

# REDUCING CARBON EMISSIONS AND LIMITING COSTS

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## **I. Introduction**

Emissions trading works. Domestic emissions of both chlorofluorocarbons (CFCs) and sulfur dioxide (SO<sub>2</sub>) have been dramatically reduced, at lower than expected costs, by establishing strict and enforceable emissions caps combined with tradable allowances. So, why are similarly fixed emissions caps not suitable for near term control of greenhouse gas emissions (GHG)? In fact, a fixed cap and trade approach for domestic emissions failed to gain more than rhetorical support in the last Administration and, apparently, is faring even worse in the present one. While some may attribute that failure to a lack of political will, others see it as at least partially related to the design of the policy itself. Arguably, great policy triumphs like the Montreal Protocol or the Clean Air Act can be dangerous if they establish policies and perspectives that get uncritically applied to other situations.

While the successes of reductions in SO<sub>2</sub> and CFCs are important, it is clear that GHGs pose fundamentally broader challenges. The pollutants involved in these earlier trading programs were limited in scope and sources to a few materials in specific sectors or industries with a relatively small number of producers.

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In contrast, those involved in decisions affecting GHG emissions extend throughout the economy. Thus, many fear that any effort to rigidly cap emissions in the near term could result in unpredictable shortages and/or unacceptable price hikes. Several of my colleagues at Resources for the Future (RFF) and I have proposed to modify the standard cap and trade approach when applied to GHGs to eliminate the chance of any major economic disruption. We do this by introducing a relief mechanism or “safety valve” which stipulates that if the price of the permits rises above a set amount, additional permits will be provided at a predetermined price, thereby capping the costs of the policy.

The safety valve approach has been embraced by a newly formed NGO, Americans for an Equitable Climate Solution, also known as Skytrust, and has been favorably reviewed by some segments of the environmental and business communities. The proposal received high marks in a recent study by the Congressional Budget Office, and has been endorsed by a number of prominent commentators, including Gregg Easterbrook, writing in *The New Republic*. It is also being favorably considered by Senators McCain and Lieberman, according to their recent announcement. An international version incorporating the principles of the domestic policy was actively discussed at the Hague, in November 2000.

This paper describes our proposal for reducing U.S. emissions of CO<sub>2</sub> and, ultimately, other GHGs. It modifies the cap and trade approach successfully used in other arenas, taking into account the complexities of controlling GHGs. Section II presents the conceptual background on the safety valve. Section III describes the basic RFF/Skytrust proposal for domestic action. Section IV summarizes the recent CBO analysis and considers a number of the arguments that have been raised both for and against the proposal. Section V offers overall conclusions and briefly considers how the policy might eventually be integrated into an international mitigation regime.

## **II. Background**

The age-old conflict over binding targets (quantity instruments) vs. emissions taxes (price instruments) has re-appeared in the climate debate. A key question is whether quantity and price instruments yield the same environmental results and, if so, is there any reason to prefer one over the other? Most of the current discussion concerning the choice of policy instruments has focused on political, legal, and revenue concerns. In the United States, environmentalists'

desire for fixed emissions targets have combined with a broad political aversion to energy taxes to give the rhetorical edge to pure quantity-based instruments as the leading method for implementing climate policies.

In a tradable permit system where each permit gives the holder the right to emit a specified amount of GHGs into the atmosphere one can, in principle, precisely control GHG emissions. However, the cost of control, in terms of higher prices for fuel and reduced productivity, is uncertain under such a system. While the recent experience with SO<sub>2</sub> trading suggests that the costs are lower than expected, the fear that carbon mitigation policies will be costly has become a deterrent to action.

Part of the cost uncertainty arises from uncertainty about the level of future baseline emissions, i.e., emissions that would occur even in the absence of new policies. In addition, there are also uncertainties about the cost of reducing emissions below baseline, and about the overall efficiency of the emissions trading system. For example, simulations developed by the Stanford Energy Modeling Forum suggest that, depending on the particular models used, the costs of the Kyoto Protocol may vary by roughly an order of magnitude.

