NATIONAL COMMISSION ON ENERGY POLICY

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Forging the Climate Consensus

Managing Economic Risk in a Greenhouse Gas Cap-and-Trade Program

Among the most important and contentious issues being debated as climate legislation advances in Congress is how to manage the economic impacts of a cap-and-trade program for greenhouse gases. On the one hand, businesses, consumers, and workers need assurance that a cap-and-trade program won't result in excessively high costs or excessively volatile energy prices. At the same time, any successful program must have economic and environmental integrity—not only in the sense that it achieves its long-term emissions objectives, but also in the sense that it generates the meaningful and reasonably consistent financial incentives needed to initiate and sustain investment in new, low-carbon technologies over time.

A variety of mechanisms aimed at satisfying these twin objectives have been proposed as the legislative debate on Capitol Hill has evolved. Some place greater emphasis on cost certainty, others on environmental certainty. The Waxman–Markey bill (H.R.2454), passed by the House of Representatives June 26, 2009 on a 219-212 vote, incorporates a number of sound ideas and provides a strong start toward successfully resolving the economic concerns that have stymied past efforts to develop national consensus around climate policy. In this issue brief, the Commission proposes strategies for further refining the bill's allowance reserve mechanism to ensure that it does not produce an unacceptable year-to-year escalation in allowance prices should mitigation costs prove higher than expected.

In the sections that follow we review elements of economic and environmental risk and uncertainty in the context of greenhouse gas regulation, discuss some of the advantages and disadvantages of the different approaches that have been proposed to manage these risks, and summarize NCEP's recommendations in the context of the current legislative debate.

Economic and Environmental Risk as Core Issues in the Climate Policy Debate

For more than a decade, inability to agree on the potential costs of carbon policies has played a large role in blocking progress toward political consensus on an approach for limiting greenhouse gas emissions. Early analyses of the cost of implementing the Kyoto Protocol varied widely depending on the assumptions and models used. Even studies conducted by different federal agencies varied considerably. For example, modelling by the White House Council of Economic Advisors in the late 1990s estimated that meeting the Kyoto Protocol target in 2010 would have cost $14 to $23 per metric ton of carbon dioxide (CO_2), while modelling by the Department of Energy showed costs as high as $95 per ton. When credible sources came to such divergent conclusions about cost, it became difficult for the public and members of Congress to sort through the conflicting information—and it became impossible for proponents of mandatory emissions limits to muster a persuasive response to the jobs and competitiveness concerns of important stakeholder groups. The fact that similar disparities can be found in analyses of more recent climate-policy proposals points to the inherent difficulty of making predictions about the future, particularly when those predictions involve complex and dynamically inter-related social, economic, and technological factors. It also points to the importance of designing policies that can effectively manage risk without relying on the accuracy of any particular set of assumptions about the future.

In the 17 years since most nations, including the United States, pledged action to avoid "dangerous anthropogenic interference in the Earth's climate," cost has never receded as *the* core objection to implementing a policy that would impose mandatory limits on U.S. greenhouse gas emissions. Today, those same concerns are heightened by the extraordinary economic developments of the last 12 months. Increasingly, members of Congress from across the political spectrum acknowledge that climate change is an extraordinarily important problem that merits a serious policy response. But as momentum grows for legislative action, the argument is also being made that now is not the time—when the country is struggling to emerge from the worst economic downturn in decades—to impose additional costs on U.S. households or employers. Critics have focused especially on the potential for an increase in the price of gasoline and in the price of electricity, as the U.S. transitions from conventional coal and natural gas generation to cleaner electricity sources. Adding to these objections, the financial crisis has heightened concerns about the potential for manipulation or excessive speculation in new greenhouse-gas allowance markets.

As the Commission has argued elsewhere,[1] we believe that a well-designed cap-and-trade program that sets reasonable targets, evolves in a steady and predictable fashion over time, and provides effective safeguards against adverse impacts on low-income households and energy-intensive, trade-sensitive businesses can offer a robust response to these objections and will be far less costly in the long term than the alternative of continued delay. There is no question, however, that to win final passage a climate bill will need to deal convincingly with the underlying cost and risk concerns that have led to stalemate on this critical issue for far too long.

