

October 16, 2024

California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Proposed 2024 Low Carbon Fuel Standard Amendments

Dear Chair Liane Randolph,

On behalf of CarbonCapture Inc., Climeworks Corporation, Heirloom Carbon Technologies and 1PointFive, four leading direct air capture (DAC) companies who plan to develop more projects in California, we extend our appreciation for the opportunity to provide comments on the California Air Resources Board's (CARB) 2024 Proposed Amendments to the Low Carbon Fuel Standard (LCFS). As a group, our four companies are dedicated and fully engaged in the broad deployment of DAC technologies at climate relevant scales.

We commend the Board for its continuing commitment to climate action and leadership in incentivizing the deployment of carbon capture and direct air capture technologies. California's leadership continues to influence other jurisdictions in shaping their climate policies and catalyzing a broader, collective commitment to fostering cleaner, more sustainable energy practices on a global scale.

We would like to reiterate our support for CARB's overall approach providing DAC projects the option of securing low-CI electricity via power purchase agreements (PPAs) as reflected in CARB's proposed revisions to § 95488.8 (Fuel Pathway Application Requirements Applying to All Classifications). DAC is a nascent technology, with substantial investment required to construct first-of-a-kind commercial projects and realize their full potential. Project proponents will need to secure a variety of financing instruments to support DAC and commercial agreements with numerous partners to bring these projects to fruition – including PPAs. To avoid creating unnecessary and, in some cases, insurmountable hurdles, the ability of DAC project proponents to utilize PPAs for power supply will prove critical.

We recognize that in proposing offsite power supply CARB must establish a book-and-claim accounting methodology that serves the dual purpose of accounting for the use of low-CI electricity and tracking the associated environmental attributes while also avoiding the risk of resource shuffling or double counting of benefits. We support CARB's efforts to address these dual challenges. We believe that the following criteria will address the need for an accounting methodology and address the resource shuffling risk:

- § 95488.8.(i)(1)(C)1. The low-CI electricity must be supplied to the grid within the local balancing authority where the electricity is consumed or delivered to that local balancing authority without substitution consistent with the requirements of California Public Utilities Code section 399.16, subdivision (b)(1).
- § 95488.8.(i)(1)(C)3. Low-CI electricity must be supplied by new or expanded low-CI electricity that begins new or expanded production on or after January 1, 2022, or within three years of the start of the hydrogen production facility or direct air capture project, whichever is later.
- § 95488.8.(i)(1)(C)5. Any renewable energy certificates or other environmental attributes associated with the energy are not issued credits or claimed produced, or are retired and not claimed under any other voluntary or mandatory program with the exception of the federal RFS, incentives under the Infrastructure Investments and Jobs Act or the Inflation Reduction Act, and the market-based compliance mechanism set forth in title 17, California Code of Regulations Chapter 1, Subchapter 10, article 5 (commencing with section 95800).

These three criteria will ensure that the low-CI electricity required by a DAC project will not result in a paper exercise that shuffles high-CI electricity to other users while dedicating low-CI to DAC projects, ensures that low-CI electricity secured by PPAs is additional to what is currently available on the grid, and that the REC or other environmental attributes are not double counted.

However, we must again highlight the barriers presented by the following proposed criteria:

- § 95488.8.(i)(1)(C)2. The pathway holder or the project operator must be the first contracted entity for procuring the low-CI electricity.
- § 95488.8.(i)(1)(C)4. Such book-and-claim accounting for low-CI electricity may span only three quarters. If a low-CI electricity quantity (and all associated environmental attributes, including a beneficial CI) is supplied to the grid in the first calendar quarter, the quantity must be claimed for LCFS reporting no later than the end of the third calendar quarter. After that period is over, any unmatched low-CI electricity quantities expire for the purposes of LCFS reporting.

The requirement that the pathway holder or project operator be the first contracted entity for procuring low-CI electricity could present serious problems for this nascent industry which, due to the entrepreneurial nature and limited resources of the project companies, may necessitate the use of their parent companies or affiliates to execute power procurement contracts or other supply arrangements. We do understand that CARB may be intending to prevent the double-counting of low-CI power procured and, if so, we respectfully recommend that the criteria be changed to require the pathway holder (not necessarily the contracting entity) to be the only entity that can claim the electricity and associated environmental attributes from the low-CI project, and such claim must be auditable and verifiable by CARB. It may be that this is already CARB's intent, i.e., CARB is already familiar with and understands that project such as DAC projects may involve several affiliated entities. Consequently, as interpreted by CARB and as applied in practice, CARB will recognize that the parent company or affiliates of a pathway holder or project operator could be the first contracting entity for procuring low-CI electricity as demonstrated by any number of corporate instruments or captive agreements. If this is the case, we respectfully request that CARB clarify this in its response to comments and in later guidance.

The requirement that book-and-claim accounting for low-CI electricity may span only three quarters also presents a significant barrier to DAC deployment today. We propose that CARB revise this proposed language to allow DAC projects to book-and-claim claim credits on an annual basis. We believe that this is necessary for climate relevant scale DAC projects given the current constraints in low-CI electricity supply and temporal attribute market systems.

