CONGRESSIONAL TESTIMONY

Addressing Price Volatility in Climate Change Legislation

Dallas Burtraw

Prepared for the U.S. House of Representatives Committee on Ways and Means

RESOURCES
FOR THE FUTURE

Hearing on Addressing Price Volatility
in Climate Change Legislation

Written Testimony of Dallas Burtraw

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Summary of Testimony

A symmetric safety valve can be expected to lower price volatility in a cap-and-trade program, thereby reducing unproductive economic disruptions. It can be expected to lower the hurdle rate for new investments in innovative technology, thereby reducing the overall cost of the program. And it provides a safeguard against potential manipulation of the market by limiting the potential payoff to such behavior.

A cap-and-trade policy and an emissions tax can be designed to share a set of attributes that are often associated with the other. Whether the choice is a cap or a tax, it would be a mistake to adopt an inflexible policy. Both can be designed to automatically adjust to information about program performance, according to decision rules that can be transparent to investors.

Hearing on Addressing Price Volatility
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WRITTEN TESTIMONY OF DALLAS BURTRAW

Mr. Chairman, thank you for the opportunity to testify before the House Committee on Ways and Means. My name is **Dallas Burtraw,** and I am a senior fellow at Resources for the Future (RFF), a 57-year-old research institution based in Washington, DC, that focuses on energy, environmental, and natural resource issues. RFF is independent and nonpartisan, and shares the results of its economic and policy analyses with environmental and business advocates, academics, government agencies and legislative staff, members of the press, and interested citizens. RFF neither lobbies nor takes positions on specific legislative or regulatory proposals. I emphasize that the views I present today are my own.

I have studied the performance of emissions cap-and-trade programs from both scholarly and practical perspectives, including evaluation of the sulfur dioxide (SO_2) emissions allowance trading program created by the 1990 Clean Air Act Amendments, the nitrogen oxide (NO_X) trading program in the northeastern United States, and the European Union Emission Trading Scheme (EU ETS). I have conducted analysis and modeling to support the state and regional efforts to design trading programs, and I served on California's Market Advisory Board overseeing the state's greenhouse gas initiative. Recently, with colleagues at RFF, I have conducted economic analysis of mechanisms to contain the costs and the variability of costs of implementing climate policy.

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The issue of how to set climate policy in the presence of uncertainty about the cost of emissions reductions has two features. One addresses how expected costs may change over a long time horizon, which gives rise to proposals for cost containment. A second aspect is how prices may vary in the short run. A market for emissions allowances in a cap-and-trade program would resemble a commodity market and experience with previous programs indicates that prices can be volatile. The two issues are related because excessive volatility in prices will undermine the incentives for new investment, slow technological change, and raise the long-run cost of climate policy.

How climate policy legislation is designed can have a significant impact on price volatility. From an economic perspective, a smooth price signal that increases over time is the most efficient way to provide incentives for investors and to minimize disruptions in the economy. An emissions tax or direct sale of emissions allowances would have none, or minimal, price volatility. A cap-and-trade program can be designed to obtain this result with a symmetric safety valve.

A symmetric safety valve is a price collar that provides a floor as well as a ceiling on the price of emissions allowances. This design does a better job of insuring against price volatility. In addition, a one-sided safety valve leads necessarily to exceeding the emissions target and thereby undermines the incentive for new investment. The introduction of a symmetric price floor leads the program to recover its expected emissions target. This in turn recovers the expected return on innovation. Moreover, the reduced price volatility resulting from the introduction of a ceiling and a floor enhances the investment climate for new investment beyond that which results from unbridled price volatility.[1]

The administration of a symmetric safety valve is straightforward. At the price ceiling, additional allowances would be sold directly into the market. Revenues from the sale of additional allowances might be dedicated to program-reinforcing investments, such as investment stimulus in technology or energy efficiency. The price floor is enforced through the introduction of a reserve price in an auction. If bids in the auction fall below the specified floor, then the given lot of allowances would not be sold. That would tighten supply in the market and bring up the spot price. Economists generally consider a reserve price to be a good feature of auction design in any event, and they are found frequently in actual auctions, including the auction for carbon dioxide (CO_2) emissions allowances in the northeast Regional Greenhouse Gas Initiative.

