Critical issues in post-2020 cap-and-trade market design:
Hot air and carbon offsets

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Summary

- California's cap-and-trade program has a large glut of extra allowances that companies do not need to satisfy program requirements through 2020. If these allowances are used in the post-2020 program, they will increase emissions on a 1:1 basis—resulting in a massive "hot air" problem in which cap-and-trade target compliance occurs on paper without actually reducing emissions.

- California's "hot air" problem is the same size as ARB's projected role for the post-2020 cap-and-trade program. It could overwhelm the market.

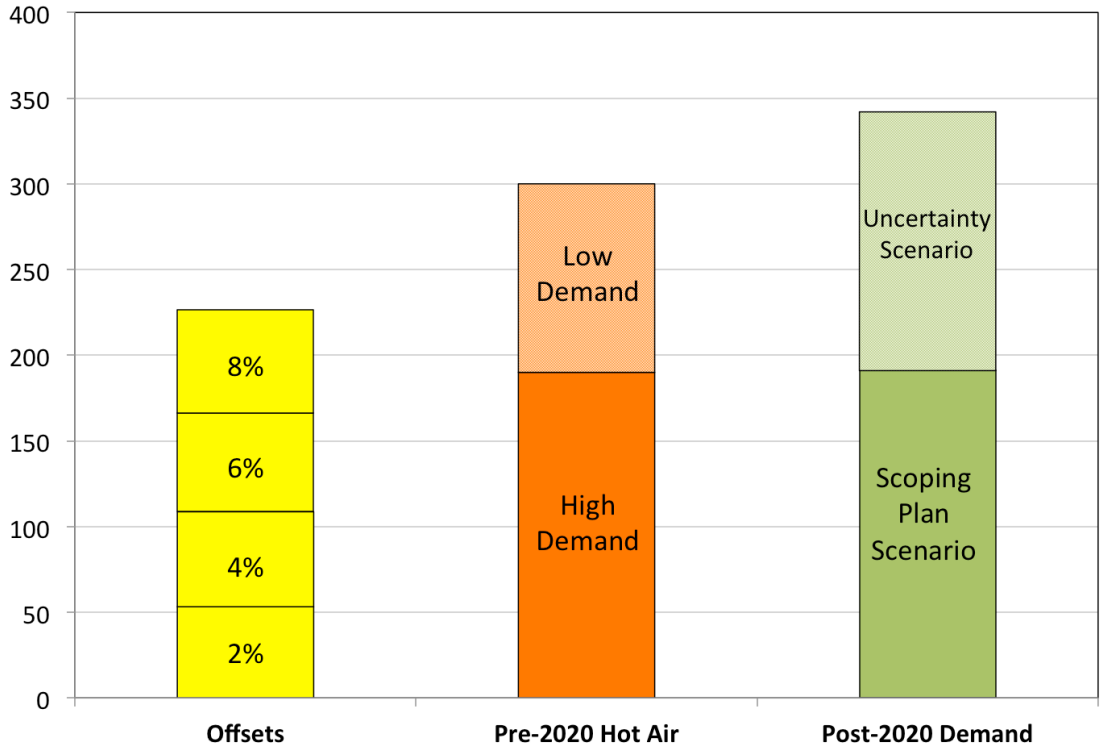
- The cap-and-trade program relies on a large volume of carbon offsets, which credit emission reductions that occur outside of the cap-and-trade program and often outside of California. If offsets are retained after 2020, they could produce a substantial majority—or even all—of the reductions required under cap-and-trade.

- **Recommendation on "hot air" allowances:** If the legislature wants the post-2020 cap-and-trade program to reduce emissions, it should address the "hot air" problem. Example solutions include making these allowances ineligible for post-2020 compliance, lowering the post-2020 program caps 1:1 to account for pre-2020 allowances that are banked into the post-2020 period, or transferring all unsold allowances to a post-2020 price ceiling account.

- **Recommendation on offsets:** If the legislature wants the post-2020 cap-and-trade program to reduce emissions in sectors subject to the cap-and-trade program, it should consider lowering the offsets limit. If the legislature wants the post-2020 program to reduce in-state emissions or produce in-state co-benefits from offset projects (e.g., forest conservation or water quality improvements), it should also consider limiting the use of out-of-state carbon offsets.

