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Three Lingering Design Issues Affecting Market Performance in California's GHG Cap-and-Trade Program

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Executive Summary

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California's GHG cap-and-trade program is a key element of policies designed to achieve the goal of the Global Warming Solutions Act of 2006 (AB 32) to reduce GHG emissions to 1990 levels by the year 2020. Throughout the process of implementing its GHG cap-and-trade program, ARB has shown an admirable willingness to continue discussions to refine and improve the program's design. Although the program has now entered its first compliance period and has already undertaken its first allowance auction, there is still opportunity for further refinement of a program that will be in effect through 2020. In this spirit, we recommend that ARB consider modifications to three program elements – the Allowance Reserve, offset programs, and holding limits – that would improve program performance without compromising environmental performance.

The cap-and-trade program has important consequences both within and outside California. Within California, design of an effective cap-and-trade program will help to lower the economic cost of meeting AB 32's ambitious emission targets. However, in terms of addressing the climate change problem, California's greatest impact may come not from the actual emission reductions achieved by the state, but by the leadership it provides on climate policy. As other countries and states watch California's policy outcomes, they will draw important lessons about which policies can help achieve policy objectives with limited economic disruption, and whether such commitments should be pursued. By developing policies that achieve environmental goals while minimizing economic risks, California can provide a positive example for other jurisdictions considering similar climate commitments. The following changes to the Allowance Reserve, offset program and holding limits each reduce the risks of adverse economic outcomes that could provide the wrong message to these other regions.

1. ARB has added the Allowance Reserve to mitigate against the risk that significant demand for allowances would drive up prices to unacceptable levels. While helping to mitigate this economic risk, the Reserve's design would be further enhanced by developing a mechanism

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that prevents Reserve exhaustion through replenishment as the Reserve is drawn down. This enhancement would avoid the risk that allowance prices could rise to unacceptably high levels under unforeseen market conditions. Several options for replenishment, including offsets purchases and borrowing from post-2020 commitments, could ensure that mitigation of economic risks can be achieved without compromising environmental effectiveness.

2. In creating the Allowance Reserve, ARB has increased reliance on offset markets to help mitigate the costs of achieving AB 32 emission targets. However, markets for offset credits eligible for compliance with the cap-and-trade program have been slow to develop, creating the risk that an adequate offset supply will not be available to help contain costs should high allowance prices emerge. Greater urgency by ARB in implementing these systems, particularly in approving protocols for new types of projects, is necessary if the flexibility codified in the rules is to be realized in practice.

   ARB should also reevaluate current rules that make buyers liable for offsets that are later determined to be invalid ("buyer liability".) These liability rules, which market participants indicate have slowed the development of offset markets, could be met through a "seller-first buyer-second" liability approach. This approach holds sellers accountable for invalid offset. However, if sellers do not deliver offsets that represent legitimate and verifiable emission reductions, then buyers would be liable. This alternative approach has the same environmental effectiveness as the current buyer-liability approach, because buyers remain liable for offset invalidity should sellers be unable to fulfill their obligation. But, this approach has advantages. Primary responsibility for offset validity rests on sellers, who are in the best position to manage the risks of invalid offsets by providing reliable project information, providing sound ongoing management of offset projects, and selecting quality offset verifiers. In addition, by reducing the "due diligence" that buyers must perform for every offset transaction, transaction costs are reduced, which would support uniformity of offset prices, improve market liquidity and increase buyer confidence in offset markets.

3. Under current rules, participants in cap-and-trade markets are subject to limits on the quantity of allowances they can hold at one time (holding limits) and limits on the quantity of allowances they can purchase in individual auctions. These limits are intended to mitigate the risks of market manipulation. However, these limits are imposed uniformly across all market participants irrespective of the difference in the costs they impose on different types of market participants. These limits could constrain the ability of firms subject to cap-and-trade to hedge the financial risks of compliance by banking allowances for use in future periods. Other markets with similar holding limits (e.g., derivative markets regulated by the Commodity Futures Exchange Commission) provide exemptions for legitimate business activities. ARB should modify these holding limits to account for legitimate hedging and banking activities through exemptions or increases in holding limits that reflect the size of market participant's compliance obligations.

While the low prices in the initial allowance auction would suggest that the underlying economic risks that these modifications seek to mitigate are a lower priority, these risks could quickly emerge under positive changes in California's economy or unexpected changes in energy markets. These proposals aim to establish systems to mitigate these risks in advance of these possible events, which can ensure program integrity, and achievement of GHG reduction goals, should unanticipated events arise.

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California's GHG cap-and-trade program is a key element of policies designed to achieve the goal of the Global Warming Solutions Act of 2006 (AB 32) to reduce GHG emissions to 1990 levels by the year 2020. With the program having gone into effect on January 1, 2013 and the first allowance auction having been successfully implemented, it is a good opportunity to consider the status of the program's design and implementation to assess whether further modifications might improve program performance.

