Conquering Cost: Optimal Policy Approaches to the Cost of Climate Change

Workshop Briefing Memo

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Introduction

Last month, the U.S. House of Representatives narrowly passed a wide-ranging energy and climate bill with the first-ever greenhouse gas cap-and-trade measure to emerge from that chamber. The American Clean Energy and Security Act of 2009 (H.R. 2454) sets a cap that covers about 85% of U.S. total greenhouse gas emissions and virtually all emissions from the combustion of fossil fuels (U.S. Environmental Protection Agency [EPA] 2009). Costs of complying with the bill were at the center of the House debate in large part due to lingering concerns about the state of the economy. As the Senate now considers comparable efforts to pass comprehensive energy and climate legislation, cost concerns will remain critical and, if they are not dealt with effectively, threaten to stall legislation.

"Cost" serves as an umbrella term for a number of issues. Cost broadly refers to the effect of the nation's climate policy on the overall performance of the economy, as measured by indicators such as gross domestic product (GDP) that capture the value of the economy's output. Cost also may refer to the possibility that a cap on U.S. industrial sectors provides a comparative advantage to producers in uncapped countries, leading to loss of competitive advantage that some fear could cause a migration of manufacturing to competitor nations, such as China, that may refuse to adopt a comparable mandatory cap as part of a post-Kyoto regime, which is up for consideration in Copenhagen in December 2009.

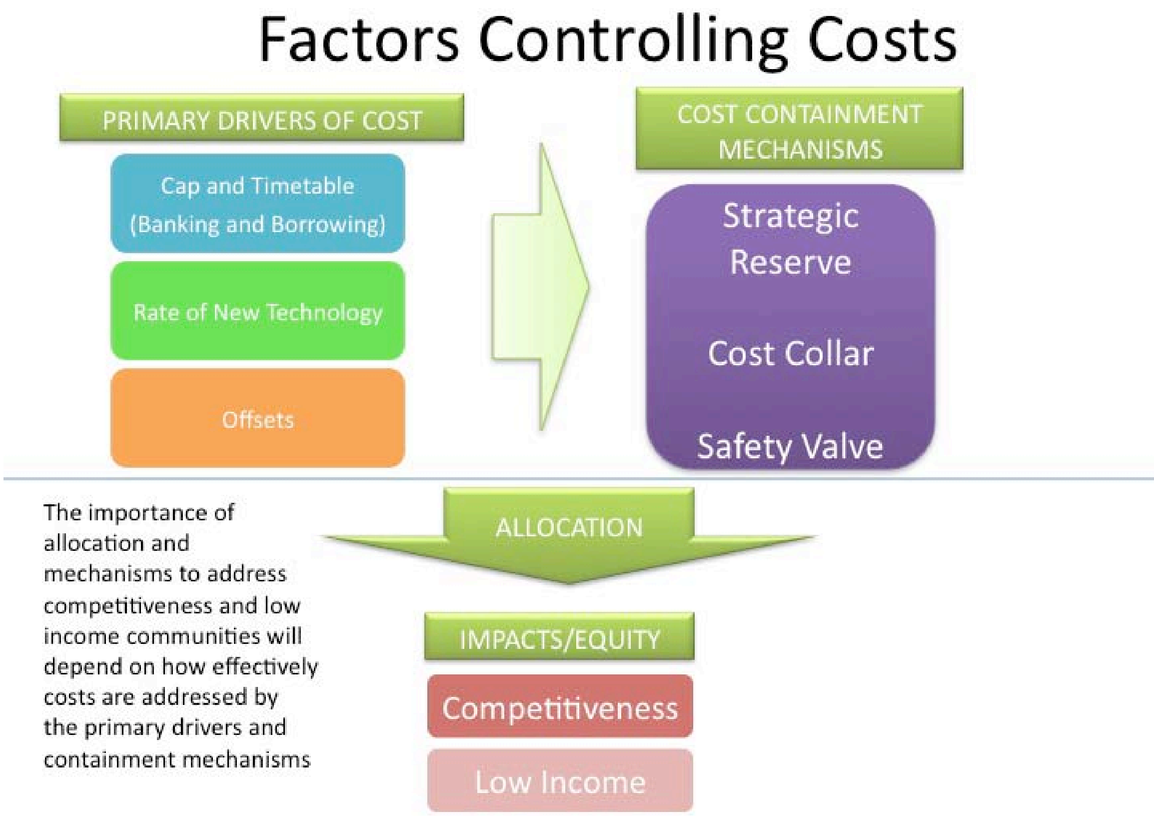
In addition to the adverse impact this could have on the percentage of U.S. producers that compete with producers from the uncapped countries, the shifting of economic activity could generate a corresponding "emissions leakage" to those countries, thereby undermining the efforts of the U.S. and other countries that do adopt a cap. "Cost" concerns also capture distributional equity factors that could arise from a climate policy, such as the impact of higher fossil energy costs on lower-income brackets of the U.S. population, who would bear disproportionately high cost, as utility bills and other energy-intensive goods and services tend to comprise a greater share of their budgets (Congressional Budget Office [CBO] 2009).

