November 23, 2021

Honorable Chair Liane Randolph
Honorable Board Members
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

COMMUNITIES FOR A BETTER ENVIRONMENT
established 1978

RE: Comments on Proposed Scoping Plan Scenario Modeling Assumptions

Dear Chair Randolph and the Air Resources Board,

Communities for a Better Environment ("CBE") submits the following comments on the Draft PATHWAYS Scenario Modeling Assumptions ("Draft Scenario Assumptions") presented at the California Air Resources Board ("CARB") 2022 Scoping Plan Update – Scenario Inputs Technical Workshop on September 30, 2021. Focusing on biofuels and hydrogen, these comments extend CBE's original set of comments on the Draft Scenario Assumptions submitted October 22, 2021.

CBE is a statewide environmental justice ("EJ") organization addressing fossil fuel energy sources that heavily pollute Wilmington, Southeast Los Angeles, East Oakland, Richmond, and surrounding areas where we live, work, and organize. Our communities are experts in the impacts of oil refineries, oil wells and drilling, power plants, and transportation infrastructure. Climate change, smog, and toxic emissions severely and disproportionately impact our communities.

CARB's treatment of biofuels and hydrogen in their modeled scenarios will not only have a significant impact on CBE's communities locally, but also all environmental justice communities disproportionately impacted by the climate crisis. Three out of the four modeling scenarios proposed assume a role for biofuels in California's decarbonization pathway as a climate mitigation technology, stated broadly as "Biomass supply used to produce conventional and advanced biofuels as well as hydrogen."[1] CBE is concerned by the lack of any parameters defining the feedstock volumes, fuel processing technologies, and fuel types that will be included under these modeling assumptions. The scenario assumption inputs and disclosures recommended are summarized here; these requests are further bolded and italicized in the discussion below.

1. Biomass availability assumptions should be made explicit to the public and be included in the input assumptions ultimately sent to E3 for modeling.
2. In any scenarios that do assume biofuels, CARB should maintain alignment with previously commissioned E3 studies to mitigate unintended ecosystem-wide emissions.
3. Pollution-induced economic costs should also be incorporated into the cost of the biofuel technology in PATHWAYS.
4. All biofuels modeling results should be disaggregated by both technology pathway and fuel type to allow for informed policymaking.
5. Given feedstock constraints, there should be a limited role for lipid-based biofuels clearly stated in modeling results.
6. The feedstock definition and end uses of 'woody biomass' should be more clearly delineated.
7. All hydrogen assumed across the scenarios must be green hydrogen produced from electrolysis of zero-emission renewable electricity such as solar and wind.

[1] Proposed PATHWAYS Scenario Modeling Assumptions, California Air Resources Board (Sept. 2021), https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops.

1. **Biofuels Are Not Zero-Carbon, Some Even Increase Greenhouse Gas Emissions**

Past E3 analyses have considered biofuels to be "zero-carbon fuels," citing IPCC guidelines.[2] However, there is now widespread scientific consensus that biofuels are in fact not zero-carbon on a comprehensive lifecycle basis.[3] In reality, production and transportation of feedstocks, as well as the refining process itself, all contribute to the carbon intensity of biofuels. In addition, market-based effects of increased feedstock demand can result in greater carbon emissions. For example, increasing the use of soybean oil for biofuels has incentivized the conversion of otherwise carbon-sequestering natural lands into agricultural lands. These Indirect Land Use Change ("ILUC") impacts result in greenhouse gas ("GHG") increases, further eroding the supposed climate benefits of biofuels.[4] CARB has acknowledged these ILUC-driven greenhouse gas emissions.[5] Furthermore, changes in the prices of feedstock can drive other industries to seek substitutes. For example, studies show increased demand for soybean oil-based biofuels raises soybean oil prices, pushing consumers to demand an increase in production of climate-hazardous oils like palm oil.[6] These subsequent substitution effects, which can also increase the greenhouse gas emissions associated with the overall lifecycle, can be captured in a displacement analysis—a "type of consequential lifecycle analysis."[7]

