RESOURCES *for the* FUTURE

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California Air Resources Board
1001 I Street
Sacramento, CA 95814

We are pleased to share the accompanying comments to the California Air Resources Board in response to the Joint Cap-and-Trade Program Workshop (in cooperation with Quebec) held on November 16, 2023.

The comment authors are researchers at Resources for the Future and the University of Virginia. Dallas Burtraw is the Darius Gaskins Senior Fellow at Resources for the Future (RFF) and serves as chair of the California Independent Emissions Market Advisory Committee. These comments are not submitted on behalf of the Committee. William Shobe is a Professor of Public Policy at the University of Virginia.

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If you have any questions or would like additional information, please contact us at the email addresses below.

Sincerely,

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Introduction

In the November 16, 2023, workshop, stakeholders were invited to comment on how cost containment features can reflect real-time valuation of allowance prices and be designed to enhance price stability.

> **Specifically, stakeholders were asked if California and Quebec should create a new mechanism where auction supply reflects recent settlement price(s), for example by adjusting the supply in response to auction settlement prices.**

We have participated with several other researchers in economics in developing a body of research that points to the general advantages of designing emissions markets so that the supply of emissions allowances responds to price.

In these comments, we describe the advantages of price-responsive allowance supply. Secondly, we discuss how program design can implement this approach in the cap-and-trade program.

We begin by noting that California's carbon market is already designed to adjust the issuance of new emissions allowances in response to the auction settlement price. The reserve price in the auction (the price floor) provides a minimum price at which allowances will enter the market. If the auction clearing price falls to the reserve price, the supply of allowances is constrained, thereby enforcing the price floor.

In a somewhat analogous fashion, the Allowance Price Containment Reserves provide a mechanism to expand allowance supply if market prices rise to support their sale. These allowances would be sold in a separate sale, also with a reserve price set at multiple price tiers.

These comments provide four findings:

1. We identify the advantages of the existing price-responsive features in the California program, including the advantages of the Allowance Price Containment Reserve.

2. We suggest that CARB should consider the addition of one (or more) additional price steps. We specifically describe the addition of an Emissions Containment Reserve.

3. We suggest a reform to the auction design that would improve its performance while implementing an Emissions Containment Reserve.

We suggest that CARB should consider reforming the way that allowances sold from the Allowance Price Containment Reserve enter the market. We describe how those allowances could enter the market through their integration into the primary quarterly auction.

1. Advantages to Preserving Cost Containment Price Steps in Allowance Supply

California's carbon market is inherently affected by uncertainty from factors including technological change, changes in fuel prices, and the interaction with other federal, state, and local actions that combine to change the demand for emissions allowances. If the supply of allowances does not adjust in the carbon market in response to changing demand and prices as it does in most other commodity markets, the carbon price will be more volatile.

The price steps in the California program include the price floor, the Allowance Price Containment Reserves (APCR), and the price ceiling. These price steps automatically adjust allowance supply in response to prices identified in the market. Moreover, price-responsive allowance supply implemented through the existing price steps improves price discovery, price stability, and the stability of revenue flowing into the Greenhouse Gas Reduction Fund (GGRF).

Changes in secular influences such as energy demand, fuel supply, or technological development can have an outsized effect on allowance prices in a market with a fixed supply of allowances. One reason is that compliance entities may not have liquidity to hold allowance banks or the expertise to prepare for market outcomes. Consequently, changes in exogenous factors may drive short-run price increases and price volatility that can be disruptive to economic activity.

Conversely, if sector-based policies in sectors affected by the carbon market are successful, they are likely to reduce demand for allowances. If allowance supply does not adjust, these policies will lead to declines in the allowance price *without an associated reduction in the available allowance supply or resulting emissions*. Perversely, the failure to adjust allowance supply in response to the beneficial climate efforts of other actors erodes and undermines those efforts.

Price-responsive allowance supply provides a mechanism for automatically adjusting the supply of emission allowances under conditions where the demand for allowances changes. Administrative intervention also can adjust market supply on a case-by-case basis during Scoping Plan or program reviews; however, this tends to propagate regulatory uncertainty and the expectation that one administrative intervention may foreshadow others, combining to undermine the confidence of actors in the stability of the market and the predictability of the investment climate. Price-responsive allowance supply implemented contemporaneously and in response to market changes revealed in the auction and allowance market reduces the need for administrative adjustments.

