



February 17, 2024

Matthew Botill
California Air Resources Board (CARB)
1001 I Street
Sacramento, CA 95814

Re: Blue Planet Comments on the Proposed Low Carbon Fuel Standard Amendments

Dear Mr. Botill:

Blue Planet Systems Corporation (Blue Planet) appreciates the opportunity to comment on the proposed amendments to the Low Carbon Fuel Standard (LCFS). Blue Planet supports CARB's initiatives to advance California's climate change goals, including supporting development of key carbon capture, utilization and storage (CCUS) and direct air capture (DAC) technologies through the LCFS. We encourage CARB to expand their CCUS definition to allow for other permanent, non-geologic approaches to carbon sequestration to support state goals around deep decarbonization, carbon neutrality and achieving the Scoping Plan objectives.

About Blue Planet

Blue Planet is a California company developing technology and products related to economically sustainable carbon management. Our goal is to solve the carbon capture problem by converting CO₂ into high-value building materials. Our technology can be deployed at a wide array of difficult-to-decarbonize industries, including cement and facilities involved in any number of transportation pathways participating in the LCFS – including ethanol, renewable gasoline/diesel, hydrogen, biogas, electricity, or direct air capture. Importantly, our technology captures not only CO₂, but also particulate matter, NO_x, SO_x and other pollutants hazardous to surrounding communities. We are currently constructing and beginning operations of a plant in Pittsburg, California on the Sacramento Delta, and our carbon-sequestered aggregate has been utilized at San Francisco International Airport, where carbon-sequestered concrete is specified.

Blue Planet's technology produces coarse and fine limestone aggregates made from sequestered CO₂ utilizing the carbon mineralization process. It fosters lower-cost carbon capture, including from direct air capture or other carbon removal pathways, by avoiding the need to purify and enrich captured CO₂ before use, reducing the cost and energy needs associated with carbon capture. It is also fully scalable and can be applied to any facility in any part of the state where concrete is utilized, regardless of its proximity or access to a geological sequestration site.

Carbonate mineralization offers a significant and permanent carbon storage and utilization solution

Almost all of earth's carbon – about 99 percent – is stored naturally through the process of mineralization in limestone rock. Trillions of tons of CO₂ have been safely and naturally stored as carbonate mineral for over 100 million years. As described previously in comments to CARB related to the Scoping Plan,¹ and validated in peer-reviewed research,² the mineralization process permanently stores carbon in rock, which can then be used in concrete and stored in our built environment. Just as very high heat (~1500°C) is necessary break limestone into its constituent elements (CaO and CO₂) to make cement, similar conditions would be required to release captured CO₂ once it has been mineralized back to limestone.

Additionally, since concrete is the most widely used building material on earth, every year California (and the world) use enough rocks in concrete that we could store all emissions from major industrial sources in our buildings and roads. Compared to geological sequestration, which only entails cost,³ carbon capture and conversion – in particular carbon storage in concrete – provides a value-added market that can make carbon capture cost effective without additional public subsidy.

While several technical, legal, and economic questions remain related to geologic sequestration, many of which CARB and other agencies will address through implementation of SB 905 (Caballero, Chapter 359, Statutes of 2022), carbonate mineralization offers a fully scalable, permanent carbon storage solution, ready for deployment today. Through the SB 905 process, we also hope CARB will consider developing new CCS Protocols, including for carbonate mineralization. We appreciate the state repeatedly already recognizing this opportunity, including:

- In the Final 2022 Scoping Plan Update, CARB discusses the role of carbon capture and carbonate mineralization in the context of decarbonizing cement and other sector transitions, stating “Direct air capture and carbon mineralization have high potential capacity for removing carbon...”⁴
- The CEC identifies carbonate mineralization, including carbon storage in aggregates, as one of the most promising strategies for decarbonizing the cement sector:⁵

Capturing carbon from industrial processes and then utilizing it in a product is considered one of the essential components for mitigating CO₂ emissions since it can achieve net negative emissions, especially for sectors that are unable to achieve zero emissions. For example, carbon capture and utilization appear to be a pathway to achieve significant decarbonization of the cement industry where 60 percent of the carbon dioxide is from process emissions... For instance, carbon capture and utilization in the cement industry has recently emerged with

¹ <https://www.arb.ca.gov/lists/com-attach/73-sp22-kickoff-ws-UTMGbFEIVGJQCQd3.pdf>

² For example, see: Xi, F., Davis, S., Ciais, P. et al. Substantial global carbon uptake by cement carbonation. *Nature Geosci* 9, 880–883 (2016). <https://doi.org/10.1038/ngeo2840>

³ Unless it is used for enhanced oil recovery, which is unlikely in California given prohibitions included in SB 905 (Caballero, Chapter 359, Statutes of 2022) and SB 1341 (Limón, Chapter 336, Statutes of 2022).

⁴ CARB (2022) 2022 Scoping Plan for Achieving Carbon Neutrality, California Air Resources Board, November 16, pg. 221. <https://www2.arb.ca.gov/sites/default/files/2022-11/2022-sp.pdf>

⁵ See pg. 10 at: https://esd.dof.ca.gov/Documents/bcp/2223/FY2223_ORG3360_BCP5441.pdf

sustainable techniques to use carbon emissions in concrete production. Some emerging utilization techniques, such as mineral carbonation, includes adding carbon into cement to enhance the concrete's compressive strength. With almost 4 billion tons of construction aggregate produced in North America, mineral carbonation could be the most efficient route to CO₂ utilization.