Managing different kinds of economic and environmental risk

One of the challenges to reaching consensus on climate policy design is that different stakeholders focus on several different types of economic and environmental risks. In general, economic risks fall into three categories: (1) long-term costs to the U.S. economy; (2) short-term costs and price volatility; and (3) costs to particular industries and competeiveness impacts. This paper focuses on the first two of these categories because the responses that have been proposed in both cases fall under the broad rubric of "cost-containment mechanisms." The third category of economic risk—having to do with industry-level impacts and competitiveness concerns—is the subject of a separate, forthcoming NCEP discussion paper. It is likely to be addressed through a different set of mechanisms primarily having to do with allowance allocation, international technology deployment activities, and trade-related provisions. Finally, as we discuss later, there is also *environmental* risk associated with *lower* than expected costs, which could inhibit investment in long-lived, carbon-friendly technologies.

[1] Multiple prior Commission reports and staff papers can be found at www.bipartisanpolicy.org.

Past debates have tended to focus on the first category of concern: uncertainty about the magnitude of the long-term burden that climate mitigation will impose on the U.S. economy. This long-term burden or cost depends on the rate of technological change and innovation as well as on the effective deployment of existing technologies. For example, the development and deployment of new options such as carbon capture and storage could drive down the total cost of a greenhouse gas program. The effective deployment of existing technologies such as energy efficiency and nuclear power could similarly lead to lower costs. Efficiency policies (such as appliance standards), in particular, have generally proved quite cost-effective; these polices can substantially reduce upward pressure on allowance prices by reducing the rate of growth in energy demand. For this reason, complementary policies to accelerate the development and adoption of lower-carbon technologies and efficiency improvements *beyond* what would occur in response to a price signal alone—particularly in the early years of a cap-and-trade program—represent a further opportunity for reducing long-term costs and managing economic risk. On the other hand, to the extent that new technologies develop more slowly and institutional or other barriers to existing technologies are not overcome, costs could be higher than projected—perhaps substantially so.

Recent economic analyses suggest that long-term program costs can vary dramatically under different policy and technology assumptions. An analysis of the Waxman–Markey proposal by the Environmental Protection Agency (EPA) shows allowance prices ranging from $13 to $15 per ton in 2015. The availability of offsets has a significant impact on potential costs: EPA modeling of the Waxman-Markey bill shows that allowance prices double with no offsets. Similarly, EPA's analysis of S. 2191, the penultimate version of the Boxer-Lieberman-Warner bill projects that allowance prices in 2020 could be nearly 100% higher if there are constraints on the availability of key technologies such as carbon capture and storage, biomass, and nuclear power. For example, difficulty siting new facilities could delay the deployment of these technologies even if they are highly cost-competitive in the context of carbon constraints.

A second source of economic risk that has recently received more attention and that sometimes gets confused with the long-term cost issue concerns the potential for short-term price spikes and volatility in the allowance market. This volatility could be caused by a number of factors, including extreme weather conditions and developments in fuel markets. Changes in economic activity could also have an impact on allowance markets. Finally, some stakeholders are also concerned that excessive speculation or other market behavior could be a source of volatility.

Stakeholders have different perspectives on how and whether these different types of economic risk should be addressed. Although there are important nuances to the debate, one basic divide can be described as pitting a desire for economic (or cost) certainty against the desire for environmental (or emissions) certainty. On one side of the divide are stakeholders who believe a cap-and-trade program should be designed to minimize cost uncertainty—both in terms of long-term cost and potential price volatility. According to this view, industry needs assurance about the levels of investment in new technologies that will be needed so as to make economically efficient decisions about how best to reduce emissions. Consumers want assurance that energy bills will not rise unexpectedly due to a climate policy. Workers, particularly those in energy intensive industries that face international trade competition, want to know that the effects of carbon prices on competitiveness will be limited. These stakeholders point out that unexpectedly high costs or excessive price volatility will erode political support and thereby undermine long-term confidence in the policy, and they emphasize the importance of consistent investment signals over achieving a particular emissions goal in some future year.

Other stakeholders have emphasized the need to maintain the environmental certainty that comes with a firm cap on greenhouse gas emissions. These stakeholders note that cap and trade is, by its very nature, a cost containment mechanism because it is designed to elicit the least-cost approach to reducing emissions.[2] They argue that it is important to safeguard emission reductions under the cap and therefore, a cost containment mechanism that sacrifices emissions certainty for price certainty should be avoided. They also point out that a cost-containment mechanism that would allow emissions to rise above the cap could prevent the United States from linking its cap and trade program to the European Union's Emissions Trading Scheme (EU ETS) or other trading programs with a "hard cap." With respect to the first argument, the Commission believes that including some mechanism for managing economic risk prior to the development of advanced technologies is vitally important—but that price certainty will give way to emissions certainty over time. The Commission also believes that a reasonable, temporary cost-containment mechanism is not a serious barrier to linkage with other systems.

