

November 12, 2025

California Air Resources Board
1001 I Street
Sacramento, CA 95814

Comments for the October 29, 2025 [Cap-and-Invest Workshop](#)¹

Affordability and Cost Containment

Two issues for consideration in assessing Cap-and-Invest costs are (1) the distinction between short-term and long-term costs (and the tradeoff between them), and (2) the cost of price volatility (e.g., in terms of investment risk premiums incurred by compliance entities).

At the outset of the Cap-and-Trade Program, CARB instituted a price floor, which addressed both of these issues. The price floor increased near-term compliance costs, but likely reduced long-term costs by incentivizing early action. (California achieved its 2020 emission reduction goal four years early as a result of the price floor.) The price floor also provided a measure of price stability, which was conducive to long-term investments in decarbonization.

The IEMAC has advocated for an [Emissions Containment Reserve \(ECR\)](#)², which would similarly incentivize accelerated emissions reduction and help stabilize market prices. CARB [has been dismissive](#)³ of the IEMAC's proposed ECR because it "could increase compliance costs." But as in the case of CARB's original price floor, it could also provide benefits that outweigh the costs. Even if future prices are expected to be well above the floor, implementing an ECR or a higher price floor would convey an indication of political will and commitment that would give investors increased confidence in the future of carbon markets.

Assessments of Cap-and-Trade costs and affordability, revenue projections for the GGRF and programs such as HSR, and the likelihood of meeting statutory emission targets all rely on allowance price modeling. Realistic and reliable modeling could provide helpful market guidance and inform regulatory policy. However, the modeling results presented at CARB's November 16, 2023 workshop only created confusion and

¹ <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/cap-and-trade-meetings-workshops>

² <https://calepa.ca.gov/wp-content/uploads/2025/02/2024-ANNUAL-REPORT-OF-THE-IEMAC-final.pdf#page=43>

³ https://climatechangepolicies.legislature.ca.gov/system/files/2025-02/jlcccp_carb_2_26_25.pdf#page=13

uncertainty about the future direction of California's carbon market. Jim Bushnell presented results of a UC Davis allowance modeling study that showed allowance prices [at the ceiling](#)⁴ in the 2030-2040 time frame, implying that the cap would be breached. But CARB staff stated in the workshop that the UC Davis modeling "does not reflect what we expect or what we're forecasting prices to be in the real world." CARB could help mitigate market uncertainty by resolving the discrepancy between its assessment and that of UC Davis. (For the record, I have attached herewith my correspondence with CARB on this matter.)

It should be noted that Jim Bushnell's November 27, 2023 Energy Institute blog, "[California's Cap-and-Trade Market Enters its Teen-Age Years](#),"⁵ also showed allowance prices at the ceiling in 2025. (They have so far been [near the floor](#)⁶ this year, but the modeling suggests that prices will quickly rise in forthcoming auctions.)

CARB similarly tried to project allowance prices at the outset of the Cap-and-Trade Program. Its original price expectations are detailed in the [Cap and Trade 2010](#) rulemaking, [Appendix N](#) (Economic Analysis). The report notes the following on page N-12:

In 2010, ARB conducted a joint analysis of the AB 32 Climate Change Scoping Plan with Charles River Associates and Professor David Roland-Holst of the University of California Berkeley. The estimated price of CO₂ in these three analyses ranged from about \$20/MTCO₂e to \$100/MTCO₂e in 2020. ... staff believes that the 397 million cumulative metric ton reduction requirement is likely to be met at an allowance price that falls within the range of \$15/MTCO₂e to \$30/MTCO₂e in 2020.

As indicated in Table N-7, the \$15-30 range is in 2007 dollars, which translates to \$19-38 in 2020 dollars with inflation. Actual auction settlement prices in 2020 were very close to the price floor of \$16.68, even with additional demand from banking.

Rather than trying to forecast future allowance prices, a useful modeling exercise would be to estimate how the carbon market might have evolved if the price floor had, at the outset, been set at a level more consistent with price expectations (e.g., around \$30 in 2020). Starting from that base, how would carbon prices have been expected to evolve in the 2030-2045 time frame and how might future costs have been impacted by proactive early action? This type of modeling exercise could help inform policy choices relating to the price floor or ECR going forward.