To address these substantive and political needs, the Nicholas Institute for Environmental Policy Solutions has helped guide the development of cap-and-trade policy proposals that foster compliance flexibility while maintaining environmental integrity. To accomplish these twin goals, the Institute has developed policy options in four key areas that pertain to different types of cost that arise from climate legislation.

The four policy levers include:

- **Offsets**: Policies to allow capped entities to minimize cost by allowing obligations to be "offset" through cheaper reductions (usually voluntary projects) elsewhere in the economy or in other countries not subject to a cap (Olander and Galik 2009);
- **Cost Uncertainty and the Allowance Reserve**: Devices to allow market intervention in times of unacceptably high or volatile carbon prices. Such interventions include the "strategic carbon reserve" included in the Waxman-Markey bill as well as "safety valve" (Murray 2009);
- **Competitiveness Provisions**: Mechanisms to address potential disproportionate costs borne by trade-sensitive U.S. industrial sectors (St. Clair Knobloch 2009);
- **Addressing Costs for Low-income Households**: Allowance allocation and other transfers to address impacts on lower-income brackets of the U.S. population (Wooten 2009).

Figure 1. Factors Controlling Costs



1. How Cap-and-Trade Creates and Conquers Cost

Figure 1 illustrates fundamental and more advanced policy levers contain or “conquer” cost. In simple terms, the emissions limits contained under a cap and compliance timetables are basic cost-control mechanisms. Offsets derived from uncapped sources are one of the most effective cost-containment policy levers. If offsets and other assumptions about cost, such as the level of low-carbon technology deployment, are insufficient or inaccurate, respectively, then more advanced price-containment measures, such as a strategic reserve or cost collar mechanisms, are necessary. Depending on costs and the degree of participation from other countries, some support for trade-sensitive U.S. firms—either allowances or border adjustments—also may be necessary. Similarly, the less effective these more fundamental cost-containment measures are, the greater the need is for mechanisms to defray costs to low-income households. On the flip side, the better the cap and offsets work to contain costs, the lower the need is for measures such as free allowances to defray costs to trade-sensitive U.S. sectors and low-income U.S. households.

Cap-and-trade is widely recognized to be less costly than conventional, highly prescriptive air pollution legislation, sometimes referred to as the “command-and-control” approach (Stavins 2008). A cap accomplishes this by allowing capped entities to trade, bank, and borrow allowances, which represent permits to emit greenhouse gases (GHG). Trading refers to the idea that entities with high abatement costs may buy allowances from lower-cost entities. Entities also may “bank” some allowances for future use if they believe future reductions could be more costly than current ones or “borrow” from future compliance periods if they believe the opposite.

The costs of cap-and-trade are determined in part by GHG abatement targets (i.e., the “cap”) and compliance timelines. A stringent cap with compressed compliance periods is far more costly than a cap that declines by a small percentage over time. Waxman-Markey, reflecting earlier Senate proposals, takes a gradual approach. The measure would take effect in 2012 at an aggregate level equal to 3% below capped entities’ 2005 emissions. The cap then gradually lowers the level of allowed emissions to 17% below 2005 levels by 2020 and to 83% below 2005 levels by 2050.

By and large, lower carbon energy sources cost more, which means that facing a cap imparts compliance costs for the capped entity or facility, such as an electricity generator.[1] Accordingly, allowance prices reflect the compliance cost to the capped entity. EPA estimates the allowance prices under Waxman-Markey to be between $13 and $17 per metric ton of carbon dioxide equivalent (tCO_2e) in 2015 under core assumptions about technology, economic growth, and the availability of low-cost offsets from uncapped sources, rising to between $17 and $22 by 2020 (EPA 2009). CBO (2009) places allowance prices somewhat higher under Waxman-Markey at $28 per ton in 2020.

[1] The economics of this situation are changing though, with some low-carbon power sources such as wind energy becoming increasingly cost-competitive with fossil power, though intermittency of the power source is still an issue to be addressed by comprehensive source planning.

The cap level and timing are crucial to cost in large part because technologies that emit low or no carbon are costly to develop and to deploy. Implicit in cap cost estimates and timelines are assumptions about whether low-carbon technologies, including carbon capture and sequestration (CCS), renewables, and nuclear power will deploy as planned. These technologies are pivotal because EPA projects that the largest sources of emissions abatement will come from electricity generation. EPA says CCS is "an important enabling technology" (2009, 47); however, it still constitutes a relatively small fraction of the overall electric power mix—4.5% by 2025 (EPA 2009, 26). For new generation capacity, CCS is projected to constitute 25.8% by 2025 (EPA 2009, 26).

Offsets

Like electricity generation, offsets constitute a major source of emissions abatement, according to EPA. An offset is a voluntary greenhouse gas reduction made by an entity, such as a small GHG emissions source or a forestry project, that sequesters carbon in biomass and soils. Entities with high marginal abatement costs may purchase qualified offsets from U.S. sources, such as agriculture or forestry, or from international sources from uncapped countries. The quantity of offsets that a cap provides typically relates to the trading system's targets and timetables. For instance, the less stringent the GHG emissions limits under the cap, the fewer offsets required.

