RESEARCH NOTE

Ready, fire, aim:
ARB's overallocation report misses its target

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Executive summary

ARB's April 2018 Staff Report fails to "[e]valuate and address concerns related to overallocation" in the cap-and-trade program, as required by AB 398. Despite widespread concern that overallocation could cause emissions to exceed California's legally binding 2030 limit, the Report does not actually analyze this key question. More troublingly, the Report makes a fundamental methodological error that ARB specifically warned against in its original 2010 cap-and-trade regulatory process; once corrected, the Report's method leads to the conclusion that overallocation will cause the state to exceed its 2030 emissions limit.

Introduction

Last year's cap-and-trade extension bill, AB 398, directs the California Air Resources Board (ARB) to "[e]valuate and address concerns related to overallocation in the state board's determination of the number of available allowances for years 2021 to 2030, inclusive, as appropriate."[1] Allowance overallocation is a critical issue because it could undermine the effectiveness of the cap-and-trade program. ARB's 2017 Scoping Plan calls on the cap-and-trade program to deliver over 45% of the annual GHG emission reductions needed to achieve California's 2030 climate target.[2]

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1 Cal. Health & Safety Code § 38562(c)(2)(D) (as added by AB 398).

2 ARB, California's 2017 Climate Change Scoping Plan (Nov. 2017) at 26 (Table 2) (indicating that regulations are expected to reduce GHG emissions by 69 $MMtCO_2e$ in 2030 under the Scoping Plan Scenario), https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf; *id.* at 30 (indicating that the cap-and-trade needs to reduce another 60 $MMtCO_2e$ to achieve the SB 32 target for 2030). The share that cap-and-trade must contribute (60 $MMtCO_2e$) is 46.5% of the total reductions required relative to business-as-usual emissions in 2030 (60 + 69 = 129 $MMtCO_2e$).

As the Legislative Analyst's Office (LAO) has explained, overallocation could put the state's 2030 climate target at risk by potentially enabling market participants to bank excess allowances not needed in the program's initial phase for use in later years.[3] If too many allowances are banked, future emissions could exceed program budgets, undermining the cap-and-trade program's intended role as a "backstop" state climate policy. Allowance overallocation (also called oversupply) has been discussed extensively in independent expert reports,[4] in the media,[5] at ARB's public workshops,[6] in public comment letters to ARB,[7] in legislative committee hearings attended by ARB Chair Mary Nichols,[8] and in legislative committee reports.[9]

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3 LAO, Cap-and-Trade Extension: Issues for Legislative Oversight (Dec. 2017), http://lao.ca.gov/Publications/Report/3719.

4 *See*, *e.g.*, Environmental Commissioner of Ontario, Ontario's Climate Act: From Plan to Progress – Appendix G: Technical Aspects of Oversupply in the WCI Market (Jan. 2018), https://eco.on.ca/reports/2017-from-plan-to-progress/; Chris Busch, Oversupply Grows in the Western Climate Initiative Carbon Market, Energy Innovation Report (Dec. 2017), http://energyinnovation.org/wp-content/uploads/2018/02/WCI-oversupply-grows-February-update.pdf; Danny Cullenward & Andy Coghlan, Structural oversupply and credibility in California's carbon market, *Electricity Journal* 29: 7–14 (2016).

5 *See*, *e.g.*, Herman K. Trabish, Is cap and trade the climate solution? The jury's still out, *Utility Dive* (Jan. 19, 2018), https://www.utilitydive.com/news/is-cap-and-trade-the-climate-solution-the-jurys-still-out/514747/; Justin Gillis and Chris Busch, A Landmark California Climate Program Is in Jeopardy, *The New York Times* (Dec. 12, 2017), https://www.nytimes.com/2017/12/12/opinion/california-climate-program-emissions.html.

6 ARB hosted informal workshops on potential AB 398 implementation strategies on March 2, 2018, and April 26, 2018, documents available at https://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm.

7 *See*, *e.g.*, comments on ARB's March 2, 2018, workshop from NextGen California, California Environmental Justice Alliance, the Natural Resources Defense Council, and Near Zero, https://www.arb.ca.gov/lispub/comm2/bccommlog.php?listname=ct-3-2-18-wkshp-ws.

8 Joint Legislative Committee on Climate Change Policies (JLCCCP), 2030 Target Scoping Plan (Jan. 4, 2018), http://climatechangepolicies.legislature.ca.gov/previous-hearings; Senate Environmental Quality Committee (SEQ), California's Cap-and-Trade Program: The Air Resources Board's 2018 Scoping Plan (Jan. 17, 2018), http://senv.senate.ca.gov/informationalhearings.

9 JLCCCP Oversight Hearing Background Document: 2030 Target Scoping Plan (Jan. 4, 2018),

In April 2018, ARB staff released a report (hereinafter, the "Post-2020 Caps Report" or "the Report") that provides the Board's first official response to AB 398's statutory direction to evaluate and address concerns related to overallocation.[10] The Report suffers from two major shortcomings.