The cap-and-trade program has important consequences both within and outside California. Within California, design of an effective cap-and-trade program will help to lower the economic cost of meeting AB 32's ambitious emission targets. However, in terms of addressing the climate change problem, California's greatest impact may arise more from the leadership it provides on climate policy that may encourage other states and regions to adopt similar climate commitments, than on actual emission reductions achieved within the state. As these other jurisdictions watch California's policy outcomes, they will draw important lessons about which policies can help achieve policy objectives with limited economic disruption, and whether such commitments should be pursued. Consequently, design of an effective, efficient and smoothly operating cap-and-trade program is essential to achieving this broader impact.

Policy failures could have broad adverse consequences. Prior experiences with energy markets and environmental programs in California demonstrate this risk. California's electric market crisis of 2000 arose, in part, due to design flaws in California's electricity markets and the South Coast's Regional Clean Air Incentives Market (RECLAIM) for NO_X and SO_X emissions. As a consequence of the crisis, electric industry restructuring was effectively halted in the other 49 states and RECLAIM was terminated. While the relatively low prices in the initial allowance auction and secondary markets suggest that these

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risks are relatively low, market outcomes could change unexpectedly, particularly if there are positive changes in California's economy or unanticipated changes in energy markets. Because the success of California's efforts depend on widespread adoption of similar policy commitments outside of California, and given the current headwinds for efforts to adopt broad and meaningful commitments to reduce GHG emissions, the implications of any negative policy outcomes are potentially great.

Within this context, we consider three issues that warrant further attention, particularly given the potential for the modifications to mitigate risks of adverse policy outcomes: (1) the allowance reserve; (2) offset provisions; and (3) holding and auction purchase limits. These represent three, but not all of the design issues ARB is still considering that will affect market performance. In particular, ARB is also considering how best and whether to link California's cap-and-trade program with other cap-and-trade programs, including programs with similar designs, such those developed by other members of the Western Climate Initiative, and programs with less-similar designs, such as the European Union Emission Trading System. While important, we do not address issues related to such linkage here. We also do not address issues related to initial allocation of allowances, which we address in another paper.[3]

1. Allowance Reserve

The Allowance Reserve was added to the cap-and-trade design to mitigate economic risks arising if the demand for allowances becomes particularly high, leading to unacceptably high allowance prices. The Reserve was created as part of what we refer to as the "Reserve Policy". At the outset of the program, allowances will be removed from the cap-and-trade budget and placed into the Allowance Reserve. Allowances can be purchased from the Reserve at any time at pre-determined, fixed prices.[4] By removing allowances from the cap-and-trade budget, the Reserve increases the stringency of the cap-and-trade program, which *increases* allowance prices. To compensate for this increased stringency, the limit on the fraction of offsets that can be used to comply with the program was raised from 4% to 8%, which lowers allowance prices.

In terms of environmental effectiveness, the Reserve Policy will likely reduce emissions. By shifting allowances from compliance budgets to the Reserve, any unused allowances in the Reserve at the end of the program in 2020 reflect emission reductions. Consequently, as long as allowances remain unused in the Reserve, emissions are reduced. Quantitative analysis of the Reserve Policy suggests that it reduces expected emissions by nearly 4%, although this estimate varies with assumptions that affect the likelihood that the Reserve is used in the future.[5]

[3] Schatzki, Todd and Robert N. Stavins, "Using the Value of Allowances from California's GHG Cap-and-Trade Program," working paper, August 2012.

[4] The Reserve has three equally sized tiers. Prices for each tier start at $40, $45 and $50 per allowance ($MTCO_2e$) in 2013 and rise annually at a rate of 5% plus an inflation index.

[5] Estimates reflect expected emissions given uncertainty in baseline emissions that affect the level of abatement and the need to draw allowances from the Reserve. Emissions reflect the combination of emissions from sources covered by cap-and-trade plus changes in emissions from uncapped sources via offsets. Schatzki, Todd, "Can Policies for Cost Containment Raise Costs? An Empirical Analysis of California's GHG Cap-and-Trade Allowance Reserve," working paper, August 2012.

The Reserve Policy's economic consequences are somewhat more complex because it has an asymmetric impact on allowance prices depending on market conditions. When costs are low, the Reserve will likely increase market prices, whereas, when costs are high, the Reserve will likely decrease market prices. Consider the "low cost" case when the Reserve is not used (that is, allowance prices are below the reserve trigger price.) Creating the Reserve increases the cap's stringency which increases allowance prices. While relaxing the limit on offset use can mitigate this increase in price, unless there are sufficient allowances at low prices to fully offset the increase in cap stringency, allowance prices will increase. In practice, given details of how the Reserve Policy was codified in the regulation, this will never occur.[6]

By contrast, consider the "high cost" case when allowance prices exceed Reserve price triggers and the Reserve is fully exhausted. In this case, the total supply of allowances is the same with or without the Reserve. However, with the Reserve, a larger quantity of offsets can be used because the offset use limit is increased to 8%. Consequently, in-state emissions increase, which lowers allowance prices. Thus, the Reserve mitigates allowance prices under "high cost" market conditions. Appendix 1 describes these two cases through a more detailed graphical illustration.

