SUBMITTED ELECTRONICALLY

Tuesday, February 20, 2024

California Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

RE: Electric Hydrogen Comments on Proposed 2024 LCFS Amendments

Dear California Air Resources Board,

Thank you for the opportunity to provide comments regarding the proposed low carbon fuel standard amendments. Electric Hydrogen respectfully submits the following comments and proposed amendments, which are intended to facilitate the adoption of green hydrogen production at scale, as a transportation fuel as well as a feedstock in the production of transportation fuels for conventional and low and zero-carbon liquid transportation fuels (including sustainable aviation fuel, power-to-liquids, and renewable diesel).

With significant facilities, management groups, and employees in California and Massachusetts, Electric Hydrogen manufactures the world's most powerful electrolyzers for critical industries to produce low-cost green hydrogen. Our 100 MW electrolyzer plant is designed to load follow variable renewable energy resources and enable customers to efficiently convert renewable electrical energy into clean molecular energy in the form of hydrogen. Electric Hydrogen's mission is to achieve cost parity with fossil fuels in a timeframe that matters. Put another way, the company exists to make green hydrogen an economic inevitability, giving hard to decarbonize industries, like heavy-duty transportation, aviation, and maritime transport, a viable and cost-effective solution to meet their urgent net-zero climate objectives.

Green hydrogen is a necessary tool in the energy transition to a net-zero economy. The 2022 California Scoping Plan for Achieving Carbon Neutrality notes that for California to achieve its net-zero goal by 2045, California will have to increase green hydrogen production 1700-fold.[1]

Within the transportation sector, green hydrogen has multiple applications for helping lower GHG emissions. In addition to green hydrogen used as a transportation fuel in fuel cell electric vehicles (FCEVs), hydrogen is a necessary feedstock in both conventional petroleum fuels and many low and zero-carbon liquid transportation fuels including renewable diesel, sustainable aviation fuel (SAF), power-to-liquids (PtL), and maritime fuels including methanol and ammonia.

[1] California Air Resources Board. *2022 Scoping Plan for Achieving Carbon Neutrality.* December 2022, page 8. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf

Enabling the adoption of green hydrogen as both a transportation fuel in FCEVs as well as a feedstock in other transportation fuels can drive emissions reductions in both the near and long-term. Low and zero carbon liquid transportation fuels for heavy duty and long-haul transportation applications such as aviation and maritime shipping will be needed for the foreseeable future. CARB's scoping plan calls for meeting 80% of aviation fuel demand in 2045 with sustainable aviation fuel and power-to-liquids—fuels that require hydrogen as a feedstock in their production.[2] The scoping plan acknowledges the role that low-carbon liquid fuels will play for the foreseeable future and calls for continued state support: "the state must continue to support low-carbon liquid fuels during this period of transition and for much harder sectors for ZEV technology such as aviation, locomotives, and marine applications."[3]

Leveraging the LCFS to incentivize liquid transportation fuel producers to switch from gray to green hydrogen can also help the green hydrogen industry scale and in turn reduce the cost of green hydrogen which will enable greater adoption of FCEVs in medium and heavy-duty transportation. California's existing annual hydrogen production capacity is approximately 1.83 million metric tons. However, only about 5000 metric tons (less than 0.3% of current production capacity) is used to fuel FCEVs.[4] While the FCEV market for green hydrogen is expected to grow in the coming years, it will remain small compared to the market for green hydrogen as a feedstock in liquid transportation fuels. Ensuring that developers producing green hydrogen for the FCEV market as well as the liquid transportation fuel market can benefit from LCFS eligibility would accelerate green hydrogen adoption, reduce emissions, and reduce the cost of green hydrogen creating a virtuous cycle enabling greater adoption of FCEVs.

To enable the LCFS eligibility of green hydrogen as a feedstock in liquid transportation fuels, Electric Hydrogen recommends the following three amendments to the LCFS staff draft.

- Allow book-and-claim delivery of low-CI electricity for electrolytic hydrogen production used as a feedstock in liquid transportation fuel.
- Allow book-and-claim delivery of low-CI hydrogen in dedicated hydrogen pipelines outside of California for transportation fuel sold into the California market.
- Allow delivery of low-CI electricity via book-and-claim for electrolytic hydrogen production in the Renewable Hydrogen Refinery Credit Program.

Allow book-and-claim delivery of low-CI electricity for electrolytic hydrogen production used as a feedstock in transportation fuel.

§ 95488.8. subsection (i)(1) restricts the use of book-and-claim delivery of low-CI electricity to electrolytic hydrogen used in FCEVs. This provision artificially limits the market for LCFS

---

[2] California Air Resources Board. *2022 Scoping Plan for Achieving Carbon Neutrality.* December 2022, page 73. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf

[3] California Air Resources Board. *2022 Scoping Plan for Achieving Carbon Neutrality.* December 2022, page 190. https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf

[4] Justin Bracci, Adam Brandt, Sally M. Benson, Gireesh Shrimali and Sarah D. Saltzer, *"Pathways to Carbon Neutrality in California: The Hydrogen Opportunity",* Stanford Center for Carbon Storage and Stanford Carbon Removal Initiative, February 2022, page 2.

eligible green hydrogen to less than 0.3% of California's current hydrogen market. Refineries and other fuel production facilities that produce the lion's share of hydrogen in this State (whether conventional, SAF, renewable diesel, or power-to-liquids) typically lack both the land and the solar/wind resources necessary to produce the hundreds of megawatts or gigawatts of renewable generation required to turn grey hydrogen production into green hydrogen production. Without amendment, this restriction will unnecessarily limit growth of the green hydrogen market and miss an important opportunity for California to drive emissions reductions in the transportation sector. It is also inconsistent with CARB's scoping plan which, as noted previously, calls for continued state support for low and no-carbon liquid transportation fuels to decarbonize hard to decarbonize transportation modes including aviation, maritime, and heavy and medium duty transportation.