⁴ https://ww2.arb.ca.gov/sites/default/files/2023-11/nc-combinedSlides_Nov162023.pdf#page=34

⁵ <https://energyathaas.wordpress.com/2023/11/27/californias-cap-and-trade-market-enters-its-teen-age-years/>

⁶ <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-data/cap-and-trade-program-data-dashboard#Figure2>

Ken Johnson
Legislation and Public Policy Committee
Climate Reality Project: Silicon Valley Chapter

Attached: Correspondence with CARB relating to allowance price modeling

Subject: Re: SB 596, new legislation
From: Kenneth Johnson <ken@kjinnovation.org>
Date: 11/10/2025, 11:03 AM
To: "Garcia, David@ARB" <david.garcia@arb.ca.gov>

David,

Thank you for the clarification. Re "The model results should not be viewed as projections or expectations of market prices ...," this raises the question of what was the purpose or benefit of disclosing the model results to the public, or of relying on the UC Davis work for the development of the staff proposal for a rulemaking. I would add the following notes:

The Nov 2023 workshop presentation made the following disclaimer (Slide 13): "They [the Modeling Exercises] do not constitute a forecast or an opinion of the Québec or California governments, but rather a projection of how the market might evolve in response to various potential measures that may or may not be implemented."

UC Davis presented "Allowance price projections" (Slide 15) based on a "Statistical Forecast Model" (Slide 18).

[https://ww2.arb.ca.gov/sites/default/files/2023-11/nc-combinedSlides_Nov162023.pdf]

Investment advisors cite CARB's modeling results and the Nov '23 Workshop in their market forecasts, e.g., see the Sept 30, 2025 KraneShares webinar, "California Extends Cap-and-Trade: What Investors Need to Know" (Slide 13)
<https://kraneshares.com/webinars/california-extends-cap-and-trade-what-investors-need-to-know/>

Ken

On 11/10/2025 9:21 AM, Garcia, David@ARB wrote:

Hi Ken,

The purpose of the modeling presented at the November 2023 workshop was to inform thinking by clarifying relative differences in modeled scenarios. The model results should not be viewed as projections or expectations of market prices due to uncertainties that were underscored during the workshop. As the market operator, CARB does not project market prices and does not comment on third-party projections of market prices.

Jim Bushnell was authorized by CARB to post his 11/27/2023 Energy Institute blog, which we see as consistent with his 11/16/2023 workshop presentation.

CARB program staff are currently working with CARB's legal team to *consider* a short public statement about how we handle market-sensitive information.

Best,



David Ernest García, Ph.D. (he/him)
LEGISLATIVE DIRECTOR
Office of Legislative Affairs
California Air Resources Board
1001 I Street, Sacramento, CA 95814-2828

From: Kenneth Johnson <ken@kjinnovation.org>

Sent: Thursday, November 6, 2025 7:52 PM

To: Garcia, David@ARB <david.garcia@arb.ca.gov>

Cc: Sippola, Mark@ARB <Mark.Sippola@arb.ca.gov>; James Bushnell <jbbushnell@ucdavis.edu>

Subject: Re: SB 596, new legislation

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Thanks, David. I also got some feedback from Mark Sippola on this issue. (Nov 5 email: "CARB has strict internal protocols on how to store and access market-sensitive data. We do not publicly provide those internal protocols. CARB worked with former federal regulators and federal and state agencies on the development of these tools and policies.") Also, Jim Bushnell has previously indicated his contractual limitations. (12/6/2023 email: "... since this is ongoing work under contract to ARB I'm not authorized to discuss it one on one.")

Obviously, CARB cannot authorize disclosure of market-sensitive information to individual members of the public or parties who might potentially use such information to gain a market advantage. That concern would not apply to information that is broadly disseminated to the public, such as the UC Davis presentation at the 11/16/2023 workshop, which was evidently authorized. Jim Bushnell also presented market analysis results in a 11/27/2023 Energy Institute blog (<https://energyathaas.wordpress.com/2023/11/27/californias-cap-and-trade-market-enters-its-teen-age-years/>), which was similar to but not entirely consistent with the workshop presentation. (Was that public disclosure authorized or required to be authorized by CARB under the UC contract?)