Options for managing economic risk in the context of a cap-and-trade program

Banking and Borrowing: Although the cost issue has always been controversial in the climate legislation debate, certain mechanisms designed to manage economic risk have not been contentious. For example banking mechanisms allow sources to carry forward surplus allowances into subsequent compliance periods. Allowance banking can create a cushion that helps prevent price spikes and can hedge uncertainty in allowance prices. Banking is allowed in both the U.S. SO_2 and NOx programs and research has shown that it has reduced the costs of these programs. Borrowing mechanisms allow sources to use allowance allocations from future years to mitigate price spikes. Some proposals would require paying back an "interest rate" on borrowed allowances. Both banking and borrowing are effective mechanisms for managing short-term price volatility and both are included in the H.R. 2454. A variation on borrowing is the use of a multi-year compliance period, which would allow a source to use allowances from a subsequent year within a rolling compliance period without penalty. This approach is used in the Northeast States' Regional Greenhouse Gas Initiative, which has a three-year compliance period; it is also contained in Waxman–Markey, which has a two-year compliance period.

Price Cap: The simplest mechanism to address both long-term cost and short-term price volatility concerns involves capping the price of emissions allowances to ensure that the per-ton cost of mitigation actions required under the program cannot rise above a known level. Functionally, this can be achieved by government making an additional, unlimited quantity of allowances available for sale at a pre-determined price. This maximum price could rise steadily and predictably over time, for example by 5% per year above the rate of inflation. A price cap is a transparent way to give companies the regulatory certainty needed to optimize long-term investment decisions. On the other hand, a price cap does not guarantee that emissions targets will be met, since if prices rise high enough additional allowances will be sold that allow emissions to exceed the program cap. Ultimately, the level at which the price cap is set will determine the likelihood that this mechanism would be triggered. The farther

[2] Of course the debate is really about managing economic risks <u>within</u> a cap and trade program, rather than the relative cost-efficiency of a cap-and-trade program versus a command-and-control regime.

the price cap is set above the projected allowance price, the less likely it would be that unexpected developments would drive allowance prices to the level of the cap.

Offsets: Offsets— credit for emission reductions from sources outside the cap— could provide significant cost savings in a cap-and-trade program. Economic modeling of all the various climate bills has shown that an offset program could significantly reduce the costs of a cap and trade program. Offsets could also be a critical source of financing for the transition to a lower-carbon energy economy in key developing countries. However, while it is clear that there is the *technical potential* for offsets to significantly reduce costs, it is less certain how an offset program will actually perform—i.e., what the quality, timing, and quantity of available offsets will be. This is because there may be tradeoffs between the ability to guarantee that virtually all offsets are "additional" (i.e., deliver emissions reductions beyond business as usual) and the ability to provide offsets in significant quantities.

Ultimately, the role of offsets and their impact on cost will depend on a variety of factors. The rigorousness of project criteria and verification requirements will be among the most important factors. Standardized approaches would reduce transaction and administrative costs and could facilitate the approval of more offset projects and tons. But these approaches also raise the risk that projects that are not truly additional will make it through the process. In any event, even a streamlined offsets process would have a difficult time producing the number of offsets anticipated in some legislation. As noted in NCEP's overview paper, *The Case for Action*, to reach the 1 billion tons of offsets forecast for the Waxman–Markey bill in 2015, thousands of projects would need to be reviewed and approved over the first three years of the cap-and-trade program.

Because they are complex, the specific concerns and issues that apply to offsets as part of a cap-and-trade program design will be addressed in a separate NCEP discussion paper. The Commission's overall view of offsets is that they provide important benefits and should be an integral part of a cap-and-trade approach. But the Commission does not believe it is appropriate or realistic to rely on offsets as the primary mechanism for managing economic risk in the context of a mandatory climate policy. While the inclusion of offsets as an alternative compliance option gives emissions sources greater flexibility and can reduce short- and long-term costs, it also introduces an additional source of uncertainty since numerous difficult-to-predict administrative, environmental, and political factors will affect the supply of offset credits and ultimately allowance prices. Thus, it is important to consider whether other economic risk management mechanisms can provide greater assurances about the potential costs of a climate program.