First, despite the clear concern that overallocation could undermine the state's 2030 climate target, the Report makes no inquiry into the impact of overallocation on *annual* emissions in 2030. Instead, the Post-2020 Caps Report calculates the *cumulative* balance of projected emissions and compliance instrument budgets for the years 2021 through 2030, from which Board staff infer the cumulative greenhouse gas (GHG) emission reductions attributable to cap-and-trade. The Report does not analyze what is likely to happen in 2030 and therefore does not address the primary risk from allowance overallocation.

Taking overallocation risks seriously requires significantly more analysis than what ARB has provided. On this basis alone, the Post-2020 Caps Report does not provide a reasoned basis for satisfying AB 398's requirement to "[e]valuate and address concerns related to overallocation."

Second, the Report makes a fundamental error in its calculations that undermines its own conclusions. Specifically, the Report misses a key step in estimating emissions subject to the cap-and-trade program that ARB identified in 2010 as essential to any analysis of overallocation (see Appendix).[11] Once the Report's mistake is corrected—using the same method of adjustment the Board used in its original 2010 cap-setting regulatory process—ARB's own methods show that overallocation will cause the cap-and-trade program to deliver significantly fewer emission reductions than what is

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http://climatechangepolicies.legislature.ca.gov/previous-hearings; SEQ, California's Cap-and-Trade Program: The Air Resources Board's 2017 Scoping Plan – Background Document (Jan. 17, 2018), http://senv.senate.ca.gov/sites/senv.senate.ca.gov/files/hearing_background_final.pdf.

[10] ARB, Supporting Material for Assessment of Post-2020 Caps (Apr. 2018), https://www.arb.ca.gov/cc/capandtrade/meetings/20180426/carb_post2020caps.pdf.

[11] ARB, 2010 Cap-and-Trade Regulation, Staff Report: Initial Statement of Reasons (October 28, 2010), Vol. 1, Appendix E: Setting the Program Emissions Cap, at E7 through E-8, https://www.arb.ca.gov/regact/2010/capandtrade10/capv3appe.pdf.

called for in the 2017 Scoping Plan. Thus, the error undercuts staff's conclusion that an overallocated cap-and-trade program "achieves [the] reductions needed to meet the 2030 target."[12]

Rather than rely on an erroneous analysis that doesn't address the primary concern related to market overallocation, the Board should engage the substantial body of analysis that is now available to inform a serious discussion of potential impacts and solutions.

Post-2020 Caps Report: ARB's Methods

ARB staff's Post-2020 Caps Report estimates the cap-and-trade program's cumulative supply/demand balance over the period 2021 through 2030 by projecting emissions (demand) and estimating the number of compliance instruments available (supply), including allowances and carbon offsets. To evaluate the impact of allowance overallocation, the Report calculates the cumulative supply/demand balance for two scenarios. The first assumes no overallocation and the second assumes that 150 million allowances (150M) from the pre-2021 period will be banked for use in the post-2020 period, effectively increasing the supply of compliance instruments in that later period.

In both of ARB's scenarios, projected emissions (demand) exceed compliance instruments (supply); the difference (demand minus supply) is reported as the cumulative emission reductions from cap-and-trade from 2021 through 2030 (expressed in million tons of carbon dioxide equivalent, or $MMtCO_2e$). Table 1 reports the calculations published in ARB's Post-2020 Caps Report and in an accompanying workshop presentation.[13] Based on this analysis, Board staff conclude that overallocation will not put the state's 2030 climate target at risk.

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[12] ARB, Workshop to Continue Informal Discussion on Potential Amendments to Cap-and-Trade Regulation (Apr. 26, 2018), slide 28, https://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm.

[13] ARB, Post-2020 Caps Report at 11 (Table 3) and 14 (Table 4); *see also* ARB, Cap-and-Trade Workshop, *supra* note 12 at slide 28.

Table 1: ARB's cumulative overallocation analysis for 2021-2030 ($MMtCO_2e$)

#	Series	Case A (No overallocation)	Case B (150M overallocation)
1	Covered emissions w/o cap-and-trade program (demand)	3,054	3,054
2	Post-2020 allowances (w/o Post-2020 Reserve)	2,532	2,532
3	Pre-2021 allowances (overallocation)	0	150
4	Offset credits	96	103
5	Total compliance instruments (supply) (#2 + #3 + #4)	2,628	2,785
6	Cumulative reductions from cap-and-trade (#1 – #5)	426	269

A detailed discussion of the report's methods follows, with corresponding lines in Table 1 in parentheses:

- **Projecting demand (#1).** ARB uses a straightforward method for projecting future covered emissions, which represents the future demand for cap-and-trade compliance instruments. However, ARB's method makes a fundamental error that, once corrected, shows that cap-and-trade is expected to fall short of the role identified for it in the Scoping Plan. We describe ARB's methods here and present the error in the next section.

