RESEARCH NOTE

California's "self-correcting" cap-and-trade auction mechanism does not eliminate market overallocation

Mason Inman
minman@nearzero.org

Michael Mastrandrea
mikemas@nearzero.org

Danny Cullenward
dcullenward@nearzero.org

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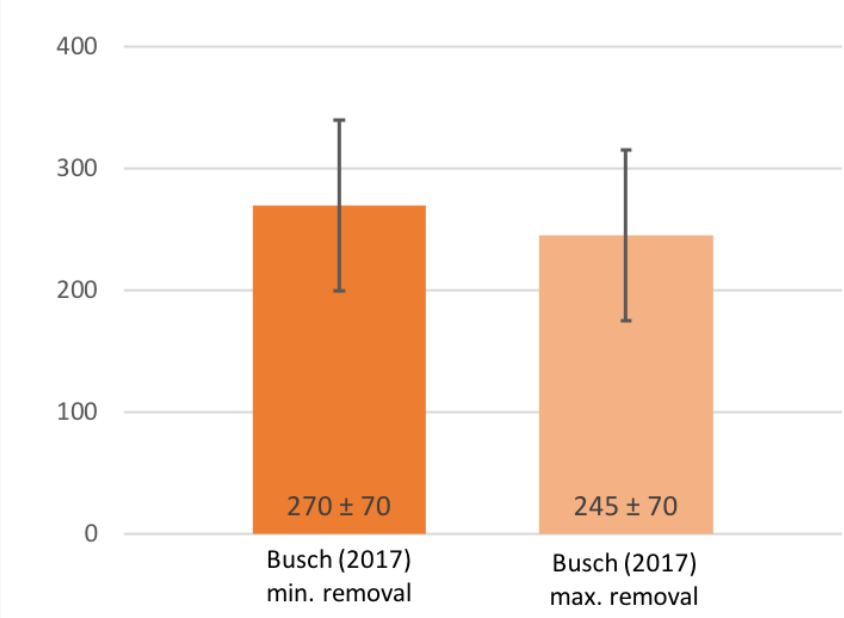
Executive summary

In recent public statements, ARB staff have suggested that California's "self-correcting" cap-and-trade auction mechanism will address overallocation—referring to a unique provision of the state's market rules that removes unsold allowances from the auction supply after 24 months. In the auction collapse of 2016 and 2017, nearly 120 million allowances went unsold and are now being reintroduced for sale at current auctions. To the extent some hit the 24-month threshold and are removed from future auction supplies, this would tend to reduce risks related to overallocation.

Our calculations show this "self-correction" mechanism will help reduce the extent of overallocation in the cap-and-trade market, but will address only a fraction of the overallocation expected by 2020 (Figure 1).

Figure 1: Market overallocation in 2020 with auction "self-correction" mechanism (million allowances)



While the magnitude of the effect is small, the exact size of the "self-correcting" mechanism depends on whether or not auctions are fully subscribed in 2018 and 2019. A prominent estimate of overallocation from Energy Innovation's Chris Busch included this mechanism and assumed that all auctions would sell out, resulting in an oversupply in 2020 of around 270 million allowances. Even if the remaining auctions are undersubscribed, we show here that, in a range of likely scenarios, at most 25 million additional allowances could be removed from the auction supply. While any assessment of overallocation should consider these potential effects, they are minor and do not eliminate the problem.

Introduction

Assembly Bill 398 requires 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] Studies by independent experts have provided estimates of significant market overallocation in the Western Climate Initiative (WCI) cap-and-trade program through 2020, which could be carried over into the post-2020 period.[2]

In the debate over allowance overallocation (also known as oversupply), ARB staff[3] and others have suggested that independent estimates of overallocation fail to account for a "self-correction" mechanism built into the cap-and-trade program, whereby California allowances that remain unsold for more than 24 months are removed from the normal auction supply. The issue is particularly salient because during the auction collapse of 2016-17, ~118 million California allowances went unsold. As required by

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

2 *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.

3 Julie Cart, Checking the math on cap and trade, some experts say it's not adding up. CALmatters (May 22, 2018), https://calmatters.org/articles/checking-the-math-on-cap-and-trade-some-experts-say-its-not-adding-up/.

current regulations, ARB began reintroducing these previously unsold allowances in the November 2017 auction. Because of limits on the rate of reintroduction, however, some of the previously unsold allowances will inevitably remain unsold for more than 24 months and therefore be removed from the normal auction supply. How many will be removed from the auction supply depends on whether the next few auctions sell out or not.

