Price control in climate policy

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Design Elements for Cost Containment in Climate Policy

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Climate policy platforms typically contain a dozen different cost containment elements:

1. Climate Policy itself	**(vs. inaction)**
2. Cap-and-Trade flexibility	**(vs. command and control)**
3. Economy wide coverage	**(vs. large reductions from a few sectors)**
4. Declining Cap	**(fast vs. slow)**
5. Timing	**(starting early vs. delay)**
6. Unlimited participation	**(vs. limiting market to emitters only)**
7. Market oversight	**(vs. unregulated trading activity)**
8. Banking	**(vs. exposure to spot prices)**
9. Early, staged auction of future years	**(vs. one vintage auctioned per year)**
10. Extended compliance period	**(vs. deadline surges, or borrowing at high rates)**
11. Offsets	**(vs. achieving all reductions inside the U.S. cap)**
12. Complementary policies	**(vs. price signal overcoming other market failures)**

If the United States…

- enacts a climate policy to diminish exposure to the risk of catastrophic climate change,
- uses a cap-and-trade framework to offer polluters maximum flexibility to access the least-cost options for reducing emissions,
- covers as much of the economy as possible to increase the supply of abatement options,
- starts reducing emissions as soon as possible to avoid an expensive crash program,
- allows non-emitters to participate in the carbon market to ensure liquidity and offer financial instruments to hedge price risks,
- establishes strong market oversight to prevent manipulation or abuse of market power,
- implements early auctions to improve price discovery and financial planning,
- encourages banking to accelerate cost-effective mitigation,
- extends the annual compliance period over 2 years to avoid year-end demand surges,
- certifies real, additional, verifiable offsets to access abatement options outside the cap,
- and authorizes policies to support rapid development of clean energy technologies and remove non-price barriers that slow their deployment,

then the cost of making a maximum effort to reach climate stabilization ought to be affordable, and *there would be no need to contain those costs.*

However, if any of the mechanisms above fail (e.g. ineffective market oversight, empty offsets, inadequate complementary policies), the price of carbon could escalate sharply – or plummet. Spikes and crashes threaten the long-term political durability of a price-based climate policy.

Therefore, *price control* is a "last resort" form of cost containment that should be seldom (if ever) needed, but it may be a political imperative to ease anxiety about carbon market failures.

13. Price control (vs. weathering spikes & crashes, or losing the policy)

Updating Price Buffers are one design for a price control provision that can keep a cap-and-trade climate policy intact during periods when a carbon market may fail.

Updating Price Buffers:

A proposed policy design for containing costs in a failed carbon market

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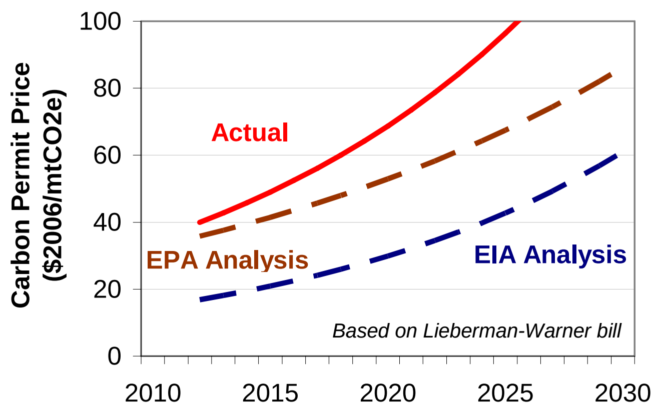
Two types of "High Prices"

If the carbon price is ***generally higher than expected*** in the context of a well-functioning carbon market, then failures in other markets (e.g. monopoly power in the electric sector, or split incentives in the real estate sector) must be preventing people from seizing low-cost abatement opportunities.