In theory, unintended GHG impacts can be partially mitigated by relying on waste-streams, to ensure that the consumption of these resources does not create market signals that risk GHG increases elsewhere. However, in theory, these waste materials must genuinely be wastes from existing production that would be otherwise unused. Yet monetizing and increasing demand for a waste stream can also create incentives to increase production, which can then lead to undesired GHG increases and pollution in environmental justice communities. For example, as commenters have repeatedly noted in Scoping Plan meetings, increased reliance on methane capture from dairy digesters can lead to larger dairies with

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[2] Amber Mahone et al., Achieving Carbon Neutrality in California: Pathways Scenarios Developed for the California Air Resources Board, California Air Resources Board, Energy and Environmental Economics, Inc. 21 (Oct. 2020), https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf. ("Biofuels are treated as zero-carbon fuels in this accounting approach, following IPCC GHG inventory guidance.") [hereinafter Achieving Carbon Neutrality]

[3] *See* Portner et al., Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change, IPBES Secretariat, (June 2021: 18-19, 28-29, 53-58. DOI:10.5281/zenodo.4659158, https://www.ipbes.net/events/launch-ipbes-ipcc-co-sponsored-workshop-report-biodiversity-and-climate-change. The failure to count carbon emissions that occur as crop suppliers replace forests and grassland to new cropland for biofuels was documented as early as 2008. Timothy Searchinger et al., Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change. 319 Science 1238 (2008), https://science.sciencemag.org/content/319/5867/1238.

[4] Nikita Pavlenko and Stephanie Searle. Assessing the sustainability implications of alternative aviation fuels. Working Paper 2021-11. The International Council on Clean Transportation (Mar. 2021), https://theicct.org/sites/default/files/publications/Alt-aviation-fuel-sustainability-mar2021.pdf.

[5] Low Carbon Fuel Standard Regulation Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Appendix I: Detailed Analysis for Indirect Land Use Change, California Air Resources Board, (Jan. 2015), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2015/lcfs2015/lcfs15appi.pdf.

[6] Fabio Gaetano Santeramo, and Stephanie Searle. Linking soy oil demand from the US Renewable Fuel Standard to palm oil expansion through an analysis on vegetable oil price elasticities. 127 Energy Policy 19 (2018), https://www.sciencedirect.com/science/article/abs/pii/S0301421518307924.

[7] Nikita Pavlenko and Stephanie Searle. A comparison of methodologies for estimating displacement emissions from waste, residue, and by-product biofuel feedstocks. Working Paper 2020-22. The International Council on Clean Transportation (Oct. 2020), https://theicct.org/sites/default/files/publications/Biofuels-displacement-emissions-oct2020.pdf.

localized impacts in the Central Valley.[8] As a result, the terms "waste" and "residue" must be treated with care.

Moreover, non-biofuel options exist for most transportation subsectors. For example, hydrogen fuel-cells for heavy duty trucking and maritime shipping are promising and should be approached with reasonable caution.[9] Long-term, overproduction of biofuels could actually compete against actual zero-carbon options, such as fuel-cells using green hydrogen produced via electrolysis and zero-carbon renewable electricity.

2. Biomass Availability Assumptions Should Be Made Explicit And Remain Highly Constrained When Used

As written, the Draft Scenario Assumptions do not disclose any assumed biomass availability. ***CBE requests that these assumptions be made explicit to the public and be included in the input assumptions ultimately sent to E3 for modeling. CBE further requests that in any scenarios that do assume biofuels that CARB maintain alignment with previously commissioned E3 studies to mitigate unintended ecosystem-wide emissions.***

The quantity and type of feedstock used to produce biofuels can determine whether biofuel is truly zero-carbon, shifts carbon emissions to other states, or increases GHG emissions. Biomass availability is a key input assumption into PATHWAYS. By design, biomass availability sets a constraint on the total volume of biofuels that can be produced in the model. PATHWAYS uses a biofuels module to then determine a least-cost portfolio of the biofuel products ultimately produced (e.g. liquid biofuel, biomethane, etc.).[10] This effectively sets a cap on biofuel production and provides an opportunity at the input-level to focus on the least climate-risky feedstocks.