By providing low-cost reductions beyond the cap and easing allowance price pressure when targets and timetables are stringent, offsets represent a significant policy lever to control costs. One consideration, though, is that the cost of climate policy as it currently is designed turns in large part on whether developing countries' efforts to stem deforestation will indeed result in international offsets that are credible, available, and convertible to tradable credits for the U.S. and other countries complying with an international cap-and-trade regime (Murray, Lubowski and Sohngen, 2009). The EPA study of Waxman-Markey costs finds that excluding international offsets from the cap-and-trade program raises allowance prices (i.e., the cost to capped entities to abate greenhouse gases) by 89% (EPA 2009, 3, 12).

Cost Uncertainty and the Allowance Reserve

As Figure 1 suggests, as long as the cap functions properly, with allowance prices that are not too high or too low, market correctives such as a reserve or "safety valve" are unnecessary. But if fundamental assumptions that underpin cap cost projections fail to hold, then allowance price correctives must come into play. Assumptions turn on for instance the question of whether international offset supply projections are correct. Other cost uncertainties are tied to the question of whether all major emitting countries take on binding GHG commitments. In particular, China's failure to join an international, post-Kyoto regime potentially would place capped competitive U.S. industrial sectors at a disadvantage. Factors such as unanticipated changes in economic activity or annual weather patterns also can lead to volatility in the allowance market, especially if flexibility mechanisms such as banking and borrowing are restricted in some way.

Advanced mechanisms to guard against excessively high or volatile climate change legislation costs include a carbon reserve mechanism, price cap (safety valve), or price collar (aka "symmetric safety valve") (Burtraw, Palmer, and Kahn 2009). As the expression suggests, a carbon reserve sets aside allowances and makes them available to the market to rein in unexpectedly high or extremely volatile allowance prices. A safety valve, in turn, serves as a price ceiling. A safety valve makes an unlimited supply of allowances available to the market in the event that allowance prices reach the ceiling level. Owing to unlimited allowance supply, a criticism of the safety valve is that it may lack fidelity to long-term GHG reduction goals.

Whereas a safety valve makes an unlimited quantity of allowances available, the carbon reserve sets a quantitative limit on the amount of allowances that a safety valve can offer (Murray, Newell, and Pizer 2009). A reserve sets aside allowances from the cap in a reserve and makes them available to the market via a supplemental auction. The supplemental auction sets a minimum reserve price at which the allowances can be sold. Despite the fact that it is a "minimum," that reserve price is something akin to an aspirational price ceiling. The reserve price is meant to reflect a high-end allowance price estimate (e.g., a set percentage above the expected market price). If the market is pushing prices toward or beyond that upper price estimate, the reserve mechanism ensures that a tranche of allowances is offered at the reserve price.

If the tranche is sufficient to satisfy the pent-up demand at the reserve price, the market price should settle there. If demand exceeds the quantity offered in the tranche, then buyers could bid the price above the reserve price. Thus, a maximum price cannot be guaranteed because the reserve permits are finite in number—in contrast to a safety valve price cap, which offers an unlimited quantity of allowances at the target price. Fixing the reserve size, however, helps to make sure that the legislation meets long-term greenhouse gas reduction goals.

A criticism of the reserve approach is that while it can limit temporary spikes in allowance prices, it fails to provide an absolute price ceiling (Dinan 2009). A symmetric safety valve or cost collar, in turn, establishes a price ceiling as well as a floor on the price of trading allowances. This instrument is thought to better protect against price volatility than a safety valve alone. Burtraw, Palmer, and Kahn (2009) found that while a safety valve may reduce expected allowance prices at the high end, the possibility of very low allowance prices (due to unforeseen advances in low-cost technology or random factors pushing down allowance demand) remains. While this may not suggest a "cost" problem per se, lower expected allowance prices would reduce incentives to turn over GHG-intensive equipment and to invest in cleaner energy technologies. Thus, Burtraw et al., see a price floor coupled with a safety valve price ceiling as one remedy to the problem. Moreover, imposing a price floor means that emissions could actually get cut below the specified cap, providing more climate benefits than initially anticipated.[2]

[2] The symmetric price collar concept is based on the experience of extant incentive-based cap-and-trade systems. History suggests that cap designers typically overestimate rather than underestimate allowance prices prior to the legislation taking effect (Harrington et al. 2000).

Another price-containment approach is "price management" with auctioning (Dinan 2009). Under this approach, the government sets a cap on cumulative emissions over several decades instead of an annual, declining cap. The price management approach reduces the ability of short-run variables such as economic growth, weather, or energy market fluctuations to drive allowance price variability. However, synchronizing the government "managed" price to the correct level to achieve the cumulative cap could be quite challenging. In essence the market price discovery process is replaced by government price tweaking, waiting (years) for the emissions result, adjusting, waiting, and so forth.