  The Post-2020 Caps Report estimates GHG emissions through 2030 using the PATHWAYS model projections developed for ARB's 2017 Scoping Plan Scenario. The Scoping Plan Scenario models GHG emissions after taking into account the effect of all of California's climate regulations except for the impact of the cap-and-trade program; the projections therefore indicate expected GHG emissions without taking into account the effects of the cap-and-trade program.

The Post-2020 Caps Report separates the PATHWAYS projections into "covered sectors" and "non-covered sectors." As the Report explains:

> Cap-and-Trade covered emissions include the transportation, electricity, residential and commercial, and industrial sectors, and non-covered emissions are from the agricultural, recycling and waste, and high global warming potential [GWP] gas sectors.[14]

To calculate emissions from "covered sectors," ARB staff added up the GHG emissions projected from 2021 through 2030 from each of the four sectors identified above (transportation, electricity, residential and commercial, and industrial), based on PATHWAYS output.[15] We manually confirmed that this data source and method accurately reproduces the cumulative emissions ARB published in its Post-2020 Caps Report—a total of 3,054 million tons of carbon dioxide equivalent ($MMtCO_2e$).[16] Projected emissions are the same across ARB's two overallocation scenarios, which vary only in the number of allowances banked from the pre-2021 period into the post-2020 period.

- **Projecting supply (#2 through #5).** The Post-2020 Caps Report's supply projections are also straightforward. The Report analyzes two scenarios to evaluate potential overallocation outcomes: one in which zero pre-2021 allowances are banked for use in the post-2020 market period, and a second in which 150M pre-2021 allowances are banked for use in the post-2020 period.

  The calculation begins with the total supply of all allowances for vintage years 2021 through 2030, a total of 2,607M under current regulations.[17] Next, the calculations subtract ARB's proposed post-2020 Reserve allowances, a pool of allowances that were set aside from the post-2020 allowance budget. Including current post-2020 Reserve allowances (52M) and additional post-2020 Reserve allowances that

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14 ARB, Post-2020 Caps Report at 10.

15 *Id*. at 11, Table 3, note ## (link to https://www.arb.ca.gov/cc/scopingplan/comparison_graphs_6cases101817.xlsm).

16 *Id*. at 11, Table 3.

17 *Id*. at 13-14.

Board staff proposed to set aside in a February 2018 discussion document (22.7M), there are about 75M post-2020 Reserve allowances.[18] The Post-2020 Caps Report assumes these 75M allowances will not be needed for compliance under the cap-and-trade program, and therefore removes them from the supply calculation (2,607M – 75M = 2,532M, as shown in Table 4 of the Post-2020 Caps Report). The Report also assumes that additional compliance instruments available for sale at the price ceiling will not be accessed.[19]

The supply estimate is then increased to account for the expected use of carbon offset credits. The Report assumes that carbon offsets usage will equal 3% of covered emissions from 2021-2025 and 4.5% from 2026-2030.[20] The total number of offset credits used varies slightly depending on how many emissions there are, which in turn depends on the number of pre-2021 allowances that are banked into the post-2020 period. In the first scenario, with no banking of pre-2021 allowances, the Report assumes 96M offset credits will be used; in the second scenario, with 150M banked pre-2021 allowances, the Report assumes 103M offset credits will be used.

Finally, the Report adds up these supplies across its two scenarios to evaluate potential overallocation outcomes. In the first scenario, zero pre-2021 allowances are used for post-2020 compliance, resulting in 2,628M total compliance instruments over the period 2021 through 2030. In the second scenario, 150M pre-2021 allowances are used for post-2020 compliance, resulting in a total supply of 2,785M total compliance instruments over the period 2021 through 2030.

- **Calculating GHG emission reductions (#6).** The final step in ARB's analysis is to calculate the GHG emission reductions the cap-and-trade program is projected to deliver in each scenario. Because the Post-2020 Caps Report projects emissions (demand) and compliance instruments (supply) on a cumulative basis, so too does ARB calculate

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18 ARB, Preliminary Concepts: Price Containment Points, Price Ceiling, and Allowance Pools (Feb. 2018), https://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm.

19 ARB, Post-2020 Caps Report at 14.

20 *Id*. at 14.

GHG emission reductions on a cumulative basis over the period 2021 through 2030.

Calculated GHG emission reductions are reported as the difference between projected emissions under the Scoping Plan Scenario (demand) and the number of compliance instruments (supply) available over the same period. Conceptually, this makes sense because, over a given period, the cap-and-trade program requires cumulative covered emissions to be no higher than the total number of available compliance instruments (allowances and offsets). As a result, if projected baseline GHG emissions are higher than the total number of compliance instruments, GHG emitters subject to the cap-and-trade program must reduce their emissions by a corresponding amount.