In the limit, if the *price collar* created by a price ceiling and floor collapses to a single point, the program would resemble an emissions tax or direct sale of emissions allowances. In general, free allocation is likely to lead to greater price volatility because the market has to discover the price through a series of trades. An auction would have less volatility than free allocation because a large number of

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[1] Several recent papers have concluded that a symmetric safety valve would add important efficiency benefits to a cap and trade program. See: Burtraw, Palmer and Kahn, 2009. "A Symmetric Safety Valve," Resources for the Future Discussion Paper 09-06; Philibert, 2008. "Price Caps and Price Floors in Climate Policy – A Quantitative Assessment," International Energy Agency Information Paper; Fell and Morgenstern, 2009. "Alternative Approaches to Cost Containment in a Cap-and-Trade System," Resources for the Future Discussion Paper in preparation.

trades occur at a market-clearing price. A direct sale of allowances, or an emissions tax, would minimize the amount of price volatility.

The leading proposal to reduce emissions of greenhouse gases is a cap-and-trade policy whereby the economy is subject to an overall cap on total emissions. Price volatility has been a notable characteristic of previous emissions trading programs. For the most part, the problem has not been a price spike, but rather a price collapse. The exception is Southern California's RECLAIM program, which suffered a price spike during the state's electricity crisis. However, experience with a price collapse has been much more troublesome.

Figure 1.
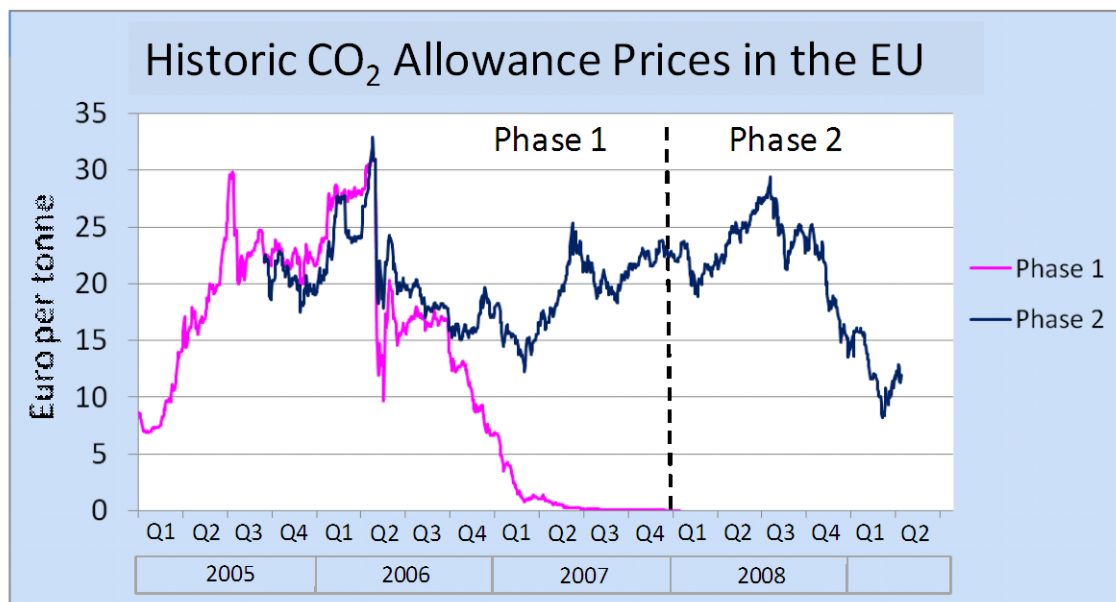
Source: Point Carbon

We have seen a price collapse in both of the first two phases of the EU–Emissions Trading System. The first phase covered the period from 2005-2007, and the second phase covers 2008-2012. The spot price for each of these program phases is illustrated in Figure 1. Less than a year ago the spot price was 30 Euros ($40.64) per metric tonne; but most recently the price had fallen to 12 Euros ($16.26) per metric tonne. This is unfortunate because it does not reflect the expected cost of abatement through phase 3 of the program running through 2020. But, because the price has collapsed, it has undermined the rewards for innovation and investments in low-emitting technology. Furthermore, the price volatility actually raises the cost of such investment by raising the hurdle rate that firms place on investments. Consequently, less investment in innovation will occur this will

slow the pace of technological change and raise the cost in phase 3. In addition, another aspect of the price collapse in the EU system is a potential collapse of the international offsets market.