This asymmetric price impact has several implications for economic outcomes. First, price mitigation achieved when costs are high has several policy benefits. As allowance prices increase, additional emission reductions are unlikely to result in positive net benefits, given that the benefits of reducing GHG emissions are relatively constant. Thus, by increasing the supply of allowances (from offsets) when costs are high, the Reserve can avoid undertaking costly in-state emission reductions. In addition, the economic disruption from cap-and-trade may rise disproportionately as allowance costs increase; consequently, the Reserve can help avoid these disproportionate impacts. The Reserve may also lower allowance price volatility, particularly when paired with a price floor, as in the AB 32 cap-and-trade program.

While reducing the risk of high allowance prices, the net impact of the Reserve Policy on prices "on average" is ambiguous. That is, the impact of the Reserve on "expected" prices, given uncertainty about future costs, could be either positive or negative. Quantitative analysis of California's cap-and-trade program has found that expected allowance prices – assuming full effectiveness of the AB 32 complementary policies – could actually increase under reasonable assumptions about future costs and emissions.[7] However, under market scenarios that require greater abatement from the cap-and-trade program (such as partial effectiveness of complementary programs, greater economic activity, and higher abatement costs), the Reserve Policy can reduce expected prices and, more importantly, limit price increases when required abatement is particularly high.

[6] Relaxing the offset use limit will not fully offset increased cap stringency for two reasons. First, the increase in cap stringency (123.5 MMTCO2e) exceeds the relaxation in offset use (107 MMTCO2e). Second, offsets are costly to produce. Consequently, offset supply at low allowance prices may be insufficient for take full advantage of the 8% offset use limit.

[7] For example, assuming full effectiveness of complementary programs and assumptions about uncertainty in the needed levels of abatement (given uncertainty about baseline emissions), expected allowance prices increase with the Reserve Policy. Schatzki, Todd, "Can Cost Containment Raise Costs?", working paper, July 2012.

While the Reserve Policy provides both environmental and economic benefits, modifications could improve economic outcomes, without compromising environmental performance. One limitation of the current Reserve design is that it does not limit allowance prices if the Reserve is exhausted. There are good policy and economic reasons to avoid the precipitous price increases that could occur if the reserve were exhausted. Economically, the net benefits of emission reductions diminish and become negative as the costs of emission reductions rise. By relaxing emission targets when further reductions would result in net costs, an allowance reserve (and a price cap) can avoid such costly emission reductions and increase the efficiency of a cap-and-trade program.[8] Avoiding such outcomes through market design – rather than ad hoc policy reactions during a crisis – is likely to lead to better policy outcomes, given political pressures that may arise in such circumstances.

ARB can address the risk of reserve exhaustion by establishing mechanisms to replenish the allowance reserve as it is drawn down. There are several potential sources of allowances for replenishing the Reserve. One approach is to use revenue from the sale of Reserve allowances to purchase emission offsets.[9] Another alternative is to borrow allowances from post-2020 commitments periods; these allowances might be replaced with offsets purchased after 2020.[10] Both of these alternatives provide the market with access to additional allowances while maintaining the environmental integrity of the cap-and-trade program.

Analysis of California's cap-and-trade program suggests that replenishment can significantly lower costs, while preventing emissions from rising above cap-and-trade targets. For example, a policy that reduces the size of the Allowances Reserve to one-third of its current size and replenishes the Reserve through offsets reduces expected allowance prices by 20% ($44.9 to $36 per $MTCO_2e$) and reduces expected total costs by 34% ($3.7 billion to $2.4 billion.)[11]

Another alternative is a price cap, referred to by ARB as a "hard cap." In effect, a price cap is synonymous with a Reserve that is replenished with additional allowances. ARB has rejected such "hard" caps in the past, in lieu of "soft" caps such as the Allowance Reserve with no replenishment. However, at some price, political forces will take over and force price discipline on markets, as seen by the experience with RECLAIM and California's restructured electricity markets. A "hard" cap acknowledges this political reality, while also providing a sensible policy that avoids costs that far outweigh policy benefits.

[8] Murray, B.C, R.G. Newell, and W.A. Pizer, 2009, "Balancing Cost and Emissions Certainty: An Allowance Reserve for Cap-and-Trade," *Review of Environmental Economics and Policy* 3(1): 84-103; William A. Pizer. "Combining Price and Quantity Controls to Mitigate Global Climate Change." *Journal of Public Economics* 85.3 (2002): 409-434.

[9] ARB apparently has concerns about any mechanism in which the Reserve purchases offsets, since this would make ARB both an issuer and purchaser of offsets. ARB's concern about the independence of these functions is understandable, but ARB ought to consider alternative institutional designs (for example, purchase of offsets from an Offset Project Registry) that would foster appropriate independence between these functions.

[10] Assuming ARB would carry forward allowances in the Reserve to post-2020 commitment periods, this approach borrows from post-2020 compliance periods in a manner analogous to the way ARB proposes to stock the Reserve initially.

[11] Schatzki, Todd, "Can Cost Containment Raise Costs?", working paper, July 2012.