In general, if the cost of limiting emissions is known with certainty and the benefits of reduced emissions are similarly known, the price and quantity approaches are perfect policy substitutes. However, as Martin Weitzman of Harvard University demonstrated a quarter century ago, when abatement costs and/or benefits are uncertain the situation can be quite different. On the one hand, quantity restrictions are preferred when incremental damages increase rapidly with the level of emissions or when marginal costs are relatively flat and predictable. In that case quantity restrictions prevent emissions from rising above a “safe” level and don’t risk cost surprises. On the other hand, when health or environmental damages are not very sensitive to short term emission levels or when concerns exist about potentially high costs, the undesirable side effects of quantity restrictions may dominate. In that case price based instruments are preferred.

Which of these situations applies to greenhouse gases? The first observation is that GHGs represent a canonical example of what is known as a “stock pollutant,” one in which the damages are a function of total accumulation in the environment and annual emission flows are a relatively small part of the total stock.

Thus, there is little basis to believe that short term increases in emissions cause large environmental damages.

What about the longer-term damages as concentrations rise over time? A great deal of attention has been given to the possibility of some “extreme event” (like major sea level rise from melting polar ice caps or a shift in the Gulf Stream that destabilizes global temperature and weather). Many scientists believe that climate change will occur gradually in response to growing atmospheric concentrations of greenhouse gases, and most evaluations of potential consequences of climate change are based upon this assumption. However, the potential clearly exists – with unknown probability – for disproportionately large responses to even small disturbances in the climate system.

Using broad economic criterion, my RFF colleague William Pizer demonstrated that price instruments are preferable to quantity targets for the abatement of GHG emissions. Following from Weitzman’s intuition that relatively flat marginal benefits/damages favors taxes, Pizer finds that an optimal tax designed to control GHGs yields gains significantly higher than the optimal permit policy.

It is, of course, possible to combine price and quantity policies in a hybrid approach that establishes binding emissions targets as long as costs remain reasonable and that allows the target to rise somewhat if costs are unexpectedly high. What is needed is a penalty, specified in advance, and paid by the source in case its emissions exceed the quantity restrictions set for that source. One way to achieve this goal is to establish a penalty per unit of emissions in excess of the quantity restriction. Such a hybrid policy (1) fixes emissions targets that are binding as long as costs remain reasonable and (2) allows the target to rise somewhat if costs are unexpectedly high. In practical terms the hybrid or “safety valve” would involve an initial allocation of permits followed by the subsequent sale of additional permits to be made available at a fixed trigger price.

For the ordinary citizen, the ideal climate policy is one that sets an upper limit on climate related expenditures. Most consumers are interested in reducing their out-of-pocket expenditures for energy and goods and services, while most businesses are interested in maintaining a stable environment for planning and investment. The risk of unexpectedly high compliance costs under a strict permit system thwarts that stability.

The hybrid approach guarantees that emissions will not exceed the target as long as the price of the tradable permits (i.e., the marginal cost of GHG control) does not rise above the trigger price. For environmental advocates who believe that the cost of reducing GHG emissions is low, the permit price will never reach the trigger level and emissions will remain capped if their belief is borne out.

### **III. The Proposal**

Building on the theoretical analyses developed more than two decades ago, the proposal developed by researchers at Resources for the Future and advanced by Skytrust has three key features: broad coverage, a modest target, and equitable burden sharing. Such a policy would create genuine incentives to look for emission reductions now and to develop new technologies for the future.

Energy producers would be required to obtain permits equivalent to the volume of carbon dioxide eventually released by the fuels they sell. By collecting permits at the mine mouth for coal, the refinery gate for crude oil, and at the initial point of distribution for natural gas, virtually all domestic emissions are covered by roughly two thousand collection points. This is then augmented by a permit requirement on imported fuels along with exemptions for non-combustion use or export. The key point is that this approach provides the same incentives as a more complex, more expensive, and less comprehensive program focused on end-users.

The "upstream," broad coverage guarantees that all sources of carbon dioxide emissions face the same incentive to cut back. Therefore, aggregate reductions are obtained at the lowest possible cost. This should be true regardless of whether those reductions occur among electric utilities, in the transportation sector, or elsewhere.

To prevent the cost of reductions from becoming too expensive, it is proposed to cap the price of permits at a predetermined level. As long as the price remains below the safety valve level, emissions are strictly limited to the number of permits in the initial distribution – the target. If the permit price reaches the safety valve level, extra permits are offered for sale and emissions are allowed to rise in order to contain compliance costs.