In summary, the existing price steps in the supply of allowances in the California market enhance program design by supporting price discovery, price stability, and revenue stability. These attributes provide support for protecting the price-responsive structure of allowance supply in the market. The existence of price steps is motivated by uncertainty about the pathway and cost of decarbonizing California. Within the broader climate policy portfolio in the state, the carbon market is especially useful in responding to unanticipated changes in behavior and technology. The introduction of an additional price step as an Emissions Containment Reserve would enhance this feature of the carbon market.

2. Advantages of Introducing an Additional Price Step (Emissions Containment Reserve)

Allowance supply in the California market has four price steps creating three asymmetric price zones for auctioned allowances. The price floor represents the minimum price at which an allowance will be sold; the price ceiling represents the maximum price. The Allowance Price Containment Reserve (APCR) is triggered at prices that are halfway between the floor and ceiling (Tier 1) or three-quarters of the way (Tier 2), as well as an additional reserve that is available at the price ceiling and potentially further supplemented by the sale of additional price ceiling units, which are non-tradable and non-bankable compliance instruments.

An asymmetry in the current market design applies because the step between the price floor and Tier 1 is twice the size (difference in allowance trigger prices) of the step between Tier 1 and Tier 2 or between Tier 2 and the price ceiling. This provides a focal point for an additional price step for an Emissions Containment Reserve to achieve symmetry in the allowance supply schedule.

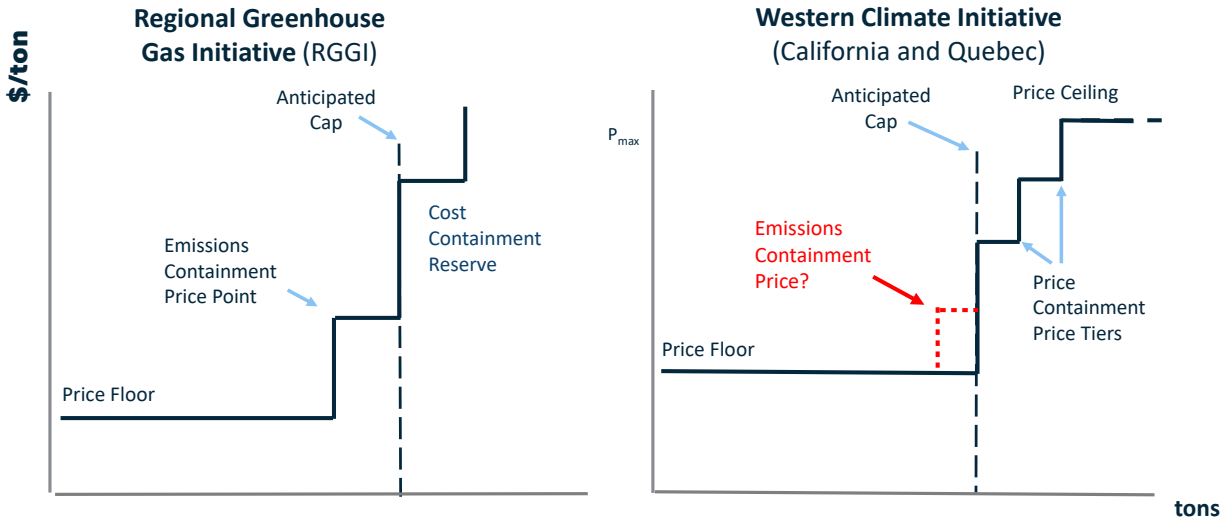
The APCR price steps stabilize the market and improve the identification of market equilibria in cases when the price might rise to those levels and correspondingly allowance demand is greater than anticipated in the initial organization of the allowance market. However, the market is less well prepared to accommodate declines in prices.

An Emissions Containment Reserve (ECR) could be implemented as an additional price step to restore symmetry to allowance supply in the market by adopting a price trigger one-quarter of the way between the price floor and the price ceiling (and one-half the way between the price floor and the APCR Tier 1). The ECR would apply to a portion of the allowances that otherwise are governed by the price floor. The ECR would be implemented in a strongly analogous way to the implementation of the minimum reserve price (price floor), which we describe below.