Another implication of the Reserve Policy is that it increases reliance on offsets for achieving compliance with the cap-and-trade program. While the Reserve Policy relaxes limits on offset use to compensate for increases in cap stringency, this increased flexibility only helps to lower costs if the market supplies a sufficient quantity of offsets at reasonable costs. If not, then the Reserve Policy only increases cap stringency without any compensating effect to help control costs.

2. Offsets

Offsets represent an important element of the cap-and-trade program. They provide a means for emission reductions from sources outside the cap to substitute for reductions from sources under the cap. Offsets are an important element of program design to limit the cost of achieving the AB 32 GHG emission target. In ARB's economic analysis, offsets represent 46% of emission reductions achieved by the cap-and-trade program (in ARB's base case scenario.) When offsets are not permitted, allowance prices increase from $21 to $106 per $MTCO_2e$ and reductions in Gross State Product increase more than four-fold.[12] Moreover, this analysis was performed prior to the introduction of the Allowance Reserve, which, as described above, has further increased reliance on offsets. Consequently, these results may understate the importance of offsets to cap-and-trade economic outcomes.

ARB has established detailed standards and procedures to ensure that offsets are real, permanent, quantifiable, verifiable, and enforceable. In some cases, ARB has made decisions supportive of developing a sufficient and timely supply of offsets, such as allowing credits generated as early as December 1, 2006 that meet certain Climate Action Reserve protocols to be certified as AB 32 offsets.

However, in other respects, the program's implementation has been slow to develop. At present, ARB has developed protocols for only four types of projects, although it will be considering protocols for two additional types of projects during 2013.[13] And, to date, relatively few projects and credits have been approved.[14] Thus, there are important concerns about whether offset markets are developing in a sufficiently timely fashion given the start of the program in 2013.[15] One recent analysis concluded that the supply of offsets from the four current and two new potential types of eligible offset projects would be insufficient to take full advantage of the full flexibility offered by offsets.[16] Even accounting for the two new project types, the study found that offset supply would be 22 percent short of the allowed flexibility

[12] Gross State Product falls 0.2% with offsets, and 0.9% without offsets. ARB, "Updated Economic Analysis of California's Climate Change Scoping Plan," Staff Report to the Air Resources Board, March 24, 2010.

[13] Protocols have been developed for forestry, urban forestry, agricultural methane, and ozone depleting substances, and are being considered for coalmine methane and rice management.

[14] The majority of offsets have been past reductions made under Climate Action Reserve protocols. The quantity of offsets that can be supplies from these past activities is limited. AS of June 2012, the Climate Action Reserve reports certification of 8.4 $MMTCO_2e$ of offsets meeting its protocols that are compliant with ARB regulations. Climate Action Reserve, "Introduction to the Climate Action Reserve and California Offsets," June 8, 2012.

[15] Point Carbon, "New push for offsets amid concerns of California shortage," Carbon Market North America, March 2, 2012.

[16] Stevenson, Sam, et al., "Compliance Offset Supply Forecast for California's Cap-and-Trade Program (2013-2020)," Winrock International and American Carbon Registry, September 2012.

in the first compliance period (2013-2014).[17] In later compliance periods, this gap grows. With the four current and two proposed projects types, the study estimates a 50 percent shortfall of supply for the third compliance period (2018-2020). Because the 8% offset use limit applies to each individual compliance period (with no carryover across compliance periods), timely development of offset markets is critical if the market is to take full advantage of offset flexibility.

ARB can do several things to facilitate offset market development. While most elements of the offset certification process and systems remain have been developed, the limited use of these systems creates investment uncertainty for developers considering new offset projects. Uncertainty over how these systems will work may delay investments until others have demonstrated that there are no unanticipated financial risks when seeking project certification from ARB. Consequently, ARB should place high priority on implementing streamlined – but rigorous – offset program rules and procedures.

ARB should also reevaluate rules used to assign liability for invalid offsets with the goal of efficiently allocating responsibility for offset quality. Under current rules, offsets can later be deemed invalid due to "errors" in calculating emission reductions identified after verification and certification.[18] ARB has assigned the liability for replacing invalid offsets to offset buyers, unless buyers cannot fulfill the obligation (for example, due to bankruptcy.), in which case, the seller (project developer) is liable for replacing the allowances. The uncertainty created by the buyer liability approach has been identified as a factor that has limited current demand for offsets.[19]

Instead of this approach, we propose an alternative approach that reverses this sequence, so that sellers are the first party responsible for replacing offset credits, and buyers are responsible only if sellers cannot fulfill this obligation. Like ARB's proposal, this proposal ensures that offsets are replaced by making sellers liable first and buyers liable second for invalid offsets; environmental effectiveness is not compromised. However, this approach – "seller-first buyer-second" liability – has several benefits over ARB's proposed approach.

First, sellers are in the best position to take measures to ensure that offsets are properly calculated, including selecting reliable verifiers, providing accurate and complete data, and subsequently managing offset projects to ensure that emission reductions are achieved. Consequently, seller-first buyer-second liability would reduce the likelihood of problems that would lead to invalid offsets, which not only improves the performance of offset markets, but reduces the burden of contentious administrative proceedings for ARB.

