



444 Castro Street, Suite 710
Mountain View, CA 94041

June 24, 2022

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

Re: Draft 2022 Climate Change Scoping Plan

Dear Chair Randolph:

H Cycle, LLC (“H Cycle”) submits the following comments on the Draft 2022 Climate Change Scoping Plan (“Draft Scoping Plan”). H Cycle’s comments are focused on critical issues relating to renewable hydrogen production and usage, landfill methane emissions, and organic waste diversion and utilization. We commend the California Air Resources Board (“CARB”) for the exhaustive staff analysis and public engagement that underlies the development of the Scoping Plan, and appreciate the opportunity to provide these comments.

H Cycle’s central message to the Board is that the Draft Scoping Plan insufficiently recognizes the tremendous potential to produce renewable hydrogen, a vital zero-emission fuel in California’s future from the utilization of organic waste diverted from landfills, resulting in the cost-effective reduction of California’s greenhouse gas (“GHG”) and short-lived climate pollutant (“SLCP”) emissions. The value of waste-derived green hydrogen was highlighted in the Getting to Neutral report prepared by the Lawrence Livermore National Laboratory. In particular, the Getting to Neutral report identifies the gasification of municipal solid waste to hydrogen as the most cost-effective gasification scenario with the potential to deliver 16-17 MMT of annual negative GHG emissions during the considered period of 2025-2045.¹

Our specific recommendations for supplementing the Draft Scoping Plan are provided after a brief summary of H Cycle and our California-focused development work in the organic waste to green hydrogen space.

¹ See Table 39, “Total Cost Results for Gasification Scenario, Negative Emissions Basis,” Sarah E. Baker, Joshua K. Stolaroff, George Peridas, Simon H. Pang, Hannah M. Goldstein, Felicia R. Lucci, Wenqin Li, Eric W. Slessarev, Jennifer Pett-Ridge, Frederick J. Ryerson, Jeff L. Wagoner, Whitney Kirkendall, Roger D. Aines, Daniel L. Sanchez, Bodie Cabiyo, Joffre Baker, Sean McCoy, Sam Uden, Ron Runnebaum, Jennifer Wilcox, Peter C. Psarras, Hélène Pilorgé, Noah McQueen, Daniel Maynard, Colin McCormick, Getting to Neutral: Options for Negative Carbon Emissions in California, January, 2020, Lawrence Livermore National Laboratory, LLNL-TR-796100, at p. 129, available at https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf (footnotes omitted).

About H Cycle

H Cycle is a developer of low-cost, low-carbon hydrogen production facilities that deploy a proven waste-to-hydrogen thermal conversion technology. H Cycle is pursuing multiple project opportunities in the San Francisco Bay area, Los Angeles area and Central Valley. Our solution utilizes a diverse composition of organics-heavy waste feedstocks (municipal, agricultural, forest) to produce valuable renewable hydrogen, allowing us to displace methane emissions from landfill disposal and support California's waste diversion targets under Senate Bill 1383. Our technology can also be utilized to fulfill other State priorities related to forest management and providing alternatives to agricultural burning. The non-combustion, waste conversion process produces renewable hydrogen that can be used for decarbonizing hard-to-abate sectors such as heavy-duty trucking and renewable fuels refining, as well as gas utilities, existing fossil-fueled power plants and other industrial applications like cement production. H Cycle is backed by Azimuth Capital Management and Larsen and Lam Climate Initiative.

Specific Draft Scoping Plan Recommendations

To further enhance the value of the final version of the 2022 Scoping Plan, H Cycle requests the California Air Resources Board ("CARB") consider integrating the following:

- Specific analysis regarding the opportunity to use organic waste diverted from landfills (SB 1383) to produce hydrogen or other low-carbon and negative-carbon fuels; thereby capturing the dual benefits of reduced landfill methane emissions and displacement of fossil-based fuels. When paired with carbon capture and sequestration ("CCS"), this strategy offers the additional benefit of offering one of the most promising and significant carbon dioxide removal strategies, which will be needed to achieve carbon neutrality in the state, as identified by the scenario modeling presented in the Draft Scoping Plan.
- Recognition that renewable hydrogen can be produced using a variety of methods, that are best defined by performance-based metrics.
- Acknowledgement that renewable gas or renewable hydrogen can be beneficially sourced from gasification of organics diverted from municipal solid waste ("MSW") [which is an RPS eligible feedstock, per PUC section 399.12(a) and 383.5], and not only from forest or agricultural waste. This could serve as a complementary source of green hydrogen – alongside electrolysis and other strategies – to accelerate decarbonization efforts in California while reducing the significant scale of additional renewable energy construction required to achieve carbon neutrality and the associated land use impacts.
- Given that CARB does not forecast an effective solution to reduce methane from organic waste (which would be the largest category of remaining methane emissions in 2045 Proposed Scenario), CARB should acknowledge that "other non-combustion conversion technologies" can play a key role in reducing landfill methane while also producing hydrogen or fuels.
- Recognition of the role of bioenergy coupled with CCS ("BECCS") as a vital carbon dioxide removal ("CDR") option. While Direct Air Capture ("DAC") is essential as rightly outlined in the plan, Getting to Neutral showcases a 80 MMT/year potential from BECCS as applied to gasification and pyrolysis to produce liquid and gaseous fuels, such as hydrogen. Furthermore, BECCS is relatively lower-cost and provides co-benefits such as wildfire risk

reduction, improvements to air quality and water supply, as well as rural economic development opportunities.

H Cycle specifically expresses support for the following existing language in the Scoping Plan:

- “Green hydrogen” is not limited to only electrolytic hydrogen produced from renewables.
- Strengthening LCFS targets in 2030 and beyond are key to continue encouraging private investment in the production of renewable fuels, including hydrogen.
- Biomass supply can be used to produce low carbon fuels for transportation, including hydrogen, which reduces demand for petroleum fuels and GHGs, and improves air quality.
- Diverting 75% of organic waste from landfills by 2025 (for compliance with SB 1383) can reduce non-combustion methane emissions and short-lived climate pollutants.
- Expanding markets for products made from organic waste, including through recognition of the co-benefits of other products, which should include renewable hydrogen.
- Incentivizing private investment in new zero-carbon fuel production in California (such as hydrogen) as well as infrastructure to support reliable hydrogen refueling. By providing LCFS capacity credits for hydrogen fueling of heavy-duty vehicles, CARB can enable private investment in infrastructure and production that will allow market scale to be achieved.
- Hydrogen produced from renewable resources or renewable feedstocks (such as MSW organics) can serve a dual role as a low-carbon fuel for existing combustion turbines or fuel cells, and as energy storage for later use.

H Cycle believes these considerations will maximize the opportunities to advance the Proposed Scenario to achieve carbon neutrality by 2045 while maintaining an efficient, cost-effective, diverse and reliable energy system.

Thank you again for the opportunity to comment on the Draft Scoping Plan, and for the thorough process that has informed it. We look forward to continuing working with you as you finalize and then implement the Scoping Plan, and supporting California’s goal to achieve carbon neutrality as soon as possible, then achieve and maintain net negative emissions.

Sincerely,



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