The structure of price-responsive allowance supply in the North American carbon markets is illustrated in the figure. The left panel represents the Regional Greenhouse Gas Initiative market design. In that market, approximately 10 percent of the allowances offered in an auction are described as the Emissions Containment Reserve and have a unique reserve price above the minimum reserve price known as the price floor.

The introduction of a similar Emissions Containment Reserve in the Westen Climate Initiative could provide symmetry to the market and a more continuous response of allowance supply. This feature is a general characteristic of supply in commodity markets. Supply generally adjusts to market prices, and this accelerates price discovery, stabilizes prices, and provides instantaneous guidance for investors. This attribute is not as apparent in the carbon market, and the introduction of an ECR is expected to improve market performance along these dimensions.

Figure 1. Price-responsive Allowance Supply in North American Carbon Markets



Observers may argue that an additional price step like the ECR is unnecessary because many expect prices to rise in the future to accommodate increasingly ambitious mitigation goals. As has proven the case in many other markets, including electricity, environmental, and resource markets in California, it is important to plan for the unexpected.

A concern of many stakeholders is uncertainty about allowance prices, and that prices may be higher than anticipated. In fact, allowance price declines below levels anticipated at the outset of the program have been common in emissions markets. However, the California carbon market is not well prepared to accommodate this type of allowance demand and price uncertainty. Given current market expectations, the implementation of an ECR is likely to be uncontroversial and easy to implement.

In automatically responding to slack allowance demand, the ECR has important value in shaping price expectations for the long run. In every important market for atmosphere resources (sulfur dioxide, nitrogen oxides and carbon dioxide) in North America and Europe, after initial price volatility representing uncertainty and hedging activities, prices have fallen to below expectations and often fallen in real terms.[1] Perhaps surprisingly, these periods of low prices rather than high prices have constituted the major challenge to the durability of these programs. In the long run, the interaction of the carbon market with other regulatory programs becomes important as compliance entities make investments that anticipate the state's long-term climate goals, and which are informed by the current and anticipated future carbon price. The ECR provides a guardrail against unexpected price declines, including potential price effects that may result from interactions of the carbon market with companion regulatory policies.

[1] Dallas Burtraw and Amelia Keyes, 2018, "Recognizing Gravity as a Strong Force in Atmosphere Emissions Markets," *Agricultural and Resource Economics Review,* 47(2): 201-219.

The purpose of the ECR is to accelerate emissions reductions when it is inexpensive to do so, and to reduce unnecessary market uncertainty (price volatility). Maintaining price stability will enhance the availability of auction proceeds directed at investments under the program. But in markets for commodities like emission allowances, the price reflects expectations about the long-run balance between supply and demand. Shifting the availability between periods or among market participants will not have significant effects on those expectations of scarcity, and hence will not have a significant or any effect on price volatility. To be most effective at reducing market uncertainty, the ECR must be designed to adjust long-run supply.

2.1. How Does an Emissions Containment Reserve Operate?

To guard against extreme price declines, it has become usual practice to have a reserve price in the allowance auction, which provides a price floor in the auction.[2] This means that the total number of allowances available responds to the market demand for allowances, just as one observes in commodity markets. In the Regional Greenhouse Gas Initiative (RGGI), the ECR adds a second reserve price, set at a level above the auction price floor, that applies to 10 percent of the allowances available for sale. Importantly, the ECR lowers price volatility by making automatic adjustments to allowance supply. This adjustment helps stabilize auction proceeds for program-related investments.

The performance of an ECR has been shown theoretically to improve emission market performance, and these results have been borne out in simulations, experiments, and actual practice.[3] The ECR is a design element of the RGGI program beginning in 2021 and has been identified by observers and researchers as a meaningful reform elsewhere.[4]

The addition of an ECR would provide an improvement in overall market design, strengthening assurances against backsliding if sector-specific regulations drive important emissions reductions. Further, the improved market design provides a stronger model for other states or the national government, addressing one of the goals of AB 32 to provide climate leadership.

In summary, the price floor and ECR combined with other potential price steps including Allowance Price Containment Reserves would create a price staircase that automatically adjusts supply in settling the allowance auction.

