Pricing Carbon and Other Options for Addressing the Economic Challenges of U.S. Climate Legislation

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The blunt truth about the politics of climate change is that no country will want to sacrifice its economy in order to meet this challenge, but all economies know that the only sensible long term way of developing is to do it on a sustainable basis.

Tony Blair

For much of the last decade, the U.S. Congress and other governmental bodies have been grappling with how best to tackle the scientifically, economically, and politically complex problem of climate change. Greenhouse gas concentrations (or GHGs, though we loosely use the term "carbon" here), due in significant part to fossil fuel emissions of carbon dioxide (CO_2), are currently on pace to double or triple pre-industrial levels within this century without policy intervention, threatening the earth's climate system. This, together with concerns that a growing reliance on fossil energy could threaten economic and political stability, has focused policy efforts on ways to "decarbonize" the energy economy.

Efforts to decarbonize the economy can take on either a philosophical or technological dimension. As a matter of philosophy, societies could decide that population or economic growth should be curtailed to lessen impacts on natural systems. The merits and shortcomings of such a view have been debated by philosophers and ethicists, but that is well beyond the purpose of this paper. As Mr. Blair states in the opening quote, nations typically are more interested in sustaining, rather than sacrificing economic growth and thus efforts in climate, energy, and other social problems ought to align themselves consistently with those goals.

Technologically, there are two ways to decarbonize: (1) increase efficiency of energy and materials (e.g., improved industrial processes, vehicle fuel efficiency, insulating homes), and (2) reduce the carbon content of the energy and materials we deploy (e.g., develop renewable energy alternatives). Government can make these things happen a number of ways: funding science and technology to develop efficient and low-carbon alternatives, building infrastructure that private capital may find difficult to invest in (e.g., the "smart grid"), preferentially purchasing low-carbon goods from the private sector, mandating the deployment of technologies and behavior, or reorienting economic incentives by placing a price on carbon. While prudential policy could include some combination of the above, putting a price on carbon has been the cornerstone of most recent efforts in the U.S. Congress and is the primary focus of this paper.

Pricing carbon—a market-based approach

Economists have long argued for the use of *economic instruments*, sometimes called "market-

based" approaches to control pollutants as an alternative to technology-proscriptive regulation. These instruments place a monetary value on the pollutant, creating a profit-loss incentive to substitute to lower-emitting and energy efficient products and for technology change to low-carbon solutions. The two market-based approaches most commonly proposed are a *carbon tax* and *cap-and-trade.*

Carbon tax

With a carbon tax the government imposes a price on the quantity of GHGs emitted and retains the proceeds to use or redistribute. The tax raises the cost of carbon-intensive actions and thereby motivates movement to low-carbon solutions. But a carbon tax does not guarantee a specific emission result; emitters will continue to emit as long as the tax is cheaper than the cost of reducing an emissions unit. As a result, there is concern that governments will not have sufficient information, or will face political resistance, to set the tax at a level that would effectively stabilize emissions and combat the underlying problem.

Cap-and-Trade

Cap-and-trade controls the quantity of emissions, distributes the fixed number of allowances to emit to the regulated entities either for free ("grandfathered") or through an auction, and allows regulated entities to trade these allowances in a market which ultimately determines the price of carbon. The underlying goal is to set the cap at a level that science and economics tells us is commensurate with the problem, ensure the desired emissions reductions are achieved, and allow the market to set the price. In principle, by fixing emissions rather than allowing them to vary (as a tax does), a cap-and-trade program can provide more certain protection from environmental damage.

The most significant climate policy proposals in the U.S. in the last decade, starting with the McCain-Lieberman Climate Stewardship Act of 2003 (S.139), through the Waxman-Markey bill (HR 2454) passed by the House in summer, 2009, are cap-and-trade bills that cover most sources of emissions in the economy, so cap-and-trade will be the focus of this discussion. Before diving into the specifics of HR 2454 and current Senate deliberations, I introduce the primary cost concerns that arise generally under a cap-and-trade climate policy.

Cost considerations

Market-based means such as cap-and-trade lower the cost of meeting an environmental goal, but there are costs nonetheless. It is fair to say that costs, or the perceptions thereof, present the most challenging hurdles to climate policy adoption. Here is a brief review of the cost issues that arise.

Cost to the overall economy. This is a macroeconomic argument that capping carbon would profoundly affect the growth trajectory of the economy (GDP), total employment and standards of living. The presumption is that constraining how energy, which accounts for about 6-8 percent of GDP, is produced through carbon constraints would reverberate through the economy in ways that would disrupt the primary engines of economic growth (monetary policy, fiscal policy, investment, innovation, work force participation, etc ...).

