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Earthjustice Comments on IEPR Commissioner Workshop on the Potential Growth of Hydrogen

Additional submitted attachment is included below.

September 23, 2023
Submitted electronically

Re: IEPR Commissioner Workshop on the Potential Growth of Hydrogen

Dear Commissioner Monahan,

On behalf of Earthjustice, we submit the following comments on the CEC Staff presentations at the September 8, 2023, workshop on the potential growth of hydrogen. Careful modeling of the potential to deploy hydrogen in a least-cost pathway for achieving California's climate and air quality goals is essential for avoiding public investment in stranded assets. There is also a risk that California may delay investment in more appropriate decarbonization technologies for certain end uses if policymakers rely on unduly optimistic estimates for the market potential of hydrogen. It would be inappropriate to favor hydrogen technologies for end uses that can rely on direct electrification because hydrogen technologies would require the build-out of several times the renewable resources of their electric competitors, increasing the cost and stretching the timeframe of the energy transition.

Power Sector

Earthjustice appreciates the CEC's focus on modeling renewable electrolytic hydrogen for use in the power sector. Electrolysis powered with 100% additional or excess renewable energy is the only technology that has been demonstrated to produce hydrogen without climate or health-damaging emissions.

It would be improper to assume hydrogen can replace all the methane that is currently burned in gas-fired power plants because widespread conversion of these facilities to operate on hydrogen would be inconsistent with California's air quality policies. The Staff presentation correctly acknowledged that hydrogen combustion not only emits health-harming pollution, but can emit more NOx than methane combustion. In the state's most polluted air basins, "there is no viable pathway to achieve the needed reductions without widespread adoption of zero emissions (ZE) technologies across all mobile sectors and stationary sources, large and small."[1] Hydrogen combustion facilities would contravene the imperative to transition to zero-emission equipment across the full spectrum of pollution sources in these regions to meet health-based State and Federal air quality standards. Scoping Plan data on gas burn in the power sector does

[1] South Coast Air Quality Management District, 2022 Air Quality Management Plan, at ES-5 (Dec. 2022), http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/final-2022-aqmp/final-2022-aqmp.pdf?sfvrsn=16.

not provide a reasonable upper bound for the sector's potential hydrogen demand because the Scoping Plan does not consider air quality mandates.

Similarly, assuming hydrogen combustion will replace all methane combustion would be inconsistent with California's transmission planning and energy justice policies. In SB 887, the Legislature declared that it is a problem that "there are load pockets where there is insufficient transmission capacity to import the renewable energy resources and zero-carbon resources that are available" and established transmission planning mandates to fix this problem.[2] Improved transmission will substantially reduce the need to rely on the polluting resources in California's constrained load pockets. The Scoping Plan does not consider these policies.

The IEPR should discuss the potential to use hydrogen fuel cells and two-way electrolyzers (i.e., equipment that can both produce hydrogen from electricity and use hydrogen to generate electricity) to generate power, as it would be incorrect to assume that turbines will the only viable hydrogen power generation technology for the foreseeable future. To date, the hydrogen industry has driven much of the focus on the power sector toward hydrogen combustion in turbines because these end uses provide large scale demand. But a narrow focus on scaling volume or extending the life of existing turbines risks ignoring unique advantages of stationary fuel cells. Fuel cells offer a promising path to displace highly polluting diesel back up generations in the event of outages or helping alleviate stress on the grid during peak demand.[3] In Calistoga, 8 MW of hydrogen fuel cell stationary power will supplement lithium-ion batteries in a microgrid to replace diesel generators and supply the city's electricity needs for at least 48 hours during outages.[4] Megawatt scale fuel cells can hasten electrification of the transportation sector by enabling high-power charging in remote locations or areas where lengthy grid-upgrades may still be required.[5] These power generation technologies could be deployed throughout California because they are zero-emission. As the technologies scale, prices are likely to decline faster for mass produced products like fuel cells and electrolyzers than for complex and customized systems like power plant retrofits.[6] Information on the potential for zero-emission long-duration energy storage options—including hydrogen technologies—will be critical for California policymakers. We urge the Commission to give special attention in the IEPR to the