Prior E3 studies have done just this, and have chosen to exclude purpose-grown crops, and limited the biomass used to in-state production in addition to California's population-weighted share of total national waste biomass supply. These limits can significantly tailor the climate impacts of indirect land use change attributable to these feedstocks. Based on assumptions in the 2020 *Achieving Carbon Neutrality* study, this limits biomass availability to 40 million bone dry tons in 2045.[11]

Pollution-induced economic costs may also be incorporated into the cost of the fuel technology in PATHWAYS. Beyond the questionable climate benefits of biofuels, there are other reasons why California's decarbonization future should not rely on currently commercially-available biofuels. Combustion of biofuels in the transportation sector results in mobile sources of criteria pollutants, such as

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[8] *See e.g.*, Jordan, J. et al., Re: Short Lived Climate Pollutant 9/8 Workshop - Recommendations for the 2022 Scoping Plan Update, Leadership Council for Justice and Accountability, Center for Food Safety, Central California Asthma Collaborative, Central Valley Air Quality Coalition, Public Justice, Center on Race, Poverty & the Enviornment, Sierra Club California, Central California Environmental Justice Network, Center for Community Action and Environmental Justice, Food & Water Watch, Earthjustice, Physicians for Social Responsibility – Los Angeles (Sept. 2021), https://www.arb.ca.gov/lists/com-attach/29-sp22-slcp-ws-AWJWP1Q0BzgKZVcj.pdf.

[9] *See e.g.*, Sasan Saadat and Sara Gersen, Reclaiming Hydrogen for a Renewable Future, Earthjustice 22 (Aug. 2021) https://earthjustice.org/sites/default/files/files/hydrogen_earthjustice_2021.pdf [hereinafter Reclaiming Hydrogen].

[10] E3 introduced a new biofuels module in the model that, unlike previous iterations of the PATHWAYS model, endogenously selects least-cost biofuel portfolios given the assumed available biomass. Achieving Carbon Neutrality, *supra* footnote 2 at 19-20.

[11] *Id*. at 29.

particulate matter and NO_x.[12] Currently, the exclusion of the pollution premium on alternative fuels and technologies in PATHWAYS will result in a distorted picture of costs and savings.

3. Modeling Results Should Be Clear About the Limited Role of Lipid-Based Biofuels

Prior E3 studies have found, under the assumption of using only in-state resources in addition to California's share of national waste biomass, lipids are a miniscule portion of the available biomass.[13] Examples of such lipids include soybean oil, used cooking oil, animal fats, and others that can be refined into transportation fuels like renewable diesel and biodiesel. As a result, nearly all liquid biofuels produced under the model are "advanced" biofuels that would likely require new infrastructure.

This type of constraint, if continued, would then preclude the kind of biofuels produced from refinery conversions already proposed across California, such as the Phillips 66 project in Rodeo,[14] Marathon project in Martinez,[15] Global Clean Energy Holdings Inc. project in Bakersfield[16], and World Energy project in Paramount[17]. While numerous technologies exist for producing biofuels from biomass resources, these projects propose a process that allows the refiners to repurpose existing equipment, limiting the feedstock options to only lipid resources.[18] In addition to feedstock-related climate impacts from induced land use changes, and displacement or substitution effects, the refining process would require large volumes of carbon-intensive "grey" hydrogen produced using steam methane reforming.[19] These conversions also pose a threat to environmental justice communities and workers, as the health and safety impacts of these conversions remain unclear.

CBE requests that all model results for biofuels be disaggregated by both technology pathway and fuel type to allow for informed policymaking. This limited role for lipid-based biofuels, given feedstock constraints, should be clearly stated in modeling results. Unfortunately, past E3 analyses have reported model results in an aggregated fashion, lumping together the various biofuel technologies (e.g. HEFA vs. Fischer Tropsch) and fuel types (biodiesel vs. renewable diesel vs jet fuel) together into a single reported volume of "liquid and gaseous biofuels."[20] Without modeling results that clearly distinguish between the future needs for lipid-based and cellulosic-based biofuels, policymakers may

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[12] S.M. Palash et al., Impacts of biodiesel combustion on NOx emissions and their reduction approaches, 23 Renewable and Sustainable Energy Reviews, 473 (2013), https://www.sciencedirect.com/science/article/abs/pii/S1364032113001524.