Disproportionate costs on certain sectors and regions. Most studies of cap-and-trade proposals suggest that even fairly aggressive policies are not likely to significantly disrupt macroeconomic growth. However, using macroeconomic measures such as GDP as an evaluation metric can obscure important differences across sectors and regions, especially those that are more reliant on fossil fuels. Recent debate has highlighted the economic anxiety about the potential costs on regions reliant on energy-intensive industry and agriculture.

Loss of global competitiveness. Related to the last point, concerns have been raised about the impact of a carbon price on sectors of the economy that have relatively high energy reliance

and trade in world markets where some of the competition may not be subject to carbon caps or prices. There are concerns that this might undermine the competitiveness of these sectors and, to further the problem, simply shift emissions to unregulated countries, a phenomenon known as "leakage."

Costs for low-income households. Low-income households spend a larger portion of their income on energy and could thus be more-exposed to carbon-price driven energy cost increases.[1] Moreover, these households are less able to invest in ways to reduce energy consumption such as insulation, energy-efficient appliances and vehicles that can help mitigate the cost burden.

Carbon price uncertainty. Under cap-and-trade, the carbon price is determined by a largely fixed supply of allowances and a demand for allowances that will vary over time based on factors such as weather, energy market fluctuations, and macroeconomic shocks. This will cause allowance prices to fluctuate. Even if projected costs are low and seemingly manageable, too much price volatility could disrupt budgets and investment decisions.

The counterargument—costs are negative. The argument that climate action more than pays its way has two dimensions. First, the economic studies of specific cap-and-trade proposals do not generally address the costs to the economy of inaction, costs such as loss of infrastructure from sea-level rise, reductions in agricultural productivity, increase in heat-related illnesses and death to name a few. Many studies suggest that these costs could be quite considerable relative to the cost of action[2] though this is not without debate.[3] The second dimension argues that a carbon price will stimulate innovation and technological transformation to a more efficient economy that will more than pay for itself in terms of lower energy costs and other efficiencies.[4]

Waxman-Markey Bill

The American Clean Energy and Security Act of 2009 (HR 2454), introduced through the House Energy and Commerce Committee by Representatives Waxman (D-CA) and Markey (D-MA) is a cap-and-trade bill that covers the electricity, transportation, and industrial sectors. These sectors, collectively accounting for about 85 percent of U.S. emissions, are capped at 17 percent below 2005 levels by 2020 and 83 percent below 2005 levels by 2050. The cap is imposed by issuing allowances each year equal to the capped total. Initially most allowances are given away for free to regulated entities and for other directed purchases (e.g., low-income households, technology funds, deficit reduction), but over time a larger share is auctioned by the government. HR 2454 has a number of key provisions to address cost concerns, as shown in Table 1.

Economic analysis of HR 2454

Since its introduction in March 2009, through its passage in June and beyond, several economic studies of HR 2454 by government agencies, academics, businesses and nongovernmental organizations (NGOs) were conducted. While results vary across these studies, the nature of the findings can be summarized as follows.

Unlikely to cause macroeconomic disruption. Estimates suggest that HR2454 impacts are not likely to be large relative to other factors driving the economy—if done steadily over time with advancement of low-carbon technologies and offset availability. EPA's study of HR 2454, indicated an annual cost of about $62/household in 2020, rising to an average cost of $117 per household in present value terms over the 2010-2050 time period.[5] The Energy Information Administration (EIA) study of the bill finds cumulative GDP impacts from 2012-2030 of 0.2-0.9 percent of total GDP, with a central estimate of 0.3 percent.[6] Under any scenario, the economy is projected to grow steadily over time, with substantially higher economic output and consumption in the future than today.

Offsets are critical for containing costs. The EPA and EIA studies show that, when freely available at the limits allowed in the legislation, offsets can account for a large share (roughly half) of total GHG abatement generated by the bill. Most of these offsets are from international rather than domestic sources and most of the international offsets come from reduced emissions from deforestation and degradation (REDD). If international offsets are limited either by changes to the legislation or supply availability, this would roughly double the allowance price.

