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Cheryl Laskowski, Ph.D.  
California Air Resources Board (CARB)  
1001 I Street  
Sacramento, CA 95814

August 10, 2023

Subject: Comments on the Cap-and-Trade Program Workshop on July 27, 2023

Dear Dr. Laskowski:

Alpha Inception (AI) is a consulting firm specializing in environmental and renewable energy commodity markets. We have been deeply involved since 2012 in the California Carbon Markets and have worked closely during those 11 years with clients who have invested large sums in the California Cap-and-Trade (“C&T”) program allowances and who are also in many cases compliance entities under the C&T program.

Alpha Inception submits these comments and recommendations in response to the ideas discussed at the two most recent workshops on June 14<sup>th</sup>, 2023 and July 27<sup>th</sup>, 2023 held by CARB staff. Alpha Inception recognizes and appreciates the significant work that has been put into both the Scoping Plan and the subsequent C&T Program Review that is currently underway to bring the C&T Program in line with current legislation, State Goals and the most recent Scoping Plan.

As presented in the most recent workshop, CARB is considering cuts to the C&T emission budgets of between 115 to 390 million tons between 2025 and 2030 depending on the scenario chosen by CARB. The secondary market price for C&T allowances rose from \$32.75 for the Dec 2023 contract to \$33.95 on the day of the workshop announcement and then as high as \$38.00 the day the workshop presentation was released and have since then stayed above \$35, as the market anticipates higher allowance prices in the future as a result of cuts to C&T emission budgets being considered by CARB.

As CARB’s Deputy Executive Officer Rajinder Sahota stated in the most recent workshop, Carbon Capture and Sequestration (“CCS”) technology would need to be commercially viable on a large scale and Renewable Hydrogen capacity within California would need to expand by over 400 times for the emission reductions contemplated by the Scoping Plan to be achievable at a reasonable cost by 2030. CARB’s own Dave Clegern was quoted in a recent news article as saying “If those tools are not widely available by 2030 with a 48% target, then prices get very high in the program and that leads to leakage — production moving out of state to reduce emissions in state and comply with the program”<sup>1</sup>. No one wants to see emissions leakage, which results in no net cuts in emissions and just higher prices to California consumers and businesses.

Lawrence Livermore National Laboratory in May of 2023 released a comprehensive report on the costs of CCS in California, including the benefits of all tax and other incentives<sup>2</sup>. According to this report, several large emitting stationary source industries already have positive economic value from installing CCS technology onsite, including refineries and Ethanol producers, however some key large source emitters such as natural gas power plants and cement manufacturers, would still need to see Carbon Allowance prices of between \$27-\$100 and between \$155-\$224 respectively before installation of CCS technology is economic based on current technology. Alpha Inception expects that CCS technologies will be available at lower prices over time, based on recent developments in these sectors and discussions with investors in these technologies, which Alpha Inception would be happy to discuss further upon request. The main issue yet

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<sup>1</sup> <https://www.washingtonexaminer.com/policy/energy-environment/daily-on-energy-trouble-for-climate-goals-in-new-york-and-california>

<sup>2</sup> <https://gs.llnl.gov/sites/gsl/files/2023-05/ca-ccs-economic-study-report.pdf>

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to be solved for CCS deployment in California is the transportation of CO<sub>2</sub> gases via pipeline and injection of these gases into permanent geologic storage, the most economically efficient and safe long-term solution. Government agencies are currently working to resolve these issues and if these issues are solved prior to 2025, Alpha Inception is confident that higher prices in the C&T Program would be an effective economic incentive in the adoption of CCS technologies and welcomes such a market driven signal.