Extending the ability to utilize book-and-claim delivery of low-CI electricity in hydrogen production for liquid transportation fuels would also create a level playing field with hydrogen produced from renewable natural gas (RNG). § 95488.8 subsection (i)(2) of the staff draft allows for the utilization of book-and-claim delivery of RNG, including for RNG used in the production of a liquid transportation fuel. This allowance applies to production of any kind of liquid transportation fuel including both conventional gasoline and diesel as well as low and zero-carbon liquid transportation fuels.

Electric Hydrogen respectfully requests that CARB amend the current staff draft to allow for book-and-claim delivery of low-CI electricity for hydrogen used as a feedstock in any liquid transportation fuel. This approach would maximize the potential for green hydrogen adoption and emissions reductions and match the treatment CARB has extended to RNG. However, if CARB is concerned with extending this policy to green hydrogen used in conventional gasoline and diesel refineries, CARB should at a minimum allow for book-and-claim delivery of low-CI electricity in green hydrogen production used as a feedstock in low and no-carbon liquid transportation fuels including sustainable aviation fuels, power-to-liquids fuels, and renewable diesel.

Allow book-and-claim delivery of low-CI hydrogen in dedicated hydrogen pipelines outside of California.

§ 95488.8 subsection (i)(3) restricts the use of book-and-claim delivery of low-CI hydrogen in dedicated hydrogen pipelines to pipelines physically connected to California. California currently has only 17 miles of dedicated hydrogen pipelines. However, nationwide there are about 1600 miles of dedicated hydrogen pipelines, of which about 1300 miles are concentrated in the Gulf Coast.[5] This existing hydrogen pipeline infrastructure network serves a variety of industrial customers, including both conventional and low-carbon fuel producers selling liquid transportation fuels into the California market. This restriction limits the ability of these fuel producers to utilize green hydrogen to lower the carbon intensity of their liquid transportation fuels. The optimal policy would be to allow book-and-claim delivery of low-CI hydrogen in any dedicated hydrogen pipeline serving as a feedstock in any fuel. However, if CARB is concerned

[5] Justin Bracci, Adam Brandt, Sally M. Benson, Gireesh Shrimali and Sarah D. Saltzer, *"Pathways to Carbon Neutrality in California: The Hydrogen Opportunity",* Stanford Center for Carbon Storage and Stanford Carbon Removal Initiative, February 2022, page 25.

with extending this policy to hydrogen used in conventional gasoline and diesel refineries, CARB should at a minimum allow for book-and-claim delivery of low-CI hydrogen in dedicated hydrogen pipelines when that low-CI hydrogen is used as a feedstock in low and no-carbon liquid transportation fuels such as sustainable aviation fuels, power-to-liquids fuels, and renewable diesel.

Allow delivery of low-CI electricity via book-and-claim for electrolytic hydrogen production in the Renewable Hydrogen Refinery Credit Program.

§ 95488.10 subsection (f) prohibits the delivery of low-CI electricity via book-and-claim for electrolytic hydrogen production in the Renewable Hydrogen Refinery Program. Requiring onsite renewable electricity generation restricts the program to pilot scale projects thereby limiting the efficacy of the program in reducing emissions.

California currently has 20 hydrogen production facilities with 1.83 million metric tons of annual hydrogen production capacity. The median production capacity of the fleet is 226,517 metric tons per year.[6] To fully decarbonize the hydrogen supply at the median-sized facility would require 1.3 GWs of electrolysis capacity assuming a 100% utilization rate and a plant efficiency of 50 kWh/kg H2. A more realistic utilization rate of 50% would increase the requirement to 2.6 GWs of electrolysis capacity. To meet even the 50% utilization rate would require an oversizing of the renewable generation capacity relative to the electrolysis capacity. Hence, to decarbonize even half of the median hydrogen production facility in California would require renewable generation on the scale of the Alta Wind Energy Center in Kern, County, which is the largest wind farm in the United States.

Requiring onsite renewable generation to decarbonize even a portion of a refinery's hydrogen production requires more land than refineries have available onsite. Allowing for the delivery of low-CI electricity via book-and-claim for electrolytic hydrogen production would allow refineries to utilize this program to lower emissions. Without this amendment, this program will likely continue to be underutilized.

Conclusion:

EH2 is committed to helping California meet its climate goals. We appreciate CARB's consideration of the three proposed amendments, and we look forward to continuing to work with CARB on this critically important effort.

Sincerely,

Paul Wilkins

Paul Wilkins
Vice President for Policy and Government Engagement

[6] Justin Bracci, Adam Brandt, Sally M. Benson, Gireesh Shrimali and Sarah D. Saltzer, *"Pathways to Carbon Neutrality in California: The Hydrogen Opportunity",* Stanford Center for Carbon Storage and Stanford Carbon Removal Initiative, February 2022, page 3.