Competitiveness Provisions

In contrast to policy levers designed to level out allowance prices, free allowances also may serve as a cost-containment tool. Free allowances can help to defray costs to U.S. industries that simultaneously incur high energy input costs and compete directly in global markets where major competitors are uncapped (e.g., iron and steel, aluminum, cement, glass, and paper).

In addition to free allowances, calibrated to production, other policy measures to address competitiveness concerns include, for example, import allowance requirements or a border tax, border rebates, and a full border adjustment. A border tax requires imports of goods that are energy-intensive to manufacture to hold allowances under a U.S. cap-and-trade system. The government levies the same tax on imported, energy-intensive goods as those of comparable capped U.S. entities. As Stavins (2009) notes, because this approach focuses solely on imports into the U.S., it has no effect on the competitiveness of U.S. exports. According to Pauwelyn (2007), such an approach is likely compliant with World Trade Organization (WTO) rules. But it remains unclear whether the WTO will consider the border tax as compliant.

In contrast with a border tax, a border rebate refunds the value of emissions embodied in exports. This approach likely also raises WTO compliance issues (Stavins 2009). A full border tax adjustment, by contrast, combines a border import tax with a border export subsidy (Stavins 2009). The adjustment approach not only carries potential WTO compliance implications, but it also entails the challenging, if not impossible analytic task of determining GHG emissions embodied in foreign products.

Addressing Costs for Low-income Households

To address disproportionate costs borne by households, allowances targeted to local distribution companies (LDCs) (regulated gas and electric utilities) and directly to low-income households through energy rebates can help to defray the cost of the higher utility bills these companies may pass on to their customers. To assist all consumers, particularly those in states that derive energy from high-carbon-content fuels, a cap-and-trade measure would give a set percentage of free allowances to LDCs. Such free allowances are conditioned upon the idea that a cap-and-trade measure would require LDCs to pass these benefits on to residential and industrial consumers through lower utility bills.

In addition to allowances targeted at all consumers, additional provisions are likely needed to offset the comparatively higher cost of energy, goods, and services to low-income households (CBO 2009). Low-income households are more vulnerable to the higher energy costs that climate change legislation would bring because they spend a larger share of their monthly budgets on energy than higher-income households. For low-income segments of the U.S. population, cap-and-trade policy could direct some proceeds from the sale of allowances directly to low-income households to reimburse them for higher energy, goods, and services costs.

2. How Waxman-Markey Addresses Cost and Policy Considerations for the Senate

Waxman-Markey employs four categories of advanced policy levers to address cost. The levers include domestic and international offsets; an allowance reserve; allocations to trade-sensitive sectors and a border tax adjustment; allocations to LDCs for households and industrial users, and direct relief to low-income households. Table 1 summarizes some key parameters employed by each policy lever to conquer cost.

Offsets

Waxman-Markey makes two main categories of offsets available: domestic (from uncapped entities in the U.S.) and international (from uncapped countries), totaling 2 billion tons. Waxman-Markey allows for up to a half billion tons of additional international offsets, should adequate domestic sources fail to materialize. On the domestic side, Waxman-Markey would depend heavily upon offsets from agriculture and forestry. Accordingly, the measure gives both EPA and the U.S. Department of Agriculture (USDA) overlapping authority for program administration.

On the international side, Waxman-Markey allows offsets to originate from uncapped developing countries. In order to serve as an international offset source, the measure requires countries to put into place a bilateral/multilateral agreement. Waxman-Markey identifies offsets from three primary categories: programs based on the United Nations Framework Convention on Climate Change (UNFCCC) (which would currently be the project-based Clean Development Mechanism [CDM]); a new sectoral approach for specific industrial sectors in higher-emitting countries; and Reduced Emissions from Deforestation and Degradation (REDD).

Table 1. Cost Features Contained in Waxman-Markey

Offsets	One billion tons each of domestic and international offsets per year (2 billion tons total) EPA analysis of Waxman-Markey found that exclusion of international offsets would increase allowance prices by 89% (EPA 2009, 3, 12). Domestic offsets receive full credit (1:1 ratio), international offsets are credited 1:1 until 2018, when they shift to a 1.25:1 ratio (20% discount).
Strategic reserve	Reserve credits are auctioned: $28 min. price in 2012. In 2015, the minimum price will be 60% above the 36-month average allowance price. It is filled with a small percentage of emissions allocation from each calendar year: 1% (2012–2019), 2% (2020–2029), and 3% (2030-2050). Maximum quantity released each year: 5% of total allocation for 2012-2016, then 10% of total allocation beyond 2017.
Competitiveness	Trade-vulnerable industries are given 2% of the emissions allowances in 2012–2013, 15% in 2014, and a declining amount thereafter. Trade losses and emissions leakage are limited by requiring the purchase of emissions allowances on imports of raw goods from uncapped countries.
Low-income households	Local distribution companies (LDCs) receive 35% of the allocation with the requirement that the benefits be passed on to utility consumers. In addition, 15% of the allocation is auctioned to benefit low-income assistance programs (EBT, earned income tax credit, etc.) CBO estimates that the lowest quintile of earners will receive a $40 benefit per household under the Waxman-Markey bill.

