



August 22, 2024

The Honorable Liane M. Randolph
Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95814

(Comment submitted electronically)

RE: H Cycle's 15-Day Changes Comment Requesting that CARB Level the Playing Field by Giving all Hydrogen Producers Access to Book-and-Claim Accounting as was Originally Proposed

Dear Chair Randolph,

H Cycle, LLC ("H Cycle") is pleased to submit comments pertaining to the California Air Resources Board's ("CARB") proposed 15-day changes ("15-Day Changes") to the Low Carbon Fuel Standard ("LCFS"). We support CARB's LCFS program as it sends a powerful market signal to decarbonize the transportation sector, is performance based, and provides long-term policy stability that supports investment. However, we respectfully encourage CARB not to bias the LCFS program structure to favor more energy intensive electrolytic hydrogen over H Cycle's non-electrolytic process that leverages waste streams from organics diversion to reduce emissions of the short-lived climate pollutant ("SLCP") methane, create a distributed hydrogen production network, and attract federal dollars to California to accelerate hydrogen production expansion.

15-Day Change

CARB's Notice of Public Availability of Modified Text ("15-Day Notice") states that regarding §95488.8(i)(1)(C), "staff proposes to add the word "electrolytic" to clarify the type of hydrogen production to which this subsection applies." There is no further explanation given for the change. The lack of explanation is unfortunate given that the original LCFS regulatory proposal posted on December 19, 2023 ("Original LCFS Proposal"), affirmatively struck the word "electrolytic" from §95488.8(i)(1)(C). The Original LCFS Proposal was responsive to strong industry support for a technology neutral and consistent approach to carbon accounting for hydrogen production.

The reinsertion of "electrolytic" into §95488.8(i)(1)(C) would perpetuate the current regulatory structure which establishes two distinct LCFS carbon accounting approaches for hydrogen production. Electrolytic hydrogen is authorized to use book-and-claim accounting to access low carbon intensity ("Low-CI") power. Non-electrolytic hydrogen production can only access Low-CI power through the establishment of a behind the meter direct connection to a renewable power generating facility and must meet the other requirements of §95488.8(h)(1).



**California's LCFS Program was Authorized by Executive Order to
Reduce the Carbon Intensity of California's Transportation Fuels and
Designed to be Technology Neutral**

In January 2007, California Governor Arnold Schwarzenegger issued Executive Order S-01-07 which ordered as its first two operative provisions:

1. *That a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020 ("2020 Target").*
2. *That a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California. (...) ¹*

As former Board Member Professor Dan Sperling explained to the Carnegie Endowment for International Peace:

A low carbon fuel standard is a carbon intensity standard applied to a fuel's life cycle. This makes the low carbon fuel standard a technology neutral policy that harnesses market forces to stimulate innovation by allowing industry and consumers, instead of government, to choose winners among competing fuel technologies and products. ²

Despite the centrality of technology-neutral carbon intensity within the LCFS program structure, CARB is proposing with this 15-Day Change that hydrogen should be subject to two distinct carbon accounting schemes depending on whether the hydrogen is produced through the electrolytic method which utilizes electricity and water, or through any other method.

**LCFS Policy Design Should
Incentivize Hydrogen Production that Uses Less Electricity**

While there may be sound policy reasons to favor some production process over others, CARB has not provided any justification in the 15-Day Notice and none is readily apparent. In discussions with CARB on book-and-claim issues, one key issue of concern that has been emphasized is an insufficient supply of Low-CI power. This has been discussed as a reason to prioritize the use of Low-CI power for fuels for zero emission vehicles including battery electric vehicles and fuel cell electric vehicles.