CARB could help to provide market stability by providing meaningful price scenario projections. But the seemingly unresolved discrepancy in the UC Davis modeling and CARB's assessment in the Nov 2023 workshop that the modeling "does not reflect what we

expect or what we're forecasting prices to be in the real world" only exacerbates market uncertainty. It also raises questions about whether cap targets will be achieved, and creates difficulties for C&I revenue forecasting.

I am confused by your responses, which appear to indicate that the UC modeling results are informing staff's development of a rulemaking proposal, even though CARB made it clear in the Nov 2023 workshop that it does not have confidence in the results and the effect of CCS on market prices was not subsequently assessed.

Can you say anything about what CARB's policies are with respect to authorizing broad (not selective) public disclosure of market-related information such as the UC Davis modeling, CARB's own modeling ("what we're forecasting prices to be in the real world"), and any resolution of the discrepancies between alternative models?

(I might summarize some of the information from this email thread in a public comment letter for the 10/29 C&I workshop.)

Ken

On 11/6/2025 3:47 PM, Garcia, David@ARB wrote:

Hi Ken,

I had our legal team review the contract. Yes, Jim Bushnell as contractor is subject to standard terms applicable to contracts with the UC, which include confidentiality provisions. He would not be able to discuss anything that CARB has deemed confidential.

The contract end date was June 30, 2025. CARB did not update the modeling needed for the rulemaking.

The current rulemaking—informal processes since 2023—is the only rulemaking CARB staff has been working on. Given the passage of AB 1207 and SB 840, staff will now shift to refocus the informal work to date to reflect new direction in statute.

Best,



David Ernest García, Ph.D. (he/him)
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From: Kenneth Johnson <ken@kjinnovation.org>
Sent: Thursday, October 23, 2025 9:46 AM
To: Garcia, David@ARB <david.garcia@arb.ca.gov>
Subject: Re: SB 596, new legislation

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David,

Is Jim Bushnell under any restriction from publicly disclosing or discussing the allowance price modeling work that UC Davis did under CARB contract?

Ken

On 10/21/2025 10:57 AM, Kenneth Johnson wrote:

David,

What was the contract completion date, and did UC Davis do any additional modeling work under CARB contract after the November 2023 workshop?

Which rulemaking proposal is being informed by the UC Davis work, and is it being informed by any unpublished modeling work?

Ken

On 10/21/2025 10:50 AM, Garcia, David@ARB wrote:

Ken,

The UC Davis contract was completed on time and as expected, and the work is informing the development of the staff proposal for a rulemaking. There was not any additional modeling conducted to assess the impact of CCS on market prices, and CARB has not published any additional work performed under the contract since the November 2023 workshop.

Best,



David Ernest García, Ph.D. (he/him)
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From: Kenneth Johnson <ken@kjinnovation.org>
Sent: Monday, October 20, 2025 8:54 PM
To: Garcia, David@ARB <david.garcia@arb.ca.gov>
Subject: Re: SB 596, new legislation

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David,

Did UC Davis continue its contract work with CARB on allowance price modeling after the Nov 16, 2023 C&T Workshop, and have any of its subsequent modeling results been published?

Ken

On 10/16/2025 2:20 PM, Ken Johnson wrote:

David, following up on question 4 I would like to get some clarity on what kind of information CARB is able to provide to the public regarding C&T market forecasting.

CARB can and has provided extensive information on market forecasting, particularly in the [Nov 16, 2023 C&T Workshop](#). My understanding is that CARB is only limited in providing such information selectively, or in advance of public dissemination, to parties who might be able to gain a market advantage from insider information.

Would CARB be limited in providing information (e.g., in response to a CPRA request) not on projected market prices, but on whether CARB has been and is continuing the modeling work and on what purposes such modeling work is being used for and why it has not been publicly disclosed?

The modeling projections would be of interest to the legislature, LAO, and IEMAC, in addition to the general public, and could potentially influence future legislation.