Second, under buyer liability, the risk of offset invalidation depends on the specific risk associated with the underlying project and developer. Consequently, offset prices will vary with project-

[17] The study finds that supply of offsets from another project type that ARB has indicated it will not consider (low-bleed pneumatic valves) could fill this remaining gap.

[18] Grounds for invalidation can include "errors that overstate the amount of GHG reductions," offset projects not in accordance with all local, state and national regulations, and issuance of credits from the reduction activity in any other program (that is, double-counting credits.) These invalidations are distinct from "unintentional reversals" in forest sequestration projects due to events such as forest fires. ARB, Final Regulation Order, California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, § 95985(b).

[19] Kahn, Debra, "Offsets slow to heat up in Calif. despite threat of shortage," *ClimateWire*, June 29, 2012.

specific risks, which will increase transaction costs for participants in offset markets. By contrast, under "seller-first buyer-second" liability, more uniform prices are likely, which will improve market liquidity and price discovery. Thus, not only will "seller-first buyer-second" liability reduce the likelihood of offset invalidation, but it may increase the use of offsets, which can help reduce costs of meeting AB 32 emission targets.[20]

3. Holding and Auction Purchase Limits

The cap-and-trade program places limits on the both the number of allowances that can be purchased in each quarterly auction ("auction purchase limits") and the number of allowances that can be held in accounts that can be actively traded ("holding limits").[21] Auction purchase limits are only in effect during the first compliance period, and are intended by ARB to ensure that entities that need allowances for compliance have "fair and equitable access" to allowances at auction.[22] Holding limits are imposed to reduce the opportunity for a market participant – by itself or in collusion with others – to control a large enough share of the market to manipulate prices.[23] Table 1 reports the holding limits for 2013 to 2020, while Table 2 reports the purchase limits for 2012 to 2014.

Table 1. Allowance Holding Limits by Year, California GHG Cap-and-Trade Program

Year	Annual Budget (MMTCO2e)	Holding Limit (MMTCO2e)
2013	162.8	5.95
2014	159.7	5.87
2015	394.5	11.74
2016	382.4	11.44
2017	370.4	11.14
2018	358.3	10.83
2019	346.3	10.53
2020	334.2	10.23

As with any commodity market, markets for cap-and-trade allowances are subject to potential market manipulation. Market manipulation occurs when market participants take actions that lead to inefficient market outcomes. Common forms of manipulation arise due to the exercise of market power

[20] Some variation in offset "quality" could still emerge given risks that project developers cannot replace invalid permits, but this risk would be smaller and vary less than with buyer liability.

[21] Holding limits do not apply to compliance accounts. Also, note that once allowances are moved to a compliance account, they cannot be subsequently removed.

[22] ARB, Proposed Regulation to Implement the California Cap-and-Trade Program, Staff Report: Initial Statement of Reasons, October 28, 2010, p. II-38.

[23] ARB, Proposed Regulation to Implement the California Cap-and-Trade Program, Staff Report: Initial Statement of Reasons, October 28, 2010, p. II-39.

or manipulation of market information (for example, a "market squeeze"[24] or providing false information to the market.) In emission markets, risks of market manipulation may increase as the end of the compliance period draws near, when emission sources with insufficient allowances for compliance need to purchase allowances form the market.

Regulators have many potential tools to mitigate the risk of market manipulation. One option is to vigorously monitor markets for market manipulation and prosecute market manipulation based on the harm created. This option is most effective when manipulation can be observed easily, violators have sufficient financial assets to pay penalties, violators are aware they are manipulating markets and administrative costs of monitoring and prosecuting are low.[25] This approach also necessitates detailed reporting of market transactions and holdings. All of these conditions hold in the context of California's allowance markets. Other options aim to reduce the likelihood of market manipulation through reporting requirements to improve market transparency,[26] emergency interventions into markets,[27] and position limits.[28]

Table 2. Auction Purchase Limits by Year, California GHG Cap-and-Trade Program

		Allowances		Quarterly Purchase Limit			Annual Purchase Limits		
Acution Year	Auction Type	Year	Per Quarter	Utilities	Capped Non-Utilities	Non-Capped Entities	Utilities	Capped Non-Utilities	Non-Capped Entities
2012	Future Vintage (2015)	39.45	39.45	9.86	9.86	9.86	—	—	—
2013	Current Vintage	67.62	16.91	6.76	2.54	0.68	27.05	10.14	2.70
2013	Future Vintage (2016)	38.24	9.56	2.39	2.39	2.39	9.56	9.56	9.56
2014	Current Vintage	68.08	17.02	6.81	2.55	0.68	27.23	10.21	2.72
2014	Future Vintage (2017)	37.04	9.26	2.32	2.32	2.32	9.26	9.26	9.26

The current market design requires careful tracking of allowances in accounts maintained and monitored by ARB and its independent market monitor. The accounts include all issued allowances, not just those submitted for compliance, and require that all market transactions be reported through the movements of allowances between accounts. Consequently, ARB can closely monitor actual allowance

[24] A market squeeze is a form of market manipulation in which a buyer with a large (future) position can use this market power to drive up the value of its futures contracts. For further details, see Pirrong, Craig. "Squeezes, Corpses, and the Anti-Manipulation Provisions of the Commodity Exchange Act," *Regulation* 17(4), 1994.