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[2] Cal. Public Utilities Code § 454.57(b)(3), -(d)–(f) (codifying SB 887 (2022)).
[3] *See, e.g.*, Honda, "Honda's Zero Emission Stationary Fuel Cell Provides Back Up Power to a Data Center" (Mar. 6, 2023) https://global.honda/en/newsroom/news/2023/c230306eng.html; Plug, "Zero-Emission High Power Fuel Cell for Larger Applications" https://www.plugpower.com/fuel-cell-power/gensure-backup-power/gensure-mw-scale-power/;
[4] Kathy Hitchens, "Plug Power to Provide Hydrogen Fuel Cell for Calistoga Microgrid" (June 12, 2023) https://www.microgridknowledge.com/generation-fuels/article/33006510/plug-power-to-provide-hydrogen-fuel-cell-for-calistoga-microgrid.
[5] See Nora Manthey, "Plug Power Presents Stationary Fuel Cell System to Charge BEVs" (May 3, 2023) https://www.electrive.com/2023/05/03/plug-power-presents-stationary-fuel-cell-system-to-charge-bevs/#:~:text=Plug%20Power%20is%20looking%20to,provides%2060%20MWh%20on%20site.
[6] *See* Abhishek Malhotra and Tobias S. Schmidt, Accelerating Low-Carbon Innovation, Vol. 4 Joule 2259 (Nov. 2020), https://www.sciencedirect.com/science/article/pii/S2542435120304402.

myriad environmental and societal benefits of zero-emission stationary fuel cells that may otherwise be overlooked by market forces alone.

The Staff presentation did not mention how the CEC will account for the costs of retrofitting or building turbines for hydrogen combustion. The CEC should not ignore these costs. If it does not have reliable cost estimates for converting to or constructing hydrogen power plants, the IEPR should acknowledge the knowledge gap around these significant costs.

Transportation Sector

We are concerned that Staff's analysis likely overestimates the role of hydrogen fuel cell electric vehicles (FCEVs) in meeting the needs of the on-road transportation sector. CEC should be mindful of the history of analysts overestimating the potential market for FCEVs and take care to avoid repeating past errors.[7] In contrast, sales of BEVs have continually exceeded previous expert projections.[8] In 2019, the International Energy Agency's annual Electric Vehicle Outlook estimated EVs would make up 9% of global car sales by 2025. By 2022, they revised that estimate to 15% by 2025. In April 2023, they announced that EV sales shares are set to reach 18% this year.[9]

In the CEC staff analysis, the main driver of FCEV adoption is declining fuel prices, but scenarios in which the price of dispensed hydrogen fuel declines to and stays at $5/kg or $7/kg are likely too unrealistic to form the basis of State policy decisions. It is unclear how the industry could achieve such low prices in the long term, particularly with the expiration of the federal hydrogen production tax credits after 10 years. Meanwhile, the industry will need to incur additional costs to transition from today's polluting hydrogen production methods to zero-emission hydrogen production methods that are consistent with California's climate and air quality policies. Moreover, the current practice for replenishing hydrogen refueling stations relies on tanking compressed hydrogen to the station via diesel truck, undercutting the emissions benefit of displacing fossil fuels with hydrogen. Transporting hydrogen to disparate truck depots or remote refueling stations without adding air pollution would require either the construction of

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[7] For instance, when CARB adopted the first Advanced Clean Cars rule in 2012, it estimated cumulative sales of light-duty FCEVs to reach 56,844 by 2022. In the 2017 midterm review for the rule, CARB estimated that cumulative sales of light-duty FCEVs would reach 35,083 by 2022. CARB, 2017 ZEV Calculator Tool *available at* https://ww2.arb.ca.gov/resources/documents/2017-midterm-review-report. However, just 11,897 light-duty FCEVs were on the road in California at the end of 2022. CEC, Light-Duty Vehicle Population in California, https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/light-duty-vehicle. In its 2022 Advanced Clean Cars II rulemaking, CARB found that California could achieve 100% sales of zero-emission light-duty vehicles with just 2.8% sales of FCEVs. CARB, Final Statement of Reasons for Rulemaking for the Advanced Clean Cars II Regulations, Appendix F at 7 (August 2022).

[8] Hannah Ritche, "Electric Cars are the New Solar: People Will Underestimate How Quickly They Will Take Off" (May 7, 2023) https://www.sustainabilitybynumbers.com/p/ev-iea-projections.