For each of the two scenarios described above, the Post-2020 Caps Report calculates GHG emission reductions. For the first scenario, in which zero pre-2021 allowances are used for post-2020 compliance, the Report's calculated GHG reductions are 426 $MMtCO_2e$ (3,054M – 2,628M = 426M). For the second scenario, in which 150M pre-2021 allowances are used for post-2020 compliance, the Report's calculated GHG reductions are 269 $MMtCO_2e$ (3,054M – 2,785M = 269M).

- **Drawing conclusions.** One curious feature of the Post-2020 Caps Report is that it never specifies a metric for evaluating whether or not the calculated GHG emission reductions are sufficient. Despite the lack of a clear metric, the Report concludes that even with 150 million excess allowances from the pre-2021 period, cap-and-trade will still "reduce emissions to help achieve the 2030 target."[21] ARB Assistant Division Chief Rajinder Sahota made similar comments in ARB's April 2018 workshop, saying that the staff analysis shows that a 150 million allowance overallocation "does not endanger" the chances of emissions in 2030 remaining below the limit.[22]

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[21] *Id.* at 14.

[22] As transcribed from the workshop, Ms. Sahota's full comment was: "The banking question really is about protecting against windfall profits, and then also endangering the post-2020 period. In looking at the analysis that we did on overallocation, 150 [million allowances] and what that might mean for post-2020, we know that the caps are so steep relative to what the emissions would be without cap-and-trade, pulling that 150 [million allowances] forward does not endanger that."

> We assume that ARB is comparing the calculated GHG emission reductions discussed above against reductions called for from the ARB's 2017 Scoping Plan. The 2017 Scoping Plan concludes that under the Scoping Plan Scenario, cap-and-trade needs to deliver 236 $MMtCO_2e$ in cumulative reductions over the period 2021 through 2030.[23] In both of the Report's scenarios, projected GHG reductions are larger than this amount, suggesting that the cap-and-trade would provide the cumulative emissions cuts identified in the Scoping Plan.

Again, we note that the Report's analysis does not evaluate what impact overallocation has on the state's ability to meet its legally binding GHG emissions target in 2030. At best, the Report's methods might indicate whether expected *cumulative* cap-and-trade reductions match the cumulative reductions called for in ARB's Scoping Plan—but the Report never addresses the impact of overallocation on California's *annual* emissions in 2030. State law requires ARB to reduce emissions to hit an *annual* target in 2030, not a *cumulative* target over the period 2021 through 2030.[24] Even if projected cumulative reductions are equal to or greater than the cumulative reductions called for in the Scoping Plan, it is still possible for emissions to significantly exceed the 2030 limit.[25]

ARB's Erroneous Covered Emissions Projection

The Post-2020 Caps Report makes a fundamental error in the way it projects future GHG emissions, inflating projected "covered emissions" subject to the cap-and-trade program by approximately 277 $MMtCO_2e$ over the period 2021 through 2030. Once corrected for this error, the Report's calculations show that ARB's estimated overallocation of 150M allowances would cause the cap-and-trade program to be non-binding over the same period, and therefore fall well short of the reductions ARB called for in the final 2017 Scoping Plan.

Simply put, the Post-2020 Caps Report used the wrong data to project "covered emissions"—that is, the emissions actually subject to the cap-and-trade program. Rather than estimate future "covered emissions" subject to the cap-and-trade program, the Report instead projected emissions

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[23] ARB, 2017 Scoping Plan, *supra* note 2 at 28.

[24] Cal. Health & Safety Code § 38566.

[25] *See*, *e.g.*, LAO, *supra* note 3.

from "covered sectors"—a broader category with emissions that are about 10% higher than "covered emissions." By projecting an erroneously high emissions trajectory, ARB's calculation also inflates the calculated GHG emission reductions attributable to cap-and-trade.

The core problem is this: not all emissions in "covered sectors" are "covered emissions" subject to the cap-and-trade program. "Covered sector" emissions include 100% of the emissions from sources classified as being in these four high-level sectors (transportation, electricity, residential and commercial, and industry). In contrast, "covered emissions" are essentially a subset of these emissions, although not a perfect subset.[26] Total statewide GHG emissions, which are subject to the legislative limits set for 2020 and 2030, are the sum of "covered sector" and "non-covered sector" emissions.

As Figure 1 illustrates, the difference between "covered emissions" and "covered sector" emissions is visually striking. Table 2 presents the difference in numerical terms. Each year for which there are data, the gap between "covered sector" emissions and "covered emissions" grew larger, starting at 30.6 $MMtCO_2e$ per year in 2011 and increasing to 37.5 $MMtCO_2e$ per year in 2015. Over these five years, the average difference was 34.8 $MMtCO_2e$.