This issue is an important concern of the business community. In the last week, I heard a representative of one of the largest chemical companies in Europe say: "We see the CO_2 price go up and down and we got so fed up with price variation we developed an internal CO_2 price. We need an idea of a stable price in order to make investment decisions." In fact, major investment in new technologies is risky and requires greater price stability than we have seen previously. Indeed, industry seems to signal that they would trade off a higher price in exchange for price stability.

In the United States, a price fall is also the prominent characteristic of the familiar SO_2 trading program. President Bush senior and the 1990 Congress adopted an emissions target of 8.95 million tons per year based on an expected price of $766-$1,005 per ton in 2010 (2006 dollars), which was provided by EPA at the time. This target reflected a considered balancing by Congress of the tradeoffs between environmental and public health benefits and the costs to firms and consumers of emissions reductions. As it turned out, we quickly learned that the price per ton of emissions reduction was one-quarter of that. Today, the price of an emissions allowance is $65 per ton. One would think that Congressional intent to purchase benefits at a cost of $766-$1,005 per ton would lead Congress to take advantage of a bargain sale when the price turned out to be so much less and to purchase additional emissions reductions.

Unfortunately the 1990 Clean Air Act amendments left our feet in cement with regards to the emissions target. The cost of this inability to adapt is that billions of dollars a year in environmental and public health benefits are left on the table, based on what Congress knew when it enacted the policy in 1990. We estimate that a symmetric safety valve at plus or minus 30 percent of the EPA's expected price level in 1990 would have introduced a floor on allowance prices of $605 (30 percent below the midpoint of the range above). If this price floor had been implemented it would have yielded billions of dollars each year in net economic benefits, even after accounting for the cost of emissions reductions, because that cost is much lower than was originally anticipated.[2]

A symmetric safety valve also contributes in a serious manner to guarding against market manipulation by limiting the range within which prices might

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[2] Burtraw, Palmer, and Kahn, 2009. "A Symmetric Safety Valve," Resources for the Future Discussion Paper 09-06.

fluctuate. The returns to price speculation or market manipulation derive from taking advantage of price volatility and potentially fueling that volatility. There is little evidence of such manipulation in previous markets, outside of the RECLAIM experience, but concern about such manipulation can be substantially reduced with the introduction of a symmetric safety valve.

What a symmetric safety valve can be expected to do is lower price volatility in a cap-and-trade program, thereby reducing unproductive economic disruptions. It can also lower the hurdle rate for new investments in innovative technology, thereby reducing the overall cost of the program. And it provides a safeguard against potential manipulation of the market by limiting the potential payoff for such behavior.

There are a variety of proposals that are intended to have an effect that would be similar in some ways to a symmetric safety valve. One is a fixed-quantity strategic allowance reserve. This approach would provide a limited number of additional allowances that could be introduced into the market at a fixed price if the allowance price reaches some critical level. Hence, it functions only as a one-sided safety valve, and thereby introduces asymmetric incentives that erode the payoff to investment unless it was coupled with an emissions floor. Further, after the allowance reserve is exhausted, the allowance price would be allowed to rise again, probably signaling an inevitable program review.

Another measure that would have effects similar to that of a symmetric safety valve is banking. A bank effectively expands the liquidity of the market at any point in time, and price volatility tends to be diminished in deeper markets. Further, in the presence of an emissions bank, the price at any one point in time is related to other time periods by the cost of holding allowances as an asset, so effectively the market is very deep because the current price would be related to prices in future periods.

Banking can help contain costs by enabling firms to plan investments over a longer time horizon. In previous trading programs, we observed that firms tend to behave in a risk-averse manner, especially in the early years of the program. The ability to hold allowances in their own account to cover contingencies is comforting to management. It is also comforting to investors. For example, in the SO_2 program, especially early on, they required firms to hold allowances to cover several years of the facility's operation or show they had contracts for allowances. This behavior was amplified when prices appeared volatile, something that is lessened with a symmetric safety valve.