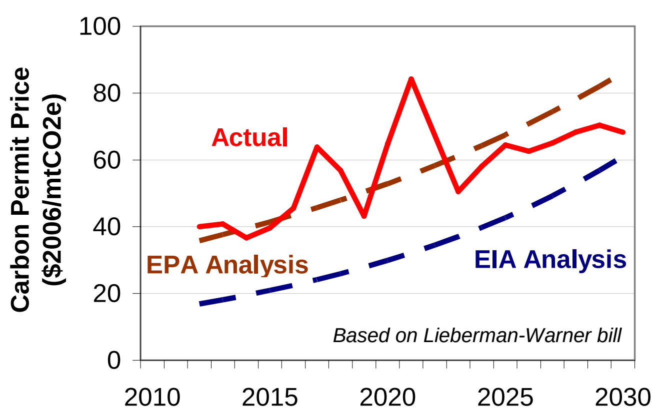
Example: Modeled vs. Actual Carbon Prices



Under these circumstances, the most effective responses are complementary policies that address those barriers, such as improving market conditions (e.g. better interconnection rules, higher building efficiency standards). The *least effective* response would be applying price controls to the carbon market because that would essentially *accommodate* failures in other markets, depress the price signal emerging from a well-functioning carbon market, and exacerbate GHG emissions.

If prices are ***highly volatile***, however, there may be failures in the structure of the carbon market itself. Under these circumstances, market participants will face challenges containing costs (price spike) or recovering mitigation investments (price crash).

Example: Modeled vs. Actual Carbon Prices



Among a dozen different policy design options for reducing the cost of addressing climate change, *price control* is the last option because it *implicitly modifies the quantity of pollution permits available*. However, price spikes and crashes throw markets into turmoil, provoking political interventions that could threaten the basis of an economy-wide, price-based climate policy.

Designing an appropriate price control mechanism requires answering three key questions:

(1) What *threshold* defines a carbon price that is "too high," or "too low"?

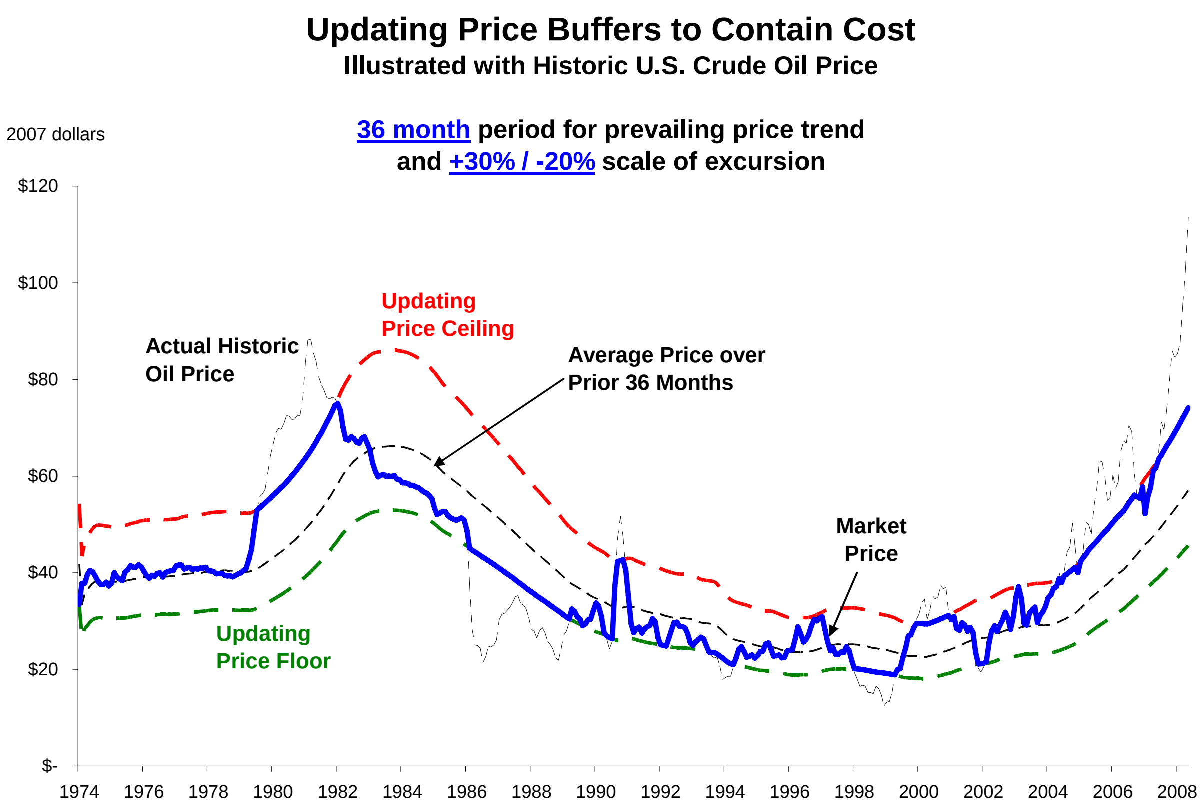
(2) Who decides what *triggers* a price control event, and on what basis?