We correct the Report's error by adopting ARB's historical practice of revising sector-wide emission estimates using facility-level data gathered through California's Mandatory Greenhouse Gas Reporting Regulation (MRR) (see Appendix). Just as ARB did in its original 2010 cap-setting regulatory process, which developed program caps through 2020, we employ the ratio of covered emissions subject to the cap-and-trade program (using MRR data) to total covered sector emissions (from the state GHG inventory). Consistent with the Board's previous cap-setting exercise, this approach uses actual historical data describing emissions subject to the cap-and-trade program to improve forecasting accuracy.

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[26] "Covered emissions" are not a perfect subset of "covered sector" emissions because some covered emissions are categorized in non-covered sectors (agriculture, high GWP gases, or recycling and waste). For example, most emissions in the agriculture sector are not subject to the cap-and-trade program, but some emissions from agricultural energy use (such as the combustion of liquid fuels and natural gas) are, even though those emissions are counted in both the PATHWAYS model and the state greenhouse gas inventory as coming from the agriculture sector.

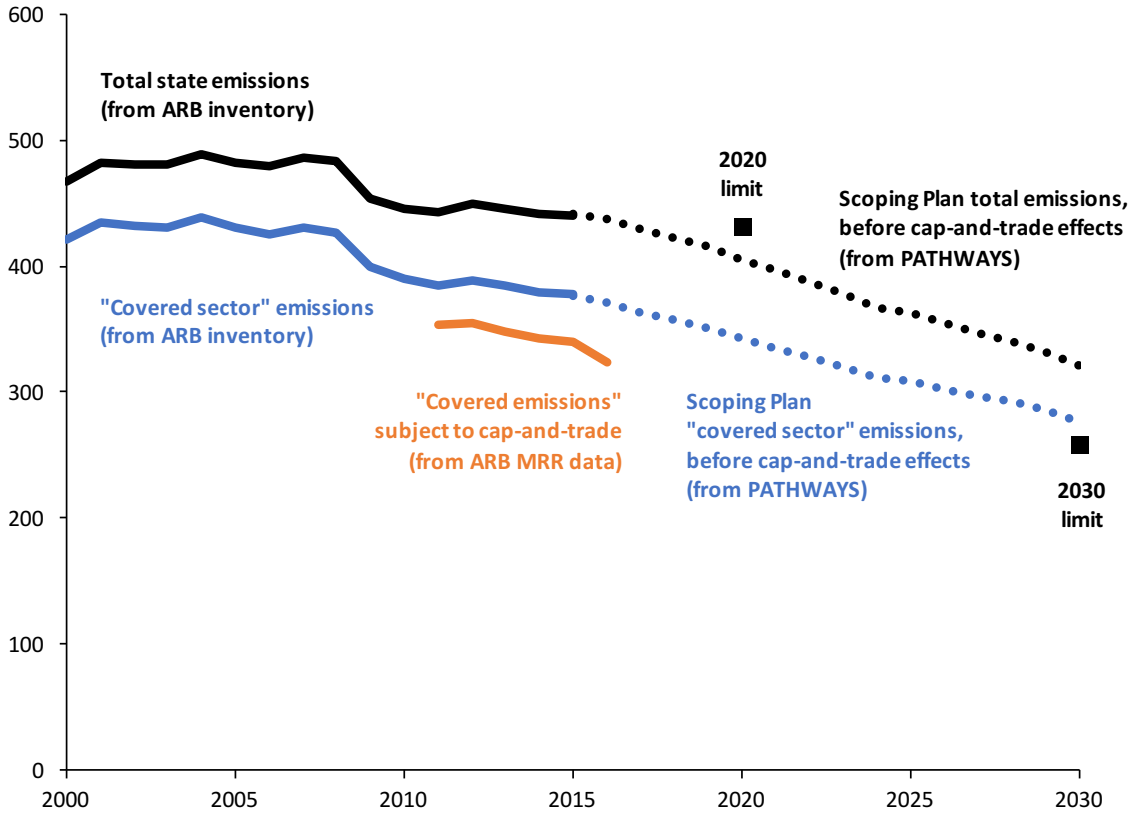

Figure 1: Comparison of statewide, covered sector, and covered emissions ($MMtCO_2e$). Total statewide emissions data are from ARB's GHG inventory (black solid line)[27] and the projection is from the PATHWAYS projection for the Scoping Plan Scenario (black dotted line).[28] Historical "covered sector" emissions (blue solid line) are derived from ARB's GHG inventory and projected "covered sector" emissions are from PATHWAYS (blue dotted line). Historical "covered emissions" (orange line) are reported under ARB's MRR regulation.[29] On average, annual emissions in "covered sectors" have been about 35 $MMtCO_2e$ higher than "covered emissions" subject to the cap-and-trade program. ARB erroneously used these higher numbers to calculate the GHG emission reductions attributable to cap-and-trade in the post-2020 period.

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27 ARB, California GHG Emission Inventory (2017), https://www.arb.ca.gov/cc/inventory/data/data.htm.

