AQUAHYDREX

1797 Boxelder Street
Louisville, CO 80027

720-543-0261
info@aquahydrex.com
aquahydrex.com

January 5, 2022

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

RE: AquaHydrex Comments on the December 7, 2021 Public Workshop on Potential Future Changes to the LCFS Program

Dear Mr. Botill:

Thank you for the opportunity to comment on the December 7, 2021 public workshop on potential regulatory revisions to the Low Carbon Fuel Standard (LCFS). The LCFS is a powerful tool in California's climate portfolio, and AquaHydrex strongly supports CARB's efforts to amend and strengthen program in line with the State's 2030 and carbon neutrality climate goals.

AquaHydrex is purpose-built to deliver an idealized platform for producing green hydrogen. We are on a mission to help the world use renewable energy to achieve total decarbonization by providing an idealized technology platform to convert zero carbon electricity to the ideal zero carbon molecule: Green hydrogen. Our electrolysis technology is a clean-sheet redesign to create the ideal electrolysis platform for large-scale, energy-efficient production of green hydrogen.

We support many of the concepts and principles provided outlined in the workshop, specifically:

- Support the principles outlined in the workshop, including aligning with the State's climate and zero emission vehicle goals, aligning with federal signals in the aviation and other sectors, supporting exportability of the program, reflecting technology and market changes, and streamlining implementation
- Support strengthening carbon intensity reduction requirements in the program through 2030 and beyond, in line with the State's climate goals and potential to use the LCFS to rapidly decarbonize California's economy
- Support adding intrastate jet fuel as a required fuel
- Support efforts to encourage deployment of green hydrogen projects through the LCFS, including the proposed hydrogen-related provisions presented at the workshop

AQUAHYDREX

1797 Boxelder Street
Louisville, CO 80027

720-543-0261
info@aquahydrex.com
aquahydrex.com

Further, we encourage CARB to consider additional potential changes to the LCFS that could further leverage the program to advance California's climate goals, including:

- Encourage CARB to fully facilitate credit generating opportunities among all transportation end uses, including interstate and international aviation to/from California airports, shipping, and other off-road applications
- Incorporate a wide array of hydrogen-derived fuels and synthetic fuels into Tier 1 pathways – including ammonia, methanol, and synthetic jet fuel – which are likely to come to aviation and shipping markets before the next set of LCFS amendments (after the current round) would take effect
- Encourage CARB to consider expanding the program to other hard-to-abate sectors and all gas end uses in order to leverage the success of the LCFS to achieve carbon neutrality as soon as possible

Additional details on these items are provided below.

We support the principles outlined in the workshop, and encourage CARB to continually adjust the LCFS to ensure its ongoing success and relevance

In the workshop, CARB presented a set of principles that generally aim to align the LCFS with prevailing technology, policy, and market trends, while continually working to make the program as simple and effective as possible. We agree with each of the principles presented, which collectively aim to ensure the continued success of the program.

In particular, we especially want to highlight the principles of aligning with technology and market changes as well as related and supportive federal policy signals. Together, we think these principles point to a strong need to support the rapidly growing and innovative green hydrogen sector listen thetic and derivative fuels that it enables, such as synthetic jet fuel or ammonia to decarbonize the aviation and shipping sectors. These will soon be key solutions to help decarbonize the entirety of California's transportation sector, but are not being considered in CARB's Scoping Plan and are not fully integrated into the LCFS. CARB should begin looking at these solutions now, rather than waiting until the next set of LCFS amendments and climate change scoping planning, which likely won't occur until the latter half of this decade.

We support strengthening the program in line with California's climate goals

As described the workshop, the LCFS has proven very successful. The program continues to provide strong, effective market signals to bring a wide array of low

AQUAHYDREX

1797 Boxelder Street
Louisville, CO 80027

720-543-0261
info@aquahydrex.com
aquahydrex.com

carbon and innovative fuels to market. CARB deserves recognition for the program's success.

The LCFS was originally developed because a specific and targeted program was expected to be needed to decarbonize transportation fuels – which at the time was thought to be a particularly hard-to-abate sector. That expectation has proven true, and the program has proven successful. We hope CARB continues to view the LCFS as perhaps the most powerful tool to achieve accelerated greenhouse gas reductions and carbon neutrality as soon as possible and highlights the LCFS as a primary aliment of the state strategy to achieve carbon neutrality, and perhaps accelerated 2030 greenhouse gas reduction targets, and its upcoming Scoping Plan update. Then we encourage CARB to strengthen the LCFS accordingly, and leverage it to its full extent to reduce greenhouse gas emissions.