- **Existing projects**: Waxman-Markey phases out existing (i.e., the Clean Development Mechanism [CDM])) as acceptable offsets by 2016 from higher-emitting countries based on specified criteria.

- **Specific industrial sectors**: The measure would require participating countries (these same higher-emitting countries) to set a baseline for covered sectors from sensitive industries such as steel. Reductions below the baseline could qualify as a source of international offsets.

- **Reduced Emissions from Deforestation and Degradation (REDD)**:

    - Market approach: The measure credits avoided deforestation as offsets for the U.S. carbon market. While project and subnational activities are creditable in the short term, these phase out over time leaving national accounting (with the same advantages just cited for sector-based accounting) the only creditable option.[3]

    - Fund approach: Pays countries directly to avoid deforestation, but these payments do not generate offset credits for the domestic market. The fund is also intended to help with capacity building and leakage avoidance.

Summary

At 2 billion tons total, Waxman-Markey affords a great deal of potential cost containment to the use of offsets, particularly from international offsets. Restrictions on the amount of domestic offsets that are eligible for compliance are not limiting. Economic modeling suggests that far fewer than 1 billion tons of domestic offsets per year are likely to be generated in the near term. But restrictions on international offsets will likely be limiting (Olander and Galik 2009). Nevertheless, it is unclear whether developing countries will be able to effectively supply forestry offsets, due to their inability to adequately arrest deforestation or credibly monitor, verify and supply such offsets to the market in a timely manner (Murray, Lubowski, and Sohngen 2009; Olander et al. 2009).

Cost Uncertainty and the Allowance Reserve

To guard against unexpectedly high or extremely volatile allowance prices, Waxman-Markey establishes the Strategic Reserve. Table 1 summarizes key parameters. They include:

- **Reserve size**: Starts at 1% per year in 2012 and increases another percentage point in 2020 and another in 2030.

[3] Waxman-Markey under some circumstances allows subnational efforts and some projects in the early years of the program prior to countries being able to develop national accounting.

- **Minimum reserve price**: The price starts at $28 in 2012 and increases the following year by 5% plus inflation. After 2014, the reserve price is set at a 36-month rolling average of the market price.

- **Reserve proceeds**: The measure targets revenue from the reserve auctions to purchase and to retire additional international offsets from Reduced Emissions from Deforestation and Degradation (REDD). Thereafter, the measure directs the EPA Administrator to establish new allowances equal to 80% of the REDD offsets to be put in the reserve and released in the same fashion as any other reserve allowance.

Summary

For stakeholders who place a strong emphasis on firmly fixing emission quantities, the Strategic Reserve is preferable to other cost-containment options that let emissions vary more, such as a pure tax or a safety valve. The main reason for this is that it is ultimately conditioned upon a fixed emissions budget as the primary policy goal, whereas the other approaches strictly cap the price and therefore can break the emissions budget, though the managed-price approach by Dinan (2009) tries to strike a similar balance between emissions and price certainty.

Competitiveness Provisions

Waxman-Markey addresses global competitiveness concerns about energy-intensive manufacturers in three related ways (St. Clair Knobloch 2009). They include:

- **Output-based allocation**: The U.S. energy-intensive industries sensitive to international competition receive free allowances to compensate for the risks the policy may pose to their competitive position. In 2014, when industrial emissions sources are first subject to the cap, they receive 15% of Waxman-Markey's distributed allowances. The percentage declines after that (H.R. 2454 Section 782).

- **Border tax adjustment**: The measure requires importers to purchase allowances for raw goods imported from uncapped countries.

- **Sectoral offsets**: Eliminates international offset projects (i.e., Clean Development Mechanism [CDM]) in 2016 for specified countries and sectors, only allowing offsets in those sectors for countries that have created a national sectoral GHG emissions baseline and have demonstrated reductions from that sectoral baseline.

Summary

A free allocation of allowances to trade-sensitive, energy-intensive U.S. sectors is likely to defray the higher energy costs that a cap is likely to cause, and would help compensate U.S. firms for any adverse impacts competing with uncapped overseas competitors. Challenges that might arise from the sectoral offset provision to promote competitiveness include administrative as well as political feasibility. Administrative challenges spring most notably from the lack of credible sectoral emissions data. Politically, removing CDM also may eliminate countries' participation incentives.

Even more potentially problematic from a political perspective may be the last-minute trade protections inserted into the Waxman-Markey measure. Shortly after the measure's passage, President Obama expressed his administration's opposition to the trade provision, citing concerns with the deep and lingering global recession and risk that trade partners would see the provision as protectionist. It also remains unclear whether WTO will consider such provisions to be trade-compliant. From a policy perspective, it is unclear to what degree the free allocation and border tax levers interact. For instance, is a border tax necessary in the presence of a large, free, output-based allocation to trade-sensitive sectors? How do these two levers interact over time?