[13] Mahone et al., "Deep Decarbonization in a High Renewables Future: Updated Results from the California PATHWAYS Model", California Energy Commission, Energy and Environmental Economics, Inc. 44 (June 2018), https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf.

[14] Phillips 66 Rodeo Renewed Project, CEQAnet Web Portal, Governor's Office of Planning and Research (Dec. 2020), https://ceqanet.opr.ca.gov/2020120330/2.

[15] Martinez Refinery Renewable Fuels Project DEIR, CEQAnet Web Portal, Governor's Office of Planning and Research (Oct. 2021), https://ceqanet.opr.ca.gov/2021020289/2.

[16] Global Clean Energy Holdings, Inc., Annual Report (Form 10-K) April 13, 2021, https://www.sec.gov/Archives/edgar/data/748790/000152013821000195/gceh-20201231_10k.htm#a003_v1.

[17] Alt/Air World Energy Paramount, CEQAnet Web Portal, Governor's Office of Planning and Research (June 2020), https://ceqanet.opr.ca.gov/2020069013/2.

[18] *See e.g.*, Contra Costa County, Rodeo Renewed Project: Draft Environmental Impact Report (Oct. 2021), https://files.ceqanet.opr.ca.gov/266594-3/attachment/7prafn-6bliZUdgW_w-ysHIZFcLk7sK5ujq1Oe5pno9Jq7KGXzlhVMkeld7K1Mq-QseaL8xrgwDYIcNF0; Contra Costa County, Marathon Refinery Renewable Fuels Project: Draft Environmental Impact Report (Oct. 2021), https://files.ceqanet.opr.ca.gov/267646-2/attachment/0yIbCHCSOxF8ExKiiSYPU8tvJVc-DVNQJyeMnUo37bk7QplUhFns_GZRp4aEyVZ2x9l6o72wncbOy-BI0.

[19] Reclaiming Hydrogen, *supra* footnote 9 at 10, 13.

[20] Achieving Carbon Neutrality, *supra* footnote 2 at 31.

inadvertently or misleadingly incentivize lipid-based biofuel production that pose counterproductive climate consequences.

Similarly, CBE requests greater clarity around the feedstock and end uses of 'woody biomass'. While advanced technologies may be eventually commercialized for the large-scale conversion of sustainable cellulosic materials to liquid fuels, the woody biomass is currently used as an electricity source through combustion. Multiple studies have found that the carbon intensity of electricity produced in this manner can still be extremely high, comparable to that of coal.[21] Combustion of woody biomass is a major source of local air pollution and is a hazard for environmental justice communities. Conflation between woody biomass used for power generation compared to liquid fuel for transportation can lead to continued GHG emissions and worsen cumulative impacts in EJ communities

4. Modeling Assumptions Should Clarify That All Hydrogen Must Be Green

Lastly, CBE requests that the modeling scenarios specify that all hydrogen assumed across the scenarios must be green hydrogen produced from electrolysis of zero-emission renewable electricity such as solar and wind. Or, at the very least, the production method for hydrogen assumed should be disclosed. Throughout the E3 modeling assumptions, hydrogen is mentioned as a potential fuel source in a variety of sectors, such as Freight and Passenger Rail, Ocean-going Vessels, and Aviation. However, the assumptions do not clarify that in order to be zero-carbon hydrogen, this requires green hydrogen produced using electrolysis of zero-emission renewable electricity, such as solar and wind. This solution will require significantly scaling up electrolysis-based hydrogen production since 99% of hydrogen in use in California is currently produced using steam methane reforming, which by design emits large levels of GHGs during production.[22] So-called "blue" hydrogen proposed by the fossil fuel industry is an experimental concept that is still carbon intensive and fails to address already existing and undercounted methane leakage in grey hydrogen production.[23] Specifying the method of hydrogen production is essential for the Board to be able to make informed decisions about the impact of the Scoping Plan on environmental justice communities.

