AQUAHYDREX

1797 Boxelder Street
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June 22, 2022

Rajinder Sahota
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: AquaHydrex Comments on Draft 2022 Scoping Plan Update

Dear Ms. Sahota:

Thank you for the opportunity to comment on the draft 2022 Scoping Plan Update (draft Plan). We appreciate the important role for green hydrogen identified in the draft Plan, including recognition that "The solution will have to include transitioning existing energy production and transmission infrastructure to produce zero-carbon electricity and hydrogen…" (pg. vi) However, as highlighted in our previous comments on the initial scenario results,[1] we feel that the analysis still widely underappreciates opportunities associated with green hydrogen to advance the State's climate change goals. We urge you to update the approach towards green hydrogen in the final Scoping Plan to fully enable it to accelerate deep reductions in greenhouse gas emissions across all sectors of the California economy.

Low-cost green electrolytic hydrogen practical at scale

AquaHydrex is an American company commercializing a purpose-driven, clean-sheet redesign of electrolysis for producing low-cost green electrolytic hydrogen from intermittent renewables at scale. We see green electrolytic hydrogen, aided by the dramatic reduction in the cost of renewable energy, practical at scale and as a key component of achieving deep decarbonization. Our own proprietary insights, based on our clean-sheet redesign of electrolysis to create the ideal platform for green hydrogen at scale, show an incredible roadmap for reducing the cost of electrolysis and green hydrogen production, especially when directly tied to inexpensive variable renewable energy. We look forward to helping the state transition to 100 percent clean energy and achieve carbon neutrality and net-negative emissions as soon as possible.

Several independent studies similarly expect significant reductions in the cost of green electrolytic hydrogen and that it will become a cost-effective climate solution once it reaches scale, within the next 5-10 years. For example, Bloomberg New Energy Finance suggests costs for green electrolytic hydrogen could plunge by 80 percent by 2030,[2] while an analysis by McKinsey for the Hydrogen Council finds that green electrolytic hydrogen could become an

[1] https://www.arb.ca.gov/lists/com-attach/12-sp22-modelresults-ws-WzpWIV0pVGZRP1Qt.pdf
[2] https://www.bloomberg.com/news/articles/2019-08-21/cost-of-hydrogen-from-renewables-to-plummet-next-decade-bnef

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increasingly cost-effective solution for decarbonizing many sectors of the economy, beginning as soon as the 2025-2030 timeframe.[3] The International Renewable Energy Agency (IRENA) agrees with this sentiment, finding that falling renewable power and electrolyzer costs could make green electrolytic hydrogen cost competitive by 2030.[4] This is validated in a recent study by E3, which shows that power plants using green electrolytic hydrogen could be profitable in Southern California by 2025-2030.[5]

Evaluate complete array of opportunities for hydrogen and its derivatives to achieve carbon neutrality

Green hydrogen provides the opportunity to decarbonize any fossil fuel end use at scale, either directly, or through hydrogen derivatives and synthetic fuels. For example, while the draft Plan asserts that ongoing fossil fuel demand will be required to serve certain end uses, including shipping, rail and aviation, those end uses could be served with zero carbon green hydrogen derivatives, including ammonia, methanol, ethanol or synthetic fuels. These are early market opportunities for the green hydrogen industry, and ones that our company and others are very excited about.

These end use sectors can also utilize green hydrogen directly, however, the focus of the draft Plan on direct hydrogen use misses the broader opportunity to deploy green hydrogen to reduce emissions. In the final Scoping Plan, we hope you will incorporate these opportunities and technologies.

The Scoping Plan misses an opportunity by not considering carbon capture and utilization

The draft Plan talks significantly about carbon capture and sequestration (CCS), including bioenergy with CCS (BECCS), but it does not talk about utilizing captured CO_2, which is a significant oversight. Captured CO_2 (from the air or a point source) can be combined with green hydrogen to make green syngas, which in turn can be converted to zero carbon products like sustainable aviation fuels, green methanol for shipping, or negative carbon products like green plastics. Sustainable aviation fuels, in particular, can – and likely will – be made via these pathways. There is also tremendous progress and interest in a number of markets for carbon negative plastics and other materials.