The least-cost low carbon path for electric power draws on carbon capture and storage (CCS) from coal plants, nuclear power and renewables. Following this trajectory, the electric power sector is largely decarbonized by 2050. If these alternatives are slow to materialize, this would drive up costs considerably.[7]

Free allocations to trade-exposed industries can substantially mitigate impacts. At the request of several Senators from key manufacturing states, the Obama Administration conducted an analysis of how well the EITE provisions could remedy economic losses to EITE sectors.[8] Industries presumptively eligible for EITE status are estimated to be 44 of the roughly 500 manufacturing sub-sectors, accounting for 12 percent of manufacturing output, 6 percent of industrial employment (0.5% of all non-farm employment) and about half of all manufacturing sector GHG emissions. The report found that a carbon price of $20 per ton (in the neighborhood of core HR 2454 estimates) could raise production costs by about 2.5 percent, reduce net exports by about the same amount, and cause 10 million tons of leakage to other countries (leakage means that emissions shift to where the production increases elsewhere to pick up slack from decline in U.S. net exports, which would be about 0.2% of the cap). However, the EITE provisions in the bill were found to counteract these effects on affected producers by giving most of their allowances for free.

U.S. agriculture can benefit from cap and trade. Agriculture is not capped under HR 2454 so it does not incur costs directly. But energy is an important input to agricultural production in the U.S. and many agricultural interests are concerned about the impact of higher energy costs as a result of HR 2454. Economic studies of the agricultural sector confirm that input costs rise, but that through a combination of changes in practices, higher output prices, higher demand for bioenergy, and revenues earned in the offset market, the gains to agriculture can outweigh the costs.[9]

Rebates to low-income households can more than offset their costs. Targeting payments to low-income households can more than make up for the costs that they incur. EPA's supplemental analysis of HR 2454 demonstrates that taking into consideration both the increase in costs of energy and other goods and the direct rebates, households in the lowest three deciles experience a net increase in economic welfare.

The strategic reserve of allowances provides a backstop to rein in allowance prices. As indicated in the previous section, HR 2454 sets aside allowances in account and introduces them to the market if prices evolve to unexpectedly high levels. Modeling performed with colleagues at the Nicholas Institute shows that the allowance reserve provisions should be sufficient to meet its intended cost containment objectives. However, as with many other cost aspects of the bill, this becomes more challenging without offsets being available and requires the steady development of low-carbon technologies over time.

Factors under consideration in the Senate

HR 2454 passed by a vote of 219-212 in the House in summer 2009, and is now being taken up in the Senate. Senators Kerry and Boxer introduced The Clean Energy Jobs and American Power Act of 2009 (S.1733) in the fall of 2009. S.1733 essentially adopts the structure and scope of HR 2454, including the cost containment provisions outlined above, with

some moderate changes to the timing of the cap, limits on offsets, and the size (and name) of the strategic allowance reserve.[10] The EPA's preliminary economic analysis estimates very similar economic impacts of S.1733 and HR 2454, and thus we will not explore the minor differences here.

As of this writing (early March, 2010), much is up in the air with respect to Senate legislation. Senators Kerry (D-MA), Graham (R-SC), and Lieberman (I-CT) are working across party lines to forge a legislative alternative that can attract a filibuster-proof 60 votes. Cost concerns remain central to the political calculus. A number of key issues have emerged through winter 2009-2010 that are being seriously considered in Senate deliberations including modification of the core features of the cap-and-trade program and alternative approaches that could either complement or substitute for cap-and-trade.

Modification of cap-and-trade design

The initial primary focus has been on how to modify the basic cap-and-trade template drawn by the House (HR 2454) and Senate (S.1733). Table 2 presents a number of design features that have been proposed for modification to address cost concerns. I assess the features, their rationale and the implications for cost and environmental effectiveness.

CLEAR Act

The most significant effort thus far to modify the design of the cap-and-trade program is the *Carbon Limits and Energy for America's Renewal (CLEAR) Act* introduced by Senators Cantwell (D-WA) and Collins (R-ME). CLEAR incorporates the first four modifications highlighted in Table 2.

- "cap-and-dividend" approach which auctions all allowances to regulated entities and returns 75 percent of the proceeds directly back to households;
- limits trading to capped entities only, with the expressed intent to avoid speculation and price manipulation by intermediaries;
- does not allow the use of offsets for compliance purposes, but does stipulate that some (unspecified) share of the auction proceeds will go for "offset-like activities;" and
- establishes a hard price collar which guarantees a price floor in the auction at $7/ton and a price ceiling of $21 by offering an unlimited number of allowances available at $21.