We calculate that about one-third of California's previously unsold allowances (~38 million) will inevitably reach the 24-month limit and be removed from the normal auction supply. This result matches past independent analyses[4] and is consistent with ARB's discussion in its April 2018 report on overallocation, which also notes that additional allowances may be removed depending on auction results this year.[5]

Additional undersubscribed auctions—that is, auctions that fail to sell all available allowances—could increase the number of allowances removed from the auction supply. We calculate that, at most, a bit more than half (~66 million) of California's previously unsold allowances will be removed if the remaining 2018 auctions are undersubscribed.

Removing 38 to 66 million allowances from the normal auction supply would help address the problem of overallocation in the WCI cap-and-trade market, but would not fully address projected overallocation. For example, Energy Innovation estimated that by the end of 2020, the WCI market will be overallocated by about 270M (million) allowances (with an uncertainty range from 200M to 340M).[6] Their estimate transparently assumes that all auctions from the start of 2018 through the end of 2020 sell out. Consistent with that view, their analysis incorporated auction "self-correction" in line with the low end of the removal range both we and ARB calculate. If there are additional undersubscribed auctions, and the "self-correction" associated with this outcome were incorporated into Energy Innovation's estimate, then overallocation would decrease modestly. We

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4 Busch, *supra* note 2; Jackie Cooley, Dan McGraw, and Nicolas Girod, Welcome to the WCI: How Ontario Might Change the California-Quebec Outlook (Dec. 14, 2017), https://www.icis.com/globalassets/documents/forms/ppf-pdf/ontariowebinar-q4final2.pdf; *see also* Table 1 in this document.

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

6 Busch, *supra* note 2.

calculate that it would fall at most to about 245M allowances (with a range of 175M to 315M; see Figure 1 above).

Going forward, the auction's "self-correcting" mechanism will have only a minor effect in reducing allowance overallocation—that is, unless there is another substantial auction collapse, or an extended period in which auctions do not sell out. Neither we nor other analysts expect these problematic outcomes.

The 2016-2017 auction collapse was a highly unusual episode due to uncertainty about the future of the cap-and-trade system after 2020.[7] With the passage of AB 398, that uncertainty has now been resolved. Market participants now have an incentive to continue to purchase excess allowances in expectation of higher future prices, as floor prices continue rising and as caps tighten. Under these conditions, any unsold allowances that result from modestly undersubscribed auctions in the future are likely to be reintroduced and purchased by market participants before reaching the 24-month limit.

ARB's "self-correcting" auction mechanism

The WCI cap-and-trade program features a significant number of allowances that went unsold when first offered at auction. From February 2016 through February 2017, demand for allowances contracted sharply across a series of five cap-and-trade auctions conducted by California and Québec. The collapse in demand left ~118 million of California's state-owned emission allowances unsold; ~25 million of Québec's allowances went unsold, too. (Separately, ~4 million of Ontario's allowances went unsold later in 2017, prior to Ontario's entry into the WCI market.)

Regulations in each WCI jurisdiction require these allowances to be reintroduced—that is, offered again for sale at a future auction—after two consecutive quarterly auctions clear above the price floor.[8] The number of allowances that can be reintroduced in a given auction by each jurisdiction

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7 Danny Cullenward & Andy Coghlan (2016), Structural oversupply and credibility in California's carbon market. *Electricity Journal* 29: 7–14.

8 Cal. Code Regs., title 19, § 95911(f)(3)(B).

cannot exceed 25% of their newly offered allowances, and the unsold allowances are reintroduced starting with those that went unsold earliest.[9]

However, California regulations also specify that any California allowances that remain unsold for more than 24 months will be removed from the normal auction supply. This feature is unique to California's regulations and is not shared among WCI market participants. Neither Ontario nor Quebec's regulations include a similar provision at present for removal of allowances that remain unsold, and thus their unsold allowances will continue to be reintroduced, subject to the rules described above, until they are resold at auction.

Under current rules, California allowances that remain unsold for 24 months will first be retired to account for emissions associated with electricity imported through the California Independent System Operator's Energy Imbalance Market (EIM Outstanding Emissions).[10] Any remaining allowances will roll over to the state's Allowance Price Containment Reserve (APCR).[11] Our calculations in this report do not include potential retirements to account for EIM Outstanding Emissions in 2018 or 2019, but we believe that they would not affect our calculations of how many allowances would be reintroduced or removed in each scenario.