5. Detailed Biofuel and Hydrogen Modeling Assumptions Are Critical for a Just Transition

Without clarity in these foundational modeling assumptions, CARB may inadvertently delay or diminish the bold state action required for an equitable and just transition away from a carbon-based society. Without rigorous and cutting-edge greenhouse gas emission accounting, communities, workers, and local policymakers will be left to cobble together a transition based on disinformation spread by fossil fuel corporations. Yet there is no time to fall for the same greenwashing tactics that have been deployed for decades. A transition is already underway, and it is not just. For example, in Contra Costa County, the pre-pandemic projections[24] of declining California crude production became reality when the Marathon

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[21] *See e.g.*, Mary S. Booth, Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy, Environ. Res. Lett. 13 035001 (2018), https://iopscience.iop.org/article/10.1088/1748-9326/aaac88/pdf; Mirjam Röder, Carly Whittaker, Patricia Thornley, How certain are greenhouse gas reductions from bioenergy? Life cycle assessment and uncertainty analysis of wood pellet-to-electricity supply chains from forest residues, 79 Biomass and Bioenergy 50 (2015), https://www.sciencedirect.com/science/article/pii/S0961953415001166

[22] *See* Reclaiming Hydrogen, *supra* footnote 9 at 32.

[23] Robert W. Howarth and Mark Z. Jacobson, "How green is blue hydrogen?", 9 Energy Science & Engineering 1676 (2021), https://doi.org/10.1002/ese3.956.

[24] *See e.g.*, Alex Kimani, Bad News for Oil: Refinery Profits are Sliding, Oilprice.com (Jan. 2020), https://oilprice.com/Energy/Oil-Prices/Bad-News-For-Oil-Refinery-Profits-Are-Sliding.html; West Coast (PADD 5) Supply

Martinez Refinery was indefinitely idled in April 2020.[25] Without state planning for a just transition, hundreds of refinery workers lost their livelihoods. Now that same old crude refinery has haphazardly proposed a short-sighted conversion to process lipid feedstocks that threaten California's climate goals, as detailed in Section 3 above. Achieving California's climate goals necessarily requires significant and investments in good quality jobs that contribute to climate solutions, an equitable relief program for displaced fossil fuel workers, and a safety net for communities at risk of significant disruption to their tax base. As stated in the California Climate Jobs Plan, "how the industry shuts down matters."[26] It is critical for communities, workers, and policymakers to have comprehensive and accurate information to plan for an equitable and just transition.

Conclusion

The stakes of precision and clarity in biofuel and hydrogen modeling assumptions are extremely high. CARB must explicitly differentiate between biofuel feedstock, processing technology, and fuel type assumptions to the public. CBE recommends the modeled scenarios constrain biomass availability assumptions to limit the use of purpose-grown crops and the role of lipid-based biofuels to account for widespread scientific consensus that biofuels are not in fact zero-carbon and that some even increase GHGs. The feedstock and end-uses for woody biomass and hydrogen production methods must be transparently defined for the public. Ultimately, without this foundational information, the Board cannot be the disciplined and decisive leader that the climate crisis needs.

We welcome the opportunity to discuss these comments and recommendations in more detail with you to further develop the scenario alternatives for the Scoping Plan. Please feel free to contact ccho@cbecal.org with any questions or concerns.

Sincerely,

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and Disposition, EIA February 26, 2021, http://www.eia.gov/dnav/pet/pet_sum_snd_d_r50_mbbl_m_cur.htm; New Climate Threat: Will Oil Refineries make California the Gas Station of the Pacific Rim?, Communities for a Better Environment (Apr. 2019), https://www.cbecal.org/wp-content/uploads/2019/09/New-climate-threat%e2%80%93Will-oil-refineries-make-California-the-gas-station-of-the-Pacific-Rim.pdf.

[25] David Joe and Jacob Finkle, Workshop Report for Draft Amendments to Regulation 6, Rule 5: Particulate Emissions from Petroleum Refinery Fluidized Catalytic Cracking Units, Bay Area Air Quality Management District 14 (Jan. 2021) https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-6-rule-5-particulate-emissions-from-refinery-fluidized-catalytic-cracking-units/2020-amendment/documents/20210127_wsr_0605-pdf.pdf.

[26] California Climate Jobs Plan. Equitable Transition (2021), https://www.californiaclimatejobsplan.com/equitable-transition.