[25] Pirrong, Craig. "Market Oversight for Cap-and-Trade: Efficiently Regulating the Carbon Derivatives Market," Brookings Institute, Policy Brief 09-04, September 2009.

[26] More frequent reporting can improve market information to improve price discovery. For example, more frequent reporting of actual emissions can improve information about the balance of allowance supply and demand, and avoid abrupt changes in market prices when new information becomes available.

[27] Under emergency interventions, regulators can impose market-clearing prices, require traders to liquidate positions, or make other interventions deemed necessary to reduce anticipated or on-going manipulation.

[28] Pirrong, Craig. "Squeezes, Corpses, and the Anti-Manipulation Provisions of the Commodity Exchange Act," *Regulation* 17(4), 1994.

holdings. However, these accounts would not track derivative markets (such as forward, options and swaps), which will be regulated under federal commodity market rules.

The current market design also includes holding and purchase limits as another mechanism to mitigate market manipulation. No other operational cap-and-trade system currently employs any holding limits, while only the Regional Greenhouse Gas Initiative imposes auction purchase limits, which are set at 25%.[29] While the ARB holding limits are based on limits established by the CFTC for commodity *derivatives* markets, note that the CFTC does not impose limits on market participant's holdings of the underlying commodities (in this case, allowances.) Because ARB's holding limits apply only to the actual allowances, and not derivative contracts, ARB's holding limits will not deter market manipulation in these derivatives markets.

Costs and Benefits of Holding and Purchase Limits

Any decision to adopt holding and purchase limits should consider the anticipated costs and benefits of such limits. Holding and auction purchase limits may reduce the likelihood of market manipulation by limiting market participant's ability to accrue a large enough position to manipulate the market. However, position and auction limits also impose costs. In particular, these limits may impose costs if they limit the ability of emission sources to hedge cap-and-trade financial risks or if they limit firms' ability to bank allowances for use in future periods:

- Holding limits may limit hedging strategies available to emission sources with compliance obligations. Hedging allows the market to reallocate financial risk from firms with less tolerance for risk (typically producers that make or use the commodity) to those with more tolerance for risk (typically financial institutions and "speculators"). One important hedging tool for emission sources is to purchase allowances early in a compliance period to cover emissions later in the same period. This tool may become particularly important if robust derivative markets for allowances (including futures, swaps, and options) do not develop. But holding limits would constrain a firm's ability to pursue this strategy. ARB suggests that emission sources can avoid this constraint by placing allowances in a compliance account; but, because allowances are illiquid once placed in a compliance account (that is, they cannot be removed), this action creates a financial risk in the event that actual emissions are lower than anticipated, or the company wishes to adjust its financial position by reducing its allowance holdings. Thus, holding limits may constrain firm's ability to optimally hedge their compliance risk, which imposes financial costs on operations, which may pass through to consumers.
- Similarly, holding limits may unduly constrain emission sources' ability to bank allowances for use in future compliance periods. As recognized by ARB, by providing flexibility to shift emission reductions across years, banking is a very important tool for achieving emission reductions cost-effectively. This has been validated by previous experience with actual cap-and-

[29] The European Union Emission Trading System (EU ETS) Auction Regulation allows a maximum bid size to be imposed to address "actual or potential discernible risk of market abuse, money laundering, terrorist financing or other criminal activity, as well as anti-competitive behavior." Through 2011, no bid limits had been imposed. Brisson, Jean-Phillippe, et al., Exhibit 1 to Comments filed by Chevron, Inc. to the ARB, August 11, 2011.

trade systems, such as the national SO_2 allowance trading system.[30] Banking also provides emission sources with a way to mitigate price volatility and ensure compliance cost-effectively, given emission uncertainty. Moreover, ARB's own economic models anticipate that the least-cost path to complying with the cap-and-trade targets will involve allowance banking. Holding limits would constrain opportunities to bank allowances, which may raise costs.

Holding limits could also increase the likelihood of manipulation by reducing market liquidity. With holding limits, large emission sources may be forced to place a large portion of their allowances in illiquid compliance accounts. Placing a large portion of allowances in compliance accounts would reduce the market "float" – that is, the supply of allowances available in the market. Reducing the float can increase the likelihood of market manipulation because the quantity of allowances needed to exert market power becomes smaller. Holding requirements could compound other factors that tend to make allowances illiquid and thereby reduce the float in AB 32 allowance markets.[31] For example, cost recovery rules for regulated electric utilities may reduce incentives for them to actively trade in allowance markets.[32] Thus, by reducing liquidity, holding limits may actually increase opportunities for market manipulation.

Purchase limits may be so restrictive that they require some emission sources (primarily electric distribution companies) to utilize secondary markets to comply with cap-and-trade, particularly if allowance banking is economically wise. This would raise costs by requiring compliance entities to go through market intermediaries to obtain allowances, or by raising their costs of risk management.