28 The PATHWAYS output file is available at https://www.arb.ca.gov/cc/scopingplan/comparison_graphs_6cases101817.xlsm.

29 ARB, Mandatory GHG Reporting Regulation, https://ww2.arb.ca.gov/mrr-data.

To correct the PATHWAYS projections for covered sector emissions, we multiply each year's projected emissions by the average ratio between actual historical covered emissions and sector-wide emissions over the period 2011 through 2015 (0.909, see Table 2). This correction reduces ARB's projected covered emissions 2021 through 2030 by a cumulative 277 $MMtCO_2e$.[30] Over the ten-year projection period from 2021 through 2030, this suggests that ARB over-estimated GHG emissions subject to the cap-and-trade program by approximately 277 $MMtCO_2e$.

Table 2: Comparison of covered sector emissions and covered emissions ($MMtCO_2e$)

Series	Source	2011	2012	2013	2014	2015	Avg. 2011-15
Covered sector emissions	State GHG Inventory	383.9	388.3	384.8	379.4	377.9	382.9
Covered emissions	MRR Data	353.3	355.4	348.5	342.9	340.4	348.1
Difference		30.6	32.9	36.3	36.5	37.5	34.8
Ratio, covered emissions (MRR) to covered sector emissions (Inventory)		0.920	0.915	0.906	0.904	0.901	0.909

Correcting the Post-2020 Caps Report

We replicated ARB's calculations from the Post-2020 Caps Report, correcting for the error in projected emissions described above. The corrected covered emissions projection for the period 2021 through 2030 is 2,777 $MMtCO_2e$ (3,054M – 277M = 2,777M), reflecting expected GHG emissions subject to the cap-and-trade program after California's non-cap-and-trade regulations take effect, but before the cap-and-trade program takes effect. We then examine the impact of this correction on the estimated reductions ARB expects from the cap-and-trade program over this period across its two overallocation scenarios (see Table 3).

[30] For the original and corrected GHG projection data, see the spreadsheet published along with this report on Near Zero's website, www.nearzero.org.

Table 3: Correction to ARB's cumulative overallocation analysis, 2021-2030 ($MMtCO_2e$)

#	Series	Case A (No overallocation)	Case B (150 M overallocation)
1	Erroneous covered emissions w/o cap-and-trade program (demand)	3,054	3,054
2	Correction to covered emissions (Near Zero calculation)	-277	-277
3	Corrected covered emissions (demand) (#1 + #2)	2,777	2,777
4	Post-2020 allowances (w/o Post-2020 Reserve)	2,532	2,532
5	Unused allowances at end of 2020	0	150
6	Offset credits	96	103
7	Total compliance instruments (supply) (#4 + #5 + #6)	2,628	2,785
8	Cumulative reductions from cap-and-trade (#3 – #7)	149	0 (*)

(*) Calculated reductions are negative (2,777M – 2,785M = -8M). This indicates the program is non-binding under these conditions and therefore produces no cumulative reductions.

In ARB's zero overallocation scenario (Case A), the corrected demand for compliance instruments (before cap-and-trade effects) remains larger than the supply, indicating the cap-and-trade program will reduce cumulative GHG emissions. Specifically, ARB assumes that cap-and-trade will reduce emissions until they are equal to the supply of compliance instruments, so the reduction in emissions due to cap-and-trade is 149 $MMtCO_2e$ (2,777M – 2,628M = 149M).

In ARB's 150M overallocation scenario (Case B), the corrected demand for compliance instruments (before cap-and-trade effects) is less than the supply of compliance instruments. According to ARB's methods, in this case the cap-and-trade program does not require any further reduction in GHG emissions. As a result, the calculated reductions attributable to cap-

and-trade would be zero. In this case, ARB's method projects that statewide GHG emissions will exceed the 2030 limit.[31]

Figure 2 compares the reductions called for in the 2017 Scoping Plan against the calculations in the Post-2020 Caps Report (from Table 1) as well as corrected calculations (from Table 3).