(3) What *price control action* should be taken when carbon prices reach these levels?

Solution Summary: Updating Price Buffers

Updating price buffers establish price boundaries that appropriate for evolving market conditions. A price floor can be set at X% below a rolling average price for the previous Y months, with a corresponding price ceiling Z% above that same average. For example, the price ceiling buffer could be 30% above a 36 month rolling average, and the price floor buffer could be 20% below.

The following figure illustrates the concept using a retrospective look at crude oil, an infamously volatile energy commodity. The most important feature to observe in this illustrative analogy is that the updating price buffers allow market dynamics to evolve with changing technologies and a dynamic policy context over multiple decades.



Because a rolling average continuously *updates* the high and low price thresholds, they *buffer* the impact of a spike or a crash, giving appropriate policy responses an opportunity to develop. Using this simple formula, the price buffers would be negotiated as part of the climate legislation, and automatic updating of the buffer values would diminish uncertainty in the policy implementation.

By adapting to evolving market conditions, the updating price buffer provision eliminates the arbitrary nature of price cap definitions advanced in earlier proposals, and the chances of triggering an inappropriate price control event in a well-functioning carbon market is vastly diminished. As described in the following section, the proposal also combines the earlier "safety valve" concept with direct action to deliver immediate abatement and uses two new mechanisms to payback any additional permits issued at the high buffer price.

No "Banking While Borrowing" at the System Level

If the clearing price for auctioned allowances reaches the top price buffer, then additional demand could be met with an unlimited quantity of additional permits at that price. Because the nation would be obligated to meet long-term emissions targets despite a carbon price spike, any additional allowances issued would implicitly be borrowed from the future. If market participants increase their combined number of banked allowances while society is borrowing allowances from the future, then very little would be accomplished aside from *intergenerational theft*.

Because the number of banked allowances should <u>*never*</u> *accumulate during periods of system borrowing*, *all allowances issued in auctions that reach the maximum price should automatically expire in the same vintage year as issued*. This condition imposes on each bidder a risk that if they drive the price up to the maximum price, the allowances they buy could be worthless by the end of the year. This expiration rule alone ought to limit demand for allowances at the high price buffer to only those who really need them to meet a compliance obligation.

To be sure the accumulated bank of allowances in circulation has not increased while society was borrowing from the future during a price control event, any increase detected in the aggregate number of banked allowances in circulation during that vintage year should be deducted from the quantity scheduled for auction in the following year.

Two Ways to Reclaim Borrowed Allowances

The lower price buffer should be the reserve price for each carbon allowances auction, indicating that no allowances may be sold for less than that price. Any allowances that remain unsold would be committed to either (a) repay system-level debt incurred during prior price control events, or (b) remain in reserve as savings so the present generation can take responsibility for price control events without imposing on people in the future.