A central concern raised by the UC Davis work reported by Jim Bushnell in the Nov 16, 2023 workshop is whether California will be able to achieve its statutory emission targets. Most of the modeling scenarios studied by UC Davis had allowance price projections at the ceiling in the 2030-2040 time frame, implying that the cap would be breached. Other issues of concern relating to market forecasting are cost containment, GGRF revenue, and impact on SB 596.

Rajinder Sahota asserted that the UC Davis results were not realistic, and that prices would not be expected to go up to the ceiling, because the modeling did not include CCS. She said the UC Davis modeling "does not reflect what we expect or what we're forecasting prices to be in the real world." She did not elaborate on what prices CARB was forecasting or what modeling its forecast was based on.

Jim Bushnell did not think the impact of CCS would be significant, but he indicated that they would definitely be looking at it. That seemed to imply that the UC Davis work with CARB would be continuing.

Can you tell me generally what happened with the UC Davis contract and whether there was any resolution to the question of whether CCS would be expected to keep prices below the ceiling? Has CARB published any modeling projections subsequent to the Nov 16, 2023 workshop?

I've copied below some notes from the workshop that highlight Jim's and Rajinder's statements on this topic.

Ken

Nov 16 2023 C&T workshop recording

<https://youtu.be/Tlgpyz3X0Zw?t=1846>

@30:46

Jim Bushnell

"So for example, CCS, where you continue to combust fuel but you capture emissions on the back end, would not be part of this calculation. We're implicitly assuming that those costs are above the price ceiling here and so we're not getting that kind of abatement at least in our calculations."

<https://youtu.be/Tlgpyz3X0Zw?t=2809>

@46:49

Jim Bushnell

"... Most of the other scenarios where we're withdrawing allowances from the current regulation end up increasing prices to the price ceiling. In 2030 almost all of those scenarios give us prices at the ceiling in 2030, and then almost of the scenarios basically just follow the price ceiling up through 2040 ..."

<https://youtu.be/Tlgpyz3X0Zw?t=4262>

@1:11:02

Rajinder Sahota

"... there's an important part of the caveats in the slide decks that is worth remembering, and that is that we don't include CCS right now or some of the other abatement options that could be there once we start to develop the 905 program. And so CCS is coming in at about \$60 per ton. That was before we included any of the federal incentives that have come into force and in the last probably two years from the IRA and other funding opportunities and tax incentives. And so we have always been clear since the 2022 Scoping Plan that we are going to need CCS, we're going to need direct air capture to hit that second target in AB 1279 which is the 85% below 1990 levels. And so the sectors captured by the Cap-and-Trade Program are the right facilities and the prime facilities where CCS would apply. And if that's coming in at a lower abatement cost there's other options to actually reduce emissions that don't push you up to that ceiling or those higher tiers as quickly as what the modeling is showing right now in the initial results that Jim presented. So I think it's really important as you're

looking at this, at the results that Jim presented to keep in mind that there is a big part of the climate portfolio that is not being represented here, and that is SB 905 that went hand in hand with AB 1279."

<https://youtu.be/Tlgpyz3X0Zw?t=4727>

@1:18:47

Rajinder Sahota

"In terms of the price ceiling and that the modeling showed that we get up there by in the mid of the next decade, again I want to make sure that we are all on the same page and understanding that the modeling is indicative and comparative of the different scenarios that we're looking at and the magnitudes across those scenarios but it does not reflect what we expect or what we're forecasting prices to be in the real world."

<https://youtu.be/Tlgpyz3X0Zw?t=5388>

1:29:48

Jim Bushnell

"... we will definitely take a look at CCS and think about how that would influence it. I mean we can sort of look at the degree of shortfalls from those supply-demand graphs and you can kind of mentally adjust by the quantity you think CCS might provide to kind of get a sense of how meaningful it might be for one of those scenarios. I will say that there is a lot of reductions already in a lot of industrial sectors coming from other channels, that is the reduction in the use of transportation fuels is feeding back and reducing emissions from the refining sector and other things. Those calculations are in there and so to the extent that the overall emissions are lower, the amount to be captured by CCS is also lower. And that might kind of mute exactly how much CCS might provide. But it's something we would definitely want to look at."