Allowance Auction Reserve: H.R. 2454 also contains provisions for a "strategic reserve" allowance auction that would make additional allowances available through an auction that begins at a specified price. Allowances for the reserve are borrowed from future years, thereby maintaining the integrity of the cumulative multi-year emissions cap while providing some price certainty in the near-term. This approach differs from a simple price cap because only a limited number of allowances are available at the trigger price (or minimum auction bid). As a result there is no absolute guarantee, either that sufficient allowances will be available at that price or that the allowance price will not rise above the trigger price.

Following is an example of how an auction reserve would relate to allowance prices. If there were 500 million allowances available in the auction reserve in the first year starting at $25 per ton, one of three outcomes would be possible:

- First, there could be no sales from the auction reserve. This would happen if the prevailing market price for allowances was less than $25 per ton of CO_2. In other words, no one would bid on allowances starting at $25 if the market price was below this level.
- Second, there could be sales of less than 500 million allowances at $25 per ton of emissions. If demand for additional allowances was less than 500 million tons, then bidders would pay $25.
- Third, there could be sales of all 500 million allowances at a price above $25. If demand was great enough, then the price of allowances would be greater than $25 (but less than the noncompliance penalty cost per ton).

The example above highlights two factors that will determine how much price certainty is provided by the allowance reserve mechanism: the initial price of the reserve auction and the number of allowances available each year. It is important to note that the way in which the trigger price for the reserve allowance auction is set will determine whether the mechanism mitigates the potential for short-term volatility, higher-than-expected long-term costs, or both. For example, a strategic reserve of sufficient size would likely provide protection from short-term price spikes and volatility, but a trigger price structured along the lines of the Waxman-Markey bill would not protect against sustained higher-than-expected costs due to the unavailability of technology or other factors.

A description of the mechanism and a hypothetical scenario reveal why this is the case. Under Waxman Markey, the initial price for the auction reserve begins at $28 in 2012 and increases by 5% above inflation in 2013 and 2014. In 2015 and thereafter, the price is set at 60% above a 36-month rolling average of the allowance spot price.

According to EPA analysis, the expected allowance price in the early years of the program is roughly $14/ton CO_2e, or half the initial price for the reserve auction. For purposes of this example, however, assume that—perhaps because of technological failures or limited availability of offsets—the actual allowance price in 2012 is double the $14 price (i.e., $28), and assume further that the allowance price remains at $28 in 2013 and 2014. In 2015, the rolling average of the previous 36 months would equal $28 and the auction price would be 60% above $28, or roughly $49 per ton. In other words, the auction wouldn't be triggered until prices reached $49 per ton, or roughly three times the expected 2015 price. Further, if the average price over the previous three years is consistently higher than expected, then the auction trigger price will continue to be driven even higher. Indeed, costs could escalate rapidly as last year's high prices are factored into the rolling three-year average used as the basis for the next year's trigger price calculation.

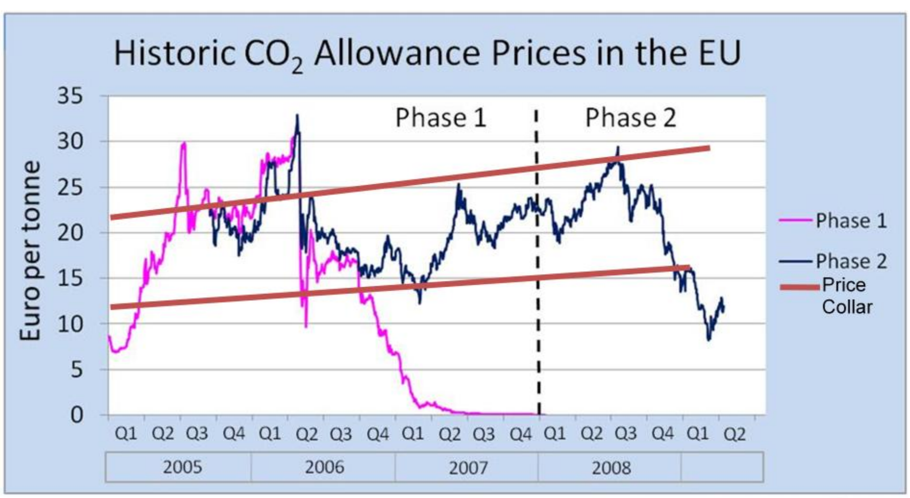
Because the reserve trigger price in later years is unpredictable and has this self-compounding feature, the allowance reserve as currently structured in Waxman-Markey is flawed as a mechanism for managing economic risk. It may provide some hedge against extreme spikes in allowance prices, but it will do little to protect the economy against sustained higher-than-expected mitigation costs in the event that low-carbon technologies do not become available on the scale or in the timeframe assumed by current forecasts, existing low-carbon technologies are deployed more slowly than expected, deployment costs are higher than projected—or some combination of all of the above.

