, and adaptation as well.

Appendix: Methodology for Determining Greenhouse Gas Emission Levels Under Proposed Climate Change Bills

- Business As Usual Emissions were estimated by using 2006 emissions and projected annual increases from the Annual Energy Outlook Business as Usual average rate of yearly increase (1.29 percent), an assumption also used by the World Resources Institute September 2007 analysis.
- Greenhouse gas emission levels under the IPCC 50 percent reduction goal were estimated by obtaining 2000 levels from the U.S. Department of Energy's Energy Information Administration at www.eia.doe.gov/oiaf/1605/ggrpt/excel/tbl1.xls.
- IPCC's 50 percent goal was estimated by multiplying 2000 emission levels (6978.4 million metric tons of carbon dioxide equivalents) times 50 percent to determine estimated emissions of 3,489.2 million metric tons of carbon dioxide equivalent.
- IPCC's 85 percent goal was estimated by multiplying 2000 emission levels (6978.4 million metric tons of carbon dioxide equivalents) times 15 percent to determine estimated emissions of 1,047 million metric tons of carbon dioxide equivalent.
- A linear equation was constructed to estimate emission levels in years 2007 through 2049 under the IPCC's recommended emission levels.
- Emissions under the Lieberman-Warner bill were estimated by adding the number of emission allowances specified in S.2191 § 1201 to the expected emissions from pollution sources not covered by the bill.
- Bill sector coverage for the Lieberman-Warner bill was assumed to be 80 percent, based on reports from the bill's annotated table of contents (World Resources Institute, "Assumptions and Methodology of Comparison of Legislative Climate Change Targets in the 110th Congress").
- Emissions for uncovered facilities under Lieberman-Warner were determined by multiplying 20 percent times Business as Usual Emissions.
- Emissions under the Bingaman-Specter bill were estimated by adding the number of emission allowances specified in S. 1766 § 101 to the number of emissions from pollution sources not covered by the bill.
- Bill sector coverage for the Bingaman-Specter bill was assumed to be 85 percent, based on reports from the U.S. EPA (EPA Analysis of the Low Carbon Economy Act of 2007).
- Emissions for uncovered facilities under the Bingaman-Specter bill were determined by multiplying 15 percent *times* Business as Usual Emissions.
- Emissions under the Manager's Amendment were estimated by adding the number of emission allowances specified under S. 3036, § 201 to the expected emissions from pollution sources not covered by the bill.
- Bill sector coverage under the Manager's Amendment was estimated to be 84 percent since sector coverage is similar to the Bingaman-Specter bill, simply excluding current greenhouse gas emissions from HFCs.⁵⁰⁵
- Emissions for uncovered facilities under the Manager's Amendment were determined by multiplying 16 percent *times* Business as Usual Emissions.

⁵⁰⁵ Science Daily. "Beyond Carbon Dioxide: Growing Importance Of Hydrofluorocarbons (HFCs) In Climate Warming." July 9, 2009. <http://www.sciencedaily.com/releases/2009/06/090622171503.htm> (Last visited July 13, 2009).

Example:

2013 emissions under Lieberman-Warner were estimated as follows –

5,104 emission allowances + (20 percent $\times (7,076 \times (1 + .0129)^7)$)
[Section 1201] **% uncovered facilities x Business as Usual emissions**
2006 emissions x anticipated growth

2013 emissions under Bingaman-Specter were estimated as follows –

6,592 emission allowances + (15 percent $\times (7,076 \times (1 + .0129)^7)$)
[Section 101] **% uncovered facilities x Business as Usual emissions**
2006 emissions x anticipated growth

2013 emissions under Manager's Amendment were estimated as follows-

5,669 emission allowances + (16 percent $\times (7,076 \times (1 + .0129)^7)$)
[Section 201] **% uncovered facilities x Business as Usual emissions**
2006 emissions x anticipated growth