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[2] The EU Emissions Trading System has implemented a different mechanism called the Market Stability Reserve to accomplish similar goals.

[3] See: Dallas Burtraw, Charles Holt, Karen Palmer, and William Shobe, 2022, "Price-Responsive Allowance Supply in Emissions Markets," *Journal of the Association of Environmental and Resource Economics*, 9 (5): 851–884, **https://doi.org/10.7910/DVN/DHU5PM**, and Marc J. Roberts and Michael Spence, 1976, "Effluent Charges and Licenses Under Uncertainty," *Journal of Public Economics*, 5 (3-4): 193-208, **https://doi.org/10.1016/0047-2727(76)90014-1.**

[4] **2021 IEMAC Annual Report | CalEPA**

3. Implementation of Price-Responsive Allowance Supply Within the Auction

3.1. The Current Approach

The existing price steps in the California program are implemented in two different ways. The price floor is seamlessly integrated into the auction as a reserve price, which identifies the minimum acceptable bid in the auction. If demand is not sufficient to sell all the available allowances at the reserve price, then some allowances remain unsold, and a reduction in the allowance supply may result. This is the approach used also for the price floor and Emissions Containment Reserve in RGGI.

An APCR sale or price ceiling sale has not occurred in California, so this implementation approach has not been tested. In contrast to the price floor, however, if the auction price rises sufficiently to trigger the initiation of an APCR or price ceiling sale, the sale would occur separately from and likely several weeks after the close of the auction.

The separation of the APCR and price ceilings from the primary auction is motivated in part by the desire to limit access to these allowance reserves to compliance entities. Moreover, allowances from these reserves cannot be traded. Sales of price ceiling units cannot be traded or banked and must be deposited directly to the entity's compliance account.

Even if implemented as intended and without the influence of strategic behavior, the separation of the reserve sales from the primary auction raises the possibility of a disruptive pattern in allowance prices. With an allowance bank in existence and before prices approach the APCR Reserve price levels, and with full information about the program design, economic theory generally predicts that allowance prices will rise at the real opportunity cost of capital—known as the Hotelling path, which presumably is greater than the 5 percent real rate of increase in the price trigger levels for the allowance reserves. While the APCR Reserve allowances are available, the market price will remain at or at least strongly influenced by the APCR price trigger levels. If the allowance bank is not exhausted before the APCR Reserve is activated, then when the Reserve is exhausted, the allowance price is expected to snap back discontinuously to the Hotelling path. The potential cycling or discontinuity in a pattern of gradually increasing allowance prices could undermine market confidence.

Further, although strategic behavior is at least partly discouraged through prohibitions on trading APCR allowances, market participants nonetheless may have the incentive to take compliance or financial steps to arbitrage the difference between the APCR sale price and a recent auction price, the secondary market price, or the shadow price representing expected long-run prices along the Hotelling path.

The simultaneous presence of different measures of value for compliance activity generally poses a challenge to the implementation of the carbon market. It provides an unfortunate opportunity for strategic behavior among market participants who may seek to precipitate or take advantage of the price discontinuity. Such behavior will erode the efficiency and viability of the market and the signal for emissions reductions.

3.2. The Influence of Reserve Prices on the Greenhouse Gas Reduction Fund

Design choices about the introduction of an ECR could have a variety of consequences for the flow of auction proceeds to the state's GGRF. The Fund was created under AB 32 to direct cap-and-trade program proceeds toward investments to achieve long-term emissions reductions and benefit disadvantaged communities and low-income- communities and households. Current regulation directs all proceeds from the sale of allowances from the APCR to the GGRF.

The reduction in allowance supply when prices are low is expected to increase the overall financial value of emissions allowances, which is the product of allowance quantity and price. Consequently, in principle, the ECR could increase proceeds going to the GGRF, but could also reduce them if designed clumsily.

However, if the entire reduction in supply is implemented through a reduction in the supply of state-owned allowances in the auction, which represents roughly only one-half of total supply, then the value of proceeds flowing to the GGRF could fall even as the total value of allowance supply increases. This outcome would constitute a shift in value from the GGRF to recipients of freely allocated allowances.