Even if price conditions never reach the lower buffer zone, allowances issued during a price control event can be reclaimed by striking allowances from an upcoming auction when the accumulated bank among market participants reaches a certain fraction of the total annual compliance obligation (e.g. 30%). Limiting the accumulated bank of allowances in circulation does not impose limits on the number of banked allowances held by individual market participants. In fact, managing slack in the supply of allowances is essential to maintaining a cap that is stringent enough to generate a meaningful price signal and drive actual abatement.

In summary, if the auction price reaches a certain threshold above a rolling average price[1], then:

- An unlimited number of current-year allowances could be issued at the high buffer price.
- *All* allowances in the auction would expire that vintage year to *prevent banking while borrowing*.
- Proceeds from the sale of extra allowances at the high buffer price could be committed to directly buy abatement that can be delivered quickly.
- The implicitly borrowed allowances could be recovered by striking allowances from the auction whenever (a) the reserve price at a lower price buffer is not met, or (b) there is a relative abundance of banked allowances, indicating slack in the market.

[1] The price buffers are calculated relative to the prevailing market price, and not for each vintage year separately. *Early auctions* (i.e. 2015 permits available for auction in 2013) would not have a high price buffer, but they would have a low price buffer.

Updating Price Buffers: Detailed Discussion

Policy Challenge: Design a market-based mechanism that establishes a price for the permission to emit greenhouse gases, *and* manages that price to contain costs.

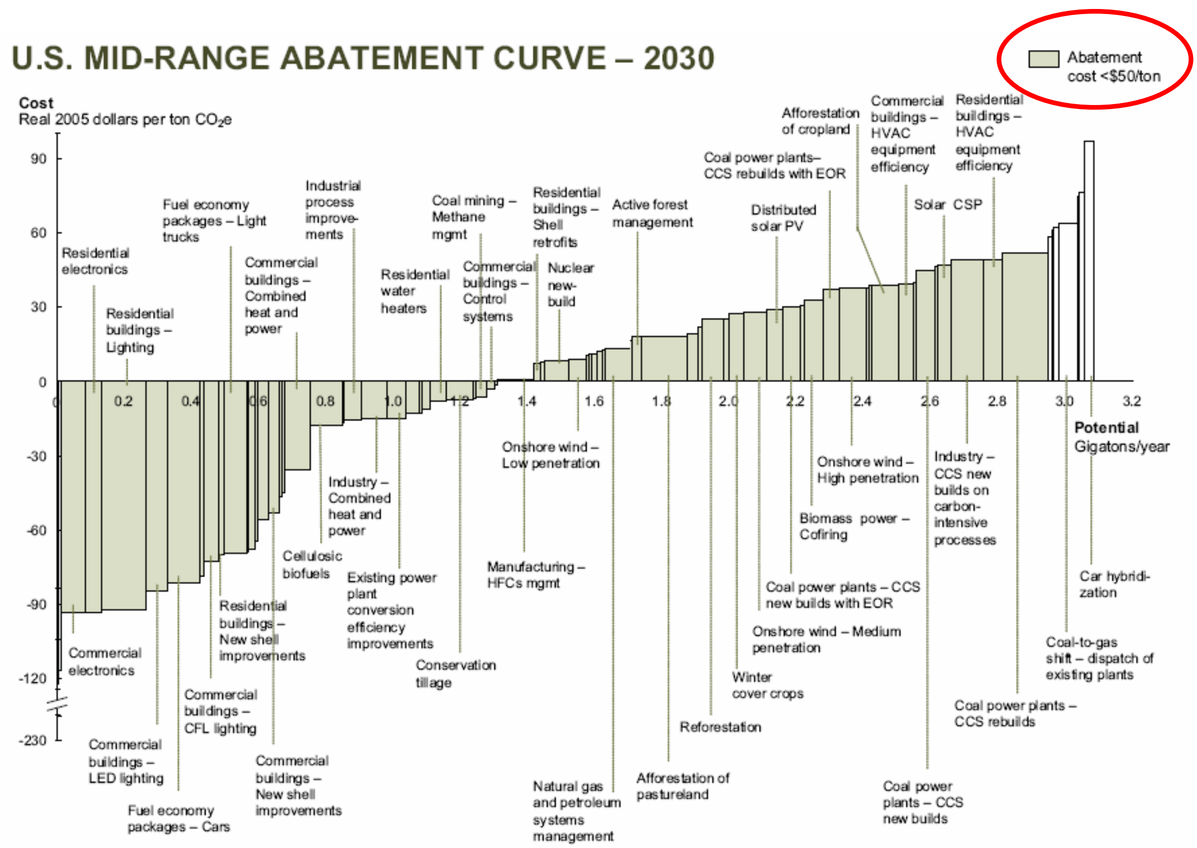
A carbon allowance market may yield prices that far exceed the actual costs of reducing carbon emissions. These conditions can arise for two reasons: market failures *outside* the allowance market block competitive opportunities for abatement, or failures *within* the allowance market itself distort prices. After briefly discussing the first type, *this memo focuses on the second*.