Although permits will be freely tradable, it is proposed that ordinary permits expire after two years and permits sold at the ceiling price expire after one year. Since future climate change goals are uncertain, it is necessary to preserve the option of lowering emission targets in the future. This option could be thwarted if there is an excessive accumulation of valid but unused permits in the system. To avoid this risk limits are placed on permit banking. With large, sophisticated markets for carbon, firms will be able to efficiently sell excess permits and purchase options on future permits, thereby eliminating the need for long-term of banking.

It is also proposed that steps should be taken to broaden the program to include other greenhouse gases, sinks, and international joint implementation or CDM-type projects. These sources represent additional opportunities for effective and potentially low-cost reductions in net greenhouse gas emissions. Yet, they also pose greater challenges to monitoring and enforcement. While the original RFF proposal did not envision the early incorporation of these broader mechanisms, international discussions on these matters have progressed over the past several years. Accordingly, it now seems appropriate to incorporate these mechanisms in any domestic program, to the extent that practical and enforceable implementation mechanisms are available.

The final cornerstone of the proposal is the sale of permits via an auction. Auction revenues may be: (a) used to reduce existing tax burdens, (b) distributed to households to lessen the burden of higher household energy prices, or (c) distributed to states to address special hardships and the vulnerability of industry. In the original RFF proposal a specific formula was advanced for the initial allocation: 75 percent to be returned directly to households on a per capita basis and 25 percent to be returned to the states to distribute to adversely affected parties. Originally, it was proposed to reduce the share that accrues to states in subsequent years (by 2.5 percent annually) as the special hardships are successfully addressed. Revenue generated by extra permit sales at the specified ceiling price would follow the same allocation as auction revenues. Other formulations are clearly possible, as is the notion of returning to households and the states the actual permits rather than the revenues from the sale of the permits. This would encourage more widespread participation in permit trading and potentially mitigate concerns that the program was too heavily administered in Washington, D.C.

#### IV. Analysis and Critique

The RFF/Skytrust proposal has been widely discussed inside and outside the Washington Beltway. This section presents the results of the recent Congressional Budget Office (CBO) analysis of alternative proposals to reduce domestic carbon emissions along with other arguments that have been raised by critics of the proposal.

In their report, the CBO examined four different proposals for domestic action. Option I is the RFF/Skytrust proposal outlined herein. Option II resembles the RFF/Skytrust proposal with two important differences: there is no safety valve or price cap, and all the auction revenue would be used to offset corporate income taxes rather than be (partially) returned to households. Options III and IV options are based on so-called downstream systems. Option III, similar to a proposal by the Progressive Policy Institute, would initially cap emissions at large sources at the current level and then decrease that cap by one percent each year. Allowances would be given to the sources, based on their emissions in the initial year of the program. Option IV, similar to three bills that were introduced in the 106th Congress (H.R.2569,H.R.2980,and S.1369), would limit emissions only from the electricity-generating sector. A generation performance standard (GPS) would be determined each year by dividing the chosen cap by the expected electricity generation. As in option III, allowances would be given away gratis to the sources.

CBO analyzed these four options according to a number of specific evaluation criterion:

- **Ease of Implementation.** Would the policy be easy to carry out and enforce?
- **Carbon-Target Certainty.** Would the policy achieve the target level of carbon emissions?
- **Incremental Cost Certainty.** Would the policy place an upper limit on the cost the U.S. economy might bear?
- **Cost-Effectiveness.** Would the policy reduce carbon emissions at the lowest possible cost to society?
- **Distributional Effects.** How would the costs and financial benefits of the policy be distributed among U.S. households of different incomes and among U.S. producers?

The results of the CBO analysis are shown in the accompanying table. While no one proposal stands out in terms of all the criteria, Option I (RFF/Skytrust) received the most favorable rankings of any of the options. Like several of the other options, RFF/Skytrust is both cost-effective and relatively easy to implement. Unlike the others, it is the only one that places an upper limit on incremental cost and the only one that yields an overall progressive effect on households. Not surprisingly, the major criterion on which the RFF/Skytrust proposal falters is its failure to provide certainty about meeting a carbon target. Interestingly, as CBO notes, neither of the downstream options provide such certainty either once one looks beyond the covered sector(s).

