AQUAHYDREX

1797 Boxelder Street
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August 8th, 2022

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

RE: AquaHydrex Comments on the July 7, 2022 Public Workshop on Potential Changes to the Low Carbon Fuel Standard (LCFS) Program

Dear Dr. Laskowski:

Thank you for the opportunity to comment on the July 7, 2022 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. We feel a target of at least 30% reduction in carbon intensity by 2030 is appropriate, and encourage stronger targets thereafter that will ensure the LCFS remains a strong driver of innovation and greenhouse gas emission reductions for California.

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 outlined in the workshop, including aligning with the State's climate goals and zero emission vehicle regulations and supporting a diverse fuel mix to decarbonize off-road equipment and heavy-duty vehicle fleets. Additionally, we reiterate our support for many of the green hydrogen provisions discussed in the December 2021 workshop and our related comment letter. We also encourage CARB to consider additional potential changes to the LCFS that could further leverage the program to advance California's climate goals, including 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.

Below we provide specific responses to some of the proposals and questions posed at the workshop.

1) Carbon intensity reduction targets should be set no less than 30% by 2030 and significantly stronger thereafter

We encourage CARB to set strong carbon intensity targets that maintain the LCFS as one of California's most powerful climate change policies and align with the State's myriad regulations, goals, and strategies outlined in the Scoping Plan. Among other things, this includes:

- Governor Newsom's Executive Order calling for 100% zero emission vehicles (ZEV) in the State, and CARB's existing and forthcoming regulations to actualize those targets,
- Goals to develop a leading green hydrogen hub(s) in California and attract billions of dollars in near-term federal and private sector investment,
- Scoping Plan goals to rapidly and significantly decarbonize refining,

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- New goals set by the Governor in his recent letter to Chair Randolph to achieve 20 $MMTCO_2$/year of carbon dioxide removal by 2030, 100 $MMTCO_2$/year by 2045 and 20% sustainable aviation fuels, and
- SB 1383 goals to reduce methane emissions, divert organic waste from landfills, and related efforts to manage woody waste resources – including state funding to demonstrate scalable pathways in California for negative carbon biomass-to-hydrogen or liquid fuels.

In addition to ongoing innovation and market developments such as ZEV sales significantly outpacing regulatory requirements and refineries converting to renewable fuels – we have no doubt that CARB would find a 30% carbon intensity target by 2030, and quite possibly something greater, to be quite achievable. We encourage a thorough analysis that includes all expected market developments and policy targets or requirements to determine appropriate near-term and longer term carbon intensity targets, including 5-year increments with significant ambition in 2035. Overall, we hope CARB will err on the side of ambition in setting carbon intensity targets, given the urgency of addressing climate change, proven success of the LCFS program, and existing cost containment measures that exist in the program and could be expanded if necessary.

2) Infrastructure crediting should support greater use of green hydrogen

While the LCFS has undoubtedly proven effective at supporting low carbon fuels across the board, one fuel that is missing from support is green hydrogen. LCFS credits accrue to the hydrogen station operator, rather than the fuel provider, and the important market signal from the LCFS may not fully reach the hydrogen producer to support green hydrogen development. As the state looks to further support the transition to green hydrogen, including additional policies and market support to help attract federal investment in a hydrogen hub in California under the Infrastructure Investment and Jobs Act, we encourage CARB to support opportunities to further bolster the green hydrogen industry through the LCFS.

One option could be to increase from 40% to 100% the renewable hydrogen requirement to receive additional HRI infrastructure credits, including in the heavy-duty sector. This could be phased in over time and fully take effect in 2030, in line with established targets by the global hydrogen industry.[1] While this requirement would not directly incentivize the green hydrogen industry through the LCFS, it would nonetheless provide additional support and momentum to accelerate deployment of green hydrogen, in line with state goals.