LCFS amendments should allow use of additional CCUS strategies as new CCS Protocols are developed

The LCFS is a critical program for advancing California's climate objectives, and likely the most important program to advance CCUS and carbon dioxide removal, both of which will be necessary to achieve California's goals of carbon neutrality and achieve and maintain net-negative greenhouse gas emissions. Indeed, the Final Scoping Plan identifies a significant role for CCUS to play in decarbonizing transportation fuel pathways and supporting carbon dioxide removal, both in 2030 and through 2045. We hope CARB will recognize the promising role that CCUS in aggregates and concrete – as well as other emerging CCUS and carbon dioxide removal strategies – can play in helping to achieve carbon neutrality and net-negative emissions in California and make further amendments to the LCFS to allow new protocols to be deployed as they are developed and adopted.

Unfortunately, while the regulatory language already references the CCS Protocol, in several instances the language also references geologic sequestration, CO₂ transport by pipeline, or other items that seem unnecessary to utilizing the current CCS Protocol in the program and serve to limit eligibility of potential new protocols as they are developed. **We hope you will consider 15-day changes to remove references in the regulation related to CCUS that serve to limit potential new CCUS and Carbon Dioxide Removal Protocols from being utilized in the future, and clarify that future protocols would be eligible under the LCFS, should they be developed and adopted.** In particular, we urge the following changes:

- Update the definition of “Carbon capture and sequestration (CCS) project” in § 95481(a) to remove language limiting the potential use of non-geologic sequestration projects:

“Carbon capture and sequestration (CCS) project” means a project that captures or removes CO₂ by an eligible entity specified in section 95490(a) of this subarticle; ~~transports the captured CO₂ to an injection site, and injects~~ and permanently sequesters the captured CO₂ pursuant to the Carbon Capture and Sequestration Protocol and as specified by section 95490 of this subarticle.

- Clarify that new protocols added to the CCS Protocol will be eligible to generate credits under the LCFS and similarly remove limiting language related to potential CCUS Protocols in § 95490:

(a) Eligibility. The following entities are eligible to submit applications and, if approved, receive credits associated with net GHG reductions from CCS projects, in accordance with following protocol or any subsequent version, which ~~is~~ are incorporated herein by reference and ~~is~~ referred to as the “CCS Protocol” hereafter.

Industrial Strategies Division, California Air Resources Board. August 13, 2018. Carbon Capture and Sequestration Protocol under the Low Carbon Fuel Standard.

(1) Alternative fuel producers, petroleum refineries, and oil producers that capture CO₂ on-site, including at the location of the production of hydrogen used as an intermediate input, and geologically permanently sequester CO₂ either on-site or off-site.

(2) An entity that employs direct air capture to remove CO₂ from the atmosphere using chemical and/or physical separation and geologically permanently sequester the CO₂.

(A) Direct air capture and sequestration projects must be physically located in the United States.

(B) If CO₂ derived from direct air capture is converted to fuels, it is not eligible for project-based CCS credits. However, applicants may apply for fuel pathway certification using the Tier 2 pathway application process as described in section 95488.7.

(3) An entity that employs a technology to capture or remove and permanently sequester CO₂ from the atmosphere in accord with the provisions of the “CCS Protocol” or any subsequent version or protocol.

(b) General Requirements.

(1) Projects and fuel pathways claiming CCS credits must comply with the CCS Protocol. To be considered in compliance with the CCS protocol, a project must be issued executive orders and meet all the requirements throughout the project life in accordance with the permanence requirements of the CCS protocol.

(2) Credit determination for any project that utilizes CCS must be performed in accordance with the accounting requirements of the CCS protocol.

(3) Except for direct air capture and sequestration projects or other projects as deemed appropriate, credits must be prorated based on the volumes delivered to California.

(c)(2)(B) An engineering drawing(s) or process flow diagram(s) that illustrates the project and clearly identifies the system boundaries, relevant process equipment, mass flows, including the quantity of CO₂ injected into pipeline or delivered by other modes of transport for CO₂ injection sequestration, and energy flows necessary to calculate the CCS credit;

(c)(2)(G) Executive orders issued pursuant to the permanence requirements of the CCS protocol, certifying the sequestration site or method as capable of permanently storing CO₂ and authorizing ~~operation and~~ credit generation.

(g)(2) Energy use and chemical use data for the carbon capture facility and CO₂ injection sequestration facility;

- Also remove limiting language in § 95489(e)(1)(D)(1):

CO₂ capture from existing anthropogenic sources at refineries, or at hydrogen production facilities that supply hydrogen to refineries, and subsequent ~~geologic~~ sequestration;

Support maintaining project-based crediting for CCS projects

Blue Planet strongly supports exempting CCS projects from the proposed phase out of project-based crediting for petroleum projects. We agree with the rationale for this proposal presented in the ISOR.

Quickly enabling a wide array of CCUS projects and protocols will accelerate California's climate change goals

Now is the time to fully enable CCUS as a solution to ensure the California stays on track to achieve its Scoping Plan objectives. By incorporating the changes referenced above to avoid presuming geologic sequestration remains the only CCS Protocol available in California and preserving project-based crediting opportunities for CCS projects, the LCFS can continue provide a strong signal for investment in CCUS and DAC projects. The next step is to develop new CCS Protocols, as referenced in SB 905 and through implementation of that legislation, and incorporate CCUS into the Cap-and-Trade program. We look forward to continuing to engage in all of these forums.

Thank you for your consideration of these comments, and please do not hesitate to reach out if you have any questions about Blue Planet, our technology, or the recommendations and comments offered in this letter.

Thank you,

Laura Berland-Shane
Vice President, Government Affairs
Blue Planet Systems Corporation