Although this "self-correcting" auction mechanism helps address allowance overallocation, accounting for the full effect is complex. Allowances transferred to the APCR are removed from the normal auction supply, but would still be available for sale at specified allowance prices (currently $54.26 or more per allowance, compared with recent prices around $15 per allowance). From one perspective, the fact that these allowances are removed from the auction supply will tend to reduce overallocation concerns because a reduction in auction supplies will increase prices and induce further emission reductions. On the other hand, these allowances will still be available for purchase, meaning that the total number of allowances has not changed—only the price at which they are made available.

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9 For California, this includes both state-owned and consignment allowances. *Id.* at § 95911(f)(3)(C); *see also* ARB, Guidance on Treatment of Unsold Allowances Following an Undersubscribed Auction (Dec. 1, 2017), https://www.arb.ca.gov/cc/capandtrade/guidance/guidance_unsold_allowances.pdf.

10 Cal. Code Regs., title 19, § 95911(g).

11 *Id.*

The ultimate impact on emission reductions and market prices depends on the reforms ARB adopts under AB 398. ARB is currently considering regulations that would transfer any allowances left in the APCR at the end of 2020 to new price containment points[12] or possibly the price ceiling[13] account; these "allowance pools" that function in a similar manner compared to the current APCR, albeit at different prices.[14] Neither the ultimate destination of newly transferred APCR allowances nor the prices at which they would be made available in the post-2020 market has been determined.[15]

In this note, we focus on the fate of allowances that went unsold in 2016-2017. For simplicity, we treat transfers of allowances from the normal auction supply to the APCR as a reduction in allowance overallocation. However, we stress that a fuller accounting of proposed market design changes is needed in the AB 398 implementation process to identify the effect of these transfers on post-2020 greenhouse gas emissions, and therefore the program's role in achieving California's 2030 emissions limit.[16]

Calculating "self-correction"

Reintroduction of the ~118 million California allowances that went unsold in 2016-2017 began in November 2017, after the previous two auctions cleared above the price floor. At the time of this research note, a combined ~38 million of these allowances have already been reintroduced and sold in the November 2017, February 2018, and May 2018 auctions, leaving ~80 million allowances still unsold.

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

13 *Id.* at § 38562(c)(2)(A) (as added by AB 398).

14 ARB, Preliminary Concepts: Price Containment Points, Price Ceiling, and Allowance Pools (Feb. 2018), https://www.arb.ca.gov/cc/capandtrade/meetings/20180302/ct_price_concept_paper.pdf; *see also* Danny Cullenward, Mason Inman, and Michael Mastrandrea, Implementing AB 398: ARB's initial post-2020 market design and "allowance pool" concepts, Near Zero Research Note (Mar. 16, 2018), http://www.near-zero.org/wp/2018/03/16/implementing-ab-398-arbs-initial-post-2020-market-design-and-allowance-pool-concepts/.

15 ARB, Preliminary Discussion Draft Regulations (Feb. 2018), https://www.arb.ca.gov/cc/capandtrade/meetings/meetings.htm.

16 Cullenward et al., *supra* note 14.

The fate of the remaining unsold allowances depends on the outcomes of the next three auctions: August 2018, November 2018, and February 2019. At that point, all the allowances that went unsold in the 2016-2017 market collapse will have either been: (1) reintroduced and sold, (2) retired to account for EIM Outstanding Emissions, or (3) removed from the normal auction supply after reaching the 24-month limit.

For the calculations presented here, we assume that all auctions through February 2019 will feature sufficient sales such that allowances reintroduced from the 2016-17 auction collapse will be sold. Based on an analysis of the rules governing the order of allowances sales, we operationalize this condition by assuming that at least 60% of allowances for sale are sold in each auction. If sales were to fall below this threshold—which we think is unlikely—then some of the reintroduced allowances would go unsold a second time, leading to further removals from the normal auction supply. As long as sales remain above this 60% threshold, the two remaining 2018 auctions will determine the range of "self-correcting" auction outcomes.