Another important difference between a price cap and a reserve auction stems from the need to borrow allowances from future years to fill the reserve. To the extent that future year allocations are reduced to compensate for this borrowing, the long-term emissions constraint is not relaxed. Thus if technology does not develop fast enough, future costs could be higher because there will be fewer allowances. This potential effect is exacerbated if allowances are borrowed from earlier years. For example, Waxman-Markey withholds allowances for the reserve beginning in the very first year of the program. The reserve is filled with 1% of the allowances that would be allocated in years 2012 through 2019; 2% of the allowances for years 2020 through 2029; and 3% of the allowances for years 2030 to 2050. In contrast, the auction reserve in previous Senate proposals borrowed all allowances from the years 2030–2050.

Price Floor with Price Ceiling: Although most discussions of cost containment address the possibility that allowance prices will be higher than expected, it is also possible that allowance prices will be lower than expected. This has led some stakeholders to argue that a price floor along with a price ceiling should be considered. Why would prices be lower than expected? In past market-based regulatory programs, a variety of factors have caused lower than expected prices, including poor emissions data that have led to over-allocation of allowances, unexpected changes in fuel markets, technological developments, and slower-than-expected economic growth. Most recently, allowance prices in the first phase of the EU ETS dropped dramatically when it was discovered that there was an over-allocation of allowances to covered entities under the program. Lower-than-expected allowance prices have again surfaced in Phase II of the EU ETS because of much lower-than-expected economic growth.

In Figure 1 below, a hypothetical price collar is superimposed on historic EU ETS allowance prices to show how this mechanism would, in effect, smooth the price peaks and troughs and provide more certainty for investments in low-carbon energy infrastructure.

Figure 1: Limiting Volatility in the EU-ETS with a Price Collar



Source: Point Carbon

A "price collar" retains the economic efficiency benefits of a price ceiling alone, which has been shown to be nearly as efficient as a carbon tax.[3] Moreover, recent research has demonstrated that a "price collar" approach has the additional benefit of reducing long-term emission abatement costs relative to expected long-term abatement costs with a price ceiling alone. This is because the policy provides more consistent financial incentives for sustained investment in low-carbon technologies that can reduce compliance costs in the long run: Rather than being subject to boom-bust cycles when allowance prices fall, new low-carbon technologies would be assured a certain level of market stability. This would allow them to develop in a more orderly and ultimately cost-effective way.[4]

Put another way, a price collar tells investors that there will always be a significant pay-off to making long-lived facilities carbon-friendly. This has both economic and environmental benefits. Economic benefits accrue from avoiding investment in higher emitting technologies during periods when, for example, slow economic growth results in low allowance prices. If such investments go forward, allowance prices and costs could increase significantly when economic growth accelerates. Environmental benefits come from the earlier deployment of clean energy sources because the price floor creates incentives for a steady level of investment in low- and no-carbon technologies. This will help bring about a smoother and faster transition to a lower-carbon economy.

Automatic vs. Discretionary Mechanisms**:** A final variation on some of the mechanisms discussed above is to have a review board decide when prices have exceeded a level that is acceptable rather than setting a price up front. The advantage of this option is that it provides for a dynamic response to changing economic conditions that may affect allowance prices. Under various versions of this proposal, the board could increase the number of offsets allowed, could expand borrowing of allowances by affected sources, or could expand the system-wide allowances available in a strategic reserve provision. However, the disadvantage of this approach is that it would inject another form of uncertainty into the overall system. Although Congress could provide guidelines for when and how such a board would intervene, participants in the greenhouse gas market might have only a vague idea of how board decisions would balance cost versus environmental considerations. This could complicate investment planning and could lead to unexpected developments in emission markets.

