

November 23rd, 2022

Ms. Liane Randolph  
Chair, California Air Resource Board 1001 I Street Sacramento, CA 95814

**RE: California Air Resources Board's Low Carbon Fuel Standard (LCFS) Public Workshop: Concepts and Tools for Compliance Target Modeling. November 9, 2022 public workshop.**

Dear Chair Randolph,

Thank you for the opportunity to comment on the California Air Resources Board's Low Carbon Fuel Standard (LCFS) Public Workshop: Concepts and Tools for Compliance Target Modeling on November 9th, 2022, public workshop. The focus of my comments is on continuing efforts to decarbonize transportation fuels without causing more harm to already impoverished populations around the world.

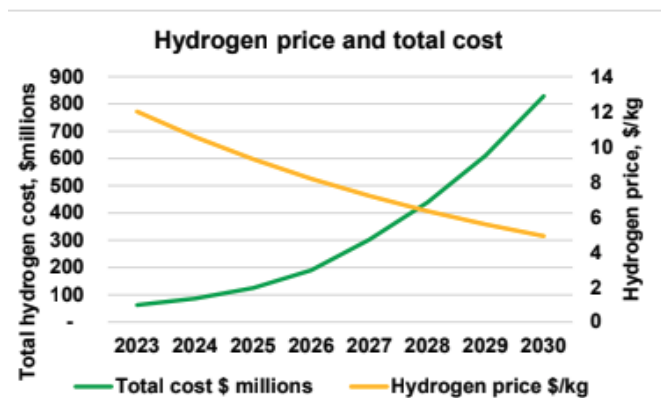
The Department of Energy's (DOE) has committed to an investment of \$8 BUSD to build a national clean hydrogen system [1]. Scenarios considered with the CATS model should include a future pathway of deep decarbonization in California with a requirement for a percentage of renewable hydrogen (RH<sub>2</sub>) as part of the pool of sources. Instead, the current proposal of income tax credits, grants, and loans to biofuels until 2045 is antithetical to international efforts to conserve jungles, which are habitat to two thirds of the planet's biodiversity [8].

CARB staff should reconsider the Model's Design Decision for unconstrained crop-based biofuels in the most stringent Scenario C. The "expected increase in global production capacity" mentioned in CARBS presentation could pose a threat to unprotected forests, jungles, and wildlife in México, Central America, South America, and Southeast Asia. Millions of tons of biofuel come from sugar cane, palm oil, rice, and soya bean [10] from areas which are critical habitats for endangered species. Deforestation and migration will be consequences of leaning on biofuels for decarbonization in the United States (U.S.). Other collateral damages include the violent displacement of indigenous nations and the assassination of environmental activists, as has been extensively observed in Brazil and México [11]. To avoid depletion of water sheds and scarcity of the vital liquid from growing these crops, CARB should consider capping credits for biofuel production by 2030. This will nudge governments and industry to develop other low carbon fuels that do not cause an increase of prices of edible crops globally.

Economic models have shown that increased biofuel use can result in higher crop prices [4]. The National Center for Environmental Economics (NCEE) found a 2 to 3 percent increase in corn prices for each billion-gallon increase in corn ethanol production on average across 19 studies [5]. While the impacts of higher food costs on prices in the U.S. are expected to be small [6], higher crop prices may lead to higher rates of malnutrition in developing countries [7]. To counter for the limitation in biofuels production, the use of RH<sub>2</sub> should be bolstered.

The Department of Energy (DOE) investment of \$8 BUSD to build a national clean hydrogen system poses the opportunity to use this long-term bipartisan initiative to "decarbonize multiple economic sectors, including heavy-duty transportation and steel manufacturing, to create good paying jobs, and pave the way towards a grid powered by clean energy resources" [1]. This national effort will lower today's price of hydrogen as a fuel from \$22 to less than \$5 dollars per kilogram by 2030 [11] making it a competitive price as it provides independence from fossil fuel imports.

The Office of Clean Energy Demonstrations and Hydrogen and Fuel Cell Technologies Office aims to cut the cost of clean hydrogen to \$1 per 1 kilogram of clean hydrogen in one decade [2].



UC Davis California Hydrogen Analysis Project, led by ITS-Davis

The cost from electrolysis from renewable energy sources like wind and solar is only \$0.5 more expensive than the current [11] steam-methane reforming (SMR) process at \$4.5 per kg. California’s goal of requiring 100 percent of new car sales to be zero-emissions vehicles (ZEV’S) by 2035 [3], is also likely to lead to an increase in demand for RH<sub>2</sub> from 20 tons a day to more than 200 tons a day [11]. The synergy between ZEV’s, LCFS, and DOE’s investment will lead to a forecast of 8 times more demand and 3 times less cost of RH<sub>2</sub> [12].

This revision of the LCFS represents an unparalleled opportunity to clean our energy sources to stop global warming without depleting other regions resources. Citing the Environmental Defense Fund comment to this same workshop: “The decisions we make now need to secure a vital earth for all. There is no room for mistake.”

Glad to clarify or elaborate on any points made ([tarnal@ucdavis.edu](mailto:tarnal@ucdavis.edu)).

Sincerely,

Terra Arnal Luna

Transportation Technology and Policy PhD Student at the University of California Davis

Sources:

[1] <https://www.energy.gov/articles/doe-launches-bipartisan-infrastructure-laws-8-billion-program-clean-hydrogen-hubs-across>

[2] <https://www.energy.gov/eere/fuelcells/h2scale>

[3] <https://www.gov.ca.gov/2022/08/25/california-enacts-world-leading-plan-to-achieve-100-percent-zero-emission-vehicles-by-2035-cut-pollution/>

[4,5,6,7] <https://www.epa.gov/environmental-economics/economics-biofuels>

[8] [https://besjournals.onlinelibrary.wiley.com/doi/toc/10.1111/\(ISSN\)1365-2664.TropicalDiversity](https://besjournals.onlinelibrary.wiley.com/doi/toc/10.1111/(ISSN)1365-2664.TropicalDiversity)

[9] <https://www.anl.gov/article/biofuel-on-the-road-to-energy-cost-savings>

[10] <https://www.dxpe.com/what-is-biofuel-types-sources-uses-renewable/>

[11] <https://escholarship.org/uc/item/22z8260f>

[12] Hydrogen Program lead by ITS-Davis and National Renewable Energy Laboratory (NREL) and the Scenario Evaluation and Regionalization Analysis Model (SERA).

<https://www.nrel.gov/docs/fy19osti/70090.pdf>