Addressing Costs for Low-income Households

Analogous to the measure's competiveness provisions, Waxman-Markey largely harnesses allowance allocations to help shield low-income households from energy cost increases. Waxman-Markey seeks to accomplish this in two ways:

- **Allocations to LDCs**: The measure gives 35% of the allocation to Local Distribution Companies (LDCs). LDCs must pass the money generated by the sale of these allowances on to all of their commercial and industrial consumers.

- **Low-income rebates**: Waxman-Markey targets 15% of the allowance allocation to existing assistance programs administered through state human service agencies.

Summary

CBO (2009) has identified some potential challenges associated with Waxman-Markey's reliance on LDCs to channel assistance to consumers. Stated challenges include regional variance in integrity of local public service commissions (PSCs). Another potential concern stems from the fact the bill requires LDCs to divide the benefits of the free allocation between business and residential customers. Since businesses comprise 63% of LDC customers, businesses would receive the lion's share of benefits (CBO 2009; Stone and Shaw 2009). It is unclear whether businesses would pass such benefits on to their customers. A final, and perhaps most fundamental, challenge is the Resources for the Future (RFF) finding that such approaches pit the goal of making some disproportionately impacted groups whole against the goal of encouraging households to use less GHG-containing energy (Sweeney, Blonz, and Burtraw 2009). To remedy this dilemma, Stone and Shaw (2009) recommend that the Senate scale back the LDC portion of the House bill and replace such provisions with more direct consumer relief.

EPA (2009) and the CBO (2009) estimate that through the use of these basic and advanced policy levers the cost to households of Waxman-Markey is relatively modest.

According to CBO (2009, 5), the total or "gross cost"[4] of complying with Waxman-Markey in 2020 is about $110 billion (measured in 2010 consumption and income levels or about $890 per household). Through the use of cost-containment mechanisms, such as rebates from Local Distribution Companies (LDCs) or through the use of lump sum rebates from the U.S. Treasury, CBO (2009) estimates the net annual cost to households of Waxman-Markey in 2020 to be much lower ($175) than the gross energy cost increase. The Congressional Budget Office (2009) estimates that LDC provisions and direct relief to low-income consumers would actually result in an extra $40 per households for the lowest-income quintile of the U.S. population. CBO estimates the net annual cost to the U.S. economy of a cap-and-trade program in 2020 to be around $22 billion. While these costs appear manageable (this is approximately 0.15% of current U.S. GDP, even less of future projected GDP for 2020), many critical unknowns remain that could substantially increase the cost of climate change policy. Most notable are unknowns involving technology deployment and the degree to which high-emitting countries, such as China opt to join an international cap-and-trade scheme.

4. Issues for resolution and next steps

As the previous discussion illustrates, some policy levers to conquer costs are aimed at preventing high costs structurally. These include the cap's target and timetables and offset provisions. Other policy levers act in reaction to allowance volatility or prolonged high price levels. These policy levers include the strategic reserve, the safety valve, or cost collars, among others. Still other levers act as a remedy to certain groups such as trade-sensitive industries or low-income households. Such levers include free allocations to target groups and direct rebates through existing state low-income assistance funding mechanisms. More stringent policy remedies to protect trade-sensitive industries include such mechanisms as a border tax. In addition to tradeoffs within each of the four categories, the previous discussion suggests that there are likely complex interactions among each of the four policy levers.

Tradeoffs within each of the four policy levers

Each of these policy levers represents a compromise. For instance:

- Offsets potentially balance cost control against environmental integrity. Large quantities of offsets that fail to represent voluntary greenhouse gas reductions that really occurred risk undermining cap-and-trade's environmental objectives. The degree to which a cap-and-trade system effectively balances such twin goals turns on the quality of rules to measure, monitor, and verify them. At the same time, costly, burdensome rule-compliance guidelines likely reduce the quantity of offsets that project developers may seek to supply to markets.

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[4] According to CBO, this "gross cost" figure reflects the cost of allowances, the cost of both domestic and international offsets, and the resource costs (e.g., switching from natural gas to coal) required to reduce GHGs over time.

- Reserve levers try to balance the certainty of climate legislation's cost with the certainty that the environmental objectives will be accomplished, erring on the side of the latter.

- Competitiveness provisions, such as free allowances endeavor to balance the need to remedy potential losses to trade-sensitive industries and still encourage such sectors to curb energy use and greenhouse gas emissions. Levers, such as border taxes similarly seek to curb losses to trade-sensitive industries and to encourage global participation in a cap-and-trade system. Such tariff provisions not only serve to promote competitiveness, but also to promote environmental integrity. Uncapped high-emitting countries have a strong incentive to emit even more in the presence of caps on their competitors. Such leakage unduly undermines global greenhouse gas reduction goals. It is likely, however, that provisions such as a free allocation and a border tax also may interact. For instance, if the goal of competitiveness provisions is to defray costs to trade-sensitive sectors, then free allowances to trade-sensitive U.S. sectors are likely a sufficient policy lever. But if the goal instead is politically motivated, for example, to push high-emitting nations to join an international cap-and-trade scheme, then more aggressive policy levers to prevent leakage and to promote competitiveness, such as a border tax, may be more fitting. At the same time, however, it is unclear to what degree border tax provisions are necessary in the presence of a sizeable, free, output-based allowance to trade-sensitive industries. A related consideration is whether competitiveness provisions comply with international trade law and are not so potentially punishing that they create international trade wars.