We support adding intrastate jet fuel as a required fuel

There is tremendous interest and developing sustainable aviation fuels, and per CARB's principle of aligning with technology changes and federal policy signals, decarbonizing aviation (as well as shipping) should be an important priority in the next set of amendments. Adding intrastate jet fuel is required fuel is an important step in this direction.

Also, as described further in these comments, and in-line with the principle of streamlined implementation, CARB should develop Tier 1 pathways for the array of fuels that will serve to decarbonize these sectors, including green hydrogen (which may be used directly in some cases) and its derivatives – such as sustainable aviation fuel generated by pairing green hydrogen with captured CO_2, ammonia and methanol. These fuels are emerging as preferred low carbon fuels in the aviation and shipping sectors.

In general, we encourage CARB to fully incorporate not just green hydrogen, but these other derivatives as well, into its planning and programs. This includes the LCFS amendments, as well as the Scoping Plan. The assumptions in the Scoping Plan scenarios focus on direct use of electricity and hydrogen in these sectors, which misses important opportunities to decarbonize them more completely and quickly than could be achieved through the use of a wider array of fuels. We hope CARB will fully explore the potential for each of green hydrogen, synthetic aviation fuel, ammonia and methanol to contribute to the State's climate goals in its Scoping Plan, and incorporate those fuels in a streamlined fashion into the LCFS.

AQUAHYDREX

1797 Boxelder Street
Louisville, CO 80027

720-543-0261
info@aquahydrex.com
aquahydrex.com

We support the hydrogen-related provisions included in the workshop

We appreciate CARB's interest in advancing green hydrogen through the LCFS and the focus on these topics at the workshop. Scaling the production and use of green hydrogen, and hydrogen from electrolysis in particular, is key to decarbonizing hard-to-abate sectors of the economy.

There is widespread interest in green hydrogen and expectation for significant cost reductions over the next decade-plus that will help make it a cost-effective climate solution across an ever-growing set of applications. However, those outcomes can only be achieved with scale, and scale can only be achieved with successful early markets, such as those enabled by the LCFS. The approaches suggested by CARB at the workshop are reasonable and will help to support the early market and broader scaling of the green hydrogen industry in California and beyond. In particular, we support:

- Allowing for book-and-claim accounting of new-or-expanded low-CI hydrogen injected into hydrogen pipelines.
- Expanding hydrogen refueling infrastructure crediting for medium and heavy-duty vehicles.
- Developing new Tier 1 calculator for hydrogen pathways, which will allow hydrogen applications to move more quickly while avoiding the need for Tier 2 pathways. We look forward to hearing in more detail how the calculator will function.
- Allowing for preferential allocation of low-CI hydrogen to specific fuel pathways used for reporting.
- Allowing hydrogen production facilities not co-located with a refinery to generate credit under the refinery investment provision.

Additionally, as CARB develops a new Tier 1 calculator for hydrogen pathways, we encourage you to develop a technology-neutral, emissions-based definition for green hydrogen and update the current definition of "renewable hydrogen" to reflect all technology available and encourage the development of new green hydrogen production. Specifically, CARB should define renewable hydrogen to include a broad definition of green hydrogen, and to include hydrogen from electrolysis using power derived from any zero-carbon or curtailed power resource. CARB should resist calls to define green hydrogen as deriving only from RPS-eligible electricity resources or to be sited or connected to California's electricity grid.

AQUAHYDREX

1797 Boxelder Street
Louisville, CO 80027

720-543-0261
info@aquahydrex.com
aquahydrex.com

We encourage CARB to consider other potential changes to the LCFS that would expand its effectiveness and reach to help achieve California's climate goals

Given the success of the program, and urgency to address climate change, we encourage CARB to consider amendments to further leverage the LCFS to achieve additional greenhouse gas emissions reductions. In particular, we encourage CARB to create opportunities for all transportation end uses to opt-in to the program to receive LCFS credits, including shipping and interstate and international aviation.

Additionally, we encourage CARB to explore through the Scoping Plan and the LCFS amendment process the opportunity for the LCFS to serve as a critical tool to decarbonize other hard-to-abate sectors such as cement and other industrial applications, existing natural gas power plants, and other gas end uses. This would be similar to the approach taken in Canada, and we expect that it could serve to effectively decarbonize those sectors by enabling a wide, technology-neutral array of innovative emissions reductions strategies to be deployed in other applications, just as it has done successfully for transportation. Such a program could be used to achieve zero emissions in the power sector, emissions reduction targets for the cement sector under SB 596, and help to decarbonize California's entire economy.

Thank you again for the opportunity to comment on this workshop. We look forward to working with you on future changes to the LCFS Program.

Sincerely,

Steven Kloos, PhD
Chief Executive Officer
AquaHydrex, Inc.