CLEAR's authors advocate it as a simplified program focusing more on "cap" than "trade." Clearly this is motivated by the havoc caused to the world economy by misunderstood derivative trading mechanisms and the sense that trading allows "Wall Street" to profit on "Main Street" businesses and households. While other approaches such as HR 2454 couple more robust trading with more general market oversight provisions, CLEAR takes a more preemptive approach by restricting trading to begin with. A thorough review of CLEAR is beyond the scope of this paper, but Table 2 gives a sense of the economic implications and tradeoffs involved in some of its key features. Some early economic modeling of CLEAR suggests that the combination of offset prohibition and price collar provisions could cause emissions to rise above the cap.[11]

Sector-based phased approaches

Another approach currently being discussed is the idea of moving from one unified economy-wide cap-and-trade program to one that treats different sectors differently and possibly at different points in time.[12] Most discussion has focused on the idea of starting with the utility sector as the most ready to take on a cap for a combination of technological, economic, and political reasons. The utility sector is already engaged in cap-and-trade through the Acid

Rain trading program for SO_2 (sulfur dioxide) and NOx (nitrogen oxide) and for CO_2 in the northeastern states through the Regional Greenhouse Gas Initiative (RGGI) and thus have requisite knowledge of how it works. Moreover, at least the first part of the low carbon technological pathway is a bit clearer in the electric power sector than it may be in other sectors via fuel-switching and the adoption of renewable alternatives in response to a labyrinth of renewable portfolio requirements being established at the state level.

The notion of phasing is that the other sectors will follow in due course either folding into the cap-and-trade program or following another mechanism. In HR 2454, the industrial sector is phased into the cap-and-trade program over the first five years, but other approaches (technology standards) are possible. One way to bring in transportation that has been advocated by some companies in the petroleum industry includes a "linked fee" approach, which is somewhat of a hybrid between cap-and-trade and a carbon tax. The "linked fee" ties a fixed per-ton payment for the carbon content of transportation fuels to some periodic average of the carbon price from the cap-and-trade program for the other sectors. This prices carbon for transportation, but does not bring allowance demand from transportation directly into the carbon market, which means that transportation demand does not move up the carbon price. This lowers the burden, but also lowers the carbon price incentive for reductions.

Incentives for nuclear power, clean coal, and oil-and-gas drilling

Economic modeling of cap-and-trade options suggests that cost-effective emission reduction strategies include fuel-switching from coal to natural gas in the near term and movement from conventional fossil generation to "clean coal" technologies such as carbon, capture and storage (CCS) and nuclear power in the mid- to longer-term. These options could require some government incentive to materialize in the form of upfront funding of CCS networks, loan guarantees and regulatory modification for nuclear power, and relaxation of restrictions on offshore oil and gas drilling. President Obama implicitly referenced this type of support in and around his State of the Union address, in recognition of the need to bring together different factions in support of his climate and energy platform and to help the Senate forge an agreement on a climate and energy bill. He has, however, argued that these programs should be complementary to a price on carbon, not a substitute for it.

Energy bill without cap-and-trade

In July 2009, the Energy and Natural Resources Committee under the leadership of Senator Bingaman (D-NM) passed the *American Clean Energy Leadership Act of 2009* (S. 1462), a bill that includes a wide range of provisions to advance clean energy, enhance energy efficiency, improve energy security, and inform the development of energy markets. One of the goals of the legislation is to develop energy sources that significantly reduce GHG emissions, and the introduction of a federal renewable electricity standard (RES) would certainly move that sector in that direction, but the bill itself does not include any direct cap, mandate, or pricing of GHG emissions.

A key issue in Senate deliberations is whether an energy bill without a cap or price on carbon is sufficient to reduce GHGs to the levels needed for U.S. contribution to global climate goals. The dominant mantra of climate policy efforts for the last decade has been "price carbon" in the belief that without a strong financial incentive permeating through all economic decisions affecting GHG emissions, transformative change cannot occur. This argument has a bit of a chicken-and-egg feel to it. A carbon price can do little more than exert pain unless there are advanced technologies available to switch to. But the incentive to develop and use those technologies is diminished without a carbon price. Efficiency and technology mandates are in some ways a hedge against the possibility that either a price on carbon will not emerge

or that it will not be strong enough to induce the technical change. Many feel that a prudent strategy would be to rely on a mix of technology funding, efficiency requirements and a price on carbon.

Concluding Thoughts

"... Lax enforcement increasingly was justified by the rapid growth of foreign competition, especially from Germany and America where the Industrial Revolution was now fully under way and where concern about smoke was just beginning. Many industrialists in Britain no longer apologized for their pollution but instead boasted that smoke signified jobs and profits."