These holding and purchase limits will have the greatest effect on large market participants. Table 3 reports the 2010 direct GHG emissions for companies with the largest emissions in the state. A comparison of the limits in Figure 1 with emissions in Table 3 demonstrates that for companies with the largest compliance requirements, holdings limits are most likely to constrain their ability to hold allowances needed for annual compliance or required for appropriate hedging or banking.

[30] Ellerman, A. Denny, Paul L. Joskow, Richard Schmalensee, Juan-Pablo Montero, and Elizabeth M Bailey, *Markets for Clean Air: The U.S. Acid Rain Program*, New York: Cambridge University Press, 2000

[31] In large commodity markets, such as markets for United States Treasury Securities, investor behavior that limits market liquidity (such as only participating in periodic auctions) may have resulted in reduced float that contributed to past market manipulation. Pirrong, Craig. "Market Oversight for Cap-and-Trade: Efficiently Regulating the Carbon Derivatives Market," Brookings Institute, Policy Brief 09-04, September 2009.

[32] Pricing anomalies in existing allowance markets have been attributed, in part, to limited market float, which, in some cases, has arisen due to factors such as regulated utility's ability to profit from allowance market transactions, and tax treatment of short-term transaction. Parsons, John et al., "Designing a US Market for CO_2," MIT Center for Energy and Environmental Policy Research Working Paper 09-001, January 2009.

Table 3. California GHG Emissions by Company, 2010

Company	Total Emissions (MMTCO2e)
Chevron	10.81
Calpine	8.07
BP	4.64
Shell	4.45
Conoco	4.32
Tesoro	3.55
ExxonMobil	3.31
Aera Energy	3.28
Los Angeles Department of Water & Power (LADWP)	2.89
Valero	2.63
Southern California Edison	2.39
Sacramento Municipal Utility District (SMUD)	2.12
La Paloma Generating Company	2.04

Note: Includes companies with GHG emissions greater than 2 $MMTCO_2e$.
Source: ARB.

Potential Improvements: Modifications and Alternatives

Modification of rules specifying holding and purchase limits could improve their likely balance of benefits and costs. Two modifications merit consideration: modifying holding limits to account for differences in costs and benefits across market participants; and more frequent auctions.

Under the current rule, holding limits are independent of the need for allowances to comply with cap-and-trade. Limits are set at the same level for all emission sources, regardless of their need for allowances to comply with the cap-and-trade program. Consequently, these limits are most costly and problematic for companies with larger emissions. In addition, holding limits are set the same whether or not the market participant is regulated by cap-and-trade. This lack of differentiation fails to recognize that hedging and banking by market participants with compliance obligations creates social benefits that can be constrained by holding limits. By contrast, market participants without compliance obligations derive fewer benefits from less stringent holding limits. In addition, uniform limits will impose greater costs on larger market participants, because beneficial hedging and banking activities are most likely to be constrained.

ARB should consider modifications to holding limit rules that better reflect the costs and benefits of imposing limits across market participants. These modifications could include: increases in holding limits for entities with cap-and-trade compliance obligations; setting holding limits for each market participant based on its expected compliance obligations or past emissions; or providing exemptions for legitimate hedging and banking activities. Other commodity markets that impose holding limits also provide exemptions to these limits for legitimate business purposes. In particular, position limits in

CFTC derivatives regulation (the same regulation used as the basis for ARB position limits) include a "bona fide hedging exemption."[33] ARB regulations currently do not include any exemption for emission sources that need allowances for compliance. Moreover, if provided, such exemptions should reflect not only hedging but also allowance banking, which also represents a legitimate business activity that can lower the costs of achieving AB 32 emission targets.

ARB should also consider more frequent auctions, which may eliminate the need for holding limits, or at least allow less stringent holding limits. More frequent auctions would improve price discovery, reduce price volatility and reduce opportunities for market manipulation. Benefits of more frequent auctions may be particularly great at the outset of the cap-and-trade program, as allowances prices adjust to be consistent with underlying abatement costs. Under the current Rule, allowance auctions are held quarterly. In contrast, other GHG cap-and-trade programs auction allowances with a much greater frequency, in some cases as often as once per week.[34]

4. Conclusion

Throughout the process of implementing its GHG cap-and-trade program, ARB has shown an admirable willingness to continue discussions to refine and improve the program's design. In this spirit, we recommend that ARB consider modifications to the allowance reserve, offset programs, and holding limits that would improve program performance without compromising environmental performance. These changes can avoid adverse policy outcomes that would undermine the broader success of this new climate policy. While some risks may be relatively far in the future, such as the risk of Allowance Reserve exhaustion, establishing rules now to address these circumstances will provide the market with greater certainty regarding how such unforeseen circumstances will affect markets outcomes, and will avoid subsequent ad hoc policy responses that could ultimately undermine policy objectives.