In a general economic context, emissions banking provides an important opportunity to achieve a cost-effective path for emissions reductions under cap and trade. This is important because it allows private firms to make decisions based on their opportunity cost of capital, and thereby leads to a cost minimum over time. Congress might specify annual emissions targets without banking, intending to mimic the decisions of firms in this regard, but it would introduce another potential element that could be incorrect and unnecessarily inflexible. If one assumes that banking is in place, the price collar allows for further cost effectiveness in the event that the forecast of the opportunity cost of capital differs from the actual outcome. It frequently has been shown in theoretical and simulation modeling, that the annual rate of change in the marginal compliance cost equals the opportunity cost of capital (the interest rate). In sum, banking is complementary to a symmetric safety valve and a feature considered to be a good part of a cap-and-trade program.

Banking also has the effect of creating an interest group that is vested in the success of the program. We saw in the SO_2 program that the regulated community that makes investments and changes behavior to achieve emissions reductions becomes the owner of a bankable valuable asset that retains value only if the program is successful. This community becomes an advocate for rigorous monitoring and enforcement because this reinforces the value of their own investments.

The same cannot be said about borrowing. Proposed borrowing in a cap-and-trade program might be implemented at a system level or at the firm level. In either case, it creates a severe moral hazard, where the regulated entities that incur a liability accrue an interest in the program's demise. That is because the borrowed allowances are a debt. At the system level, it reflects a future reduction in the cap beyond the original design, with associated costs for firms. If borrowing by individual firms is allowed, they have an individual incentive to see the program fail. The moral hazard stems from the fact that firms that are the least solvent have an incentive to borrow more, betting on the possibility of insolvency for the system, or potentially their own insolvency.

The Medicare program illustrates the kind of dilemma that can emerge with such a system of incentives. Medicare spending goals are linked to the growth of the economy. Currently, when actual spending on doctor's services exceeds the goals under Medicare, payments to doctors are supposed to be reduced or else Medicare is supposed to recoup the money by making deeper cuts in payments for services in future years. Essentially, Medicare runs a debt that is growing to significant levels.

This does not mean we need to remove every element of flexibility where it might be helpful in administering the system and to straightforward compliance actions for firms. In some programs, the "true-up" period before allowances must be surrendered overlaps with the next year's allocation or sale of allowances, enabling the use of a small portion of the next year's allowances in a previous year. This resembles a small bit of borrowing. The feature may be innocuous, as long as there is a symmetric safety valve in place to guard against adverse outcomes.

How might the symmetric safety valves or price collars be determined? There is no specific theory emerging from the literature about this yet. The size of the collar or the difference between the ceiling and floor is less important than the midpoint because the midpoint represents a signal to investors about the level of effort Congress and society expect to have to make to achieve climate goals. In setting a symmetric safety valve, the opportunity for shenanigans exists if the collar is not aligned with price expectations generally reflected in the modeling community. For example, if the price ceiling were below the expected price path associated with an emissions target, then the price ceiling would be expected to bind immediately at the start of the program.

A number of models are available to predict the cost of various emissions targets. Although models are inevitably wrong and they differ to some degree, the differences are primarily driven by differences in assumptions about program design. General guidance from the modeling community can provide a reasonable expectation about allowance prices. For a given program design, the expected price path in the models maintained by EIA and EPA provide a reasonable range that can be used as a basis for expected costs. I suggest that a symmetric safety valve with the ceiling and floor set equal distance from that expected path would be a good design.

How large should the collar be? I will nominate a range of plus or minus 30 percent of the expected price as a reasonable price collar. A feature of this decision is to pay attention to the ceiling relative to the price that is expected to be necessary to bring in private sector investment for what we refer to as backstop technology, that is, a technology that is expected to deliver significant emissions reductions if it is available. An obvious focal point for this is carbon capture and storage. A couple years ago, the Massachusetts Institute of Technology suggested an allowance price of $30 per ton CO_2 would be necessary, if coupled with substantial public-sector investment in research and development.[3] More recently, Carnegie Mellon University suggested a greater value, depending also on the amount of public sector

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[3] MIT, 2007. *The Future of Coal: Options for a Carbon-Constrained World.*

investment.[4] For illustration, I observe that the EIA suggests a price of $20.91 (2006 dollars) in 2015, and $29.88 in 2020, would have been necessary to implement the Lieberman-Warner legislation. This represents an annual rate of growth in the allowance price of 6.89 percent per year. A safety valve of plus or minus 30 percent would have created a price collar of $14.64-$27.18 in 2015 and $20.92-$38.84 in 2020 (2006 dollars). I defer on the underlying question of the stringency of the program overall.