Whatever the outcome of upcoming auctions, a certain number of allowances will inevitably be removed from the normal auction supply. California regulations limit the reintroduction of previously unsold allowances at any given auction.[17] When there are a large number of allowances that go unsold—as was the case in the 2016-17 auction collapse—the limit means that not all allowances can be reintroduced prior to the 24-month threshold. Thus, even if all auctions continue to sell out through 2019, a significant number of allowances will still be removed from the normal auction supply. In this case, we calculate that ~38 million allowances will be removed through this mechanism (see Figure 2 and Table 1 below).

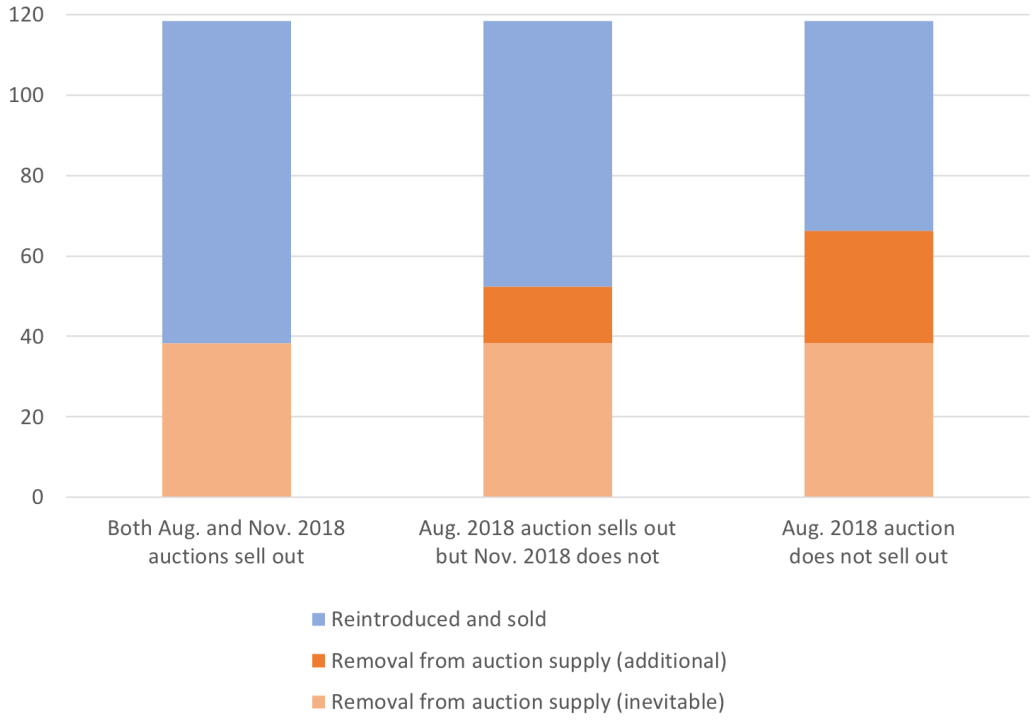
The ultimate number of allowances removed from the normal auction supply depends on two additional factors: how many auctions fail to sell out in 2018, and the timing of any such undersubscribed auctions. On the first factor, more allowances will be removed if both remaining auctions in 2018 are undersubscribed. Second, an undersubscribed auction that occurs earlier (rather than later) will cause more allowances to be removed. Because previously unsold allowances cannot be reintroduced until two consecutive auctions clear above the price floor, an undersubscribed auction will

[17] Cal. Code Regs., title 19, § 95911(f)(3)(C); ARB, *supra* note 9.

pause the reintroduction of previously unsold allowances for at least two quarters, leading to more allowances hitting their 24-month threshold.

If one of the remaining auctions in 2018 does not sell out, we calculate that ~14 million additional allowances will be removed from the normal auction supply. If the two remaining auctions in 2018 do not sell out, we calculate that ~28 million additional allowances would be removed.

Figure 2: Possible outcomes for California's unsold 2016-17 allowances (millions of allowances)



Comparison to other estimates of "self-correction"

Our calculations are in close agreement with recent estimates from Energy Innovation, ARB, and the consultancy ICIS. Table 1 summarizes these results.

Energy Innovation assumed that all auctions would sell out, calculating that 41.6 million allowances would be removed from the normal auction supply.[18] The Energy Innovation report used an ICIS projection for auction quantities that is slightly lower than the actual 2018 auction amounts.

[18] Busch, *supra* note 2.

Compared to the Energy Innovation assumptions, our calculations (based on more recent data) indicate that slightly more allowances will be reintroduced to auction in 2018, and thus slightly fewer allowances will inevitably be removed. For more details about uncertainties, see this research note's Appendix.