However, an electricity consumption comparison of electrolytic hydrogen production versus hydrogen produced through H Cycle's process demonstrates that favoring electrolytic hydrogen via biased carbon accounting will waste rather than conserve power for zero emission vehicles. The H Cycle process is distinct from electrolytic pathways as it uses municipal solid waste ("MSW") from material recovery facilities ("MRFs") residuals as its feedstock and primary energy source to produce hydrogen. The H Cycle process is capable of taking what may be described as the "waste of the waste"- organic waste that is not suitable for anaerobic digestion or composting. One of H Cycle's primary uses of electricity in the process is to power plasma torches in the thermal conversion unit that enables the processing and conversion of organic waste in an environmentally friendly manner.

¹ California State Library, "Executive Order S-01-07," (January 22, 2007) at <https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/5107-5108.pdf>

² Carnegie Endowment for International Peace, "A National Low-Carbon Fuel Standard," (July 19, 2012), at <https://carnegieendowment.org/events/2012/07/a-national-low-carbon-fuel-standard?lang=en>.



In the case of electrolytic hydrogen, the energy value of the hydrogen is derived solely from the electricity input with some of the energy value of the electricity lost due to energy inefficiency. The U.S. Department of Energy has set the technical targets for high temperature electrolyzer stacks and systems at 76% energy efficiency for 2026.³

As a result of the inherent inefficiencies of electrolytic hydrogen production and H Cycle's ability to capture the energy value of the waste in hydrogen, H Cycle can produce a kilogram of hydrogen using only one-third of the electrical power required by an electrolytic hydrogen facility. Thus, returning to CARB's goal of strategically utilizing California's Low-CI power sources to generate the maximum quantity of fuel for zero emission vehicles, the deployment of H Cycle facilities will yield 3x the amount of hydrogen than electrolytic facilities for the same electricity. Yet, the 15-Day Change proposal creates a carbon accounting disparity such that the electrolytic hydrogen producers will receive more favorable CI scores under the LCFS due to their ability to access Low-CI power via book-and-claim accounting. In the words of Professor Sperling, *this approach places the government in the position of choosing winners among competing fuel technologies and products.*

In addition to its ability to produce more hydrogen from less electricity, the environmental services that H Cycle provides further underscore the importance of providing H Cycle with equal access to Low-CI power via book-and-claim.

H Cycle is the Leading Company in Organic/Biogenic Waste-to-Hydrogen

H Cycle is a California company based in Concord that was founded in 2021. H Cycle is a developer of low-cost, low-carbon hydrogen production facilities that deploy an advanced waste-to-hydrogen thermal conversion technology. H Cycle is currently developing multiple projects in California. H Cycle facilities will be capable of utilizing a diverse composition of waste feedstocks including post-separated organic fractions of municipal solid waste, agricultural residues, and woody biomass from wildfire risk reduction projects to produce Low-CI hydrogen. The successful development of these projects will reduce methane emissions from landfill disposal and other waste streams and facilitate achievement of California's waste diversion targets under Senate Bill 1383 ("SB 1383"). The H Cycle process delivers Low-CI hydrogen that can be used as a fuel for decarbonizing hard-to-abate sectors such as low-carbon fuel production, heavy-duty trucking, and sustainable aviation. H Cycle is excited to work with CARB and local communities to deploy our solution and support the State in meeting its climate, sustainability and air quality goals. H Cycle is the first company to have received a favorable Article 2 determination from CalRecycle.

Conclusion

Non-electrolytic hydrogen technologies have the potential to be a meaningful contributor to the State's and CARB's goals. Supporting waste-to-hydrogen as a technology and commercial pathway brings many benefits including achieving organics diversion targets and SB 1383 short-lived climate pollutant reductions; and job growth and investment tax base from new facilities.

³ Office of Energy Efficiency and Renewable Energy, "Technical Targets for High Temperature Electrolysis," at <https://www.energy.gov/eere/fuelcells/technical-targets-high-temperature-electrolysis>.



For the reasons discussed in this comment, we respectfully request that CARB revert to the Original Proposal that utilizes consistent carbon accounting for hydrogen production technologies.

We appreciate the opportunity to submit these comments, and are available for further discussions on these important issues.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Quentin Foster', on a light gray background.

Quentin Foster
VP, Policy and Government Affairs