If we expect allowance prices to rise at the interest rate we should also expect a similar change in the price ceiling and floor. It would be reasonable to expect, as a consequence, that the decision rule I suggest the initial spread of plus or minus 30 percent would be maintained.

There is a trade-off between price certainty and other attributes. If the goal is to provide maximum price certainty, the policy design option to be preferred would be an emissions tax. A frequent dichotomy is poised between a cap-and-trade program and an emissions tax policy, suggesting that each provide a different type of certainty, but this difference is sometimes overblown. It is suggested a cap provides emissions certainty, but it is not providing environmental certainty.

Emissions certainty is even an illusion since the United States is responsible for just 22 percent of global emissions, and emissions certainty depends on our successful engagement of the international community especially developing nations. The introduction of a symmetric safety valve introduces some uncertainty about domestic emissions but the outcome could be they are either greater or less than anticipated. It could actually provide additional certainty about emissions targets by demonstrating a self-correcting feature of the program design that gives investors and others confidence in the longevity of the program.

A tax, in contrast, is expected to provide cost certainty but not emissions certainty. On the other hand, the emissions target is not rudderless under a tax. First, one would expect the tax to rise at the anticipated opportunity cost of capital over time. If the anticipated opportunity cost of capital is incorrect, then the tax itself would deviate from a constant relative price in the economy, yielding a change in the emissions path from expected levels. Second, technological change and economic activity will vary, leading to a change in emissions from expected levels. Hence, a well-designed tax system should have a self-correcting mechanism built in to allow it to change over time.

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[4] Samaras, et al. 2009. *Cap and Trade is Not Enough: Improving U.S. Climate Policy*, Carnegie Mellon University.

The available information to inform this evolution is observed emissions. Associated with a price path is an expected emissions path that can be identified from modeling. Congress could adopt an emissions path as the goal of the policy, and choose a price instrument as the mechanism for achieving that goal. The price path, that is the path of the emissions tax, could *automatically* evolve according to a predetermined rule by adjusting its annual rate of change around the opportunity cost of capital. For example, if the rate is expected to be 6.89 percent per year, but emissions start to grow faster than expected, the rate of growth of the tax could automatically increment by 0.2 percent to 7.09 percent and subsequently to 7.29 percent, as necessary to retain an emissions goal. These small adjustments would not provide short-run jolts to the decision calculus of investors. But since the rate compounds over time, a difference of even 0.2 percent would accumulate to a substantial difference in the tax over time. Similarly, a reduction in the tax could be implemented automatically if emissions fall below expectations.

The advantage of either of these processes, either a symmetric safety valve or a tax that can adjust, is that the program could be self correcting, unlike the experience in the SO_2 program or the EU Emissions Trading program. There is a difference in this regard. In large measure, the lesson is that each instrument can be implemented to achieve a combination of goals.

In summary, a cap-and-trade program and an emissions tax can each be designed to share a set of attributes that are often associated with the other. The ultimate decision may involve many criteria. Whether the choice is cap and trade, or an emissions tax, it would be a mistake to adopt an inflexible version of the policy. In particular, an emissions cap for CO_2 should be coupled with a symmetric safety valve in order to capture some of the flavor of a tax approach. Similarly, a tax approach should have an associated emissions goal and an automatic mechanism so the rate of change in the tax adjusts over time to adjust emissions trends back toward original goals. The administration of either of these flexible aspects of design is easy to develop, communicate, and implement. That is important for the creation of a new environmental market. Moreover, there are substantial economic benefits to such flexible designs, in either case.

I have focused on relatively narrow aspects of the architecture of a cap-and-trade program. In general, costs can be kept to a minimum by good program design that achieves cost-effective emissions reductions and encourages innovation and investment to bring down the cost of compliance over time.

Thank you for the opportunity to testify today.

Dr. Burtraw is a senior fellow at Resources for the Future. He holds a Ph.D. in economics and a master's in public policy from the University of Michigan. Dr. Burtraw has conducted research in the design of incentive-based environmental policies in the electricity industry and written extensively on the performance of emissions trading programs in the United States for sulfur dioxide and nitrogen oxides and the European Union's Emission Trading System for carbon dioxide. He also has advised on the design of climate policy for U.S. state governments. He currently serves on the EPA Advisory Council on Clean Air Compliance Analysis and on the National Academies of Science Board on Environmental Studies and Toxicology.