(1) Failures <u>outside</u> the carbon market block access to low-cost abatement opportunities

Examples:

- Monopoly power and barriers to entry in the electric power sector
- Split incentives between building tenants and landlords, or builders and owners
- Limited information on energy prices or usage obscures investment opportunities
- Inability to capture the full benefit of private investments in research

These types of failures result in carbon prices that are *generally higher* than should be necessary to reach annual reduction targets. The figure below illustrates a cost assessment of emission abatement opportunities, indicating that the market will pursue high cost abatement options in the absence of *complementary policies* that address market barriers to lower cost options.



Source: McKinsey analysis

If the market price persists at a high level (e.g. \$50/ton CO_2) while many low cost abatement options remain available, the appropriate response is to address market failures that are preventing those cost-effective reductions from being realized. For example, policies that remove market barriers and increase competition include improving access to the electricity grid, strengthening building codes, and increasing investments in research and development.

A generally high carbon price does not warrant manipulation of the price or quantity of allowances in the carbon market, which may be functioning well. Indeed, high carbon allowance prices in a functioning market serve as an indicator of *other* market failures, and higher proceeds from elevated prices in the allowance auctions should be committed to solutions to address them expeditiously (e.g. public investments that accelerate technological innovation and deployment).

If carbon prices are capped in response to generally high prices with no action on the underlying market failures outside the allowance market itself, it could be difficult and perhaps impossible to maintain the integrity of an economy-wide emissions cap.

(2) Failures <u>within</u> the allowance market distort the carbon price

Examples:

- Exercise of market power (e.g. hoarding or trading manipulation)
- Imperfect information about emissions, compliance obligations or offsets
- Government cap on the value of emission allowances below the cost of abatement

These types of failures result in carbon allowance prices that can either *spike or crash*, causing disruptive market conditions for everyone exposed to an economy-wide cap-and-trade policy. Two well-known examples of internal market failures include the electricity price spike in California due to exercise of market power by Enron, and the carbon allowance price crash in Phase 1 of the European Union Emissions Trading Scheme due to imperfect information about actual emissions.

A strong commitment to market transparency and oversight is the best protection. However, if regulatory oversight of the carbon market is inadequate, *the cap-and-trade policy itself should be protected* by a price control mechanism that can buffer price excursions while the source of the market failure is addressed and/or market participants respond to new conditions.

A price ceiling would protect fossil fuel users from being forced to shut down by sudden shortages in the market, and a price floor would protect clean energy investments from becoming stranded by a sudden glut in the market that suddenly makes polluting cheap.