[33] Harris notes that: "Most of these limits include exemptive relief for bona fide hedging purposes. Commercial entities engaged in the market for hedging purposes are typically exempt from limits since their holdings are presumed to relate to risk management activities emanating from the operation of commercial activities. Notably, however, exemptions are typically granted and monitored by the market regulator to ensure that the trading activities of these commercial firms do indeed represent risk management. In this regard, greenhouse gas emitters might also be considered for exemptions, but should be subject to reporting requirements and regular review by the regulator." Harris, Jeffrey, "Report on Holding Limits to the Western Climate Initiative Markets Committee," May 6, 2010. See also, CME Group, "Speculative Position Limits and Hedge Exemptions."

[34] Brisson et al. summarize auction frequency for auctions in the EU ETS. Brisson, Jean-Phillippe, et al., Exhibit 1 to Comments filed by Chevron, Inc. to the ARB, August 11, 2011.

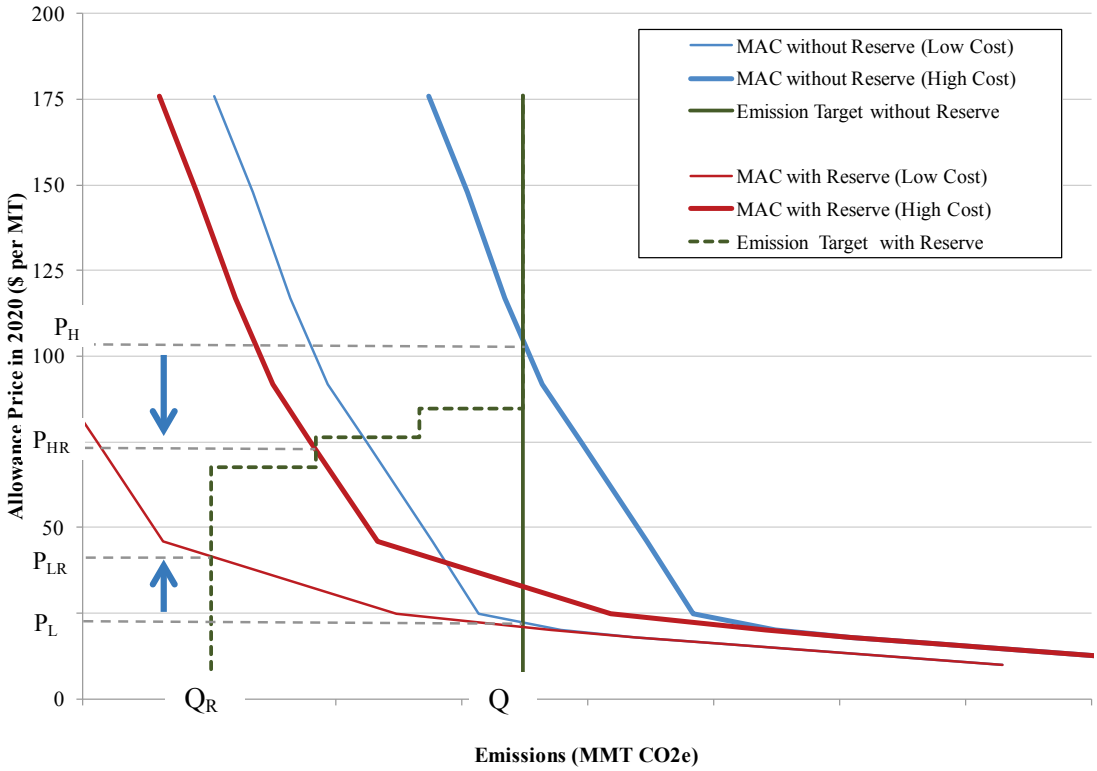
Appendix 1: Graphical Illustration of the Allowance Reserve Policy

Figure 1 illustrates the ARB Allowance Reserve Policy's asymmetric impact on allowance prices under "High Cost" and "Low Cost" market conditions. The marginal abatement cost curve (MAC) reflects emission reductions from both capped sources and uncapped sources (that is, offsets.) Introduction of the Reserve Policy has two effects: (1) the MAC shifts downward because the offset use limit is increased from 4% to 8%, and (2) the emissions cap decreases (to fill the Reserve.) Allowances are released from the reserve as the allowance price exceeds Reserve price triggers, which increases the emission cap. Market conditions affect the cost of emission reductions; under Low Cost market conditions, the MAC shifts downward to reflect the lower cost of achieving emission reductions.

Under Low Cost market conditions, the cap is at Q without the reserve, and at Q_R with the Reserve, because the allowances remain unused in the Reserve. Thus, the equilibrium prices increase from P_L, without the Reserve, to P_{LR} with the Reserve.

Under High Cost market conditions, the cap remains at Q without the Reserve, and the equilibrium allowance price is P_H. With the Reserve, the MAC is high enough that increases in equilibrium allowances trigger use of the 1st Tier of the Allowance Reserve. Consequently, the emissions cap rises to Q_R plus allowances from the 1st Tier of the Allowance Reserve, and the equilibrium allowance price is P_{HR}. Consequently, allowances price is reduced from P_H to P_{HR} with the allowance Reserve.

Figure 1. Marginal Abatement Cost Curve and Emission Targets Under AB 32 Cap-and-Trade Program



Source: Schatzki, 2012.