[9] IEA, "Demand for electric cars is booming, with sales expected to leap 35% this year after a record-breaking 2022" (Apr. 26, 2023) https://www.iea.org/news/demand-for-electric-cars-is-booming-with-sales-expected-to-leap-35-this-year-after-a-record-breaking-2022.

pipelines or zero-emission trucks – solutions that are not likely to be utilized in the near term and would put more upward pressure on the final price of the fuel. If CEC is not examining the likelihood or feasibility of the $5/kg or $7/kg fuel price scenarios, it would be essential to clarify that in the IEPR.

In addition, CEC's estimated purchase prices for FCEVs and BEVs appear misaligned with the estimates of other experts. For instance, a recent study by the International Council on Clean Transportation (ICCT) surveyed a body of literature on vehicle price projections and found that BEVs would maintain a price advantage over FCEVs for short-haul and rigid class 8 trucks and that BEVs alone will beat diesel trucks on price in these categories by 2040.[10] The only vehicle category where FCEVs beat BEVs on price by 2040 was long-haul class 8 tractor trucks, and even in that category FCEVs achieved only a slightly advantageous retail price.[11] University of Cambridge professor David Cebon explains why it is difficult to produce FCEVs at lower cost than BEVs: a FCEV has all the components in a BEV (with a smaller battery) plus complicated fuel cell, hydrogen tank, and hydrogen delivery equipment.[12] The most expensive part of a BEV is the battery and the massive ramp-up of BEV manufacturing for the light-duty sector will driving learning curves that bring down costs for all BEVs.[13] At a minimum, CEC should consider a scenario in which the cost curves for FCEVs and BEVs mirror the trends in the literature that ICCT surveyed. The CEC should also thoroughly explain the basis of its vehicle price estimates.

Many independent experts have found that BEVs will be the dominant zero-emission technology in the medium- and heavy-duty sector because of their favorable total cost of ownership (TCO), which accounts for both fuel and vehicle costs and is the main driver of fleet purchase decisions. BEV trucks have a significant TCO advantage over FCEVs, even for long-haul. ICCT finds that:

> [B]attery electric trucks have a lower TCO than hydrogen powered trucks for long-haul applications due to lower fuel costs. This is the case even when accounting for tax credits in the Inflation Reduction Act. With estimated charging costs ranging between $0.15/kWh and $0.30/kWh, green hydrogen fuel prices would need to be in the range of $3.00/kg to $6.50/kg for hydrogen fuel-cell trucks to reach TCO parity with battery electric during the next decade.

[10] Yihao Xie et al, ICCT, Purchase costs of zero-emission trucks in the United States to meet future Phase 3 GHG standards (March 2023) at 16–20, https://theicct.org/wp-content/uploads/2023/03/cost-zero-emission-trucks-us-phase-3-mar23.pdf.
[11] *Id.* at 22 (Fig. 17).
[12] Einride, "The gap will widen", says prof. David Cebon on electric vs hydrogen (March 5, 2023), https://www.einride.tech/insights/prof-david-cebon-on-electric-vs-hydrogen-the-gap-will-widen.
[13] *Id.*

Academics,[14] truck manufacturers,[15] and multiple independent analysts have concluded that battery electric technology is best positioned to decarbonize the vast majority of road-transport, even long-haul trucking.[16] If the IEPR's forecasts for the TCO of FCEVs are unrealistically low, it may inadvertently stall the transition to zero-emission vehicles. Fleet owners may wait for steep declines in hydrogen prices to purchase FCEVs instead of buying lower-cost BEVs, though the CEC's low-cost hydrogen scenarios may never materialize.

Conclusion

Thank you for the opportunity to comment on CEC's analysis of the potential for hydrogen in the power and transportation sectors.

Sincerely,

Sara Gersen
Sasan Saadat
Earthjustice

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[14] *See* Patrick Plötz, *Hydrogen technology is unlikely to play a major role in sustainable road transport*, 5 Nature Elecs. 8 (Jan. 2022), https://www.nature.com/articles/s41928-021-00706-6.
[15] *See* Matthias Grundler and Andreas Kammel, *Why the future of trucks is electric*, TRATON (Apr. 13, 2021), https://traton.com/en/newsroom/current-topics/furture-transport-electric-truck.html.
[16] *See, e.g.*, Amol Phadke et al., *Why Regional and Long-Haul Trucks are Primed for Electrification Now*, Berkeley Lab (Mar. 2021), https://etapublications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf; Transport & Environment, *Why the future of long-haul trucking is electric* (June 18, 2021), https://www.transportenvironment.org/discover/why-the-future-of-long-haul-trucking-is-electric/.