Policy Design Criteria

- ☐ Credibly address the worst-case market failure concerns in climate policy negotiations
- ☐ Protect the economy against the effect of carbon price spikes and crashes
- ☐ Maintain the integrity of the emissions cap
- ☐ Update trigger values as market conditions evolve
- ☐ Avoid the uncertainty of undue political influence, litigation and delay for each update
- ☐ Preserve ability to link to other trading regimes that may not tolerate price control [2]
- ☐ Leverage surplus revenues in a way that does not depend on fast action from a bureaucracy with no long-term assurances.

Defining a "Too High" and "Too Low" with Updating Price Buffers

Buffer values are price thresholds at which government intervention is warranted to stem a price spike or put a floor under a price crash. Rather than establishing the price buffer values years before trading even begins, those values should be defined in the context of the prevailing price trend, which reflects technological innovation and recent market activity – not just politics and a series of economic assumptions at the time of a climate policy's enactment. The thresholds for intervention should be relative to the level of volatility the market can withstand and the underlying policy can endure.

Therefore, the trigger values can be defined with a simple expression involving the negotiation of only three terms: *period of prevailing price trend* and *scale of high & low price excursions*.

Price Ceiling = Average carbon price over *period of prevailing price trend* X (1 + *Scale of High Price Excursion*)

Price Floor = Average carbon price over *period of prevailing price trend* X (1 - *Scale of Low Price Excursion*)

For example, if the prevailing price trend were defined over 36 months and the scale of price excursion was 30% above and 20% below, the price buffers would be updated as follows:

Price Ceiling = Average carbon price over 36 months X (1 + 30%)

Price Floor = Average carbon price over 36 months X (1 - 20%)

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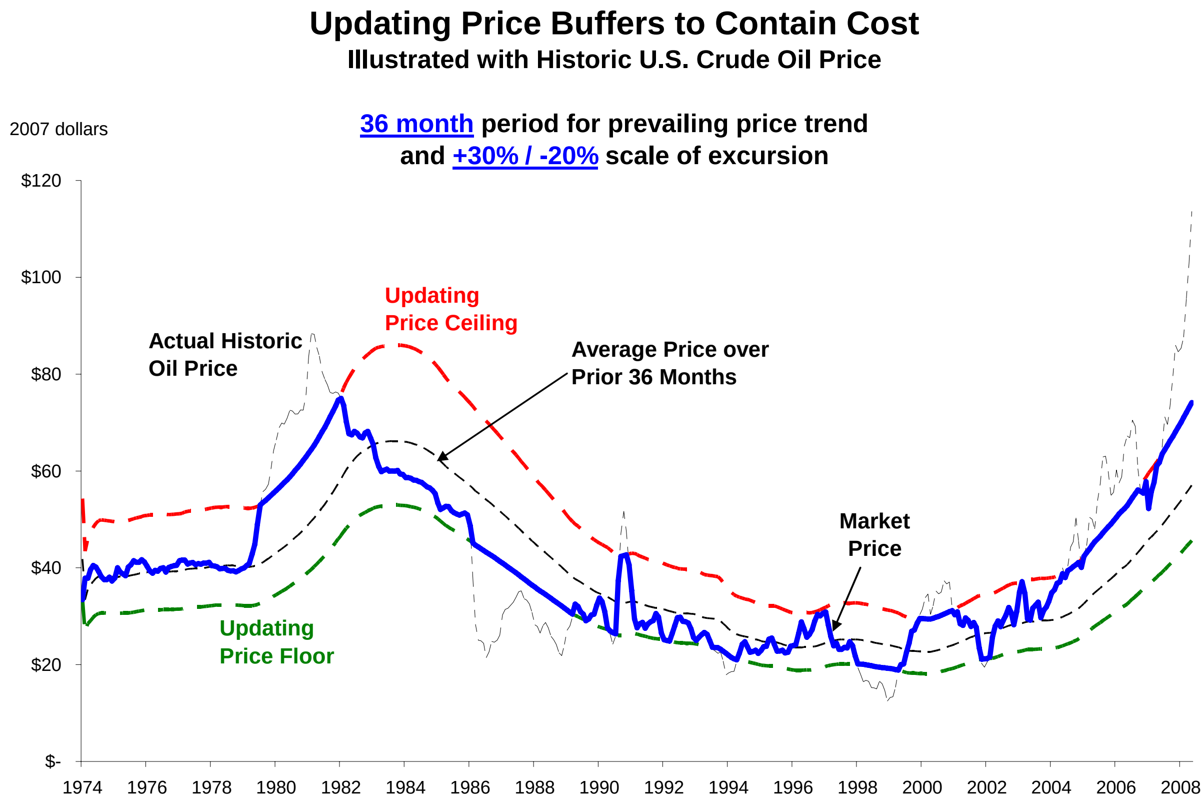
[2] Without reliable and enduring linkages to international trading systems, access to international offsets could be extremely restricted, which could actually increase the cost of the climate policy.