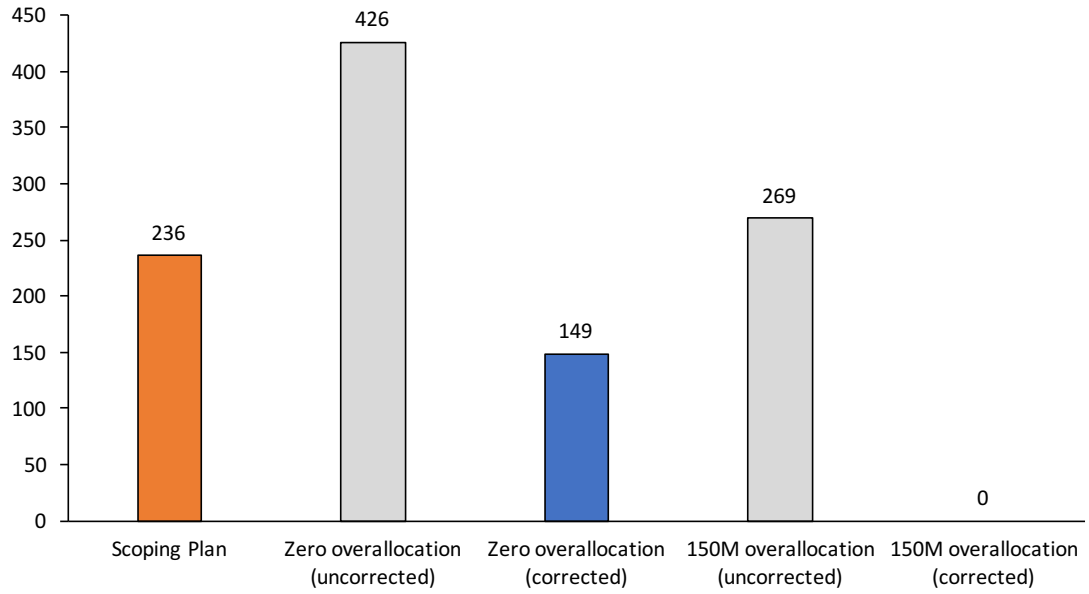

Figure 2: Calculated reductions from cap-and-trade, 2021 through 2030 ($MMtCO_2e$)

ARB's uncorrected estimates suggest that whether or not there are 150M overallocated pre-2021 allowances, the cap-and-trade program will deliver at least as many reductions as called for in the Scoping Plan. Once corrected for ARB's error, however, the Report's analysis indicates that the status quo market design is expected to fall short of the Scoping Plan's requirement—with or without 150M overallocated allowances.

In our view, neither the original Post-2020 Caps Report calculation (reported in Table 1) nor the corrected calculations (reported in Table 3) offer a reasonable basis for evaluating whether overallocation puts California's 2030 climate target at risk. Nevertheless, we have illustrated how a critical

[31] A calculated effect of zero implies that California's greenhouse gas emissions trajectory would follow the PATHWAYS Scoping Plan scenario projection. In reality, a non-binding cumulative program cap would still impose supplemental reductions as a result of the auction price floor. However, the Scoping Plan analysis does not explicitly model the effects of price-induced mitigation from the cap-and-trade program.

error in ARB's calculations undermines the Post-2020 Caps Report's conclusions. Additional and more substantive analysis is needed to address the risks of overallocation.

Conclusion

ARB's Post-2020 Caps Report offers the Board's first formal analysis of how allowance overallocation might impact the cap-and-trade program's effectiveness in ensuring California meets its legally binding 2030 climate target. This issue is critical to state climate policy because the Board decided to rely on cap-and-trade to deliver over 45% of the annual GHG emission reductions needed to achieve California's 2030 climate target.[32] If overallocation leads to excess allowance banking in the cap-and-trade program, then climate emissions will not fall in line with program limits and the state will overshoot its 2030 target.

The Report falls short of AB 398's instruction to "[e]valuate and address concerns related to overallocation" on two grounds.

First, the Report does not address the primary concern related to overallocation—namely, the risk that excess allowances will be banked and used such that emissions in 2030 exceed the state's legally binding emissions limit. Instead of evaluating whether overallocation could lead to 2030 GHG emissions exceeding the state's climate target, ARB calculated the cumulative balance of market supply and demand over a ten-year period. This method is insufficient to address the serious risks LAO and independent researchers have identified. As a result, the Post-2020 Caps Report does not provide a reasoned basis for responding to AB 398's instruction to "evaluate and address concerns related to [allowance] overallocation" in its rulemaking process.

Second, the Report incorrectly asserts that overallocation of up to 150 million pre-2021 allowances will not impact the state's ability to meet its 2030

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[32] ARB, 2017 Scoping Plan, *supra* note 2 at 26 (Table 2) (indicating that regulations are expected to reduce GHG emissions by 69 $MMtCO_2e$ in 2030 under the Scoping Plan Scenario); *id.* at 30 (indicating that the cap-and-trade needs to reduce another 60 $MMtCO_2e$ to achieve the SB 32 target for 2030). The share that cap-and-trade must contribute (60 $MMtCO_2e$) is 46.5% of the total reductions required relative to business-as-usual emissions in 2030 (60 + 69 = 129 $MMtCO_2e$).

climate target. The Report contains a fundamental analytical error that undermines its own conclusion. Once corrected for this factual error—using the same method the Board adopted in its original cap-and-trade rulemaking—the Report shows that the cap-and-trade program is expected to deliver significantly fewer emission reductions than what the Board called for in the 2017 Scoping Plan.

This error is not an esoteric technical detail. It is a question of basic emissions accounting. ARB properly addressed these issues when the Board set the original program caps in a 2010 rulemaking, observing that projections of "covered sector" emissions have to be adjusted downward to account for the fact that "covered emissions" subject to the cap-and-trade program are smaller than total "covered sector" emissions (see Appendix). Given the fundamental importance of cap-setting to the environmental and economic performance of California's cap-and-trade program, the lack of substantive analysis in the Report is striking—especially in comparison to the Board's prior efforts to analyze the same question in 2010.

