Carbon Sink LLC

September 22, 2021

The Honorable Liane M. Randolph
Chair, California Air Resources Board
P.O. Box 2815
Sacramento, CA 9584

Re: Comments of Carbon Sink LLC on the California Air Resources Board's 2022 Scoping Plan Workshop on September 8, 2021, on Short-Lived Climate Pollutants

Dear Chair Randolph:

On behalf of Carbon Sink LLC, a Maryland-based company committed to developing large-scale projects that will produce ultra-low carbon fuels and chemicals from carbon dioxide captured from the atmosphere and industrial processes, I am pleased to submit these comments in response to the **2022 Scoping Plan Update - Short-Lived Climate Pollutants Workshop,** held on September 8th 2021.

Requested Policy Change (summarized): grant parity to renewable fuels produced at facilities that capture CO_2 and recycle it into products that displace fossil fuels with those that sequester, or "landfill", CO_2 in geologic formations.

Justification (summarized): recycling CO_2 from biofuels plants into renewable, sustainable fuels and chemicals will directly displace fossil fuel use and its associated emissions. Carbon capture and sequestration stores about .88 tonnes of CO_2 for each tonne of CO_2 captured (CO_2 is emitted in the capture, liquefaction, transportation, and injection). By comparison, CO_2captured from the same plant and recycled into fuel to replace bunker fuel in ships will result in a net of 1.0 to 1.9 tonnes of CO_2 from crude oil that will not be released into the atmosphere, and as much as 2.5 tonnes if the CO_2 is captured and used in the manufacture of materials.

At Carbon Sink we believe the best pathway to reducing greenhouse gas concentrations in the atmosphere is by finding productive, commercial uses for those gasses that can displace future fossil energy extraction, processing, and combustion. While government policies and incentives can create markets for low-carbon solutions, innovation and efficiency improvements will drive down the cost-curve for these solutions and make them both environmentally and economically sustainable. Carbon Sink's model is to take advantage of increasingly affordable electricity from wind energy systems to produce "green hydrogen" via electrolysis of water. The zero-carbon H_2 will be combined with biogenic CO_2 captured from existing ethanol plants in the U.S. Midwest to make

green methanol (eMethanol) which can be sold into the shipping sector to replace bunker fuel, to the railroads to displace diesel, to intra-coastal shipping and transportation to also displace diesel used in ferries, harbor tugs, barge tugs and other near-shore transportation, for use in direct-methanol fuel cells for transportation and power generation and for use in the materials sector, where it will be converted to building materials, auto parts and other long-lived products that will serve to sequester the carbon that we initially extracted from the atmosphere.

As we establish our business, we will seek to expand into other sectors to capture and utilize CO_2 to produce eMethanol. The second-generation model will focus non-biogenic CO_2 from ammonia manufacturing, natural gas processing, and certain chemicals plants. The third-generation will use CO_2 from Direct Air Capture (DAC) plants as they become more economically viable. Imagine, a network of plants, some in remote, windy locations around the world, that produce eMethanol from the air.

About Methanol and eMethanol

Methanol is the simplest form of alcohol, with the chemical formula of CH3HOH. It is the most "hydrogen-dense" liquid, with 4 hydrogen atoms to 1 carbon atom and 1 oxygen atom. It is miscible in water. Most methanol produced in the world today is from either natural gas or coal and is ether used in the production of various materials like polymers, plastics, adhesives, and fibers, which are then used to make auto parts, electronic devices, plywood, and clothing, respectively. It is also blended with gasoline in Europe and China, sometimes used in methanol-powered engines, and increasingly as a replacement fuel in shipping.

eMethanol is chemically identical to conventional, aka "grey" methanol, but is produced using renewably produced hydrogen and captured carbon dioxide. It is known as "e"Methanol because it is a member of the "eFuels" family, a grouping of emerging fuels that are dependent upon utilization of renewable electricity.

Because it is a liquid at ambient temperatures and pressures, it can be shipped easily via truck or rail, and stored in tanks used for alcohol storage, or transported over dedicated pipelines. The Methanol Institute is a good source for information on the properties, market and uses of both methanol and eMethanol, which can be accessed at www.Methanol.org.

Carbon Sink Model and the Value to California

As indicated above, Carbon Sink will develop plants that will use CO_2 from existing ethanol plants to make eMethanol. Our plants will be co-located with ethanol production, which will allow us to optimize the operations of both facilities. As an example, our

hydrogen and eMethanol production processes will produce excess heat that can be used to displace some natural gas use in the ethanol production process, lowering the carbon intensity of the ethanol.