Carlos Flick, from The Movement for Smoke Abatement in 19th-Century Britain[13]

Things are much different, of course, in 21st century America than in 19th-century Britain, but the pitting of "jobs versus the environment" has withstood the test of time. Despite widespread recognition that smoke from factories and homes was a serious health problem and despite the widespread availability of furnace combustion technologies to curtail smoke, it took more than 100 years for the British to solve this pollution in any significant way. The major difference between smoke in the 19th century and GHGs now is the amount of time that each stays in the atmosphere. Smoke or smog stay in the atmosphere for a matter of days or months, while GHGs reside in the atmosphere for hundreds of years. Britain could have saved thousands of premature deaths by solving its smoke problems earlier, but once Britain finally decided to do so, the effects were reversed relatively rapidly. But delaying GHG reductions means that atmospheric levels will continue to increase and remain elevated for some period of time, sustaining the environmental threat even after the technological change has taken place. Clearly the timing of action is a critical issue. The scientific community would argue that we do not have anywhere like 100 years to sort this out.

The wake of a deep recession is a difficult place to start a technological revolution, especially one to forestall a looming future threat. Times like these tend to freeze capital as investors lose confidence in the future. Recent events have turned our attention back to lessons learned from the Great Depression in the 1930s. That period did display a decline in innovative activity as many investors and businesses played wait-and-see. But there were important exceptions. Companies such as DuPont developed pioneering new products, RCA expanded into new markets (television), and others such as Polaroid and Hewlett-Packard were essentially high-tech start-ups seeded in the 1930s.[14]

We should not ignore the damage caused and still remaining from the economic crisis of the last two years in looking for climate and energy policy solutions, but we should avoid tendencies to use the recession as the primary factor driving what to do (or not to do) about climate change. Action should be driven by the long-run fundamentals of the problem: reducing climate threats, increasing energy efficiency, and developing clean energy sources in a timely and economically sustainable way. Ignoring these issues in the name of "getting our economic house in order" pushes the problem off into the future, where it is likely to become more expensive to fix and thereby threaten future prosperity. But using a shotgun approach in an attempt to regulate or spend the economy back to health through a laundry list of climate and energy initiatives could be misguided as well unless care is taken to ensure each initiative supports the long-run fundamental goals and creates the proper incentives for reducing emissions and enhancing technological innovation.

References

1 Burtraw, D., J. Sweeney, and M. Walls. 2009. "The Incidence of U.S. Climate Policy: Alternative Uses of Revenues from a Cap-and-Trade Auction." *RFF Discussion Paper, DP 09-17-REV.* Resources for the Future. June, 2009.

2 Stern, N. 2006, *Stern Review: Report on the Economics of Climate Change,* Cambridge University Press, Cambridge. Weitzman, M. 2007, 'The Stern Review of the Economics of Climate Change', *Journal of Economic Literature,* vol. 45, no. 3, pp.703–24.

3 Richard S. J. Tol (2008). The Social Cost of Carbon: Trends, Outliers and Catastrophes. Economics: The Open-Access, Open-Assessment E-Journal, Vol. 2, 2008-25. http://www.economics-ejournal.org/economics/journalarticles/2008-25

4 See, for instance, numerous reports by the American Council for an Energy-efficient Economy (ACEEE).

5 U.S. EPA. *Supplemental EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress.* January 10, 2010. http://www.epa.gov/climatechange/economics/pdfs/HR2454_SupplementalAnalysis.pdf

6 U.S. Energy Information Administration (EIA). Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009. Report #: SR-OIAF/2009-05. August 4, 2009. http://www.eia.doe.gov/oiaf/servicerpt/hr2454/

7 In a worst-case scenario modeled by the U.S. EPA in response to a request by Senator Voinovich, no increase in nuclear power or biofuels are allowed, CCS is significantly delayed, and no international offsets are available leads to a tripling of the allowance price estimate.

8 The Effects of H.R. 2454 on International Competitiveness and Emission Leakage in Energy-Intensive Trade-Exposed Industries: An Interagency Report Responding to a Request from Senators Bayh, Specter, Stabenow, McCaskill, and Brown. http://www.epa.gov/climatechange/economics/pdfs/InteragencyReport_Competitiveness&EmissionLeakage.pdf

9 Studies demonstrating these effects include USDA study *The Impacts of the American Clean Energy and Security Act of 2009 on U.S. Agriculture,* Office of the Chief Economist, December 18, 2009.