ARB's April 2018 report on overallocation states, "Due to low demand for allowances through 2017, approximately 40 million allowances will be transferred to the Reserve and removed from general circulation. Depending on auction results for this year, additional previously unsold allowances may also be transferred to the Reserve."[19]

ICIS examines three possible scenarios in a 2017 analysis.[20] If all auctions sell out, ICIS calculates a minimum removal of 38.6 million allowances. If February 2018 had not sold out or February and May 2018 had not sold out, this rises to 64.7 million or 77.8 million allowances, respectively. These estimates are roughly similar to our estimates, differing because our estimates incorporate data on the February and May 2018 auction outcomes, which were not available at the time of the ICIS study.

Table 1: Comparing estimates of "self-correction" (millions of 2016-2017 unsold allowances removed from normal auction supply)

Source	Number of undersubscribed auctions through end of 2018		
	None	1	2
Near Zero (this report)	38.3	52.4	66.3
Energy Innovation	41.6	-	-
ARB	~40	-	-
ICIS	38.6	64.7	77.8

[19] ARB, *supra* note 5 at 16.

[20] Cooley et al., *supra* note 4 at slide 22.

Implications for overallocation

Many independent analysts have concluded that the WCI market has a significant overallocation of compliance instruments.[21] Some stakeholders have since suggested that independent reports are not credible because they do not properly account for the "self-correcting" auction mechanism described in this note. For example, ARB's April 2018 analysis of overallocation asserts that it is "likely that the vintage 2013 through 2030 unused allowances are less than third-party estimates," citing the "[m]echanism of moving into the APCR allowances that remain unsold for eight auctions [24 months], which will move at least 40 million unsold auction allowances to the Reserve."[22]

As a threshold matter, we note that several of the most prominent independent reports on allowance overallocation have explicitly accounted for California's auction mechanisms. For example, Energy Innovation included the inevitable transfer of previously unsold allowances to the APCR based on the explicit assumption that all auctions in 2018 would sell out. To the extent this assumption turns out to be wrong—that is, if upcoming auctions turn out to be undersubscribed—then Energy Innovation's estimated overallocation numbers would need to be updated. But it is incorrect to argue that reports like Energy Innovation's fail to account for the self-correcting auction mechanism in California's market regulations.

The analysis in this research note evaluates the extent to which California's "self-correction" auction mechanism could reduce the extent of overallocation in the WCI market. We show that if all auctions sell out, approximately 40 million allowances will be removed from the auction supply (consistent with ARB, Energy Innovation, ICIS, and other estimates). Alternatively, if one or two auctions are undersubscribed, up to ~66 million allowances would be removed from the future auction supply.

These effects should be included in estimates of allowance overallocation, but even at the upper end of possible impacts, the effect is small relative to the total overallocation calculated by independent analysts. For example,

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21 For a partial list of studies, *see* Mason Inman, Danny Cullenward, and Michael Mastrandrea, Ready, fire, aim: ARB's overallocation report misses its target. Near Zero Research Note (May 7, 2018), http://www.near-zero.org/wp/2018/05/07/ready-fire-aim-arbs-overallocation-report-misses-its-target/.

22 ARB *supra* note 5.

Energy Innovation estimated that by 2020, the WCI market would have an overallocation of about 270 million allowances (with an uncertainty range from 200 to 340 million).[23] This estimate includes the minimum number of allowances removed from auction supply as described above. If two auctions in 2018 and 2019 are undersubscribed, then the Energy Innovation estimates should be reduced by up to 25 million allowances. In this case, the adjusted Energy Innovation analysis would report overallocation of about 245 million allowances in 2030 (with an uncertainty range from 175 to 315 million).

Market design choices affect overallocation

An analysis of the risks of allowance overallocation needs to factor in the fate of allowances that will be made available at the new Reserve tiers mandated by AB 398, including 81 million allowances from the pre-2020 APCR and up to 75 million allowances from post-2020 budgets.[24] These allowance pools are not included in the 2020 overallocation estimates discussed above, and these pools will grow larger if undersubscribed auctions lead to additional transfers to the APCR.

The ultimate impact of excess pre-2021 allowances—including unsold allowances that are transferred to the APCR—depends on the prices ARB sets for the post-2020 price containment points and price ceiling. We urge ARB to evaluate these design choices. If excess pre-2021 allowances are carried into the post-2020 market without adjusting program cap levels and are made available at relatively low prices, then they will exacerbate overallocation. If prices are set higher, overallocation risks will diminish, but remain present.