Indeed, it is entirely possible that carbon utilization becomes the dominant means to manage and store captured carbon. CARB should recognize these important and promising strategies in the final Scoping Plan and commit to actions to advance them, including:

- Expanding the CCS Protocol to include utilization strategies

[3] https://hydrogencouncil.com/wp-content/uploads/2020/01/Path-to-Hydrogen-Competitiveness_Full-Study-1.pdf
[4] https://www.irena.org/publications/2020/Dec/Green-hydrogen-cost-reduction
[5] https://www.ethree.com/e3-evaluates-hydrogen-opportunities-in-a-low-carbon-future/

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- Incorporating green hydrogen derivative fuels and sustainable aviation fuel directly into the Low Carbon Fuel Standard and other relevant climate change programs
- Calling for incentives to demonstrate these promising strategies, including through the California Energy Commission's Clean Transportation Program

The final Scoping Plan should aim to achieve 0 MMTCO$_2$e in the electricity sector through the use of green hydrogen

We are disappointed to see the draft Plan continuing to rely on natural gas to maintain reliability of the electricity grid, even through mid-Century. The result of this assumption is that electricity sector emissions never decline after 2030, and remain high at 30 MMTCO$_2$e/year in 2045. This is 30 MMTCO$_2$e/year of readily available greenhouse gas emission reductions that the draft Scoping Plan leaves on the table.

We understand the ongoing role that gas plants will serve to maintain grid reliability, but they can be readily decarbonized through the use of green hydrogen. This is the approach that E3 proposed in their original carbon neutrality scenarios developed for CARB, which would have achieved 0 MMTCO2e/year in the electricity sector with estimated costs in line with other industrial decarbonization strategies.[6] We hope the final Plan will take these reductions off the table and envision accelerated, beneficial emissions outcomes in California.

Kickstart the green hydrogen market through hydrogen blending standards and other policies

CARB can unleash green hydrogen as a low-cost climate change solution by supporting policies to create initial markets for green electrolytic hydrogen, with defined economics and bankability, and large enough to encourage a wide array of industry players to jump in. The markets should be simple and straightforward and have access to the cheapest forms of electricity – directly from renewable generation.

The best markets from our perspective to initiate cost reductions and broader opportunities for green hydrogen are the gas market and the power market. We appreciate that the modeling scenarios include hydrogen blending in the natural gas pipeline, however we note that the state should not wait until 2030 to begin deploying this important strategy. Also, as described above, the draft Plan falls short of decarbonizing the electricity sector, and we hope the final plan will suggest specific actions to achieve zero carbon emissions in the electricity sector, including through the use of green electrolytic hydrogen.

In the final plan, we hope that CARB will identify additional *Strategies for Achieving Success* that will kickstart markets for green electrolytic hydrogen to rapidly scale this important climate solution and slash costs, including:

[6] https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_presentation_oct2020_2.pdf

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- Support for the CPUC to consider renewable hydrogen blending requirements as part of its Phase 4b renewable gas proceeding, at least at levels needed to support and scale the electrolysis industry.
- A commitment to work with CEC and CPUC to evaluate 0 $MMTCO_2e$ scenarios for the electricity sector through the SB 100 (De León) and SB 423 (Stern) implementation processes, and to achieve those goals through the Integrated Resource Planning Process. As part of these efforts, the agencies should specifically identify and enable the role of green hydrogen in helping to achieve 0 $MMTCO_2e$ emissions in the electricity sector.
- A commitment to explore additional policies to decarbonize the electricity sector, including natural gas power plants, such as strengthened emissions performance standards for thermal power plants, beyond levels required under SB 1368 (Perata).
- A commitment to explore mechanisms to increase deployment of green electrolytic hydrogen in the industrial sector, including through implementation of SB 596 (Becker) and the Cap-and-Trade program.

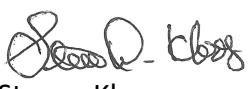
Other comments on the draft Plan

In addition to the recommendations above, we want to offer the following comments on specific applications of hydrogen identified in the draft Plan:

- For aviation, the Proposed Scenario (pg. 58) assumes 10% of fuel demand is met by electricity or hydrogen in 2045 and that sustainable aviation fuel meets most of the rest of aviation fuel demand. We request clarification that this means that 90% of aviation fuel is assumed to come from sustainable aviation fuels, and we encourage CARB to specifically identify green hydrogen-derived sustainable aviation fuel as an attractive option for decarbonizing this sector.
- For ocean going vessels, the Proposed Scenario (pg. 59) assumes 25% of ocean going vessels utilize hydrogen fuel cell technologies by 2045. This assumption ignores methanol and ammonia, which are leading candidates to utilize green hydrogen to decarbonize shipping. CARB should update this assumption to include all sustainable ocean going vessel fuels, including but not limited to green hydrogen, green methanol, green ammonia, green ethanol, and any other green fuel options.

Thank you again for the opportunity to comment on the draft Plan and your consideration of these comments. Please do not hesitate to reach out to me with any questions.

Sincerely,



Steven Kloos
Chief Executive Officer, AquaHydrex, Inc.