- Low-income levers seek to find effective means to reduce net costs to low-income households while still providing incentives for them to reduce their energy demand.

The Senate may seek to modify or augment each of these four areas of balance or compromise. For instance, the Senate may opt to increase the quantity of offsets in response to cost concerns or reduce the quantity of offsets in response to environmental concerns. By extension, rules to verify that reported voluntary offset reductions represent GHG cuts that actually occurred may be stiffened. The tradeoff is potentially lower offset project development and supply. Following the same logic, the Senate may, in response to the Obama Administration's objectives or to WTO opinion, opt to relax or remove trade provisions, such as Waxman-Markey's border tariff provision, or to make them even more stringent through the imposition of such measures as border rebates or a full border adjustment. While the strategic reserve, in turn, endeavors to respond to concerns that cost-containment measures compromise environmental integrity, some may argue that a safety valve, symmetric safety valve, or price management provide superior guards against price volatility or persistently high allowance prices.

Interactions among the four policy levers

In addition to these intra-lever issues, however, it is clear that the four policy levers also interact with each other in complex ways. For instance, a cap without stringent GHG abatement levels leads to low allowance prices, which in turn likely make large amounts of offsets unnecessary. Conversely, a stringent cap could call for a greater supply of offsets from uncapped sources to control cost. Offsets not only reduce compliance costs to capped entities, but they ostensibly result in lower energy bills which would be passed on to industrial and to residential consumers, including low-income segments of the U.S. population, thus requiring less from the relief measures specifically directed to these segments of the population.

Offsets policies also may be used to prevent leakage and promote the competitiveness of trade-sensitive U.S. sectors. For instance, Waxman-Markey's sectoral offset provisions encourage high-emitting uncapped countries to set targets for certain sectors and receive incentive payments for going below those targets through an international offset market. A variation on this, called "sectoral CDM," is being discussed for the post-Kyoto framework. It addresses some of the problems with the current project-based CDM, notably leakage. But it remains unclear to what extent such provisions are administratively and politically feasible.

Incorrect assumptions about cost-driving factors such as the timing of low-carbon technology advancement, or other considerations such as the global scope of the cap could cause costs to increase above initially predicted levels, making price-containment measures more relevant and relief to stressed industries and households more critical.

In the same way that offsets can reduce costs of achieving the cap, a cap accompanied by a price-containment mechanism such as the strategic reserve can help to guard against price volatility and extremely high costs. Conversely, if rising abatement costs trigger the strategic reserve auction, reserve allowances reduce the need for further domestic reductions and offset purchases. The reserve is also related to international offsets under Waxman-Markey. The measure targets revenue from the reserve auctions to purchase and to retire additional international offsets from Reduced Emissions from Deforestation and Degradation (REDD) and place them in the reserve. Placing more REDD credits into the market presumably helps keep credit prices down and provides environmental co-benefits in form of saving forests and the species that depend on them. But if prices remain below the price point for strategic reserve relief, there will be no auction and thus no means to purchase the REDD credits for reserve purposes. At the same time, however, there will be no cost-containment need for them.

Waxman-Markey's free allocations to trade-sensitive U.S. sectors and to low-income households compete for a limited allowance supply. Allocating more allowances to competitive sectors reduces the allocation available for low-income households and vice versa. At the same time, the strength of the allocation lever to defray costs to these groups is directly linked to allowance prices. Higher allowance prices raise the allowance value allocated to targeted groups. To some degree, this phenomenon is self-correcting: the higher the allowance price (or cost), the greater the initial harm to disproportionately impacted groups, but the greater the relief from allocating allowances to them. Questions for further consideration may include:

- **Offsets**:
    - If the Senate tightens cap targets and timetables, what quantities of domestic and international offsets are necessary to reduce costs? Does this introduce a tension between offset quantity and quality?
    - If sectoral offsets are not viable, and CDM is cut from major emitters, will this significantly curtail offset supply and impact costs?
    - Are there ways to design the international forestry (REDD) provisions in a way that will provide early offset supply and help to maintain lower costs?
    - If there remain offset supply uncertainties, what does that mean for mechanisms to help contain allowance price?

- **Reserve**:
    - Under what circumstances will incorrect predictions of offset supply lead to price increases (or decreases) that trigger demand for price-containment mechanisms, such as the reserve, or price support mechanisms such as the auction floor price?
    - How close does the reserve mechanism under Waxman-Markey come to providing the type of price containment that a hard safety valve would? How would changes in the size of the reserve affect this tradeoff?
    - Under Waxman-Markey, the reserve comes from "within the cap." Should creating the reserve with extra allowances outside of (supplemental to) the cap be considered?
    - What is the precise relationship between reserve auction revenues and REDD? How much could the reserve mechanism be expected to generate to finance REDD?