Using this example, the following figure shows the effect this mechanism would have had on the price history of crude oil, an infamously volatile commodity. The crude oil price history clearly shows periods of market failure characterized by market power exercised by OPEC in both the price spike in the late 1970's as well as the price crash in the early 1980's.



Oil price spikes and crashes mark American history – and the fortunes of both policies and products that deliver renewable energy and energy efficiency. In a federal carbon market, the U.S. government would be the monopoly supplier of pollution permits, making it entirely possible to buffer price spikes and crashes caused by external events. The updating buffer values allow prices to rise over time at a rate that does not stifle an important market signal but still moderates volatility.

Establishing Terms for Updating Price Buffers

Period for the rolling average

The duration of the rolling average price should only be long enough to establish a stable price trend because longer values causes the buffer to lag behind changes in market conditions. Therefore, a longer rolling average causes a longer lag. In the illustration above, this effect is apparent in the delayed surge in the price buffer after the price spike in the late 1970's. A shorter rolling average is more sensitive to market movements and provides shorter price visibility into "worst case" or "best case" scenarios.

Starting the rolling average

For the opening months of the carbon price market, the prevailing average price may be based on politically negotiated constants, such as $40 for a ceiling and $10 for a floor. The economic impact of these political decisions would diminish each month until the first full period of market data emerged. Alternatively, an existing carbon price signal generated by a cap-and-trade program of similar stringency could be used as a point of reference, such as the European Union's Emission Trading Scheme price.

High and Low Buffer Values

The scale of excursion for the price ceiling and floor do *not* need to be symmetrical. Because the carbon price should rise over time as scarcity increases, it may be desirable and defensible to set the scale of excursion for the floor as a tighter value (e.g. -20%) than the ceiling (e.g. 30%). This asymmetry would also permit the price control mechanism to be used to take advantage of low-price periods to develop a system-level bank of permits that could repay permits implicitly borrowed from future generations when the price is at the high buffer.

Price Control Action at the High Price Buffer

If the high price buffer value is reached, there are at least three different types of responses:

A) A **"safety valve"** response to high prices involves printing an unlimited number of additional allowances at the threshold price. As proposed in the Bingaman-Spector bill, the proceeds from sale of additional allowances would be committed to programs that accelerate technological development. However, this response is better suited to address the case of generally high prices, and a price spike calls for direct investment in immediate abatement options.

B) A **reserve-based** response would release a limited number of additional allowances at an unlimited price, which dampens a price spike. As proposed in the Lieberman-Warner bill, the additional allowances would be borrowed from future years, and there is no explicit method for repaying that debt.

C) An unlimited number of additional allowances would be available at the maximum price, and all would expire that year, relaxing demand from speculators without a compliance obligation. More importantly, this expiration prevents present-year polluters from effectively banking permits that have been borrowed from the future.

   Proceeds from the sale of additional permits at record high prices could be committed directly to addressing the source of the market failure as well as paying for immediate abatement through rebates or tax credits for consumer investments in energy efficiency.