Fundamentally at issue is whether a constraint on allowance supply is implemented across all channels through which allowances enter the program, affecting all sources of supply proportionately, or if it is implemented only through a reduction in state-owned allowances. In the latter case, GGRF revenues could fall if the ECR were activated.

3.3. An Opportunity for Improved Auction Design

The introduction of an ECR can be folded directly into the primary auction to achieve seamless integration and instantaneous equilibrium in allowance prices. For an operating example, one can look to the way the ECR is implemented in RGGI, where it is activated by a reserve price in the primary auction. If the auction clearing price is at or below the ECR trigger (reserve) price, then some portion or all the ECR allowances are not sold. This design has the considerable advantage of reducing the complexity of the auction provisions. However, as noted, this approach could erode revenues in the GGRF as the auction is currently designed.

We suggest the introduction of an ECR while preserving or enhancing the proceeds going to the GGRF would be best accomplished if it were to be accompanied by two program reforms to ensure the viability of the GGRF.

1. One is to remove the priority sale of utility consigned allowances in the auction. If reserve prices that reduce allowance supply are triggered in the auction, then all sources of supply in the auction would be adjusted proportionately.

2. The second is to require the consignment of all freely distributed allowances to the auction, with the revenues from their sale returning to their original owners. Entities that receive free allocation can submit bids to the auction to purchase allowances at a price that makes them indifferent. There are several advantages to the use of consignment to implement free allocation, including improved price discovery, transparency in the program, and creation of incentives within large organizations.[5]

[5] Dallas Burtraw and Kristen McCormack, 2017, "Consignment Auctions of Free Emissions Allowances," *Energy Policy*, 107: 337-344.

The parallel implementation of these two reforms would practically allow adjustments in allowance supply to be enforced across all channels through which allowances enter the market. Allowances could be held out of the market and introduced in a subsequent auction, or preferably, they could be immediately canceled as occurs in RGGI. In either case, the auction would instantaneously adjust market supply.

The auction revenue from the sale of consigned allowances accruing to entities could be adjusted in proportion to the overall change in allowance supply. The mechanism for doing so is the annual true-up in free allocation, which already adjusts for things like a change in economic activity among industries. To accommodate a change in allowance supply triggered by the ECR, entities that receive free allocation that is consigned to the auction would see an adjustment to their allocation in alignment with the automatic change in allowance supply implemented through annual program true-up.

4. An Opportunity for Improved Design of the APCR

California can take a further, valuable step in reforming the sale of APCR allowances by implementing their sale in the primary auction using reserve prices calibrated at the APCR trigger prices. This is the approach used in the implementation of an analogous Cost Containment Reserve in RGGI.

Currently, the APCR allowances are available at a fixed price. There is a fixed but substantial volume of APCR allowances at each price tier and the whole volume is available in any given sale. The allowances are only available to compliance entities. These features can be preserved by issuing the APCR allowances, if they are ever brought into the market, within the primary auction. The fixed sale price of the APCR price tiers serves as a reserve price in the auction. That APCR tranche of allowances would not enter the market at an auction clearing price below the price trigger.

The sale of APCR allowances to compliance entities can be accommodated within the auction software by designating the availability of APCR allowances to be available only to compliance entities, and dynamically adjusting the supply stack accordingly. Bids from compliance entities that are above the APCR trigger price would be satisfied with APCR allowances at the APCR tier price. The remaining bid stack would be adjusted accordingly, and the price in the primary auction could rise above the APCR price if there is sufficient demand.

A different approach is possible if the program goal is to restrict access to the APCR to compliance entities and to discourage activity from noncompliance entities. In this case, if the market reaches high prices, then the maximum bids from noncompliance entities could be constrained or reset to be the APCR trigger price.

Conclusion: Addressing the Directive of AB 32

A directive of AB 32 was for California to provide leadership in addressing the climate challenge. To this end, the introduction of an Emissions Containment Reserve in California would have influence outside the state. It would set an important precedent for other states potentially joining in the regional Western Climate Initiative emissions market. Washington state has an ECR built into its program, although it is suspended. The introduction of an ECR in California sets expectations for discussions across jurisdictions and provides a positive example that could propagate to other jurisdictions and strengthen climate policy generally. By mirroring the direction of program development in RGGI, and incrementally improving the program, this reform in California would set the stage for a well-designed program in other states or nationally.