Because of the absence of certainty about meeting the target, a number of influential environmental organizations have expressed strong reservations about the RFF/Skytrust approach. Yet, given the obvious concerns about the potentially high costs of action, it seems unlikely that a proposal without some limit on costs, such as a safety valve, is achievable in the near term. Arguably, if the goal is near term emissions reductions, the RFF/Skytrust approach represents a critical first step in what will inevitably be a long process. Over time, particularly if it turns out that emissions control is cheaper than forecast, the U.S. will be in an even stronger position to take additional actions and to press others to do so as well.

Apart from the claim that it fails to provide certainty about meeting a carbon target, several other critiques of the RFF/Skytrust proposal have been advanced and are addressed below.

*The supply of cheap tons (e.g., 17 cents per ton) from developing countries will disappear if the price cap is imposed.*

The basic idea is that current contracts, allegedly involving the purchase of low cost offsets in developing countries, would be undermined if a price cap or safety valve were formally introduced into the system.

Criterion	Upstream Trading		Downstream Trading	
	Option I <sup>a</sup>	Option II <sup>b</sup>	Option I <sup>c</sup>	Option II <sup>d</sup>
Is Relatively Easy to Implement	Yes	Yes	No	Yes
Provides Certainty About Meeting Carbon Target	No	Yes	Yes for large emitters, No for the economy	Yes for the electricity sector <sup>e</sup> , No for the economy
Places Upper Limit on Incremental Cost	Yes	No	No	No
Cost-Effectiveness <ul style="list-style-type: none"> <li>• Creates incentives for least cost emission reductions</li> <li>• Uses revenue to offset tax-interaction effect</li> </ul>	Yes	Yes	Yes for capped sources, No for others	No
	No	Yes	No	No
Distributional Effects <ul style="list-style-type: none"> <li>• Creates regressive price increases</li> <li>• Creates windfall gains for selected industries</li> <li>• Overall effect on households</li> </ul>	Yes	Yes	Yes	Yes
	No	No	Yes	Yes
	Progressive	Regressive	Regressive	Regressive

SOURCE: Congressional Budget Office.

a. Similar to the "Sky Trust" proposal by Resources for the Future and Americans for Equitable Climate Solutions. Suppliers of fossil fuels would be required to hold emission allowances, which the government would sell by auction with the price per allowance capped. Auction revenue would be distributed evenly to all U.S. residents and to some companies hurt by the policy.

b. Similar to the previous option except that allowance prices would not be capped and auction revenue would be used to cut corporate income taxes.

c. Similar to a proposal by the Progressive Policy Institute. Large sources of carbon emissions would receive allowances free of charge on the basis of their current emissions. Their allocations would shrink by 1 percent per year.

d. Similar to three bills introduced in the 106th Congress (H.R. 2569, H.R. 2980, and S. 1369). Only carbon emissions from electricity generators would be capped. Generators would receive free allowances on the basis of their annual production multiplied by a generation performance standard.

e. Assuming that the government could adjust the generation performance standard each year to maintain the target level of emissions.

Presumably, anyone who is selling carbon rights for 17 cents per ton believes they are getting good value for their tons. In 1997, before the Kyoto Protocol was drafted, 17 cents was probably a fair price. Today, carbon credits are selling for more, although still below a likely safety valve price. Few doubt that once a serious international effort is mounted to constrain carbon emissions, a robust international market will be established. At that time, the proverbial 17 cent tons will vanish with or without a safety valve. In all likelihood, the safety valve would serve to lower rather than raise the price of carbon credits.

*RFF/Skytrust is really a carbon tax in disguise and, as such, it is politically unacceptable.*

Of course, any policy which leads to an increase in the price of carbon-intensive goods could be labeled a tax. Higher electricity prices resulting from the SO<sub>2</sub> trading program or higher pump prices resulting from the phase down of lead in gasoline can also be construed to be a tax.

The principal difference between the RFF/Skytrust proposal and others is that the former recycles the money to those hardest hit. No other proposal mitigates the associated energy price hikes. The government is simply serving as a mechanism for offsetting the regressive impacts. Certainly, if all the GHG permits were given away gratis to the companies (as is the case of the SO<sub>2</sub> program) and the government played no role at all, then the tax argument would disappear. But such a policy would, in fact, be regressive. Thus, the tax issue really arises from the progressive nature of the program, not from the safety-valve per se. For those who see the refund checks from Washington as the problem, it may be preferable to distribute GHG allowances rather than checks back to U.S. households and the states – or at least create the option to do so. Thus, anyone choosing an allowance over a check would be able to sell directly to the energy producers, thereby avoiding the need for the money to pass through the federal government.