10 S. 1733 refers to it as the "Market Stability Reserve."

11 Williams, Eric. *An Analysis of the Carbon Limits and Energy for America's Renewal (CLEAR) Act and Comparison to Waxman-Markey.* Policy Brief NI PB 10-01, Nicholas Institute for Environmental Policy Solutions, Duke University, March 2010.

12 Samuelson, Darrin. "Got Ideas? Kerry, Graham, and Lieberman want to hear from you." *E&E Daily,* Jan 29, 2010

13 Technology and Culture, Vol. 21, No. 1 (Jan., 1980), pp. 29-50.

14 Nicholas, Tom. "Innovation Lessons from the 1930s." *McKinsey Quarterly,* December 2008.

Table 1. Cost containment provisions under HR 2454

Provision	What it does
Banking and borrowing	Firms can hold allowances issued in one year for compliance in a later year or borrow a limited quantity of allowances from a future year for current use. This provides compliance flexibility, allowing firms to shift their abatement in better timing with their investment decisions.
Offsets	Firms in the capped sectors can use as a form of compliance offset credits generated by certified net GHG reductions in uncapped sectors of the economy, such as agriculture, forestry, landfills, and livestock, or in uncapped countries (e.g., reduced deforestation or renewable energy investments in developed countries). These reductions are often less expensive than capped sector reductions and thus can reduce the costs of achieving the targeted cap.
Competitiveness/trade-exposed industries	The bill gives allowances for free to energy intensive trade exposed (EITE) sectors to alleviate competitive disadvantage. Industries presumptively eligible for EITE status are based on energy intensity, GHG intensity, and trade intensity.
Aid to low-income households	The government auctions 15 percent of the allowances each year with proceeds to be used as a rebate for low-income households.
Allowance price containment	The bill establishes a strategic carbon reserve which holds a fixed number of allowances in reserve and introduces them to the market if prices rise above a certain level (starting at $28/ton). The bill also provides a price floor of $10/ton by establishing that as a minimum floor price for government auctioned allowances.

Table 2. Cap-and-Trade Design Features: key proposed modification in Senate deliberations

Feature	Description	Rationale	Economic implications/tradeoffs
Cap-and-dividend	Auction all the allowances to emitters, and redistribute all or most auction revenues directly back to households via a dividend or a tax cut.	Transparent distribution of revenues to households focuses on correcting incentives (pricing carbon) rather than taxing households.	Foregoes use of auction revenues to centrally fund low carbon technology and network initiatives. Dividend could produce income transfers from more fossil-dependent regions to less
Limit trading to regulated entities	Allowance trading only among entities subject the cap ("first sellers")	Avoids profit and speculation by financial intermediaries	Reducing participation reduces trading volume and could make market less efficient.
No offsets	Prohibit the use of certified offsets from uncapped sectors and countries to meet compliance obligations.	Offsets are mistrusted by some as illusory and a means to send U.S. money overseas	Potentially large increase in cost of program by focusing all compliance on capped entities. Loss of revenue streams to domestic uncapped sources such as agriculture and forestry and foregoes flow of funds to stop deforestation
Hard price collar	Establishes a price ceiling by guaranteeing an unlimited number of allowances available at a maximum price and establishes a price floor by establishing a minimum price at which allowances can be auctioned	Goes beyond current legislation's strategic reserve, which limits quantity of allowances released to maintain price ceiling and thus may not guarantee the ceiling. This guarantees ceiling by issuing unlimited allowances.	By guaranteeing a price ceiling, it does not guarantee an emissions result. Unless otherwise addressed, emissions are allowed to exceed the cap over time. Current reserve approach enforces emission budget.
Utilities first	Start cap-and-trade first with electric utilities only	Utilities already experienced with cap-and-trade through SO2 and NOx trading programs and RGGI in Northeastern states. Relatively small number of large stationary sources with well-defined low carbon options to contend with	Emission reductions in electric power generally seen as the most cost-effective, but limits the opportunitity for cross-sector trading and efficiencies. Only addresses one-third of the emissions, so cannot solve long-term problem on its own.
Linked fee for transportation	Transportation sector pays a fee on carbon content of fuels based on carbon price in the cap-and-trade program	Lower carbon price for transportation and capped sectors reduces burden and may lower volatility	Depending on how the cap is set and whether transportation is inside or outside the cap, could reduced strength of incentives for economywide reductions.