- The first challenge is technological: Intermittent seasonal renewable electricity is the lowest cost and most available low-CI electricity source for DAC projects today that can be developed on timelines compatible with DAC project development. The technology for supplying continuous 24/7 low-CI electricity at the scale and duration needed for DAC is not yet readily available, and the market systems for tracking and trading the necessary low-CI power attributes at sub-annual time resolution do not currently exist. Pairing seasonal and intermittent renewable electricity with long term energy storage technology is simply not achievable today at the scale needed to support DAC projects with electricity supply balancing over three-quarterly periods. The majority of the existing battery energy storage systems that have been deployed in the US only have a 1-4 hour duration, and only represent a small portion of the available capacity of the grids where they are installed, making it infeasible to firm-up intermittent resources for prolonged periods. Furthermore, in order to maximize the amount of carbon removed, DAC

technologies should not be cycled in response to the seasonality of renewable resources, and instead should operate at maximum capacity year-round to optimize efficiencies and maximize climate benefits. Annual matching, in conjunction with the locational and additionality requirements, accomplishes CARB's goal of ensuring that enough new low-CI generation is installed in the grid where the project will operate, while allowing DACs to operate at full capacity year-round without the burden of having to over-build or over-procure, which negatively impacts project economics, decreases efficiency for the overall market, and ultimately hinders the ability to rapidly deploy this necessary technology.

- The second challenge is market systems availability: the tracking, trading, and usage systems supporting energy attributes (e.g., RECs) currently only allow for annual granularity; systems capable of handling higher granularity are projected to take years to put into place (with a few very limited exceptions like PJM and M-RETS). Moreover, the mere availability of tracking systems to handle higher granularity is not sufficient; robust liquid markets for more granular energy attributes will be needed to achieve acceptable supply and pricing risk for project finance. In the interim, there is no ability for a project to be able to cover this risk other than significantly over contracting/installing new renewable electricity generation.
- The third challenge is economics and financeability: The additional economic burden and financial risk required to comply with the first two challenges is significant and risks stifling this nascent industry. The three-quarterly book-and-claim matching period is not aligned with the full annual seasonal cycle of output from intermittent renewable electricity sources. Each subsequent three-quarterly period will cover a different part of the seasonal cycle to the previous and subsequent three-quarterly periods, making it very difficult to commit to long-term power procurement contracts with confidence that supply will be sufficient in each subsequent three-quarter period. However, signing long-term power procurement contracts is necessary in order to bring new additional power sources online that meet the additionality requirement. The only way a DAC project can cover the low-CI electricity supply risk is by significantly over-contracting for new renewable electricity capacity, which will introduce substantial additional cost and untenable financial risks associated with selling excess contracted generation to the market at times of high renewable output that are likely correlated with low prices. The additional cost and financial risk created by sub-annual matching requirements would be a severe barrier for DAC deployment, particularly given the context that DAC

technologies are nascent, these will be first-of-a-kind commercial projects with inherent technology and market risk, and many DAC developers are early-stage companies without deep financial resources. This combination of factors creates extreme project financial risk that will limit investment in DAC deployment.

We strongly recommend that CARB revise § 95488.8.(i)(1)(C)4 as follows:

“Such book-and-claim accounting for low-CI electricity may span only ~~three~~ four quarters. If a low-CI electricity quantity (and all associated environmental attributes, including a beneficial CI) is supplied to the grid in the first calendar quarter, the quantity must be claimed for LCFS reporting no later than the end of the ~~third~~ fourth calendar quarter. After that period is over, any unmatched low-CI electricity quantities expire for the purposes of LCFS reporting.”

We believe that at this nascent stage of both DAC technology deployment and availability of continuous 24/7 low-CI electricity, an annual book-and-claim matching period for DAC under LCFS is appropriate. This would account for the full annual seasonal cycle for intermittent renewables. Matching periods shorter than 12 months will significantly impact the financeability of early DAC projects and impede deployment of this critical climate technology that is likely to be vital to meet the State’s 2045 net-zero goal.

We would like CARB to confirm our understanding of the proposed book-and-claim balancing provisions as applying on a rolling quarterly basis, i.e., that if a low-CI electricity quantity is supplied to the grid in a calendar quarter, the quantity must be claimed for LCFS purposes no later than the end of the third calendar quarter following the beginning of such quarter. This is the only logical reading because it would permit low-CI electricity supplied to the grid when solar or wind generation peaks to be balanced sometime during the following three quarters on a rolling basis. We strongly recommend that CARB confirm this understanding in its response to comments and also commit to issuing guidance for the use of book-and-claim accounting by DAC projects that confirm this understanding (the current Low Carbon Fuel Standard (LCFS) Guidance 19-01 Book-and-Claim Accounting for Low-CI Electricity is not as clear as it could be).

We do expect that the analytical understanding of the emissions and financial implications of different book-and-claim matching periods, as well as the ability to achieve shorter matching periods, will improve as energy storage technology and the market systems needed to support temporal matching are advanced. Imposition of sub-annual temporal matching criteria can be contemplated at such time when it is practically and technologically feasible if there is strong justification that such requirements are necessary.

Again, our group of companies support the LCFS and the critical role it continues to play in advancing the deployment of clean technologies to address our current climate crisis (and as a courtesy, we include copies of our earlier submitted comments with this letter). We believe that California has the opportunity to set the bar for rigorous policy design that accelerates DAC technology deployment, unlocking investment and job opportunities in California and the United States.

Regards,

CarbonCapture, Inc.

Climeworks Corporation

Heirloom Carbon Technologies

1PointFive