Figure 1: Offset and hot air supply vs. post-2020 market demand

Million compliance instruments ($MMtCO_2e$) over 2021-2030



Sources:

- Offsets: calculations in Table 1 in this document, below. Percentages shown indicate the volume of post-2020 supply available at different usage limits.
- Pre-2020 Hot Air: Figure 6 in Busch (Mar. 2017).[1]
- Post-2020 Demand: Figure II-2 in ARB Scoping Plan (Jan. 2017).[2]

Allowance oversupply and the "hot air" problem:

- California's cap-and-trade program suffers from a glut of excess allowances that are not needed for compliance with the pre-2020 caps.[3]

- According to the Legislative Analyst's Office, emissions from companies subject to the cap-and-trade program are significantly below the cap levels.[4] This condition results in an abundant supply of allowances and carbon offsets relative to demand for those same compliance instruments.

- If the cap-and-trade program is extended without addressing the oversupply issue, excess "hot air" allowances will flood the post-2020 market period and likely cause California to miss its SB 32 emission target. This is because every surplus pre-2020 allowance that is used in the post-2020 market allows a company to emit an additional ton of greenhouse gases in the future—on a 1:1 basis.

- Dr. Chris Busch from Energy Innovation LLC estimates that there are between 190 and 300 million surplus allowances in the current market, through 2020.[1]

- For comparison, the Air Resources Board (ARB) estimates that cap-and-trade will need to reduce 191 million tons over the period 2021-2030 in its scoping plan scenario.[2] In this case, excess "hot air" allowances could completely overwhelm the market, resulting in emission reductions on paper but not in reality.

- Even in ARB's uncertainty scenario—which anticipates a much larger role for cap-and-trade (342 million tons of reductions from 2021-2030)[2]—excess "hot air" allowances could overwhelm most and potentially all of the post-2020 market, again producing compliance on paper but not in reality.

- See Figure 1 for a visual comparison of the supply of "hot air" relative to ARB's expected role for the post-2020 cap-and-trade program.

- If a significant number of "hot air" allowances from the pre-2020 period are used in the post-2020 market design, then the market will likely fail to reduce emissions and California will likely miss its SB 32 target for 2030.

Carbon offsets

- Carbon offset credits recognize emission reductions that occur outside of the sectors that are subject to the cap-and-trade program. Companies regulated under the cap-and-trade program can submit carbon offset credits to comply with a certain percentage of their compliance obligations.

- Carbon offset credits are awarded to projects that satisfy the standards of ARB-approved carbon offset protocols. There are currently six offset protocols. So far, most of the offset credits awarded to projects under these protocols come from out-of-state projects—including under the forest protocol, the largest source of offset credits awarded to date.[5]

- In the current cap-and-trade program, companies can submit carbon offset credits equal to up to 8% of their total emissions in any given year. While this number might seem small, it is in fact quite large. Dr. Barbara Haya from UC Berkeley estimates that this limit is equal to more than 100% of the reductions ARB expected from cap-and-trade through 2020 and up to 53% of total reductions required to meet the 2020 target under AB 32.[6]

- So far, companies haven't fully exploited this limit. In the 2013-14 compliance period, regulated parties submitted offset credits equal to 4.4% of their total emissions—about half of the limit.[7] ARB data from 2015 indicates that the share of offset credits may be rising, as preliminary compliance submissions for that year included offset credits at 7.9% of total compliance instruments.[8]

- Going forward, the role of offsets could play a similarly large role. As described in the previous section, ARB expects the cap-and-trade program to reduce 191 million tons of emissions over 2021-2030. For comparison, retaining the 8% offsets limit would enable companies to use 227 million offset credits—more than what ARB calculates is needed from the cap-and-trade market. Even smaller offset limits can still lead to offsets playing a large or even dominant role in California's post-2020 cap-and-trade program. Figure 1, Table 1, and Table 2 provide calculations.

- If offsets play a large or dominant role, emissions are unlikely to fall much in sectors subject to the cap-and-trade program because regulated parties can use offsets to meet most of their compliance obligations.