- **Competitiveness**:
    - Are the revenues available for trade-sensitive manufacturing sectors sufficient to compensate them for potential losses to uncapped competitors?
    - Can border tax adjustments do a more effective job than allowance values allocation?
    - To what extent are such provisions administratively and politically feasible?

- **Low income**:
    - Are current low-income allocations called for in the Waxman-Markey bill sufficient to make these households "whole" (along with the LDC allocations distributed to all households, including poor ones)? If not, what corrections might fix this?

References

Burtraw, D., K. Palmer, and D. Kahn 2009. "A Symmetric Safety Valve." Resources for the Future, February. http://www.rff.org/RFF/Documents/RFF-DP-09-06.pdf.

CBO (Congressional Budget Office). 2009. "The Estimated Costs to Households from the Cap-and-Trade Provisions of H.R. 2454." June 19. http://www.cbo.gov/ftpdocs/103xx/doc10327/06-19-CapAndTradeCosts.pdf.

Dinan, T. 2009. "Reducing GHG Emissions via a Tax or a Cap: Implications for Efficiency and Cost-Effectiveness." Unpublished draft on file with authors.

EPA (U.S. Environmental Protection Agency) 2009. "EPA Analysis of the American Clean Energy and Security Act of 2009, H.R. 2454 in the 111th Congress." June 23. Office of Atmospheric Programs. http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf

GAO (U.S. Government Accountability Office). 2008. "Carbon Offsets: The U.S. Voluntary Market Is Growing But Quality Assurance Poses Changes for Market Participants." Report to Congressional Requesters. August. http://www.gao.gov/new.items/d081048.pdf.

Harrington, W., R.D. Morgenstern, and P. Nelson. 2000. On the Accuracy of Regulatory Cost Estimates. *Journal of Policy Analysis and Management* 19:2, 297–317.

H.R. 2454. The American Clean Energy and Security Act of 2009, in the 111th Congress.

Murray, B.C., R. Lubowski, and B. Sohngen. 2009. "Including Reduced Emissions from International Forest Carbon in Climate Policy: Understanding the Economics." Draft Policy Brief NI-PB-09-02, Nicholas Institute for Environmental Policy Solutions, Duke University. http://www.nicholas.duke.edu/institute/policy_brief.09.02.pdf.

Murray, B.C. 2009. "Strategic Carbon Reserve: Nicholas Institute Discussion Memo on H.R. 2454 American Clean Energy and Security Act of 2009." http://www.nicholas.duke.edu/institute/cleanenergyact/StrategicCarbonReserve.pdf.

Murray, B.C., R. Newell, and W.A. Pizer. 2008. "Balancing Cost and Emissions Certainty: An Allowance Reserve for Cap and Trade." Resources for the Future. July. http://www.rff.org/rff/documents/RFF-DP-08-24.pdf.

Olander, L.P., W. Boyd, K. Lawlor, E.M. Madeira, and J.O. Niles. 2009. "International Forest Carbon and the Climate Change Challenge: Issues and Options." Nicholas Institute Report. http://www.env.duke.edu/institute/carbon.issues.06.09.pdf.

Olander, L.P and C. Galik. 2009. "Offsets: Nicholas Institute Discussion Memo on H.R. 2454 American Clean Energy and Security Act of 2009." http://www.nicholas.duke.edu/institute/cleanenergyact/Offsets.pdf.

Pauwelyn, J. 2007. "U.S. Federal Climate Policy and Competitiveness Concerns: The Limits and Options of International Trade Law." Nicholas Institute for Environmental Policy Solutions, Duke University. April. http://www.nicholas.duke.edu/institute/knowledge-energy.html.

Sweeney, R., J. Blonz ,and D. Burtraw. 2009. "The Effects on Households of Allocation to Electricity Local Distribution Companies," Resources for the Future, June 5. http://www.rff.org/wv/Documents/LDC_Allocation_090605.pdf.

Stavins, R.N. 2009. "Worried About International Competitiveness? Another Look at the Waxman-Markey Cap-and-Trade Proposal." June 18. http://belfercenter.ksg.harvard.edu/analysis/stavins/.

Stavins, R.N. 2008. "Addressing Climate Change with a Comprehensive Cap-and-Trade System." *The Oxford Review of Economic Policy* 24.2 (2008): 298–321.

St. Clair Knobloch, N. 2009. "Competitiveness: Nicholas Institute Discussion Memo on H.R. 2454 American Clean Energy and Security Act of 2009." http://www.nicholas.duke.edu/institute/cleanenergyact/Competitiveness.pdf.

Stone, C. and H. Shaw. 2009. "Senate Can Strengthen Climate Legislation by Reducing Corporate Welfare and Boosting True Consumer Relief." Center on Budget and Policy Priorities. July 10. http://www.cbpp.org/cms/index.cfm?faview&id=2871.

Wooten, T. 2009. "Low-income Issues in Climate Policy." Unpublished memo on file with authors. Nicholas Institute for Environmental Policy Solutions, Duke University. April.