*Setting the level of the safety valve is an intractable problem.*

Setting the level of the safety valve, i.e., the price, is a difficult issue. It is even more difficult if one starts with the proposition that without the safety valve people will believe that the cost of carbon mitigation is negligible. In my view, such a proposition is highly unlikely. Certainly organized interests – using humorous TV characters like Harry and Louise of health policy fame – are well positioned to argue that the costs will not be negligible.

The key point is that the level of the safety valve needs to be set initially and then allowed to increase gradually over time. Research shows that both individuals and firms making decisions about long-lived capital focus as much on future energy prices, as they do on current ones. The original RFF/Skytrust proposal set the initial price at \$25 per ton and allowed annual escalations of seven percent per year in real terms. At current rates of inflation, that is about nine or ten percent per year.

In my view, too much unproductive debate has focused on the initial level of the safety valve. As long as the price of carbon emissions remains virtually zero we are missing opportunities for low cost emission reductions. More importantly, we are not sending the necessary signals to capital markets. The key to long term progress on GHG reduction is to set the carbon price above zero, and then continue to impose additional increases over time, as a signal that carbon use is not free.

*Overall, the proposal is politically unrealistic because it is not widely supported in either the environmental or business communities.*

It is true that while there is some support for RFF/Skytrust in the environmental and business communities, there is also significant opposition in both communities. The first question to ask, of course, is what other policy that achieves real reductions is more widely embraced by both communities? Surely a cap and trade policy without a safety valve is not more popular in both communities. And a sectoral approach that targets utilities, for example, would inevitably face opposition if there were an attempt to achieve serious emission reductions. Perhaps a cap and trade system – either economy-wide or utilities only – which allocated permits gratis would be more attractive to business, but it seems unlikely that a multi-billion dollar transfer would be politically acceptable in the U.S., at least once the magnitude of the transfer became apparent. Not surprisingly, organized labor along with some segments of the environmental community are already focused on the transfer issue.

Interestingly, recent research by my RFF colleagues Dallas Burtraw, Karen Palmer and others suggests that taken as a group, electric utilities might be better off with an auction system as opposed to a gratis allocation of permits when those permits are allocated on the basis of each facility's share of total generation – the so-called generation performance standard or “output based allocation.”

The real answer is that any serious climate policy – involving a safety valve or not – is politically difficult to advance in the United States. To date, remarkably little effort has been made to develop grass roots support for specific policies. Instead, most of the

public discussion has been conducted in very general terms. Until specific policies are advanced – and debated in the public arena – little progress will be made on obtaining real reductions.

## V. Conclusion

It is clear that both the domestic and the international debates on climate change have shifted. The question is no longer whether action should be taken but what practical steps can be mounted in the near term. The more flexible and cost-effective the means pursued of achieving a long-term goal, the more affordable the goal becomes and the more likely that it is achieved. Notwithstanding the extensive flexibility contained in the standard cap and trade system, such an approach is inflexible with respect to both the timing and specificity of the emissions targets. Recognizing that a strict quantity-based system is not achievable in the near term, many are looking for other options. Literally, we are at a point where doing something is far better than doing nothing. Domestically, the safety valve represents a practical means of starting down the long road of reducing GHG emissions.

Internationally, it might be possible to incorporate the safety valve concept into some future agreement. The idea is straightforward. Countries with excess emissions would be permitted to pay a fixed per ton amount in order to come into compliance. This payment would be made during the true-up period following an initial budget period.

Such a compliance payment would create significant economic incentives for countries to undertake domestic mitigation activities. Under this option, the failure to undertake domestic mitigation activities costing up to the level of the fixed per ton amount would oblige countries to make more expensive extra-territorial payments.

The sum of compliance payments by all countries would constitute a ‘virtual’ fund that could be used to acquire additional permits worldwide. Using a reverse auction approach, the countries, or their designated agents, could solicit bids for additional permits from around the world. A single price, reflecting the highest selected bid, could be paid to all successful bidders. Funds would be disbursed by the countries choosing to make compliance payments directly to the successful bidders, thereby avoiding the financial and bureaucratic issues associated with using an international organization to transfer the funds. Adoption of such a system could greatly increase the likelihood of successful implementation of an international agreement, despite the potential for a slight relaxation of the stated limits for a first budget period.