The lower the prices at which ARB makes pre-2021 allowances available in the post-2020 market, the more likely these allowances are to re-enter the market, even after removal from the normal auction supply. Thus, the choices ARB makes in its post-2020 market design could undermine the "self-correcting" auction mechanism's efficacy as a tool to address market overallocation.

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[23] Busch, *supra* note 2.

[24] Cullenward et al., *supra* note 14.

Conclusion

We analyze the impact of California's "self-correcting" auction mechanism on allowance overallocation in the WCI cap-and-trade program, focusing on the ~118 million California-owned allowances that went unsold in the auction collapse of 2016-17.

Consistent with others' estimates, we find that about one-third (~38 million) will inevitably remain unsold for more than 24 months and therefore be removed from the normal auction supply, even if all upcoming auctions are fully subscribed. Energy Innovation's report—arguably the most prominent analysis of allowance overallocation—appropriately included this effect in its estimates.

If the August 2018 auction is undersubscribed, then regardless of the outcomes of the November 2018 and February 2019 auctions, slightly more than half of the previously unsold allowances (~66 million) will be removed from the auction supply. If the August 2018 auction sells out, but the November 2018 auction is undersubscribed, less than half of the previously unsold allowances (~52 million) will be removed.

This "self-correction" mechanism will help reduce the extent of overallocation in the WCI market, but will address only a fraction of the overallocation expected by 2020. Our results continue to indicate that allowance overallocation is significant and presents risks to California's ability to achieve its 2030 climate target.

However, we note that the overallocation estimates discussed in this note do not account for the fact that market participants could eventually access allowances removed from the auction supply in the post-2020 market period. The likelihood that those allowances will be sold again depends on choices ARB makes in its AB 398 implementation process. If these allowances are accessed in the future, they will enable higher emissions and cause the program to be less effective at reducing emissions than the adjusted calculation discussed here suggests.

The large buildup of unsold allowances in 2016-2017 was a highly unusual episode that was associated with uncertainty about the future of the cap-and-trade system after 2020. With the passage of AB 398, that uncertainty has now been resolved. If covered emissions continue to remain below program caps, auctions could conceivably fail to sell out for an extended pe-

riod. But market participants also have an incentive to continue to purchase excess allowances in expectation of higher future prices as caps tighten. It will be important to carefully observe auction and emission outcomes during in the coming years.

We conclude that California's "self-correcting" auction mechanism will have only a limited effect on overallocation. Absent another crisis in market confidence—which neither we nor other analysts are predicting—the mechanism will only modestly reduce the supply of excess allowances in California's cap-and-trade program. In turn, the choices ARB makes with respect to the allowances transferred out of the auction supply could reverse the beneficial environmental effects of the state's "self-correcting" auction mechanism.

Appendix: Sensitivity analysis

The primary uncertainty about how many allowances will be removed from the normal auction supply concerns whether all of the auctions in 2018 will sell out or not.

There are also much smaller uncertainties related to the size of the February 2019 auction, the last auction at which any allowances unsold in 2016-2017 could be reintroduced. These smaller uncertainties are due to: (1) uncertainty about the number of allowances that will be in the 2019 industrial allocation and (2) uncertainty about the number of allowances that will be optionally consigned by utilities.

For the results described earlier in this report, we chose values for California's 2019 industrial allocation and optional consignment that were the same as in 2018 (industrial allocation of 41.6M allowances, and optional consignment of 10.4M allowances). If the industrial allocation is higher and/or the optional consignment lower, then allowance reintroductions will be lower. This will lead to, at most, about 2M fewer allowances being reintroduced and sold, and therefore 2M more allowances transferring from the normal auction supply to the APCR. For example, if the industrial allocation in 2019 is 20M higher than in 2018, and optional consignment is zero, then for the case in which all auctions sell out, we estimate that 40.2M allowances are removed from the auction supply, 1.9M higher than the 38.3M estimate we report in the body of this research note.

Varying the size of the 2019 industrial allocation and optional consignment does not have an effect on the high end of estimates for removal from the normal auction supply because in those high removal scenarios, because there are no reintroductions of allowances in 2019 due to the required delay in reintroductions following an undersubscribed auction.

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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.

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