Table 1: Maximum offset use during 2021-2030

Million offset credits (MMtCO2e)

		Maximum offset use limit (%)			
	Cap	2%	4%	6%	8%
2021	320.8	6.5	13.4	20.5	27.9
2022	307.5	6.3	12.8	19.6	26.7
2023	294.1	6.0	12.3	18.8	25.6
2024	280.7	5.7	11.7	17.9	24.4
2025	267.4	5.5	11.1	17.1	23.3
2026	254.0	5.2	10.6	16.2	22.1
2027	240.6	4.9	10.0	15.4	20.9
2028	227.3	4.6	9.5	14.5	19.8
2029	213.9	4.4	8.9	13.7	18.6
2030	200.5	4.1	8.4	12.8	17.4
	Total:	**53.2**	**108.6**	**166.4**	**226.7**

Source:

- Cap levels: ARB, Proposed cap-and-trade amendments (2016).[9]

Notes:

- Because regulated parties can bank allowances and offset credits, it is unlikely that the total number of offsets submitted in any given year will match the annual numbers shown in the table above. On a cumulative basis, however, the total calculations are reliable because regulated parties can use banking only to shift the timing of when emissions and compliance submissions occur, not the total amount.

- Thanks to Dr. Barbara Haya for consulting on the calculations presented here. The offset limit in each cell is calculated as:

  $Offsets_t = Cap_t \times Limit / (1 - Limit)$ For all years *t*

Table 2: Maximum offset use during 2021-2030

As percentage of cap-and-trade and full scoping plan measures

	Offsets as a percentage of:		
Offsets limit	Cap-and-trade (Scoping Plan)	Cap-and-trade (Uncertainty)	Total reductions (2021-2030)
2%	28%	16%	8%
4%	57%	32%	16%
6%	87%	49%	24%
8%	119%	66%	33%

Sources:

- ARB, Proposed Plan Scoping Plan, Figure II-2.[2] ARB reports cumulative emission reductions required over the period 2021-2030 for:
    - The cap-and-trade program under the scoping plan scenario (191 MMtCO2e);
    - The cap-and-trade program under the uncertainty scenario (342 MMtCO2e);
    - The total reductions to hit SB 32 target for 2030 (680 MMtCO2e).
- Volume of offsets from calculations in Table 1, above.

Note:

- The current cap-and-trade program offsets limit is 8%.

References

[1] Chris Busch (Mar. 2017), Recalibrating California's Cap-and-Trade Program to Account for Oversupply. Energy Innovation LLC Report, *available at* http://energyinnovation.org/wp-content/uploads/2017/04/RecalibratingCA_Cap-Trade_2017.pdf.

[2] Air Resources Board (Jan. 2017), The 2017 Climate Change Scoping Plan Update: The Proposed Strategy for Achieving California's 2030 Greenhouse Gas Target, Figure II-2, *available at* https://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

[3] Danny Cullenward and Andy Coghlan (2016), Structural oversupply and credibility in California's carbon market, *The Electricity Journal* 29: 7-14 *available at* http://www.sciencedirect.com/science/article/pii/S1040619016300707.

[4] Legislative Analyst's Office (Feb. 2017), The 2017-18 Budget: Cap-and-Trade, Figure 7, *available at* http://www.lao.ca.gov/Publications/Report/3553.

[5] Christa M. Anderson, Christopher B. Field, and Katherine J. Mach (2017), Forest offsets partner climate change mitigation with conservation, *Frontiers in Ecology and the Environment* (in press).

[6] Barbara Haya, California's Carbon Offsets Program—The Offsets Limit Explained, *available at* http://beci.berkeley.edu/research/carbon-trading-project/.

[7] Air Resources Board, 2013-14 Compliance Report, *available at* https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.

[8] Air Resources Board, 2015 Compliance Report, *available at* https://www.arb.ca.gov/cc/capandtrade/capandtrade.htm.

Note that this report is for the first year of the second compliance period, whereas the 2013-14 Compliance Report is for the entire first compliance period. In the first year of a compliance period, companies only need to submit compliance instruments equal to 30% of their total reported emissions, with the remainder due by the end of the compliance period. Thus, the share of carbon offsets in this one year of data may not be representative of a trend in total offsets usage.

[9] Air Resources Board (2016), Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Appendix A, Section 95841, Table 6-2, *available at* https://www.arb.ca.gov/regact/2016/capandtrade16/capandtrade16.htm.