Renewable Hydrogen production technology is well understood and developed and, in some ways, has been around for over 100 years. The simplest and most economical way to produce Renewable Hydrogen is through electrolysis, where water is split by electrical energy into its component parts hydrogen and oxygen. Most technologies used in this effort run at between 45% to 55% efficiency, requiring around 9 liters of water and 50 kWhs of electricity to produce one kg of Renewable Hydrogen. While there are some emerging technologies that might improve efficiency to higher levels, these are still in their infancy and cannot be counted on being commercially available before 2030. Currently, hydrogen produced using traditional methane reformation technology has a lifecycle carbon footprint of roughly 12 MT per MT of hydrogen. Renewable Hydrogen therefore has a net environmental benefit of roughly 12 MT per MT of production. Wholesale power prices in California are currently around \$50/MWh on a 7X24 basis and requiring roughly 50 MWh<sup>3</sup>, to produce a ton of Renewable Hydrogen, the variable cost of Renewable Hydrogen using technology currently available is roughly \$2500 of electricity and roughly \$25 for the required 9000 liters of clean treated water. Now dividing that variable cost by roughly 12 MT of carbon savings to using Renewable Hydrogen, equates to a variable cost of roughly \$200/MT. Therefore, even if the technology were to improve by a factor of 2 in terms of efficiency or the power price were to drop by 50%, possible before 2030, but not very likely, this would mean that C&T allowance prices would need to approach \$100 before any significant Renewable Hydrogen capacity would make any economic sense in the power generation sector and for other general industrial or consumer uses. We would note that Renewable Hydrogen is currently much closer to economic break even in the fuel sector, refinery uses and vehicle fueling as examples, where incentives are higher due to the double dipping benefit of the LCFS and the Federal RINS programs and the generally higher carbon equivalent prices available in those markets.

As demonstrated by the market's reaction to the workshop documents, the cut in the emission budgets is likely to result in higher allowance prices in the future. The market currently has somewhere around 300 million credits in surplus, sometimes also referred to as banked allowances, representing the excess of allowances issued in the C&T program since it started in 2012 compared to the total aggregate emissions to date by the covered entities in the program. This bank of allowances is held within compliance accounts and holding accounts of investors in the program, While these allowances are technically available to the market, they have already been absorbed by the market and therefore holders of these allowances would need to be compensated and incentivized to sell these allowance back into the market for compliance entity use, through higher prices. It is only reasonable to expect that the proposed budget cuts by CARB will further constrain the expected supply in future years and that one would expect higher prices going forward, everything else being equal. It is Alpha Inception's opinion, as a market expert, that current market prices are reflective of a market expectation of CARB implementing the middle level scenario that results in a 48% emission reduction by 2030 and a cut in allowance budgets of approximately 265 million tons, as identified by CARB in the workshop presentation.

Furthermore, going forward, this 48% emission reduction scenario, with the resultant 265 million tons emission budget cuts starting in 2025, would result in the first level of the APCR being triggered and sold out sometime in 2025-26, in Alpha Inceptions' opinion based on our modeling. This forecast depends on market demand from investors and compliance entities continuing at current levels. Once the first tier of the APCR has been triggered and sold, it would be reasonable to expect prices to remain somewhere

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<sup>3</sup> <https://www.ice.com/marketdata/reports/142>

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between the first and second APCR tiers sometime in 2026-27. Based on comments made by Rajinder Sahota in the June 14<sup>th</sup> workshop, that APCR price levels would likely also be raised as part of this rule making, Alpha Inception has assumed a one-time price hike in both APCR tiers and ceiling price of an additional \$10 starting in 2025, after which the APCR price triggers would continue to increase as currently structured. This series of assumptions results in an approximate price forecast for the allowance auctions of \$71, \$81 and \$95 in 2025, 2026 and 2027 respectively.

Alpha Inception supports CARB's efforts to remove allowances from the emission budgets, which will result in higher allowance prices as detailed above. These emission budget cuts will bring the C&T program in line with California's increased climate goals and allow for C&T prices to provide a sufficient economic incentive for CCS and Renewable Hydrogen to be implemented in a meaningful way in California.

CCS technology and Renewable Hydrogen should start to mitigate these increased prices starting sometime around 2027-28 as prices approach \$100 per MT. This price forecast reflects, roughly a tripling of allowance prices in the next four years. CARB should note that in net absolute, as well as percentage terms, these increased market prices would be the most rapid and sustained increase in prices since the C&T market started. Therefore, cost containment and allowance allocation for compliance entities becomes more important than ever in mitigating the impact of higher prices on compliance entities and the end users of electricity distribution and gas pipeline companies.

#### Cost Containment and Allocations to Compliance Entities

During the workshop presentation on July 27<sup>th</sup>, CARB asked for comments on the proposed emission budget cuts and where those cuts should occur. The three possible pools that CARB staff suggested as possible removal avenues were the Price Ceiling, APCR and Auction-Allocation Pools.

