March 23, 2023

Governor Gavin Newsom
1021 O Street, Suite 9000
Sacramento, CA 95814

Senate President pro Tempore Toni Atkins
1021 O Street, Suite 8518
Sacramento, CA 95814

Speaker Anthony Rendon
1021 O Street, Suite 8330
Sacramento, CA 95814

Re: Environmental justice and environmental principles regarding the buildout of hydrogen in California

Dear Governor Newsom, Pro Tem Atkins, and Speaker Rendon,

On behalf of the undersigned organizations, we respectfully raise vital concerns, considerations, and principles on the buildout of hydrogen in California and its use as part of the state's pathway to decarbonization. Without proper guardrails, hydrogen production threatens to increase climate pollution and make it harder to reach California's ambitious climate goals. Hydrogen could have potential benefits in the fight against climate change, but it is critical to understand its limitations. Before California moves to rely heavily on hydrogen to meet its climate goals, it is essential to understand how and where hydrogen is produced, stored, delivered, and used. Even green hydrogen can itself have short-term climate warming impacts and cause harm to local communities if implemented poorly and without stringent safeguards.

We are diverse groups that agree on bedrock principles for the limited role of hydrogen in meeting California's climate and air quality goals; even this letter cannot capture each group's complete perspective on hydrogen policy. As California considers the role of hydrogen in our decarbonized future, we urge you to enact measures that will:

1. Ensure that any hydrogen used or produced in California is produced via electrolysis through clean and renewable sources and prohibit hydrogen produced with fossil fuels or other polluting feedstocks and processes;
2. Ensure robust monitoring, prevention, and enforcement against leaks in hydrogen infrastructure;
3. Discourage the use of hydrogen for end uses better served by electrification, such as light duty transportation and providing space and water heating in homes and businesses;
4. Avoid blending hydrogen into existing pipelines and minimize other forms of hydrogen transportation;
5. Ensure community engagement from design to completion of any hydrogen project.

1) Hydrogen produced with fossil fuels or other polluting feedstocks and processes is not a climate solution and cannot be used for hydrogen production in California.

Currently, California's supply of hydrogen comes almost entirely from fossil fuels and is produced through a process that emits health-harming pollution in the communities on the fencelines of the state's oil refineries. Hydrogen production by any means other than clean, renewable-powered electrolysis only entrenches the continued use of fossil fuels, plastics, and biogas, even when paired with carbon capture and sequestration (CCS) technology. Methane leakage from producing hydrogen using natural gas and CCS technologies is of significant concern; the climate effects of methane leakage are often underestimated in hydrogen assessments,[1] and methane is a powerful greenhouse gas with high global warming potential. The level of climate harm only increases if there is embedded carbon in the lifecycle analysis of

[1] Ilissa B. Ocko and Steven P. Hamburg, Climate consequences of hydrogen emissions, Atmospheric Chemistry and Physics (July 2022). https://acp.copernicus.org/articles/22/9349/2022/acp-22-9349-2022.pdf

hydrogen. Biogas feedstocks, including dairy biogas, must be excluded from all hydrogen production.

The exclusion of hydrogen produced through polluting industrial processes is also a public health imperative. Carbon dioxide is not the only important pollutant produced through the hydrogen generation process, especially when not produced with renewable energy. Currently, petrochemical companies rely on the steam reformation of fossil gas to produce nearly all of California's hydrogen supply. Steam methane reformation emits health-harming pollution such as nitrogen oxides, fine particulate matter, and carbon monoxide and these facilities are primarily located in disadvantaged communities on the fencelines of California's oil refineries. Policymakers must guard against a build-out of steam methane reformation infrastructure or other hydrogen production equipment that would exacerbate California's air quality crisis.

2) Any hydrogen project must consider the environmental impact of hydrogen including the climate warming impact of leaks and water resource demands.

Hydrogen is not inherently a net benefit for the climate – even when it is produced through electrolysis. Hydrogen itself is an indirect greenhouse gas.[2] While it doesn't trap heat, hydrogen, through a series of chemical reactions, increases the concentration of other greenhouse gases like methane that accelerate the rate of warming. This means that hydrogen itself has a short-lived but powerful impact on the climate, even when produced with renewable energy-powered electrolysis.

Hydrogen is also a very small and slippery molecule and leaks easily into the atmosphere.[3] Any rapid expansion of hydrogen infrastructure (pipelines, storage tanks, etc.) would increase the opportunity for hydrogen to leak.

Because of the inherent climate risk posed by hydrogen use, California's approach must include robust leak detection and monitoring to prevent or swiftly repair leaks of any size. There is emerging consensus among the scientific community on hydrogen's warming impact as a powerful short-lived indirect greenhouse gas; it is a highly potent gas given its indirect impacts as previously discussed. Its potency also changes over different time horizons; it is more powerful over a 20-year period than a 100-year period, but the short-term effects are not typically measured in assessments. When monitoring leakage, hydrogen's impact should be measured both in the short and long term. Minimizing or eliminating hydrogen leakage is absolutely critical to the success of hydrogen as part of the solution to climate change.