Price Control Action at the Low Price Buffer

Alternatively, the low price buffer could help define when to repay the additional permits implicitly borrowed from the future when the price reached the high buffer. The low price buffer could serve as a reserve price, below which no bids would be accepted. Any permits not purchased at that price could repay the system debt, and if the balance is even, the permits could be saved for use as a reserve if the high price buffer were reached once again.[3]

The borrowed permits can also be repaid when the number of banked permits in the system exceeds a certain percentage of the annual economy-wide emission limit (e.g. 30% of the annual compliance obligation). Under these conditions, the supply of permits is abundant and market conditions are presenting an opportunity – and a need – to *take in slack* or effectively tighten the carbon constraint. The system authority should reduce the number of permits available in the next auction in order to induce the use of surplus banked permits instead.

Maintaining Integrity of the Economy-Wide Cap

All of the three price control actions described above imply that the current generation can borrow a large quantity of permits from a future generation. While the "safety valve" proposal does not obligate repayment, the other two proposals endeavor to maintain the integrity of the cap and its targets.

If the reserve price (i.e. the low price buffer) is not reached in any auction, the saved permits should be used to stock a system-level savings account.[4] Then if the high price buffer is subsequently reached, polluters would tap their own savings rather than impose on the future. *Under these conditions, the price control mechanism has the potential over time to be managed entirely within the current emissions cap.*

The original bargain in a cap-and-trade policy framework is to use a price signal rather than a regulator to drive the economy away from fossil fuels. If the price signal fails, it is perfectly valid to revisit this bargain and seek authority for additional command-and-control style abatement. Assuming that the cost of abatement has not spiked like the cost of carbon, there should be plenty of cost-effective abatement options available when the price escalates to a historic high.

If the high price buffer conditions persist, then proceeds from an auction should be at their highest level. That ought to generate a revenue stream that could fund "severance packages" to pay for direct closure of power plants with the highest carbon intensity. In addition to helping meet the current year target, these deals would also relax future market demand for permits.[5]

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[3] Alternatively, the permits could be permanently retired

[4] The savings account could also be stocked by permits reserved from the auction when the system-level bank is high (e.g. 30%), even if the price is above the low price buffer.

[5] The market value of the most carbon-intensive power plants ought to be declining over time under an economy-wide carbon constraint.

Advantages of Updating Price Buffers

In addition to satisfying all the criteria on page 9, this policy design has the following advantages:

1. It does not commit the future for decades to a decision made in the singular historical and political moment of legislative enactment.
2. It allows a politically negotiated price cap and floor to influence the first three years, with steadily diminishing influence.
3. It distinguishes between market failures within the carbon market and outside of it, which would indicate different types of appropriate policy responses.
4. It provides price floor protection for long-term investments in low-carbon energy technology.
5. Use of a price floor creates opportunities to repay system-level loans from the future made when the carbon price reaches a high buffer.
6. The rolling average basis for defining the market price trend provides some assurances about the upper and lower bound prices in near-term future market conditions.
7. The mechanism itself can be updated with a political negotiation of three simple primary terms – the *period of prevailing price* and the *scale of the high and low excursions*.
8. Political renegotiation of the terms of the policy is unlikely to have a disruptive impact on the trading price behavior at that time.
9. It avoids applying price controls inappropriately to address prices that are generally higher than expected based on modeling analysis or consistently higher than available abatement options.
10. The design addresses legitimate policy concerns, without dismissing them as so improbable to occur that the price control provision does not need full functionality.
11. International linkages with other trading regimes can be temporarily suspended under extraordinary market conditions without establishing rules that would categorically exclude the possibility of such linkages.
12. By establishing clear conditions for releasing additional permits, Congress is less likely to be called upon or provoked to re-open the larger cap-and trade bill for reconsideration.
13. When asked for the bottom line, the updating price buffer can be summed up as, “It doesn’t get worse than… XX% above the average price over the last three years, and we can hold onto the cap.”