While it seems obvious to state that removing allowances from the Price Ceiling Pool makes little sense, as the net result would have no impact on prices or emissions, due to the allowances in the Price Ceiling Pool being supplemented by unlimited alternative compliance instruments sold by the government at the same price as those in the Price Ceiling Pool. Alpha Inception, nevertheless, states with 100% confidence that any removal of allowances from the Price Ceiling Pool would be ineffective and should not be considered.

Alpha Inception is also of the strong opinion that no allowances should be removed from the APCR tiers and that, if anything, CARB should consider increasing the number of allowances in the APCR pools with some of the allowances removed from the emission budgets. The APCR pools are designed to provide a "speed bump" for the compliance market when prices are rising rapidly. These "speed bumps" should actually be increased in size, now that CARB is considering raising their trigger price levels to compensate for the expected higher market prices, as suggested by Rajinder Sahota in the June 14<sup>th</sup> workshop.

This leaves one pool for allowance removal, the Auction and Allocation pool. CARB already has a significant reduction in allocation budgets to all compliance entities under the current regulations due to adjustments such as the Cap Adjustment factor. It is Alpha Inception's contention that any further reductions to compliance entity allocations should only be contemplated once the costs and availability of CCS and Renewable Hydrogen are better known and understood. As an example, total allocations to electric utilities under the current regulations are reduced from 73.5 million in 2021 to 61.5 million allowances in 2030 and these reductions, between 2021 and 2030, are roughly 43 million allowances in aggregate. Assuming a levelized compliance cost of \$95, Alpha Inception's price forecast for the middle

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year 2027 of the 2025-2030 period of emission budget cuts, there would be an additional \$4 billion in total costs to electric utility customers that are not covered by allowance allocations to utilities. In 2030 alone the increased costs to utility customers from allowance allocation reductions, already in regulation, is over \$1 Billion, at the expected market price in 2030. Any further cuts to allocations without more clarity in the availability of emission mitigating technologies like CCS and Renewable Hydrogen would be premature. Alpha Inception would note that reductions to industrial and gas pipeline compliance entities are equivalent, if not higher, than those to the electric utilities on a proportional basis. Alpha Inception is available to discuss these other sectors if requested.

This leaves the allowances offered by the government for sale during the quarterly auctions as the most prudent and reasonable pool for the reduction of allowances required by the emission budget cuts being considered. These allowances fund the Greenhouse Gas Reduction Fund or GGRF which is appropriated and directed through legislative efforts annually. The number of allowances being sold by the California government is roughly stable at about 35 million allowances per quarterly auction, both current and future vintage. Even as overall emission budgets have fallen every year since 2021, the burden on compliance entities has increased proportionally as their share of the budget has dropped and the GGRF monies have increased due to higher market prices and roughly stable number of allowances for sale. Based on Alpha Inception's rough calculations, approximately 820 million allowances in aggregate would be sold by CARB on behalf of the GGRF from 2025 through 2030 under the current regulations, approximately 35 million allowances per quarter starting in 2025 through 2030. This represents anticipated revenues of around \$80 billion for the GGRF between 2025 and 2030, based on the forecasted prices in our models. As discussed previously in this letter, this market price assumes the equivalent of the middle 48% reduction scenario or a cut of 265 million allowances from the aggregate budgets from 2025 through 2030. If the entire emission budget cut of 265 million allowances were to come out of the GGRF pool of allowances, reducing the number being sold by CARB on behalf of the GGRF to roughly 550 million allowances between 2025 and 2030. The total revenues to the GGRF would still be roughly \$53 billion or close to \$9 billion per year on average, which is still almost double the amount raised in the two most recent fiscal years<sup>4</sup> as reported by CARB. It seems clear that, based on these anticipated revenue numbers, bolstered by an increase in auction clearing prices, itself the result of the emission budget cuts, the emission reduction cuts should be taken 100% from the government allowances sold by CARB on behalf of the GGRF. This is the only logical pool for these cuts to come from. The GGRF is the only entity within the C&T program that will benefit from the emission budget cuts in terms of increased net expected revenues. Even with this pool taking all of the emission cuts, it still ends up seeing a more than 100% increase in its revenues in the 2025-2030 period to close to \$9 billion annually from the roughly \$4 billion currently received annually.

We deeply appreciate all the work that CARB does and your continued leadership worldwide in mitigating climate change and hope that our comments and suggestions will help inform your decisions in the future.

Respectfully,

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<sup>4</sup> [Summary of Proceeds to California and Consigning Entities](#)