However, the greatest value of our plants will be in the recycling of CO_2 from the ethanol fermentation process into a zero or near-zero carbon fuel. Currently, this CO_2 is vented back to the atmosphere, but our process will recycle into a product, eMethanol, that will displace fossil-derived fuels and chemicals. And while this CO_2 will return to the atmosphere if it is combusted, it will prevent the extraction, refining and combusting of crude oil and the associated release of carbon that was previously deep in the earth.

Currently, the California Low-Carbon Fuels Standard does not give credit for recycling CO_2, although it does give emissions credits for sequestering CO_2 from the ethanol production process. While sequestering CO_2 from the ethanol production process will reduce GHG gasses in the atmosphere, it wastes valuable, pure CO_2 that could be used to displace petroleum use and result in greater reductions of atmospheric carbon dioxide.

Proposed Policy Change

In calculating the carbon intensity of a biofuel, such as ethanol, sold under the LCFS, CARB should give equal value for CO_2 captured and recycled into commercially saleable products that displace petroleum products, as is given to biofuels produced in plants that capture and sequester the associated CO_2 in geologic formations. In doing so, the biofuels from such plants should be able to realize the same carbon intensity reductions under the LCFS as biofuels produced at plants that sequester their CO_2 in geologic formations.

Greenhouse gas reductions because of this proposed change

Productive utilization of captured CO_2 from industrial sources, whether biogenic or anthropogenic, will be the most effective solution for reducing carbon concentrations in the atmosphere because it can be self-sustaining. By making products we use every day from captured CO_2 rather than from hydrocarbons extracted from the earth, we can turn things we currently view as contributors to climate change into solutions for addressing climate change. However, the technologies and processes for converting CO_2 into products will not become a reality if we continue to give greater incentives for the sequestration of CO_2 in the ground rather than encouraging its use, as is the effect of the current LCFS structure.

Under current LFCS rules, an ethanol plant that captures and sequesters its CO_2 is given a reduction of about 25 points off its per-gallon carbon intensity (CI). However, a plant that

captures its CO_2 and uses it to make a product that is not sold into the California renewable fuels market receives no reduction in their CI, even though that CO_2 is displacing fossil fuel use. If it is used in making building materials or other long-lived products it is not only displacing carbon from coal, crude oil or nature gas, but is also sequestered in those products, making carbon utilization even more beneficial to the climate than sequestration.

If CARB grants equal treatment to carbon utilization and sequestration it will spur innovative solutions for converting CO_2 into low-carbon fuels and materials and allow biofuels plants that do not have geologic sequestration options to contribute to the solution.

Under the Carbon Sink model, we will produce zero-carbon eMethanol from the CO_2 emitted from the fermentation process at ethanol plants in the US Midwest. Wind energy will be used to make green hydrogen and to combine the CO_2 and H_2 to make eMethanol. The eMethanol will likely be sold as a replacement for heavily pollution shipping fuel (No. 6 fuel oil, or bunker fuel) to shipping companies that are utilizing ships that are duel-fuel/methanol compatible, which is a growing number in the global fleet. Because of existing market forces, several global shipping companies are converting their fleet to methanol compatible ships to decarbonize their operations and, in turn, help their customers cut the carbon footprint of their supply chains. Fortunately, many consumer brand companies are responding to customer pressure to cut emissions, and this is translating to shipping companies taking material steps to compete in the low-carbon transportation market, including paying a premium for low-carbon fuels and signing long-term contracts.

In California, methanol is not a qualified blend-stock with gasoline but could be utilized in certain applications such has harbor operations like ferries, tugs, loading and warehouse vehicles, rail, power generation and potentially some fleet vehicles. Currently, these markets do not exist and growing them will be difficult due to the “chicken and egg” nature of the problem: does someone invest in capital equipment that runs on eMethanol before there is sufficient production of eMethanol? We believe that, because of the increasing availability of methanol-powered fuel cells, there will be growing options for carbon-neutral ferries and harbor vehicles, trains, and trucks in the coming years. Until then we will likely focus on decarbonizing the shipping industry and companies like Maersk, Stena, MSC, Oldendorff and others who are actively seeking eMethanol supplies as the primary substitute for petroleum-derived fuels.

If CARB does not change its current policy, favoring carbon capture and sequestration over carbon capture and use, producers of carbon-based products will be hampered by

the availability of CO_2. Accordingly, a change in the policy to provide CI score credits to ethanol plant owners for both sequestration and carbon capture and use will support the creation of a US production ecosystem whereby the CO_2 our economy needs for our modern lives is increasingly from the atmosphere rather than from underground.

Sincerely,

James P McVaney
Chief Commercial Officer, Head of Communications
Carbon Sink LLC
(800) 583-5223
JIM@CarbonSinkLLC.com
www. CarbonSinkLLC.com