3) Time to fully implement SB 1505, strengthen emission requirements

Simultaneously, CARB should formally adopt and increase renewable hydrogen requirements pursuant to SB 1505 (Lowenthal). SB 1505 requires CARB to adopt regulations, to take effect in any year following a 12-month period where hydrogen dispensed for transportation purposes exceeds 3,500 metric tons, that would require (1) well-to-wheel emissions of greenhouse gases for the average hydrogen powered vehicle in California to be at least 30 percent lower than emissions for the average new gasoline vehicle in California, when measured on a per-mile basis, (2) no less than 33.3 percent of the hydrogen

[1] At California's Global Climate Summit in 2018, the Hydrogen Council announced a commitment to achieve 100% decarbonized hydrogen in the transportation sector by 2030, while "calling on governments to build a global alliance that will create the necessary regulatory frameworks to help make this commitment a reality." https://hydrogencouncil.com/en/global-climate-action-summit-san-francisco-u-s/

produced or dispensed in California for motor vehicles be made from eligible renewable energy resources, (3) well-to-tank emissions of nitrogen oxides plus reactive organic gases to be at least 50% lower than similar emissions of average motor gasoline sold in the state, and (4) well-to-tank emissions of relevant toxic air contaminants from hydrogen fuel produced or dispensed in California be reduced to the maximum extent feasible at each site when compared to well-to-tank emissions of toxic air contaminants of the average motor gasoline fuel on an energy-equivalent basis. The bill further requires CARB to strengthen the emissions requirements every four years if it finds doing so is technologically feasible and will not substantially hinder development of the hydrogen market.[2]

With hydrogen expected to surpass the low volume exemption threshold (420 million MJ, which is equal to 3,500 metric tons of hydrogen, per year) in 2025, it will be time for the SB 1505 regulations to formally take effect in 2026. We hope as part of these LCFS amendments or a separate process that CARB will (1) formally adopt the SB 1505 regulations and (2) consider strengthened emissions targets, as required by the law, including a schedule where they would be strengthened at least through 2030, and potentially beyond.

4) We support the new vehicle and fuel applications proposed in the workshop and covering intrastate fossil jet fuel

We strongly support incorporating into the regulation credit generating opportunities for all transportation end uses, including interstate and international aviation to/from California airports, shipping, and other off-road applications. Accordingly, we strongly support the proposal to allow methanol, ammonia, and other fuels to opt-in to the program. We particularly encourage CARB to 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.

We also support requiring intrastate fossil jet fuel in the program and allowing zero-emissions applications for rail, agricultural equipment, commercial harbor craft and airport ground support equipment to opt-in under Tier 2 EER-adjusted CI pathways.

5) The LCFS can advance equity through support for green electrolytic hydrogen

Finally, we note that the recommendations in this comment letter – including formal implementation of SB 1505 and broader market support for green hydrogen – will help to advance equity and environmental justice by better aligning the greenhouse gas reduction goals of the LCFS with further reductions in criteria air pollutants. The only emissions associated with electrolysis and its use in a fuel cell vehicle are oxygen and water vapor. When paired with renewable electricity, green electrolytic hydrogen can deliver truly zero emissions transportation pathways across the board. While more should be done to advance equity in the LCFS and other programs, we think additional, targeted support for green hydrogen production and use in the transportation sector can be an important element.

Finally, the LCFS could especially advance equity if it were expanded to cover the industrial sector and other gas end uses. This would expand the successful LCFS model to support deeper greenhouse gas and criteria air pollutant reductions throughout the economy, including in hard-to-abate sectors such has cement, existing natural gas power plants, and other sources that are often located in low income or

[2] http://www.leginfo.ca.gov/pub/05-06/bill/sen/sb_1501-1550/sb_1505_bill_20060930_chaptered.pdf

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disadvantaged communities. 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, which could serve to effectively decarbonize those sectors by enabling a wide, technology-neutral array of innovative emissions reductions strategies to be deployed. 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 continuing to work with you on future changes to the LCFS Program.

Sincerely,

Steven Kloos, PhD
CEO