Conclusions and Recommendations

The Commission has long taken the position that credible, transparent, equitable, and predictable mechanisms for managing the economic risks associated with a greenhouse gas cap-and-trade program are essential to the success and political viability of U.S. climate policy. A simple price cap that is paired with a minimum price floor and that escalates in a pre-determined manner over time still offers, in our view, the most straightforward and effective response to the cost concerns expressed

[3] "Limiting Carbon Dioxide Emissions: Prices Versus Caps," Congressional Budget Office Economic Budget Issue Brief, March 2005, P. 4. As acknowledged in previous Commission documents and in an extensive academic literature, considerations of macro-economic efficiency tend to favor a carbon tax with socially productive revenue recycling over other forms of regulation. As we have also long acknowledged, however, the political debate in the United States to date has strongly favored a cap-and-trade approach (this preference was evidenced most recently in the climate bill passed by the House).

[4] Fell H. and Morgenstern, R. "Alternative Approaches to Cost Containment in a Cap-and-Trade System," RFF Discussion Paper DP 09-14, April 2009, P. 23.

by many stakeholders, both with respect to long-term mitigation costs and with respect to mitigating the potential for short-term price volatility. An allowance reserve coupled with a price floor offers, in our view, many of the benefits of a simple price cap and has the not insignificant advantage of providing greater certainty about cumulative emissions reductions over the time horizon of the program.

To be effective as a mechanism for managing economic risk, however, the allowance reserve must be structured to reduce uncertainty, not add to it. In other words, the trigger price for the allowance reserve should rise over time in a transparent, pre-determined fashion (just as we would recommend for a straightforward price cap). We do not take issue with the initial allowance trigger price proposed in Waxman–Markey (at $28 per ton)—rather our concerns focus on the method used to calculate the trigger price in subsequent years.

Another issue that needs close attention concerns the size of the allowance reserve. If the quantity of additional allowances available through this mechanism is too small, it will provide only minimal leverage in managing economic risk. While NCEP has not undertaken a full analysis of this issue, our preliminary estimates suggest that roughly 6 billion tons of allowances should be available in the reserve to cover the first 10 years of the program.[5] A more rigorous effort to analyze the allowance reserve size needed to effectively address long- and short-term cost concerns is now underway and we urge Congress to take these results into consideration in refining future legislative proposals.[6]

An allowance reserve also raises the question of what to do with the revenues generated by the reserve auction. Under Waxman-Markey, the government would use proceeds from the auction to purchase forestry offsets that would replenish the reserve. Under this approach, the size of the reserve and the effectiveness of the cost-containment mechanism would depend on resolving some of the uncertainties associated with the evolving offset market. However, a better variation on this approach might be to have the government purchase offsets and use them to "pay back" the allowances borrowed from future years. This would reduce concerns that, as a result of borrowing to fill the reserve, future emissions caps might be too tight if technology does not develop as fast as expected.

In sum, a price floor coupled with a price cap, or a robust, well-designed reserve auction mechanism could be extremely useful for increasing public confidence in the nascent greenhouse gas market. If true costs are much higher than projected, the reserve would provide a "cushion" while Congress considers whether further program adjustments are needed. On the other hand, if allowance prices are in line with, or modestly above expectations, the allowance reserve auction would never be triggered. A well-designed auction reserve could also assist in making a smooth transition to a robust international offsets program. This is important because it will take some time before offsets can provide the program stability and cost-containment benefits envisioned in many current legislative proposals.

[5] This assumes that, on average, 300 million metric tons of offsets are available annually. Clearly, this is a conservative estimate regarding the availability of offsets. As noted above, we urge additional analysis on this issue.

[6] Building on the recent study by Fell and Morgenstern, Resources for the Future has recently begun work on a new study to examine the probability that a price ceiling or floor will be triggered and to estimate the size of the reserve needed to provide reasonable certainty that the allowance reserve mechanism will be effective.

Likewise, NCEP believes that strong oversight of the new greenhouse gas market is a priority, but that it could take some time before a full and comprehensive oversight regime is in place. For all of these reasons, designing a reliable, reasonably simple, and effective approach to managing economic uncertainty *from the outset* will be critical to ensuring that a new U.S. climate policy achieves meaningful environmental results and commands broad support from policy makers, key stakeholders, and the American public.

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