We hope that ARB will acknowledge the shortcomings of its new Report, improve its analytical standards to maintain the scientific integrity for which the Board is known, and seriously engage the well-founded concern that overallocation risks undermining California's 2030 climate target.

Appendix: ARB's 2010 Cap-Setting Analysis

In a 2010 cap-and-trade rulemaking process, ARB developed the original cap trajectory through 2020. The Board's Initial Statement of Reasons (ISOR) explained that overallocation is a critical problem that could undermine the program's efficacy. Furthermore, staff showed how projections of broad sector-based emissions must be adjusted to account for the fact that covered emissions subject to the then-proposed cap-and-trade program would be lower than sector-wide totals. Moreover, in 2010 staff also identified the mandatory reporting regulation (MRR) data as an appropriate data source for calculating the difference between actual "covered emissions" and broad sector-based totals. We replicated the Board's exact methods from its 2010 rulemaking process to correct the Post-2020 Caps Report in this research note.

The following excerpt is from the ISOR Volume 1, Appendix E.[33] All text is original, except for text in [square brackets], which we added to clarify how terminology used in the 2010 ISOR relates to the terminology now in use today.

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2. Reliance on Mandatory Reporting Data to Ensure Accuracy in Cap Setting

Setting the cap to achieve an appropriate level of stringency is critical to the proper functioning of a cap-and-trade program. If the cap is set too tight, unacceptably high allowance prices will result. If the cap is set too loose, prices will be lower than expected and a weakened incentive to reduce emissions will be created. Accuracy in emissions estimates from covered entities is a key component of ensuring that the desired level of cap stringency is implemented. Throughout the regulatory process, staff heard concerns from environmental groups that the cap would be unintentionally set too lax—a condition sometimes referred to as "oversupply" or "overallocation."

[33] ARB, 2010 Cap-and-Trade Regulation, ISOR, Vol. 1, Appendix E: Setting the Program Emissions Cap, at E-7 through E-8, https://www.arb.ca.gov/regact/2010/capandtrade10/capv3appe.pdf.

The over-allocation condition occurs if too many allowances are supplied to covered entities relative to expected business-as-usual emission levels. This issue arose in the early years of the European Union's Emission Trading Scheme (EU ETS). During the trial phase of the program, which ran from 2005–2007, caps were set without a good source of GHG emission data for the facilities covered in the program.

The lack of accurate emissions data led to initial cap levels that, although intended to require a reduction of 4 percent at the outset of the program, in actuality created a surplus of approximately 4 percent. This oversupply—8 percent beyond intended levels—coupled with the fact that allowances could not be saved from the trial periods for use in the later phases, led to a price crash in August 2006, when the first year of verified emissions data were made publicly available.*

In 2007, ARB put in place a mandatory reporting program to provide accurate greenhouse gas emissions data for the sources that will be covered in the first compliance period of the cap-and-trade program [the MRR regulation]. The data gathered through this program [the MRR data] will help ensure that the over-allocation issue is not repeated in the California context.

3. Adjustment of the Cap-and-Trade 2020 Target from Scoping Plan Levels Using Mandatory Reporting Data

The Scoping Plan's rough estimate of the target for the 2020 allowance budget (Point E in Figure E-1) was 365 $MMTCO_2e$. Since the plan was adopted, staff have developed more specificity on what emission sources within the different sectors will be covered in the cap-and-trade program. Staff have also used the 2008 facility-level data gathered through the mandatory reporting program [MRR data] to improve emissions estimates for the covered entities. Using these improved estimates, staff calculated a new broad scope 2020 allowance budget of 334 $MMTCO_2e$. This number was developed by multiplying the Scoping Plan 365 $MMTCO_2e$ 2020 budget estimate [based on "covered sector" emissions] by the ratio of the improved estimate of 2008 broad scope emissions (403 $MMTCO_2e$, de-

* Pricing Carbon: The European Union Emissions Trading Scheme. A. D. Ellerman, F. J. Convery, C. Perthuis, E. Alberola, and B. Buchner. Cambridge University Press. Cambridge, U.K. 2010. [Citation in original ARB document.]

termined using information from mandatory reporting of GHGs at the facility level [the MRR data]) to the 2008 emissions inventory estimate for broad-scope sector categories (440 $MMTCO_2e$, calculated used the Scoping Plan accounting [covered sector emissions from the state GHG inventory]).

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About Near Zero

Near Zero is a non-profit environmental research organization based at the Carnegie Institution for Science on the Stanford University campus. Near Zero provides credible, impartial, and actionable assessment with the goal of cutting greenhouse gas emissions to near zero. This research note is for informational purposes only and does not constitute investment advice.

Data used in this research note are available at our website.

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