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[2] D. Ehhalt and M. Prather, et al, Atmospheric Chemistry and Greenhouse Gases: Intergovernmental Panel on Climate Change (2018). https://www.ipcc.ch/site/assets/uploads/2018/03/TAR-04.pdf

[3] Shanti Menon, Everyone's excited about this new climate solution, but it could create a new climate problem, Environmental Defense Fund (July 2022). https://www.edf.org/article/we-need-talk-about-hydrogen

Furthermore, hydrogen projects must account for the full climate impact of upstream emissions as well as of the hydrogen itself as an indirect, short-lived greenhouse gas. To that end, hydrogen use must include a full lifecycle analysis of emissions associated with its production, transportation, storage, and use.

Production of hydrogen through electrolysis also requires water, though it is not as water-intensive as the steam methane reformation process that industry uses to produce hydrogen today.[4] As California grows its renewable hydrogen sector, consideration of water resource demands must be taken into consideration.

3) Hydrogen should only be used in limited, hard-to-electrify sectors; not sectors that could decarbonize more efficiently through electrification.

Given the risks of a rapid, large-scale buildout of hydrogen production, including its climate warming potential, California should only encourage the use of hydrogen, if at all, for hard-to-decarbonize sectors such as steel, plate glass, cement manufacturing, or as an alternative fuel for maritime shipping, aviation, and long-haul heavy-duty trucking.

Given its relative energy intensity, even green hydrogen risks squandering renewable energy if it is used in end uses that could more efficiently be directly electrified, like the vast majority of road-transportation, cargo-handling equipment, and residential and commercial space heating needs, as well as a large share of industrial heating needs. Moreover, it would be inappropriate to burn hydrogen in residential and commercial buildings or in industrial heating applications that have electric alternatives because hydrogen combustion emits lung-damaging pollution.[5] California should avoid promoting hydrogen use of any kind in these end uses.

Hydrogen is not efficient or well-suited to all sectors, and should not be used as a catch-all decarbonization solution or to delay electrification. Analysis from the Environmental Defense Fund shows that using green hydrogen in passenger vehicles would require much greater quantities of renewable energy – perhaps as much as 2 to 5 times as much renewable energy – than direct electrification of light duty transportation.[6] An even more significant “energy penalty” emerges in the use of hydrogen for home heating; it is far more efficient to use renewable energy to electrify passenger vehicles and heat homes than to use renewable energy to produce hydrogen.

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[4] Andi Mehmeti et al, Life Cycle Assessment and Water Footprint of Hydrogen Production Methods: From Conventional to Emerging Technologies, Environments (February 2018). https://www.mdpi.com/2076-3298/5/2/24

[5] Sara Baldwin, et al, Assessing the Viability of Hydrogen Proposals: Considerations for State Utility Regulators and Policymakers, Energy Innovation (March 2022) pg 9, https://energyinnovation.org/wp-content/uploads/2022/03/Assessing-the-Viability-of-Hydrogen-Proposals.pdf.

[6] Eriko Shrestha and Tianyi Sun, Rule #1 of deploying hydrogen: electrify first, Environmental Defense Fund (January 2023). https://blogs.edf.org/energyexchange/2023/01/30/rule-1-of-deploying-hydrogen-electrify-first/

A widespread transition to electrification is also necessary to address California's air quality crisis, whereas using equipment that burns hydrogen could worsen air quality. In some hard-to-decarbonize sectors such as steel manufacturing or maritime shipping, renewables-based hydrogen could play a valuable role in decarbonization. But in many other sectors, direct electrification is a much safer and more energy efficient route. Therefore, hydrogen should be considered a last resort, not a silver bullet. Furthermore, as is discussed in more detail in following sections, transportation of hydrogen and proposed blending of hydrogen in existing pipelines pose significant leakage risks, further limiting hydrogen's potential use for sectors beyond those mentioned here.

4) California should only use hydrogen produced via electrolysis through renewable sources.

Within the specific sectors that are best suited for hydrogen use, it is crucial that the only hydrogen used is produced via renewable-powered electrolysis. Strict standards for hydrogen production are essential because emissions-intensive hydrogen production technologies could worsen the climate crisis and harm public health in California's most vulnerable communities. Hydrogen is not an inherently 'climate-neutral' source of energy; its effects on the climate, positive or negative, depend on where and how it is produced.

Renewable electrolytic hydrogen production must meet certain standards to ensure it actually delivers climate and public health benefits. First, any renewable hydrogen developed must simultaneously build out renewable sources in tandem to support them. This is necessary to prevent the problem of "resource shuffling," in which the increased demand on renewable energy resources results in pushing demand back to fossil fuel resources.[7] By building out renewable energy sources in tandem with renewable hydrogen projects, California can ensure that its renewable energy generation capacity is expanded and that the renewable hydrogen industry is supported with a stable and renewable power supply.