On 10/14/2025 11:00 AM, Garcia, David@ARB wrote:

Moving Mark off this chain since it is inappropriate to have CARB program staff on emails regarding proposed legislation

Hi Ken,

This inquiry touches on a market program with federally overseen secondary market activity. We are not allowed to comment on the future revenue from the program. Additionally, we are not in a position to validate external analyses, especially if it would require staff to conduct a new analysis and divert them from their current assignments. We often receive these types of requests, but we have no capacity to respond to them. We must focus our resources on implementing programs.

1. That is incorrect. Please see the definition of “cement” in the [current C&T Regulation](#).
2. This is outside the scope of CARB's current work.
3. This is outside the scope of CARB's current work.
4. As noted above, federal regulations preclude CARB from advising individuals on the subject matter of this question as it requires forecasting of market behavior.
5. This is outside the scope of CARB's current work.

Best,



David Ernest García, Ph.D. (he/him)

LEGISLATIVE DIRECTOR

Office of Legislative Affairs

California Air Resources Board

1001 I Street, Sacramento, CA 95814-2828

From: Ken Johnson <ken@kjinnovation.org>

Sent: Monday, October 13, 2025 3:56 PM

To: Sippola, Mark@ARB <Mark.Sippola@arb.ca.gov>

Cc: Garcia, David@ARB <david.garcia@arb.ca.gov>; Branson, Ken <Ken.Branson@sen.ca.gov>; Spahnn, Leslie <leslie.spahnn@sen.ca.gov>

Subject: SB 596, new legislation

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Mr. Sippola,

I have approached legislative staff with a potential bill proposal to require that Cap-and-Trade revenue raised from the cement industry be used for cement decarbonization pursuant to SB 596. The initiative would need to be undertaken in consultation and coordination with CARB. I have some general questions about the potential of Cap-and-Trade to support SB 596 objectives (with or without the proposed legislation), and also about the potential impact of the proposed cement set-aside on other GGRF-funded programs:

(1) It is my understanding that under CARB's output-based allocation of Cap-and-Trade allowances, zero-carbon cement producers would qualify for the same output-based allocation as incumbent producers even if they have no compliance obligation. Is that correct?

(2) Under that premise, and using cement market data from 2019 and assuming a \$100/ton-CO₂e allowance price in 2030, I estimate that California cement producers would incur a \$69 per ton-cement allowance cost (on average) without free allocation. But based on CARB's [output-based allocation formula](#), incumbents would incur a cost of only \$13 per ton-cement, while a zero-carbon new market entrant would receive a subsidy of about \$56 per ton-cement. Has CARB made any economic estimates of projected zero-carbon cement subsidies from Cap-and-Trade, and do you have any information contrary to my estimates?

(3) The preceding estimates are based on a [Cap Adjustment Factor \(CAF\) of 0.756](#) and a cement [Benchmark of 0.742 ton-CO₂e per ton-cement](#). About 75% of cement allowances would be freely allocated in 2030; the remaining 25% would be purchased and the revenue would be deposited in the GGRF. I estimate that the annual GGRF contribution from cement in 2030 would be about \$150 million (again based on 2019 market data and a \$100/ton-CO₂e carbon price). Does CARB have any information contrary to this estimate?

(4) Cement accounts for about 2% of statewide emissions and the cement

industry currently pays for 16% of its allowances (at a CAF of 0.841 in 2025). About half of the allowance allocation is currently auctioned, and 65% of auction revenue is continuously appropriated while 35% is legislatively appropriate through the annual budget. I estimate that moving the cement contribution into a continuous appropriation (for SB 596) would reduce the annual legislative appropriation by 1.8%. By comparison, the market variation in allowance prices amounted to 13% in 2025 Q1-Q3, and 38% in 2024. Do you see any errors in those revenue and market volatility numbers?

(5) CARB reports [\\$/MTCO2e cost estimates](#) for all GGRF-funded programs (except HSR) in the annual California Climate Investments report. Has CARB estimated the comparative \$/MTCO2e cost of sustainable cement investments?

Thank you for your attention to this query.

Ken Johnson
Legislation and Public Policy Committee
Climate Reality Project - Silicon Valley Chapter