The threat of increased pollution is particularly acute when hydrogen producers use electricity from the grid. A hydrogen producer that relies on grid electricity cannot meaningfully claim to use renewable power unless it meets the following conditions: (1) it must support additional renewable electricity on the grid (i.e., renewable electricity that would not have existed on the grid but for the electrolyzer's demand), (2) the renewable electricity must be deliverable to the same balancing authority where the electrolyzer is located, (3) the producer must use the renewable electricity in the same hour that it's delivered onto the grid, and (4) it retires all renewable energy credits (RECs) associated with this electricity. Without all of these guardrails, fossil-fuel power generators will likely ramp up and spew more health-harming pollution into neighboring communities to serve hydrogen producers. About half of the state's gas-fired power plants are located in CalEnviroScreen defined disadvantaged communities. Furthermore,

[7] Sasan Saadat and Sara Gersen, Reclaiming Hydrogen for a Renewable Future: Distinguishing Oil & Gas Industry Spin from Zero-Emissions Solutions, Earthjustice (August 2021). https://earthjustice.org/wp-content/uploads/hydrogen_earthjustice_2021.pdf

hydrogen produced from average grid electricity is even more carbon intensive than both incumbent gray hydrogen and fossil fuels like diesel.[8]

5) Hydrogen should not be blended in existing natural gas pipelines and co-location of production and end use should be prioritized.

Because hydrogen leaks easily, one key strategy to avoid any amount of leakage is to move it around as little as possible. Transporting hydrogen increases leakage risk whether by rail, truck, or pipeline. To the extent possible, hydrogen should be produced near the few appropriate end uses to minimize leakage.

Blending hydrogen into existing natural gas pipelines presents significant safety concerns and requires a massive investment in infrastructure to ensure compatibility and integrity. Studies have shown that hydrogen blends up to 20% offer only marginal climate benefits, even without considering the risk of leakage, and could potentially compromise the safety of pipelines made of steel or polymeric materials.[9] The Hydrogen Blending Impacts Study that the University of California, Riverside performed for the California Public Utilities Commission did not identify a level of hydrogen blending that would not jeopardize safety and reliability.[10] The compatibility of end-use appliances, such as cooktop burners and heating furnaces, is also a concern. Building infrastructure to support hydrogen blending would require a significant investment in retrofitting existing natural gas pipelines and ensuring their safety, making it a challenging and expensive proposition. Policymakers must focus on ending reliance on the gas distribution system through rapid and widespread electrification because rapid electrification will advance both climate and air quality goals, whereas injecting hydrogen into the gas distribution system threatens to increase health-harming air pollution.

6) Community engagement is imperative from the start of project development through to project completion.

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[8] According to data CARB has compiled for the Low Carbon Fuel Standard program, hydrogen produced through the electrolysis of California's grid-average electricity has a carbon intensity of 164.46 gCO2e/MJ, far higher than diesel's carbon intensity of 100.45 gCO2e/MJ. CARB, Table 7-1. Lookup Table for Gasoline and Diesel and Fuels that Substitute for Gasoline and Diesel, https://ww2.arb.ca.gov/sites/default/files/classic/fuels/lcfs/ca-greet/lut.pdf?_ga=2.69927632.1369297514.1670526688-1354554675.1652381457.

[9] Jochen Bard, The Limitations of Hydrogen Blending in the European Gas Grid: A study on the use, limitations and cost of hydrogen blending in the European gas grid at the transport and distribution level, Fraunhofer Institute for Energy Economics and Energy System Technology (January 2022). https://www.iee.fraunhofer.de/content/dam/iee/energiesystemtechnik/en/documents/Studies-Reports/FINAL_FraunhoferIEE_ShortStudy_H2_Blending_EU_ECF_Jan22.pdf

[10] Arun SK Raju and Alfredo Martinez-Morales, Hydrogen Blending Impacts Study, University of California at Riverside, (July 2022). https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF

Community engagement and consent are critical components of any process to build out clean energy, and any hydrogen buildout must prioritize early and robust local engagement with communities. We should not repeat the top-down model of decision making that has created environmental injustice, which unfortunately we are experiencing on the ground today with proposed hydrogen projects. Local needs and concerns such as the community selection for projects and the localized impacts of pipelines cannot be overlooked by companies working in this space.

Furthermore, California must ensure that the production of hydrogen does not replicate the extractive cycles of the fossil fuel industry by continuing to pollute Environmental Justice (EJ) communities. It is critical to acknowledge the disproportionate impacts of pollution and environmental harm on EJ communities, and any investment in the renewable hydrogen industry must ensure that these communities are not further burdened with pollution or negative health outcomes. California must prioritize equity and justice in its approach to the renewable hydrogen industry and ensure that it does not perpetuate environmental harm in already overburdened communities.

As the renewable hydrogen industry is in its infancy, California has an opportunity to ensure that the accelerating investment in hydrogen projects yields the climate benefits being sought in the near term, and thereby avoid needing to make major retrofits down the road or even abandon large capital investments that do not turn out to be climate solutions. Hydrogen must only be produced using renewable energy, and should only be applied for hard-to-decarbonize end uses while prioritizing the co-location of production and end use to minimize transportation.

Thank you for your consideration of these issues. We are happy to discuss these concerns further.

Sincerely,

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